SPREP

South Pacific Regional Environment Programme

Participatory Monitoring and Evaluation in SPBCP Conservation Areas

Workshop Report

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SPBCP

South Pacific Biodiversity
Conservation Programme

Participatory
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in
SPBCP
Conservation Areas

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Contents

Note: Unless indicated otherwise, financial figures quoted in this report are in United States Dollars

Welcome

Mr Don Stewart
Acting Director of SPREP

The Honourable Minister, Mr Tony Patten, representatives of Pacific island countries, Conservation Area Project Managers and Support Officers, distinguished guests.

On behalf of SPREP, I would like to welcome you to this workshop.

SPREP is proud to co-host this workshop, in association with UNDP. We have organised this workshop as part of our strong commitment to building technical and management capacity in the region.

SPREP has been host to the South Pacific Biodiversity Conservation Programme for the past three years. During that time the number of conservation areas receiving support from the programme has grown to 14 projects in 12 Pacific island states, with proposals being developed for another two or three projects.

All of your projects now have Project Preparation Documents (PPDs) and locally based coordinating committees. In every case, your work programmes call for a large number of new activities to be initiated in the near future to address the problems that have been identified during the project planning phase.

You have clearly indicated that you want to help bring about change in your communities. However, bringing about change in attitudes and behaviour, and establishing new income-generating opportunities based on biodiversity resources, are both very difficult tasks. Communities are complex entities, and introducing a new technique into a community can often have unexpected consequences. In addition, the scientific knowledge underlying the sustainable harvesting of many forest and marine products is still in a developmental phase.

It is therefore critical that, before you start to introduce major changes into the communities and the natural systems you are working with, you have a clear understanding of the current state of affairs and of how you will track change as the project unfolds. Your task this week is to work together to gain this understanding.

This workshop brings together a wide range of individuals, with a variety of roles and skills. We have Conservation Area Project Managers, Conservation Area Support Officers, members of conservation area co-ordinating committees, and people who are responsible for developing concept proposals for new conservation area projects. I hope that you use the opportunity provided by this workshop to learn not only from the workshop facilitators, but also from each other.

I am well aware that in Pacific island countries, one person often has to perform many roles. Quite apart from your work in developing and implementing conservation area projects, many of you will have other responsibilities relating to the protection of the environment in your countries.

I hope that as well as gaining the skills and the confidence to develop a monitoring and evaluation system for your conservation area, you are able to apply these new skills in your other areas of responsibility. Effective monitoring and evaluation is critical for the long-term success of any endeavour in the field of conservation and environmental protection.

Finally, I would remind you that the SPBCP is only one part of SPREP. We also have specialists in areas such as Waste Management, Coastal Planning, Environmental Education, GIS systems and Environmental Planning. If you require assistance from any other area of SPREP, please do not hesitate to ask our staff here for assistance in contacting the appropriate member of staff.

I would like to take this opportunity to wish you a successful workshop, and a pleasant and enjoyable stay in Western Samoa.

Opening Address

The Hon Tuala Sale Tagaloa Kerslake

Minister for Lands, Surveys and the Environment
Government of Western Samoa

Talofa!

Mr Tony Patten, Resident Representative of UNDP, Mr Don Stewart, Acting Director of SPREP, representatives of Pacific island countries, Conservation Area Support Officers from Conservation Area projects throughout the region, distinguished guests.

On behalf of the government of Western Samoa, I would like to welcome you to our country. I thank you for the opportunity to address this workshop.

When teachers are trying to explain why it is important to protect the environment, they often ask their pupils to imagine that they are living on an island. This is because when you live on an island, it is immediately clear how much you depend on the services which the environment provides.

We all live on islands, and our people know that they need the clean water, the soil protection, the fish and other marine resources, and the food, timber and medicines which the forests provide.

Furthermore, because in most Pacific island countries local communities have the right to manage their land and marine resources, people know that it is their responsibility, and nobody else's, to protect their environment.

This is the basic principle upon which the South Pacific Biodiversity Conservation Programme (SPBCP) is founded; that the most effective way to protect important natural areas is to assist local communities to effectively plan and manage such areas.

All of you are actively engaged in such work. All day, every day, you are immersed in the detail of implementing the detailed plans which have been agreed upon for the protection of the important natural areas under your care.

But it is vital to stand back at regular intervals and ask yourselves whether your hard work is producing the intended results. If not, then you must do things differently, and keep changing until you find the most effective strategy for achieving your goal.

Tracking change in complex communities, whether it is social change or biological change, is not a simple task. That is why you are here this week; to learn how to monitor and evaluate the changes that occur as a result of the activities you undertake on a day-to-day basis. I wish you the best of luck with this challenging task.

I am pleased that you have chosen Western Samoa as the venue for your workshop. Western Samoa has considerable experience in the development of community-based conservation areas. My department is responsible for one such area, the Sa'anapu/Sataoa conservation area on the south coast of Upolu.

Other areas, both on Upolu and on the big island of Savaii, are managed with the assistance of one of our NGOs, the O Le Siosiomaga Society. In addition, the Fisheries Department is assisting communities in the Aleipata area to develop and manage a marine conservation area.

Representatives from each of these organisations are participating in this workshop. I am sure that they will be happy to provide you with information on the challenges and the successes of conservation area management in our country.

I wish you well with your work, both here in Western Samoa and after your return to your home countries. I hope that your stay in Western Samoa is enjoyable, and that you find the time to appreciate the beauty of our country and the traditional friendliness of the Samoan people.

It is therefore with great pleasure that I declare this workshop open.

Acronyms

AMCA	Arnavon Marine Conservation Area
BACI	Before/After, Control/Impact
CA	Conservation Area
CACC	Conservation Area Co-ordinating Committee
CAP	Conservation Area Project
CPUE	Catch per unit effort
CASO	Conservation Area Support Officer
EIA	Environmental Impact Assessment
ENSO	El Niño–Southern Oscillation
FSM	Federated States of Micronesia
GEF	Global Environment Facility
IOC	Intergovernmental Oceanographic Commission
IUCN	World Conservation Union
MOU	Memorandum of Understanding
NGO	Non-governmental Organisation
PPD	Project Preparation Document
PRA	Participatory Rural Appraisal
SPBCP	South Pacific Biodiversity Conservation Programme
SPREP	South Pacific Regional Environment Programme
TNC	The Nature Conservancy
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WMO	World Meteorological Organization

1. The South Pacific Biodiversity Conservation Programme (SPBCP)

The South Pacific Biodiversity Conservation Programme (SPBCP) is a five-year endeavour to identify, establish, and initially manage a series of large, diverse "conservation areas" containing ecologically important features of biodiversity conservation. The SPBCP is funded by the Global Environment Facility (GEF) and is executed by the South Pacific Regional Environment Programme (SPREP).

The overall aim of the SPBCP is to facilitate efforts by the local communities and governments to preserve the biological diversity of the South Pacific for the benefit of the peoples of the region and the world, for now and the future.

The guiding objective of the SPBCP is "to develop strategies for the conservation of biodiversity by means of the sustainable use of biological resources by the people of the South Pacific".

Its more specific objectives are to:

1. Facilitate establishment of conservation areas that protect biodiversity, demonstrate ecologically sustainable development through management by local communities, NGOs and government agencies.
2. Protect threatened and/or endangered terrestrial and marine species in the Pacific region.
3. Identify new areas important for conservation of biodiversity.
4. Improve regional awareness of the importance and means of conserving biological diversity.
5. Improve capacities and working relationships between different sectors and agencies contributing to the conservation of biodiversity.

Implementation of the SPBCP commenced in 1993. There are now 14 Conservation Area projects in 11 South Pacific countries, from Palau to the Cook Islands. The Conservation Areas range from small mountainous forest patches to extensive areas of lowland forests and coral atoll systems. The projects are as detailed on the following page:

Conservation Areas are managed by Conservation Area Coordinating Committees, or CACCs, comprised of representatives of the local community and appropriate government and non-governmental organisations. Each CACC is serviced by a Conservation Area Support Officer (CASO), who is responsible for providing advice and assistance to the community.

Network of terrestrial and marine Conservation Areas (CAs) being established under the South Pacific Biodiversity Conservation Programme (SPBCP)

CONSERVATION AREA	COUNTRY	AREA	LEAD AGENCY
Takitumu	Cook Islands	155 ha	Ministry of Works, Environment and Physical Planning
Uafato	Samoa	1400 ha (terrestrial area only)	O Le Siosiomaga (a Samoan NGO)
Ngaremaduu Bay	Palau	At least 859 ha	Division of Conservation and Entomology, Bureau of Natural Resources and Development
Funafuti	Tuvalu	4000 ha	Environment Unit, Ministry of Natural Resources
Arnavon Islands	Solomon Islands	8270 ha (incl 3100 ha core conservation area)	Environment and Conservation Division, Ministry of Forestry, Environment and Conservation
Ha'apai	Tonga	10,000 sq km	Land and Environmental Planning Unit, Ministry of Lands, Survey and Natural Resources
Utwa/Walung	FSM	n/a; Utwa-Walung Channel extends for more than 8.1 km in length	Division of Tourism, Department of Commerce and Industry
Komarindi	Solomon Islands	19,300 ha	Environment and Conservation Division, Ministry of Forestry, Environment and Conservation
Vatthe	Vanuatu	approx 2276 ha	Environment Unit, Ministry of Home Affairs
Koroyanitu	Fiji	2984 ha (core); potentially may be extended to cover 19,000 ha	Land Use Planning Section, Native Land Trust Board
Sa'anapu/Sataoa	Samoa	75 ha (core); potentially may be extended to cover 12,000 ha	Division of Environment and Conservation, Department of Lands, Surveys and Environment
Pohnpei	FSM	10,600 ha	Department of Resource Management
Huvalu Forest	Niue	5400 ha	Environment Unit, Community Affairs Department
North Tarawa	Kiribati	2150 ha (terrestrial area) plus 3500 ha (marine area)	Ministry of Natural Resources

2. The SPBCP Participatory Monitoring and Evaluation Workshop

The first phase of the South Pacific Biodiversity Conservation Programme (SPBCP) has concentrated on establishing management frameworks and developing Conservation Area Project Preparation Documents (PPDs) for individual conservation areas. This phase has now been completed in most Conservation Areas.

The SPBCP is moving into the second phase, during which it is expected that activities related to biodiversity conservation, sustainable resource management, income generation and other project objectives will be implemented. In order to assess progress towards achievement of these project objectives, and to give feedback to refine project management, it is considered important that monitoring and evaluation systems be developed as soon as possible for each Conservation Area.

The initiative for the holding of this workshop came from the SPBCP Technical Management Advisory Group (TMAG). The 1995 TMAG meeting recommended that a process be developed for the systematic collection of baseline data in Conservation Areas, as a basis for the ongoing monitoring and evaluation of the programme. It suggested that a regional workshop should be organised to cover the technical and community aspects of biodiversity survey, monitoring and evaluation.

The issue of monitoring was raised again at the TMAG meeting in 1996, where it was noted that the development of "indicators of success" was a matter of urgency, both to assist donors to assess the overall effectiveness of the SPBCP in conserving biodiversity and to allow local communities to monitor the success or otherwise of their local project.

Accordingly, it was decided to hold a workshop on Participatory Monitoring and Evaluation in SPBCP Conservation Areas. The workshop was held in Apia, Western Samoa, from Monday 2 December to Thursday 5 December. The primary objective of the workshop was to provide key people involved with the management of SPBCP Conservation Areas in Pacific island countries with the knowledge and skills necessary to design and implement participatory monitoring systems for such areas.

There were 24 participants from 13 Pacific island countries, most of whom are actively involved in the management of community-based conservation areas supported by the SPBCP. Participants at the workshop included 13 Conservation Area Support Officers (CASOs), three project managers, two members of Conservation Area Coordinating Committees (CACCs) and two representatives from countries which are looking at the possibility of establishing an SPBCP project. The full list of participants is included as Annex 2.

A questionnaire distributed at the outset of the workshop found that few participants had any experience of monitoring and evaluation, and that few projects currently undertake such activities. However, virtually all participants planned to both develop a monitoring and evaluation system for their project area, and implement this system, in the coming twelve months.

The primary facilitators were Sanghamitra (Sango) Mahanty of Canberra (Australia) and Tony Whitaker of Motueka (New Zealand). Special presentations were made by Etuati Ropeti, Senior Fisheries Officer with the Western Samoa Fisheries Division; James Aston, Coastal Management Officer with the South Pacific Regional Environment Programme (SPREP); and Sue Miller, SPREP's Species Conservation Officer. The workshop organiser was Michael McGrath, Programme Officer (Socio-economics), SPBCP.

The workshop sought to cover the following matters:

- the general principles underlying monitoring and evaluation;
- matters specific to either biophysical or socio-economic monitoring; and
- monitoring and evaluation techniques which are suitable for application in community-based conservation projects in the South Pacific.

Throughout the workshop there was a strong emphasis on community involvement. The classical approach towards monitoring and evaluation (M&E), where technical staff are the dominant actors and resource users (local communities) are largely excluded from the process, has often been found to be ineffective. The SPBCP has therefore chosen to emphasise a methodology known as Participatory M&E, where Conservation Area communities are involved in all aspects of monitoring.

Community participation in M&E gives communities the knowledge which they need to manage projects in accordance with their own objectives. It puts knowledge into the hands of those who are in the best position to utilise it, and thus maximises the chance of a quick and effective response to any issue of concern.

Opportunities for practical application of methodologies for biophysical monitoring during the workshop were limited both by the relatively brief duration of the workshop (4 days), and by the difficulty of covering in a single workshop the range of techniques relevant to the wide diversity of environmental and social conditions found in the 13 countries concerned. Practical exercises for the socio-economic monitoring methodologies taught at the workshop were made difficult by the fact that the only lingua franca amongst the participants was English, a language which is not uniformly understood in rural villages in the host country for the workshop (Western Samoa). Nevertheless, some practical exercises were included in the workshop.

The detailed workshop programme is included as Annex 1.

3. Basic Principles of Participatory Monitoring

Michael McGrath
Programme Officer (Socio-economics), (SPBCP)

3.1 What is monitoring?

There are many complicated definitions of monitoring. However, in essence it is just systematically observing and recording change over time, for a purpose.

Monitoring can be very informal, or very formal. It can range from simple observation of a particular feature at irregular intervals, to formal, scientifically designed surveys carried out on a regular basis. In general, the more carefully you plan monitoring activities, and the more strictly you adhere to the monitoring plan, the more reliable the information you will obtain.

However, there is absolutely no point whatsoever in gathering information that you cannot use. What, when and how you monitor, and who does the monitoring depends entirely on your purpose.

Casual observation is different from monitoring. It is the difference between seeing and looking. The difference is that monitoring always has a purpose. If you aren't looking for the answer to a question, then you are not monitoring.

The question may be as simple as "is anything changing?"; it may be as specific as "is leachate from the tourist bungalow toilet causing change in the benthic community of the adjacent watercourse?". But the person setting up a monitoring programme has a question in mind; they are there to get some answers.

By contrast, the casual observer has no idea what to look for; he or she is just randomly recording information for no purpose.

In Conservation Area projects, we do two types of data gathering that could be classified as monitoring:

1. Ideally, we monitor the situation in a Conservation Area prior to the commencement of project activities. (This is often referred to as the survey or investigation phase of project development.)

   This monitoring will tell us the answers to questions such as:

   - What is the "baseline" or "normal" situation, against which we will measure the success of our project? e.g. The Conservation Area contains populations of a rare species of tree, slowly recovering from a catastrophic cyclone.
   - What are the problems we will have to address in our project? e.g. There is low but constant logging of this rare species for manufacture of handicrafts, plus infrequent higher-volume logging for the furniture industry in the distant capital city; taken together, this logging is in excess of the sustainable yield.
   - What opportunities present themselves? e.g. Craftsmen in the Conservation Area are concerned about the possible loss of the species; in addition one church is particularly strong on conservation.
   - What factors will we have to take into account in developing these opportunities? e.g. Fishermen in the village have no source of income during the cyclone season, and look to logging of the rare tree species to survive through this difficult time. There is also increasing pressure on village families to obtain cash to pay for previously free services such as education and health.

2. Once project activities are underway, we need to monitor:
   - if project activities are being implemented in accordance with the plan;
   - if the objectives set out in the plan are being achieved; and
   - if there are any adverse impacts as a result of the implementation of project activities.

Let's look at an example:

The Conservation Area Coordinating Committee (CACC) bans the harvest of mangroves, and proposes canoe-based ecotourism and intensive horticulture adjacent to the mangroves as alternative sources of income. Under the project plan, the activities to be undertaken include conservation patrols by wardens, the establishment of a community credit fund, and training of tourist guides and farmers.

In this situation, monitoring questions we could ask are:

To monitor implementation of activities

- Are patrols occurring; are infringements being dealt with swiftly and fairly?
- Is credit going to financially sound ventures; are loans repaid promptly?

- How many people are trained; how many trainees subsequently successfully take up the new activity?

To monitor achievement of objectives

- Is the area of mangroves stable or increasing?
- Is the catch/unit effort for mangrove crabs stable or increasing?
- Is significant mangrove recruitment occurring?

To monitor unintended impacts

- Are toxic chemicals from the horticulture plot leaching into the mangrove forest?
- Are fishermen using the canoes they built with project funds for eco-tourism purposes to get out to the turtle nesting grounds on an off-shore island?
- Has the experience of rebuilding canoes in a traditional manner led to a revival of interest in tradition, and thus greater respect for traditional conservation restrictions?

3.2 Why monitor?

You may sometimes be tempted to ask yourself, why bother monitoring?

You have limited time, the local people have limited time, you both have limited resources. There is enormous pressure on you, from the local people and from your project manager, to produce real change out in the field. You know that badly planned and poorly implemented monitoring is worse than none at all. You may ask, "why waste energy on monitoring, when I could be doing practical things?"

Why not just implement the activities as set out in the Project Preparation Document (PPD)? After all, a lot of hard work and expert advice went into the writing of the PPD. Can't we assume that implementation of the project activities as set out in the PPD will produce a good outcome?

No, we can't manage "by the book", however good the book is. Why? Because the PPD can only be a theory, a "best guess" as to the solution to the problems that have been identified during the planning phase of the project.

For example, an SPBCP Conservation Area PPD may propose that awareness activities be carried out in an effort to protect a community or species that is being over-exploited. The assumptions that underlie this proposal include the following:

- *if* we conduct awareness activities, people's knowledge will increase;
- *if* their knowledge increases, their attitudes will change;
- *if* their attitudes change, so will their behaviour;
- *if* people have other sources of income, and *if* the additional income gets to the people who were responsible for the over-exploitation of the threatened community or species, people will reduce their level of harvesting in the conservation area; and
- *if* they reduce their level of harvesting, then the depleted population concerned will recover.

The first four of these are assumptions about the social system; the final one is an assumption about the biological system.

To know whether our objective of protecting the population was being achieved, you would have to monitor key features of the population (number of individuals, recruitment rate, morbidity, etc.). And you need to know while the project is still under way; it is not much use finding out only after the project is completed that you have failed to achieve your objective!

If your monitoring indicates that you are not achieving change as fast as you had hoped, then you can choose to either modify your strategy or set more realistic objectives. Essentially, monitoring gives you the power to continuously improve your project as you implement it.

You may be satisfied if you know that you have achieved your objective. However, if you or your agency wants to use the project as a model for other similar areas, you may want to know why you have achieved your objective.

To be able to make a case for the proposition that project activities were at least partly responsible for the protection of the threatened population, you need to monitor outside the project area as well as inside it. And to have any confidence that it was the awareness activities that resulted in the improved protection of the threatened population, you need to monitor most, if not all, of the factors referred to above (changes in attitudes, changes in behaviour, changes in community income, beneficiaries of any increased community income and changes in the threatened population).

There are a few other reasons for monitoring. They are perhaps not quite as important to the person in the field, but they are important.

- If you monitor, and you feed the results back to the community, it will almost certainly increase their commitment to the project. The people who were enthusiasts all along will be buoyed up, and will promote the project to others. The skeptics will be forced into retreat, and may even be converted. Nothing gives a flagging project a boost more than clear evidence of positive results.

- If you monitor, in an open and transparent manner, you will have evidence that you can present to your government or a donor to show that you can achieve results. That will obviously help you when you seek additional funds, whether for this project or any other project your agency puts forward.

3.3 What should you monitor?

It may seem strange, after the lengthy exposition on the importance of monitoring above, but I would recommend that you monitor as little as possible!

Monitoring costs time, your time and the time of the local community, and money. You often need to gather data for quite a long period before you get any useful information.

There is a high drop-out rate amongst monitoring programmes. In one New Zealand study, 45% of monitoring programmes were not completed. In other words, more than 45% of the effort expended on monitoring was wasted.

You should monitor the minimum number of things that, after receiving the best advice from experts in the field, you think will be sufficient to provide the information that you need.

If you try and monitor everything, you will fail. Neither you nor the community will be able to maintain the effort. Furthermore, if you monitor too many things, you will have so much data that you don't know where to begin analysing it.

In general, the best things or activities to monitor are those that are strongly *indicative*, *causal* and/ or *consequential*.

- *Indicative* things or activities are those that will warn of or easily show changes occurring on a broader scale (e.g. consumption of tinned food indicates rising income, number of sightings of a rare bird suggests the recovery of population numbers)
- *Causal* things or activities are those which are likely to lead directly to significant changes (e.g. an increase in the number of tourists visiting a Conservation Area is likely to result in an increase in gross takings by a local tourism venture, granting of additional logging licenses is likely to result in increased clearance of rainforest)
- *Consequential* activities or things are changes occurring as a result of an event or management intervention (e.g. an increase in the numbers of farmers adopting new agroforestry techniques suggests that an extension programme has been successful; an increase in the area of regenerating forest suggests either an increase in shifting cultivation or an increase in logging activity).

3.4 How should you monitor?

Sango Mahanty and Tony Whitaker cover this in more details in their papers. However, despite the variability in situations, and the consequent variability in monitoring questions, there are a few basic principles to follow:

1. Inform yourself as fully as possible before you start. Don't forget the importance of retrospective data (information about changes that have already occurred). Older members of the community can be an excellent source of information on this. Consider *all* sources of information, not just those within your departmental records.
2. *THINK!* Discuss, argue and revise. Seek expert opinions on such matters as:
   - the necessity to monitor areas outside your project area (control areas);
   - frequency of monitoring;
   - sample sizes;
   - the necessity for randomisation;
   - the degree of accuracy that is necessary;
   - appropriate methods of analysis; and
   - interpretation of results.
3. Pilot test your methodology before you apply it throughout your project area.
4. Document your methodology.
5. Be consistent. The same methodology should be rigorously applied throughout the study. Observers should be reliable, so that personal bias, motivation, attitude or circumstances does not affect data collection. If possible, it is also best to use the same observer or observers throughout the monitoring programme, to avoid the very real problem caused by between-observer bias. If you can't use the same observers, you need to have a standard training programme for all observers, in an effort to ensure that each observer applies the methodology consistently.
6. Store your data securely.
7. Ensure that the local community is involved in every aspect of monitoring design and implementation.

3.5 Participation

Participation is so central to the monitoring of community-based conservation projects that it is worth going over it in some detail.

Participation means many things to many people. The need for local participation can mean that local people must:

- contribute to the project (in cash or in kind);
- be aware of the project;
- understand the nature and purpose of the project;
- agree with the project; and/or
- share responsibility for project decision-making.

Each definition is valid. Even a local contribution in money or labour is better than no participation at all.

However, in the SPBCP we use "participatory" to mean that local people must be involved in making the decisions.

This means that local people must understand the factors affecting the decision; they must have an opportunity to express their views and an opportunity to hear the views of others; and there must be a real preparedness on the part of others involved in the decision-making process to modify their stance based on the views of the local people.

To give an example:

In a particular project area, deforestation and erosion is a concern on strongly sloping hills. Farmers are offered assistance with developing intensive agriculture on the lower slopes, if they cease shifting cultivation on the higher slopes. The upper slopes are to be reforested by farmers.

There are many options as to how much local participation could be provided in this project.

Four possible options follow:

1. Farmers are told what to plant and where. They are required to plant timber tree species on upper slopes, distant from their houses. They participate by contributing their labour.
2. Farmers are given the choice of where to plant. They choose locations closer to their houses. They are allowed to choose what species of timber tree to plant. However, they are still required to plant timber trees.
3. Farmers are told that the only important thing is to plant trees. They choose a mix of timber trees and fruit trees, and agree to pay a portion of the cost of the fruit trees.
4. Farmers are told that the objective of the project is to protect soil, and are asked to help design projects to achieve that objective. They choose a mix of orchards close to the house, small woodlots a bit further away, and grazing with shelter belts on the hills. Farmers contribute 50% of the cost of fruit trees; the cost of shelterbelts and improved grasses are paid for by a livestock rolling fund established by the project.

3.6 Why is participation important?

There are at least three major reasons for facilitating and encouraging participation.

1. Because people have the right to be actively involved in decisions affecting them. In any country, governments sometimes must override the wishes of individuals for the greater good. Even when providing some benefit to the community requires that the rights of an individual be adversely affected, the persons affected have the right to know why and what the alternatives were. But there are usually a number of alternatives available. In Pacific island countries, local communities often own the land, and thus have the legal right to be actively involved in any decision about the use of resources. However, even where local communities don't have the legal right (as is the case with marine resources in Tonga), they have a moral right.
2. Because, without a substantial ongoing source of funds, you have almost no chance of long-term sustainability without full community participation. Everything requires maintenance — aid posts, walking tracks, fish processing plants, tourist lodges. *No real commitment usually means no maintenance, which means the failure of the venture and a waste of time and money.*
3. Because, without real participation, you will probably either badly design or badly implement the project. It is almost impossible for an outsider to completely understand the complexity of a community's relationship with the environment as well as a local person can.

You need their help in analysing the problem, in finding the solution, in implementing the solution and in modifying the plan in response to changed circumstances.

Consider a hypothetical marine example:

A marine environment is degraded by reef gleaners from a nearby city, working for restaurants. The project wants the community to reassert control over their resources, and thus allow the environment to recover. The project design calls for the promotion of community awareness of the importance of the marine conservation through the establishment of clam circles.

However, this particular community no longer depends on the harvest of marine resources for subsistence; it is now primarily a cash economy. As a result, few in the village are interested in the clam circles. The clams are stolen by people from the nearby village to sell in the market; local people do not do anything to stop their neighbours from taking the clams.

If the people had been offered the chance to help design the project, perhaps they would have pushed for help with setting up an ecotourism venture, including a small marine reserve, guide training and minimal facilities. This could have been just as effective a way of educating the community about the value of the marine environment, and is likely to have been more successful in this case.

3.7 Participatory monitoring and evaluation

So what is the benefit of having community participation in monitoring?

It is easy to see that communities need to be involved in defining problems and finding solutions. However, you may think that technical things like monitoring are better left to experts.

It is important to be practical here. Unless you have an enormous budget for employing consultants on a long term basis, you are going to be reliant upon the community for help in implementing any monitoring programme. The community is not going to help, over the long term, unless its members are convinced that the monitoring is a worthwhile investment of their time.

The second consideration is that our project is not going to involve activities which are divorced from the life of the community, like an experimental plot in an agricultural demonstration farm. Inevitably, we will be undertaking activities that affect some aspect or other of the everyday life of the community.

We may be seeking to promote recovery of the marine environment through modifying fishing practices, or introduce a new income-generating activity. Whether we are monitoring the recovery of a fish stock following the imposition of restrictions on fishing, or changes in income, we are going to be monitoring people, their activities and their impacts on the environment in a small community. Even a tolerant community is unlikely to stand being treated as experimental subjects for long. They will demand to know what is going on, what the results are and what they mean.

Finally, with real community involvement in monitoring, so long as you have done your training well, you are going to get much better monitoring. The people whose activities are being monitored are less likely to want to falsify results if they know and support the purpose of monitoring. Local monitors can supply ancillary information which supports the formal results or highlights deficiencies in the methodology or data analysis.

It is important to acknowledge that there is a down-side to involving local communities in monitoring. Local people may have limited knowledge, especially of scientific methodology. They may not share our enthusiasm for quantitative data, or accuracy. They may be too embarrassed or afraid to pursue certain lines of inquiry, or may even falsify data to avoid causing offence.

However, all these problems can be minimised by training and follow-up supervision and support. Indeed, community participation in monitoring can be used as a means of transferring certain skills to a local community.

3.8 At what stage do we involve a local community in monitoring?

Local communities need to be involved at every stage of the design and implementation of a monitoring programme. These stages include:

- collection of baseline data;
- framing of questions or issues to be addressed;
- deciding what to monitor;
- development of the methodology (local people even have to be involved in decisions about the frequency of monitoring, accuracy vs. sample size, etc. This will help them to understand why they need to check the same things so often, and why it is important to apply the methodology strictly);
- implementation of the chosen monitoring programme;
- recording of data (preferably using community logbooks, notebooks, diaries, etc.)
- data analysis; and
- presentation of data to adjacent communities government agencies, donors or other outside bodies.

4. Participatory Socio-Economic Monitoring and Evaluation

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4.1 Introduction

Monitoring and evaluation (M&E) provide a tool to help with project management. By keeping a check on how a project is affecting communities, the project can be improved in design; its implementation can be carried out more smoothly, as problem areas are identified quickly and strategies can be developed to address them; and communities' needs can be better met. This ultimately leads to a more sustainable project. This is perhaps why more and more donor agencies are making socio-economic monitoring a requirement in the projects they fund.

The nature of participatory M&E makes a "recipe" approach to developing a monitoring programme inappropriate. This paper and presentation will aim to highlight issues, questions and methods that may be relevant to the projects being developed under SPBCP. Working through these questions will help to design monitoring programmes for specific projects.

4.2 Principles of participatory M&E

4.2.1 Monitoring and Evaluation: some key concepts and examples

Monitoring and evaluation are a kind of social impact assessment: they aim to assess the likely effects of projects and policies on people. A major aim is to provide information and analysis for better decision-making on development options. A participatory approach to monitoring and evaluation involves communities in collecting and analysing information on socio-economic impacts; it empowers them to take an active part in project related decision-making.

Why monitoring and evaluation?

The uses of impact assessment, monitoring and evaluation might be different at different stages in a project: from early in the process of formulating the project, during project implementation, and when outside funding for a project is winding down.

Impact assessment

At the outset of a project, we may try and predict the likely impacts the project will have on communities, as a means of improving project design. This is the predictive part of social impact assessment: we are aiming in this process to try and anticipate positive and negative impacts on communities so that the project design can take these into account. The project can try to maximise positive impacts and minimise negative ones.

For example, community meetings and surveys (as in the Arnavon case) helped to document which resources were important to communities in the Arnavon area. This could then be used in developing the management plan for the area — community use of certain resources has been maintained in the Conservation Area. The initial impact assessment also helped to highlight the economic importance of the Arnavon area to local communities. The development of income-generating opportunities in the form of fisheries centres is an important means of providing alternatives to overexploiting resources in the conservation area.

Monitoring

Monitoring generally takes place during project implementation. Monitoring can cover things like:

- whether project implementation is proceeding as planned;
- whether the original objectives of the project are being met; and
- what sorts of impacts the project is having on the community.

In the socio-economic realm, the focus is particularly on critical aspects of the social and economic life of the community (discussed further in Section 4.4).

Monitoring during project implementation can help with project management in many ways:

- Problems or concerns with the project can be highlighted early e.g. unequal distribution of project benefits, project related disputes arising from the level of participation and power of specific groups. This allows project managers and the community to adjust the project to address these concerns.
- Depending on how monitoring is conducted, it can raise community awareness of the project

and its goals and facilitate better participation by the community in the project. This is particularly true of a participatory monitoring programme.

Evaluation

The focus of evaluation is a bit broader than monitoring: it assesses the overall effectiveness, impact, and sustainability of the project, and the relevance of its objectives. Evaluation can be conducted during project implementation but is more often done at completion or as outside assistance for the project is winding down. In the case of SPBCP projects, which are generally quite long-term, it may be more appropriate to nominate a time after which a detailed evaluation can take place. This is what is being done in the case of the Arnavon project — an evaluation will be done in three years time.

Monitoring is most useful for project management if it is an ongoing process rather than a one-off effort. This allows constant feedback between project staff and the broader community, and can build a better partnership for the project. Community participation can help to make monitoring an ongoing process.

4.2.2 Community participation in monitoring and evaluation

What is community participation?

Most SPBCP projects would be participatory in nature. It is useful to reflect on what we mean by participation, and how this affects our approach to monitoring and evaluation. Community participation has been defined as:

> *A process through which stakeholders influence and share control over development initiatives and the decisions and resources which affect them. (World Bank Participation Sourcebook)*

In practice community participation can happen in different ways and to different extents. The range of participatory approaches can be seen as a continuum, with a high degree of community autonomy and ownership on one side and little control on the other.

collective action/	cooperation/	"outsider" control/
self determination	joint management	token representation

In reality, most SPBCP projects would probably fall somewhere in the middle, or hopefully closer to the left than the right hand side of this spectrum. It might also be possible that a project starts off with a joint management approach and gradually shifts to greater community control in the long term.

How does community participation fit in with monitoring and evaluation?

A participatory approach to monitoring has many benefits:

- people have a lot of knowledge and inside information on how things operate in their communities;
- it enables communities to participate more effectively in project decision-making, giving them opportunities to raise any concerns or ideas, as well as giving the community information on positive and negative impacts of the project;
- the community can check and verify monitoring data, so that monitoring produces a clearer and more accurate picture of social impacts;
- it raises community awareness of the project;
- it supports and builds community skills.

At the same time, participation in monitoring generally involves time, training and resources. Like the project itself, participation in monitoring cannot happen unless there is a commitment to putting time and resources into it. Also, it is important to remember that "community politics" can affect how much people are willing to say or to disclose to other members of the community.

The approach taken to community participation in the project as a whole will determine how the community is involved in monitoring and evaluation. The kind of community involvement in a more top-down project and the way in which monitoring data is used will be quite different from a project which is primarily being run by the community.

The kind of approach which is being used in the Arnavon Project fits with a joint management approach to participation. Like the project itself, the monitoring programme is being partly run by project staff and partly by community members. The overall design of the programme has been developed by "outsiders" to the community (project staff, consultants), but the community has been involved in deciding what issues are important and what methods should be used (e.g. annual workshops).

Monitoring is a new concept to most village people, and perhaps even to project staff. And yet, monitoring change in our community is something that most of us do unconsciously. A participatory approach to monitoring means building on skills which communities and project staff already have, while introducing some concepts and methods which can make monitoring easier and more useful to project management. It is important to validate and recognise the knowledge local people have when involving them in a monitoring programme.

4.2.3 What sorts of things do we monitor in participatory socio-economic monitoring?

To answer this question, it is necessary to look at the objectives of the project and its likely impacts. In many of the SPBCP projects there is likely to be some kind of change to a community's resource use patterns, as well as the development of alternative economic options and enterprises. In developing a participatory programme, the concerns of project staff and the community also need to be factored in.

Some areas for socio-economic monitoring in this context might include:

- *social dimension*: is the project changing people's access to necessary services (e.g. education, health), the strength of community support networks and of community institutions and organisations, and the vitality or health of a community in terms of its social and cultural life. For example, a project might affect social cohesion if there is conflict over the management of an enterprise associated with the project.
- *political dimension*: how a project is interacting with the community's internal processes for decision-making, how it is affecting the distribution of power in the community. For example, are some groups in the community more able to have a say in the running of the project than others? It is important to look at why this may be happening and whether any change is necessary in the way the project is being run.
- *economic dimension*: is the project affecting the viability of the local economy, is it affecting the mix of economic activities in the community? For example, does the proposed enterprise compete with existing economic activities like gardening. How is this affecting the community? If some people are getting an increased income from the project's activities, who are they? Which group in the community do they belong to? Are the benefits being evenly distributed?
- *community values*: the project might affect people's ideas about resource management, and about what sorts of things are important to them for income or subsistence. In some cases, for example, an enterprise project might foster more competition for income and resources than is normal in the community. These sorts of values changes can have important ramifications for the community and their culture.
- *cumulative impacts*: the concept of cumulative impacts basically recognises that the impacts of a project do not occur in isolation. Communities have a history, are part of a broader region, and most rural communities today are living in an environment of change. Because of this, it is not always possible to say for certain whether changes to a community are being caused by a particular project or were happening anyway. To help with this, it is important to be aware of what sorts of trends there are in a community at the time the project is going ahead. For example, wealth distribution in the community might already be uneven. The project might amplify such differences, for instance if only people with canoes and outboard motors can participate in a fisheries project. Or it might reduce this by giving more opportunities to less well-off people.

Importance of determining priorities

A lot of potential issues can be covered in a socio-economic monitoring programme. However time, skills and resources are generally limited. It is therefore important to identify a few priority areas which can form the core of monitoring during project implementation. Broader issues might be picked up in a later evaluation, as is going to happen in the Arnavon case. In deciding on which issues to focus on, it is worth thinking about:

- key impact areas for the specific project;
- what information is important in terms of helping with project management during implementation; and
- what sorts of issues the community is concerned about in relation to the project and its possible impacts.

As an example, the village-based monitoring for the Arnavon project will focus on four main areas:

1. community participation and project decision-making — extent of participation by relevant groups in the community (fishermen, women, youth), level of community satisfaction with project-related decision-making.
2. changes to household income and the mix of economic activities — for households directly involved in the project.
3. distribution of economic and any other significant perceived benefits from the project.
4. community values and attitudes to resource conservation and the project.

There are a lot of broader issues which will be picked up in a more detailed evaluation in three years.

4.3 Steps in developing a participatory M&E programme

There are a number of key areas that need to be

considered in developing a monitoring and evaluation programme. Section 1 already discussed where impact assessment and monitoring and evaluation fit in at different stages of project development and implementation. In developing a participatory monitoring programme, it is important to consider these points:

- *identifying monitoring objectives:* apart from the broad aims of monitoring discussed in Section 1, you will need to think about questions like the key issues to be assessed in the monitoring programme. This will be based on the likely impacts of project objectives and activities, and community interests. In the Arnavon case, for example, information from household surveys and meetings held in the communities last year, as well as information needs of project managers, were used in arriving at key issues for the monitoring programme. The monitoring programme will focus on community participation and satisfaction with project decision-making, changes to household income and the mix of economic activities and the distribution of benefits from the project.
- *establishing information needs:* what kind of information can be used to assess change in the key areas? Can such information be readily collected? For example, information needs for the Arnavon monitoring programme relate to who is participating; what kinds of benefits are flowing from the project; who is benefiting; figures for household incomes; and information on how people divide their time between different economic activities.
- *identifying possible data sources and monitoring methods:* how will you collect information on the key monitoring issues? And, importantly, how will the community be involved in this process? Possible information sources include community meetings and workshops; secondary sources like national census information; and other research which has been done in the area and a range of other fieldwork and Participatory Rural Appraisal (PRA) tools which are discussed in Section 4.4.
- *baseline study:* in order to monitor change, it is necessary to have baseline information on the current socio-economic situation in the community. This is basically a "snapshot" of social and economic life in the community today, which provides a benchmark against which change can be assessed. The information covered in a baseline will depend on what sorts of issues have been identified for the monitoring programme, but it is better to look broadly rather than focus too narrowly when doing a baseline study. This provides some flexibility in conducting the monitoring programme in case new and important issues emerge during project implementation.

The Arnavon community baseline study, for instance, covers things like population and migration trends, settlement history and patterns, the physical environment, infrastructure and services, political organisation, social issues (e.g. key community groups, community vitality, health and nutrition, education), economic issues (e.g. main subsistence activities, main income earning activities, what the balance is between these two, wealth distribution in the communities, household expenditure and income needs), and community values. Most SPBCP projects would not cover all of these issues in their baseline study, but it provides an indication of what potentially can be assessed.

- *data collection and interpretation:* how will the information for the monitoring programme be collected? how often? how will it be documented? who will do the collection and the interpretation? are there any issues with confidentiality of information? For example, in the Arnavon project, village-based monitoring teams have been trained. These groups will hold annual workshops in the three project communities; have meetings with some special groups in the community, like women and young people; make general observations on indicators like housing types, what is selling at stores in the village; look through records of the fisheries enterprise; and do follow-up interviews with some individuals and their families. Interpretation of information will generally be by the teams and project staff — well-selected indicators and community discussion of the significance of any observed changes make interpretation easier. However help might be needed occasionally from someone with more experience in social monitoring.
- *communicating monitoring information:* this is an important part of monitoring because this is where the monitoring programme can be useful for project management and the community. Some questions to consider include: how will the information from the monitoring programme be recorded and used? how will it be communicated to communities and project management? what will happen once monitoring information is communicated? For example, in the Arnavon project, monitoring information will be documented in log books held by the village-based monitoring teams. It will be shared with the management committee for the project and with the community at annual workshops.

It is also important to consider what happens with feedback on the project received in the monitoring process. Can the project try to meet community concerns? Are the concerns outside the scope of the project? And if they are outside the scope of the project, are there strategies the community can use to address such concerns?

The kinds of processes described above are not necessarily sequential; many of these questions need to be considered early on in the design of the monitoring programme. They might also be revisited once the monitoring programme is in place.

To give an illustration of how a monitoring programme might look in an SPBCP project, an outline of the approach taken in the Arnavon project is provided below:

- *Initial SIA and findings:* a household survey and community workshops looked at possible impacts on the communities of establishing a conservation area: what the resource trends were; which resources were important to the communities and how; and possible management options for these resources.
- *Baseline study:* this was completed last year, using data from the household survey in 1993, secondary data including census information, information from the Solomon Islands Forest Resource Inventory Project, other research in the area, information collected last year using Rapid Rural Appraisal (RRA) techniques (e.g. focus groups, direct observation) and some PRA techniques (e.g. seasonal calendar, daily calendar).
- *Ongoing monitoring* during project implementation: village based "komiuniti monitoring teams" to collect, interpret and share data through:
- *village observations*: "luk luk" especially on indicators and the village economy;
- *indicators:* for example, housing types, number of canoes and outboard motors, sales in stores;
- *interviews and meetings*: individual interviews, e.g. with people directly participating in project; focus groups with women, community leaders, youth;
- *notebooks*: forms for interviews and meetings, indicators and observations; and
- *presentation:* information presented to management committee.
- *Detailed evaluation:* in three years by a team of community members and experienced advisors to look at the overall effectiveness, relevance and sustainability of the project.

4.4 Tools for M&E

Rapid Rural Appraisal and Participatory Rural Appraisal have developed some tools and methods that are particularly useful for *participatory* monitoring and evaluation. The focus in these methods is on the timeliness and usefulness of information rather than "perfection". A summary of some of the key techniques is provided below.

4.4.1 Core techniques in PRA and RRA

Secondary data review involves reviewing existing data that may have been collected on the relevant communities. This might include national surveys such as, for example, the 1986 Solomon Islands National Census and the 1989 Solomon Islands National Nutrition Survey which were used for the Arnavon project; locally collected data, for example, household surveys, data from local clinics and schools, and prior research in the area, for example, anthropological studies.

Direct observation includes observation of physical objects, events, processes, relationships and people in the community. For example, housing types, attendance at community meetings.

Semi-structured interviews are a commonly used RRA technique. Interviews may be conducted with groups or key informants who have been selected on the basis of particular characteristics. The interview follows an informal format and requires careful facilitation. Some questions may be predetermined, but new lines of questioning usually arise and are pursued during the interview. This can be used to work with particular groups in the community, like women, youth, community leaders, business owners. It allows space for a range of different perspectives to be heard, which may not emerge through conventional surveys or larger village meetings.

Analytical games are common to PRA and RRA particularly in village meetings and workshops. The use of *ranking exercises* is an example of an analytical game where meeting participants are asked to prioritise problems facing the community, or the distribution of wealth in the community. The wealth ranking process has not worked particularly well in the Solomon Islands, but may be useful in more highly stratified cultures.

The use of *stories, portraits and case-studies* in both PRA and RRA helps to draw attention to the ways in which rural people perceive local conditions, problems and opportunities. For example, case studies may be a useful method to analyse economic activity in a few selected households, or to gather data on issues which are difficult to address directly, like whether relationships and networks in the community are being affected by project activities.

The use of *diagrams* to display and share information is central to PRA. Commonly used techniques include transects of watersheds, village or farm maps, seasonal calendars, trend diagrams and timelines or chronologies of events. In a monitoring context, useful techniques may include mapping of village institutions and networks, and seasonal diagrams to look at how activities in the existing village economy are interacting with the activities of a new enterprise.

Finally, *workshops and village meetings* are an important means of bringing people together to gather, discuss and evaluate information. They also provide a forum to work towards consensus on priorities for action. They can be used to discuss the overall approach to monitoring, as well as involving communities in data collection and analysis.

In addition to these techniques, it may be possible to use methods like community-generated indicators (indicators which the community has come up with itself), and mapping land use changes.

4.4.2 Socio-economic indicators

An indicator is an easily identifiable and measurable sign of a broader process or change. For instance, two commonly used socio-economic indicators are life expectancy at birth, and adult literacy rate. These provide information about the level of health and education in a society, and by implication, about the community's development status.

These kinds of very general indicators might provide useful baseline information and background on a community. But in terms of project-related monitoring, such indicators do not provide information about project-induced change. To be useful, indicators used in SPBCP projects need to be:

- relevant to the project, indicating progress towards project objectives;
- relevant to the communities, where a lot of economic activity is informal and unmeasured; and
- appropriate to the skills and resources available for data collection.

It is worth remembering that any indicators used will inevitably have limitations, must be carefully selected and need careful interpretation. Indicator-related data needs to be interpreted in the context of other data that is emerging in the monitoring programme, and preferably discussed with the communities. This provides a check against misinterpretation of indicator-related data.

Examples of some indicators which have been identified for the Arnavon project include:

- *dietary change* as an indicator of changes to the balance between subsistence and cash-generating activities; the baseline data on this was collected from a 24-hr meal recall in the 1993 household survey; and
- *increase in number of outboard motors, canoes, permanent housing* as an indicator of increasing cash flow in community.

In both of these cases it is difficult to tie the indicator specifically to the project, and to say that changes are the direct result of project activities. The causes of change will have to be discussed with the community and their opinions sought.

4.5 Analysing and presenting data

4.5.1 Data analysis and interpretation

In working with monitoring data, it is important to analyse rather than just describe findings, to try and understand the significance of emerging information for the project and the community. There are many tools used in data analysis, but the common thread is that analysis involves looking for trends, patterns, and relationships in data. For example, interview information might reveal that some groups are not participating in a project. To draw this conclusion you will have identified patterns (e.g. identified groups in the community, which ones are participating), trends (whether this has been changing or not) and so on.

Interpretation involves looking at the implications of these trends or patterns. For instance it is important to consider why the pattern might be there, and its implications for the community or the project. This will help to make the monitoring process a useful input to project management and community participation in the project.

If a monitoring programme is designed well, appropriate training provided and data presented in a form which is easily understood, it should be possible for project staff and community members to be involved in analysing and interpreting socio-economic data. There are two basic types of data which might need analysis in socio-economic monitoring programs for SPBCP projects — quantitative data and qualitative data.

- *quantitative* data are numerical measurements of some feature in the community's social and economic life, for example, collated figures from a household survey, how many new permanent houses were built in the last year. When dealing with quantitative data it is important to discuss and think about what the numbers

mean. Only then are the data useful for project management and to the community. For example, to use the housing case, is the number of new houses higher than the usual number that might be built in the community? Is the change related to the project's activities? What are the implications for the community (is this consistent with their aspirations and objectives?);

- *qualitative* data are not numerical, but provide descriptive information about some facet of the community's social and economic life, for example, data obtained in interviews, discussion in a community meeting etc. Qualitative data can be very useful in that they provide more open ended information than can be obtained through indicators and numerical analysis.

Spatial data such as maps and transects can also provide valuable information on resource use patterns.

4.5.2 Being careful about bias

Both kinds of data need to be collected, analysed and presented carefully to minimise bias and provide as accurate a picture as possible. For instance, a household survey might only question men in the household, or the method of selecting households may have been biased towards one area of the village, whether people were at home or not, and so on. Interviews may provide information on the views of a few individuals, but not represent the views of the larger community.

One way of checking on the validity of data is to check information from one source against information from other sources. This is called *triangulation*. For instance, if a person in an interview claims that people in the community are not happy with an aspect of the project, this should be checked in interviews with other people or in community meetings.

Another good way to check the validity of monitoring data is to involve the community in data analysis. This is a strength of participatory monitoring. The community can not only point out if something seems to be wrong in the data collected, but they can also assist in its interpretation.

4.5.3 Data presentation and interpretation

There are many different ways of presenting data; some key concerns are:

- understandable results — easily understandable to the community and to others involved in the project;
- timely results — this should fit in with the timing of important decisions; and
- data should be presented in a form appropriate to the audience, for example, written, oral, visual. It is important to consider the cultural context and the level of literacy of the community.

Quantitative (numerical) information might be collated on summary or tally sheets e.g. information on household income. Qualitative data can also be analysed and summarised in many different ways, for example, interview data might be summarised on sheets to highlight key issues. To involve the community in the interpretation process it can be useful to present data in a partially analysed form.

The process of analysis involves asking questions about:

- What are the patterns and trends in the data? what do these patterns suggest?
- What are some similarities in the data (e.g. between different groups in the community)?
- Is the data truly representative? What might be some other perspectives on the situation?

Community meetings can be a good opportunity for discussing some of these questions.

Most PRA methods involve visual display of information as part of the data collection process, for example, using diagrams, role plays. These are adaptable to the available materials and needs. Other methods include tables, graphs, trend diagrams, and so. These need to be explained so that the key points are easily understood by the audience.

4.5.4 Seeking help when you need it

There may be times when data is difficult to interpret or present. In such cases it may be useful to seek help from appropriately qualified people.

4.6 References

Bowles, R.T., 1981. *Social Impact Assessment in Small Communities: an integrative review of selected literature*. Butterworths: Toronto.

Branch, K., Hooper, D.A., Thompson, J., and Creighton, J., 1984. *Guide to Social Impact Assessment: a framework for assessing social change*. Westview Press: Boulder.

Chambers, R., 1992. *Rural Appraisal: rapid, relaxed and participatory*, Institute of Development Studies Discussion Paper No. 311. University of Sussex: Brighton.

Davis-Case, D., 1989. *Community Forestry: participatory assessment, monitoring and evaluation*. FAO UN: Rome.

Davis-Case, D., 1990. *The Community's Toolbox: the idea, methods and tools for participatory assessment, monitoring and evaluation in community forestry*. FAO UN: Rome.

McCracken, J., Pretty, J.P., and Conway, G.R., 1989. *An Introduction to Rapid Rural Appraisal for Agricultural Development*. International Institute for Environment and Development: London.

Government of Kenya National Environment Secretariat, Egerton University, Clark University and Centre for International Development and Environment of the World Resources Institute, 1991. *Participatory Rural Appraisal Handbook*. Clark University: Worcester, MA.

Odour-Noah, E., Asamba, I., Ford, R., Wichhart, L., and Lelo, F., 1992. *Implementing PRA: a handbook to facilitate participatory rural appraisal*, Program for International Development. Clark University: Worcester, MA.

Ross., H., 1990. "Community social impact assessment: a framework for indigenous peoples", *Environmental Impact Assessment Review*, 1990(10) 185-193.

Russell, D., 1996. "Studying the social dimensions of biodiversity conservation: strategies, approaches, methods and resources", draft for review, Biodiversity Conservation Network.

5. Participatory Biophysical Monitoring and Evaluation

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Biophysical monitoring is the collection of information to determine changes in the environment. It is an integral part of Conservation Area (CA) project design and implementation as it provides the data on which to base management decisions and measures the subsequent effect of those decisions.

5.1 An introduction to participatory biophysical monitoring

5.1.1 What is 'monitoring' — some definitions

Monitoring has been described by one author as the systematic measurement of variables and processes over time in order to ascertain the degree of deviation from some expected condition. There are lots of less technical definitions but, put simply, it is *repeated sampling or assessment to detect changes*. The changes measured can be:

- *normal* — these can be cyclic (such as daily, seasonal, annual variation) or non-cyclic (such as irregular cyclones);
- *abnormal* — these are non-cyclic and result from some unexpected disruption of the ecosystem (e.g. colonisation by introduced predator); and
- *induced* — these are changes that result from some management action or human intervention.

Depending on what is being measured and why, monitoring can be similarly divided into:

- data collection to determine the natural variations occurring in populations and ecosystems when the results are predictable to a degree (e.g. following changes in bird numbers with season) — this seeks abnormal changes to provide *baseline information;*
- data collection when the likely results are not known (e.g. following forest health to detect a problem) — this seeks abnormal changes and is often termed *surveillance;*
- data collection to follow the effect/impact of an event or action where change is expected and for which the outcome is predictable to a degree (e.g. effect of newly-established hunting ban) — this follows induced changes and is *monitoring* in the strictest sense of the word.

Another term to consider is '*survey*'. In practice a survey is indistinguishable from a data collection event for monitoring. Put another way, monitoring is a series of replicated surveys and it is possible to turn what was originally a one-off survey into a monitoring programme by repeating it, preferably on exactly the same site and with the same methodology.

The important components of monitoring are the *magnitude* of the change and the *time interval* over which that change has occurred. However, on their own these are often insufficient and it is necessary to make repeated samplings to determine the *variability* of change and the *rate* of change.

Monitoring requires the establishment of *benchmark* data — usually the results of the first sampling — and assesses change as the departure from or about this benchmark over subsequent samplings. Keep in mind that monitoring can, in some cases, be retrospective. It is sometimes possible to get enough information about a former situation to be able to detect a significant biological change.

The normal variability which occurs in a population or ecosystem is termed *noise*, and abnormal change or variation is termed a signal. Monitoring sets out to detect a *signal* amongst the noise.

Participatory monitoring is when landowners or communities design and implement monitoring projects in relation to their own CAs, perhaps with outside guidance or assistance. This is the best approach to monitoring in CAs because it creates a strong community involvement with the project, it gives a sense of responsibility for the project's success, and it also makes the best use of local knowledge. It may, however, require the development of technical skills for implementing the monitoring methodology, and it does need a level of understanding of the science behind the monitoring. Care will need to be exercised to avoid the universal problem of bias — monitoring of resources by the resource users often results in a lack of objectivity. A further possible drawback for projects requiring repeated sampling and/or sampling over a long period of time is that the initial enthusiasm or willingness may be lost, or people may become unavailable for carrying out the project at critical times.

5.1.2 Why monitor?

With respect to CAs, monitoring can serve several purposes of which the most obvious are to:

- *detect changes* so remedial management actions can be taken if needed (normal changes will not require intervention; abnormal changes may or may not require intervention);
- *measure the success* or otherwise of management actions.

5.1.3 What to monitor?

The selection of appropriate things for monitoring is covered in more detail below. However, in general terms the things or activities that are most useful to monitor are strongly *indicative*, *causal* and/or *consequential*.

- *indicative* things or activities are those which will warn of or easily show changes occurring on a broader scale (e.g. size and composition of hunting harvest);
- *causal* things or activities are those that are likely to lead directly to significant changes (e.g. frequency of hunting);
- *consequential* things or activities are changes occurring as the result of an event or management intervention (e.g. changes in animal populations following hunting ban).

Some things can fall into any or all of these categories depending on the predicted/expected change or situation. For example, increased vine growth could be an indication something has happened within the catchment of the village, or it could lead to changes within the CA, or it could be the consequence of a management action.

5.1.4 Points to keep in mind

It is easy to say monitoring is needed and to start a monitoring programme off; it is a lot more difficult to see it to its conclusion, especially if it is long term. This is because individuals, funding and circumstances can change. For example, one study in New Zealand found that ~45% of botanical monitoring studies were never completed, representing a huge waste of effort and resources. Do not start on something where there might be difficulties in getting it completed — it is better to finish some small and meaningful monitoring project(s) than start on more elaborate schemes that fail.

When undertaking a monitoring programme consistency is essential otherwise analysis and interpretation may be difficult or impossible. The same methodology should be rigorously applied throughout the study, but if it must be changed then it is critical that sufficient overlap is made to enable one method to be calibrated against the next.

It is also preferable to use the same observer(s) throughout the monitoring programme to avoid the very real problems caused by between-observer bias. Observers should also be reliable so that personal bias, motivation, attitude or circumstances does not affect the data collection.

Data collection can be objective (the result of systematic measurement) or subjective (an opinion, impression or feeling), the information gathered can be quantitative (dealing with numbers or quantities) or qualitative (dealing with rank, e.g. better/worse). As a sweeping generalisation, biological monitoring tends to be objective/ quantitative (whereas socio-economic data are often subjective/qualitative).

Quantitative date collected during monitoring programmes can deal either with real numbers or with indices. Real numbers refer to actual areas, densities or whatever; indices reflect real numbers. Both counts and indices allow for valid comparison of one area with another or for detecting changes on the same area over time but frequently indices are easier to obtain. For example, mapping the breeding territories of birds on a study plot would provide a census of birds (accepted error margins) — a real number — but counts of bird calls on the same area would provide only an index of relative abundance without giving a clear idea of how many birds were actually present.

The other important point to consider in data collection is accuracy (how close the data are to the real situation) compared to precision (the variability in the data). The best possible situation is to have accuracy and precision with all data but this is not always easily obtainable.

5.1.5 Steps to developing a monitoring project

- Identify problem or question
- Set goals and objectives
- Select methodology (data collection, storage and analysis)
- Select site
- Field test (pilot study) and refine
- Implement
- Analyse data
- Input to management decisions

Questions to consider in developing a monitoring programme:

What do you want to know and why? Is it really important?

In any monitoring programme it is vital to make sure you have a very clear idea of what you want to know, why you want to know it, and — most importantly — how it will help the project. You must:

- set clear goals and objectives because all other components of a monitoring project are dependent on them;
- make a long-term commitment of labour and resources and they must be used effectively;
- only undertake monitoring if it will provide meaningful and useful information; and
- only undertake monitoring if it is necessary for the project.

Is background information needed?

There is a real need to have good background information on the organism or community about which you seek information. This enables the right questions to be asked, guides the selection of the most appropriate methodology to address these questions, and aids interpretation of the data.

How will data be collected? Over what period? At what frequency? And how will the data be analysed?

Not only is there a huge range of methods available for biophysical monitoring but every situation to be monitored is different. The chosen methodology will nearly always need to be specifically adapted to the project. The methodology must specifically address the questions being asked but beyond that should be as simple, easily repeatable and as standardised as possible. Decisions will need to be made on qualitative versus quantitative data, and between objective and subjective data collection. In most cases it would be wise to seek expert advice to ensure the most appropriate methodology is used.

Before embarking on a monitoring programme it is wise to seek statistical advice on the sample sizes required to detect real differences (power analysis), the sampling frequency, and the need for randomisation. These are all critical to the success of the project. If sample sizes are too small the data are worthless; if they are too large the results will be all right but effort and resources will have been wasted. The big danger with too few samples is that real differences will not be recognised and opportunities for remedial action lost. The sampling frequency is also critical. If sampling is too widely spaced, important changes may be missed or detected too late for remedial action. If it is too frequent, effort and resources will be wasted. When sampling methods are being used for monitoring it is frequently, but not exclusively, necessary to use some form of randomisation to select the samples to avoid the very real risk of introducing the observer's bias to the results. The methods for making random selections vary widely and statistical advice should be sought on the most appropriate randomisation method to use.

Are the chosen methods going to work?

Often it is sensible to run *pilot studies* and/or *sample analyses* to ensure the methodology is capable of providing the answers required. Pilot studies can prove the methodology, and determine sample sizes and sampling frequency. If need be the programme can be refined before it is too far advanced, but once the monitoring is underway it is important that the methodology is not changed or modified unless absolutely necessary and then only after and overlap period that will enable calibration of one method against the other.

Where will the data be collected?

Selection of the study areas, sites or situations for monitoring requires careful thought based on the location and the environment, the questions to be addressed and the methodology to be used. There are no easy answers and each project will be different. When no background or baseline data are available against which to measure change it may be necessary to simultaneously monitor control sites or situations. If controls are used they must be carefully selected to ensure they are providing the correct comparative information.

What to record about the monitoring?

Record your methodology and study sites very carefully. The secret to successful monitoring is to ensure the sampling can be replicated at regular intervals. Every detail of the methodology should be written down in an unambiguous way so it is very clear exactly what was done, when and how.

Control Plots

Often it is difficult or impossible to measure changes or effects of management actions unless an identical monitoring study is done on a site or sites or for parallel situations that have not been subjected to the same influences. These other sites are called 'controls' and they provide the comparative data that shows what the normal results should be. For example, the use of exclosure plots to measure the effect of seed predators on tree regeneration requires that identical studies are done on identical plots at the same place and to which the seed predators still have unrestricted access. Without control plots to provide comparative data it will be impossible to determine the true effect of seed predator removal.

The location of study areas and sites should be described, mapped and marked, and all study transects and plots should be marked with permanent materials.

How will the data be stored and analysed?

Plan data storage and retrieval carefully because data needs to be easy to extract and interpret. Make sure all raw data are kept together and clearly identify for future users just how you have stored the data. Give thought to having duplicate datasets to avoid problems caused by accidental data loss. Think very carefully about how you might analyse your data as this can influence the storage and retrieval. Interim data analysis will not only verify data collection methodology but indicate whether storage and retrieval techniques are appropriate.

5.2 Monitoring biodiversity — principles, processes and problems

Conservation of biodiversity — a central goal of Conservation Areas — is achieved by sustaining the physical and ecological processes that occur in ecosystems. To know whether those processes are being sustained requires some form of biological monitoring.

Biophysical monitoring methodology is so diverse and every situation so different that a recipe book approach will not work. Instead some of the main principles and problems will now be discussed, and examples used to illustrate them.

Biophysical monitoring is used:

- to investigate the biology and ecology of species, ecosystems or processes, and determine the natural variations that occur within them over time;
- to detect changes that require some management action; or
- to measure the performance of management actions.

The first two are *strategic* monitoring and the last is *performance* monitoring. In other words, monitoring either provides baseline ecological data, or it drives management, or it is driven by management.

5.2.1 Understanding natural variations

Monitoring results in recording changes against time. For management it is vital to be able to separate normal variation (noise) from abnormal changes (signals) which may require a response. The normal or natural changes (variations) observed in biology are influenced by a huge variety of factors, the effects of which vary widely depending on whether you are dealing with animals, plants, ecosystems, or whatever. These factors can be:

- cyclic, regular and predictable (e.g. daily, seasonal, annual, tidal);
- non-cyclic, irregular and unpredictable (e.g. normal weather variation, dry/wet years (ENSO);
- catastrophic events (e.g. cyclones, severe floods); or even
- long-term (e.g. climate change).

Amongst other things they can involve changes in:

- occurrence (e.g. life-stages or movements to or from the study area);
- availability for sampling (e.g. conspicuousness or numbers);
- behaviour;
- performance (e.g. growth rates, reproduction).

These factors all interact with each other, making design of monitoring programmes critical and interpretation of results tricky — a background 'noise' against which it becomes a lot more difficult to identify a signal unless the ecology of the species, ecosystems or processes is fully understood.

The effect of natural variations

A simple example of interacting natural variation and how it could affect monitoring results is bird song. The most common way to monitor bird species or populations is to count bird song (5—minute bird counts). However, studies have shown that birds sing more in the morning, and to a lesser extent in the evening, than during the middle part of the day; they sing more in the breeding season than at other times of year; and they sing more in good weather than in bad. Furthermore, some bird species may move regionally or migrate on a seasonal basis, and annual variation in weather patterns will advance or delay breeding. These patterns will be different for different species, and they will vary with altitude and habitat. Unless these patterns are fully understood comparison of bird counts are fraught with problems.

The other component to consider in monitoring when you are recording changes that occur over time is the normal life-cycles and the turnover rates of the organisms or ecosystems of interest. This requires that the time scale selected for monitoring is appropriate to the organism or ecosystem being studied and the expected events that might affect it — and this is where knowledge of basic biology and ecology becomes significant. For example, the sampling frequency for phytoplankton (days) will

be markedly different from that of albatross (years) or trees (decades).

To be able to detect the 'signal' against the background 'noise' requires careful design of the monitoring programme. If the monitoring is surveillance looking for unexpected changes, the ways to do this are either to:

- run the programme for a long time to determine the natural variation (if a change occurs in the early part of the programme it will be difficult to detect); or
- run several controls well beyond the area of potential impact so they will not be influenced by the same factors.

If the monitoring is seeking consequential change resulting from an event or management intervention, the easiest way is to set up control sites at the same time as the study sites and measure the difference between them before and after the treatment or management action. This process is called BACI sampling (**B**efore/**A**fter, **C**ontrol/**I**mpact).

BACI sampling

An example of BACI sampling is the monitoring of a wide variety of organisms and processes prior to and following the removal of Pacific rats (Rattus exulans) from some small islands off the north-east coast of New Zealand. Some of the islands in the Mercury group were inhabited by rats, others had never had rats on them. For several years before the rats were eradicated detailed studies were made of the vegetation, invertebrates and lizards on islands both with rats ('treatment' sites) and without rats ('control' sites). These studies have continued since the rats have been removed and they show clearly the effect the rats were having on the biota in that there has been an unexpectedly rapid response to release from predation and herbivory. For example, one lizard species showed a 30-fold increase in density, a significant increase in body size, and a greatly expanded distribution and habitat use in just 6 years following rat eradication, yet on nearby naturally rat-free islands its situation was completely unchanged. Without the use of rat-free islands as controls, to show what was occurring naturally in the area at the time, it would have been difficult to prove that it was just release from rat predation that caused these changes.

Apart from the changes that occur over time, as discussed above, biological monitoring should also consider the location and size of the sample area. The distribution of organisms and ecosystems is affected by a wide variety of factors such as altitude, aspect, microtopography and so on. Combine these with the distribution and density of individual organisms as determined by their size and behaviour, or of habitat patches or ecosystems, and it is clear that the location of the monitoring effort and the size of the sample area is critical to the success of the programme. For example, it is obviously unrealistic to use the same size study areas to monitor ant populations and landscape changes. A practical example of this is the use of nested plots — plots within plots — to survey the various elements of forest vegetation. This is commonly done by selecting a 20m x 20m plot for the canopy trees, and randomly chosen 5 x 5 m plots for the shrub layer or 1 x 1 m plots for seedlings within it.

A cautionary note: one very important thing to ensure when selecting monitoring methodology (including method, frequency, timing, etc) is that the monitoring itself does not create changes within the study site or population. If counting bats in a small cave causes them to desert their roost site the monitoring is not *measuring* decline but *causing* it. A real example from New Zealand involves small native frogs which live in rocky forest streams. The currently accepted monitoring method of turning stones to find frogs disrupts the habitat and appears to result in significantly lowered recruitment.

5.2.2 Standardisation, precision versus accuracy, consistency

As outlined in the introduction it is important to plan how you will deal with the variables you have identified before starting or very early in the monitoring programme. It is also important to know — preferably from advice from a suitably qualified biometrician — the size and number of samples needed to achieve meaningful results, the frequency of sampling, the need for standardisation to particular dates to allow for varying weather conditions, and the need for randomisation.

Standardisation is important to impose some discipline on the monitoring project but it can also create problems with natural variables. Standardisation to a date for anything less frequent than monthly sampling (which will pick up year-to-year variation) is risky and it is better to standardise to a life-stage. For example, rigorously counting turtle nests on the same date each year is useless if some years the prevailing weather means they do not come ashore until later in the season. Standardisation for particular weather conditions is important in most animal studies because animal

Plot size and sampling frequency

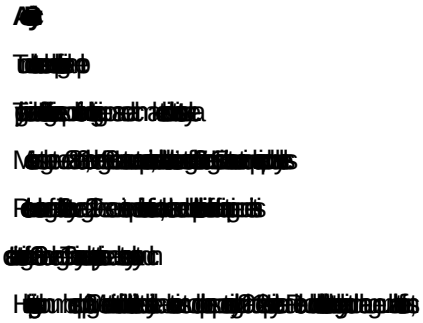
There is a direct relationship between area and time with respect to the size of the study organisms or ecosystems and their life-spans and population burn-over rates, and the size of study area, frequency of sampling, and the duration of the study. In other words the size of the study plot increases with the size of the subject; the frequency of sampling decreases with increasing age of the subject; and the duration of the study increases with increasing turn-over period of the subject. Exactly the same scale can not be applied to plants, animals and ecosystems but the principle holds true for all. This relationship is best illustrated by the following simple examples:

- for a small insect with a short life-span and a high turn-over rate the plots would be small (square metres), the sampling frequent (perhaps weekly) and the study short (perhaps <2 years).
- for a lizard with a moderate life-span and a relatively high turn-over the plots would be moderate (100s m), the sampling frequent (perhaps monthly), and the study short (perhaps <5 years).
- for a large canopy tree sith a long life-span and low turn-over rate the plots would be large (ha), the sampling infrequent (maybe 5 year intervals), and the study long (decades).
- for a large ecosystem/landscape where the turn-over is measured in millennia the study area would be huge (km), the sampling would be very infrequent (decades) and the study long (centuries?).

behaviour, and hence visibility, is strongly weather dependent. For example, the abundant skink fauna on Pacific islands is all but invisible except during bright sunshine so lizard counts in anything but fine, sunny weather would give seriously misleading data.

Selection of an appropriate sampling frequency is critical to the interpretation of the results and, as pointed out above, is related to the life-span and turnover of the subject. Examples of the importance of selecting an appropriate sampling frequency can be drawn from long-term monitoring data on many species. For instance, examination of the population density of possums (*Trichosurus vulpecula*) over a 25 year period in a New Zealand forest revealed wide variation from year to year but overall population stability. By selecting different sampling intervals along this continuous sampling period (say five-yearly) it could be shown that possum numbers had declined steadily or increased steadily, neither of which was true.

Similar patterns have been demonstrated with data on nesting albatrosses and other species, where long-term studies have shown wide variation from year to year. The difference between precision and accuracy, and between subjective/objective and qualitative data was touched on in the introduction



(above). When dealing with real numbers accuracy is important because if individual samples are big enough or there are numerous samples there are analysis methods to overcome lack of precision. On the other hand, if you are dealing with indices, accuracy is less critical for detecting change than precision and consistency.

Subjective, qualitative information can be used in biological monitoring — and sometimes is very useful as an early warning of a problem — but only rarely is it detailed enough to make a robust case that change has occurred. The preference for biological monitoring is for the objective collection of quantitative data and projects of this kind have the added advantage that they are much more

likely to create discipline with data recording, leading in turn to greater precision and accuracy. Motivation and enthusiasm are still issues to be grappled with — data from someone who *has* to collect data are likely to be inferior to that from someone who *wants* to collect data and this is something that organisers of participatory monitoring projects will have to consider. However, it works both ways — over enthusiastic people can be a lot less objective, leading to bias in the data. For example, a study on British butterflies indicated they were exceptionally abundant one year but checking showed this was solely because the observer that season had deviated from the standard transect to visit a patch of better habitat!

When the statistics behind the monitoring call for consistency it is critical that this is adhered to. If, for example, changes in canopy species composition are being recorded in a homogeneous area of forest using 500 random point samples they need not necessarily be the same points each time the area is sampled (for some statistical treatments they should not be the same plots or you get autocorrelation and skew the results). However, if you are re-measuring plots or transects to detect change it is very important that they are permanently marked and their location is described in sufficient detail they can be relocated easily many years later. If you are remeasuring a transect you must not deviate from the route or include individuals just outside the transect area. For example, some New Zealand native frogs live in patchy habitat along rocky, forested streams. In one study the failure to accurately mark the transects used meant that significantly different numbers of frogs were recorded during a subsequent survey, not because the population density had changed but because some areas of prime habitat were not re-examined.

5.2.3 Real numbers and indices

For some species or situations it is possible to deal with *real numbers* — counting the total number of birds or trees in an area, or measuring the total area of rainforest remaining in a CA (there will be a margin or error and this should be determined); for other species or situations a sampling method can be used to derive proportions which allow you to arrive at the same conclusion. For example, from air photos or satellite imagery it is possible to physically measure the number of hectares of rainforest and cleared land in a CA. Alternatively, sampling methods could be used on the same photos or in the field (e.g. transects) to show 25% of the area is forest, therefore the total area of forest remaining is (x). However, for some species or situations it is far more effective to work with *indices* because they are usually easier to obtain and provide an acceptable level of accuracy for comparing one site with another or detecting changes. For example, the number of birds seen and heard per five-minute stationary bird count is the standard method of monitoring bird fauna. It does not give the number of birds present (density) but it does give relative density — an index — which in this case could be the mean number of species or individuals per count.

5.2.4 What to monitor

A biological monitoring project can be directed at:

- single species (e.g. flying fox);
- groups of species or guilds (e.g. rainforest ants, canopy trees);
- habitats/ecosystems (e.g. mangrove forest);
- ecosystem processes (e.g. litter decomposition).

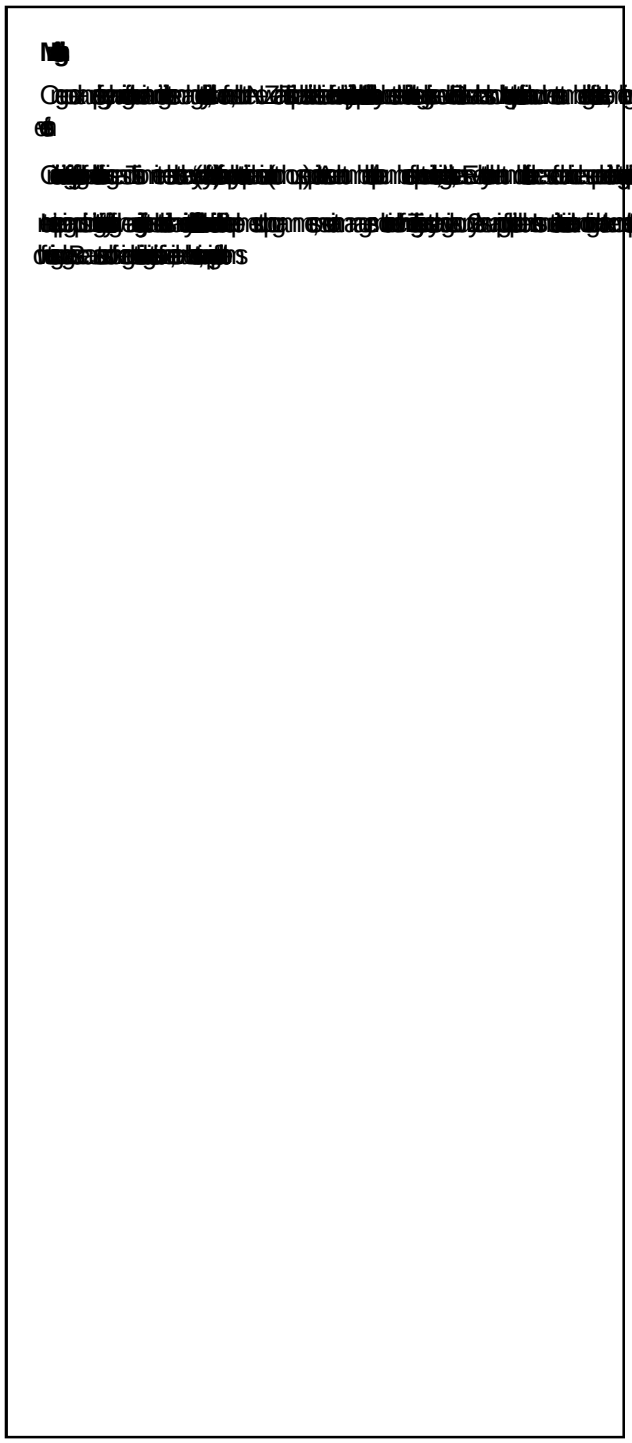
When directed at species (singular or plural), monitoring can target:

- Threatened species: to preserve biodiversity any species at particular risk requires special attention;
- Indicator species: some species are indicative of overall community or ecosystem health because they are sensitive to disruption or point to a problem. Indicator species themselves are not necessarily important species in ecosystem health; they are often the top predators, but may be seemingly insignificant species (frogs, for example, are regarded as very sensitive indicators of environmental pollution);
- Keystone species: there are species, plant or animal, which have such an important role in the ecosystems they inhabit that they are integral to community health and their loss sets up major perturbations affecting the welfare of the whole ecosystem (e.g. litter decomposing invertebrates);
- Economically/culturally important species: some plants and animals are economically important to the local people because they are harvested or they are important to species that are harvested (e.g. food plants for animals that are hunted); others are of cultural significance.

With species monitoring the most important measurements are:

- occurrence (presence/absence)
- distribution
- abundance (population density)

More detailed monitoring might also consider recruitment and various population parameters. Species monitoring also has a temporal component in that the timing of the monitoring is critical in relation to natural cycles and life-stages. When dealing with species that are harvested it is usually most important to monitor first the life-stage which



is being harvested, and then the life-stage most affected by such harvesting.

Monitoring of whole ecosystems typically involves recording or mapping *distribution* and *extent* but monitoring ecosystem processes involves widely different parameters depending on what is being studied (e.g. litter decomposition, leaf-fall). Ecosystem processes can also be *functional indicators* of overall community or ecosystem health.

The selection of which indicators to monitor depends on whether the need is to measure changes in the composition or function of an ecosystem. To measure composition you might choose species richness; if you were measuring the function of an ecosystem you might decide to monitor nutrient cycling. Invertebrates are often good animals to choose as indicator species because they are sensitive to environmental changes and often play an integral role in ecosystem processes. Indicators can also include physical parameters such as light or humidity levels on the forest floor. Above all, the selected indicators need to be appropriate to answer the questions being asked. For instance, some can be 'early warning' indicators, others point to trends. An example of monitoring using a functional indicator, and a 'keystone' species, involved the monitoring of defoliation of rata trees by introduced possums in New Zealand. Rata, a significant emergent in lowland rainforest, is particularly vulnerable to browsing by possums and its loss leads to rapid collapse of forest structure, changes in composition, and profound effects on a wide range of species.

5.2.5 Particular things to monitor

When carrying out biological monitoring in CAs it is very important to follow the progress and spread of colonising species by mapping, and by documenting their impacts on the indigenous biota. There are many weeds and pest species in the Pacific which have had — or are still causing — profound effects on the ecology of the region. Some have been in the region for so long that only retrospective monitoring can measure their effect, and in many places they are now in some sort of equilibrium with the environment. For example, the Pacific rat has been in the region for 2–3000 years. Its effects can be determined by examining subfossil fauna for changed species composition for by comparing sites with and without rats. Other species (e.g. African land snails) are relatively new arrivals and their spread is causing major perturbations in ecosystems. A serious example from New Caledonia is the fire ant (Wasmannia). This tiny insect has relatively recently arrived from the Caribbean and is now spreading rapidly. Its spread and impact are being monitored by sampling a variety of sites for the occurrence of ants and by sampling other fauna (mainly invertebrates) to document the effect. This species is severely affecting forest ecology and the population density of animals as large as the big geckos (*Rhacodactylus*) have declined significantly.

For conservation and biological monitoring it is also important to assess the effects of changing technology within the local community on the biota. For instance, a change from traditional hunting methods to firearms, or from axes to chainsaws,

could require a joint effort from both the sociological and biological teams, monitoring, respectively, the cause and the effect. Other things which might require a joint sociological/biophysical approach are the impact of visitors on an ecosystem or species, the changing use of vehicles or boats, or perhaps even the installation of electric power.

5.2.6 Participatory monitoring

In socio-economic programmes, people provide information about themselves and their activities. With participatory monitoring in biology, there is often a significant difference between the local community's knowledge and the cumulative scientific knowledge of the same biota. Local people usually have an intimate knowledge of species which are important to them and which help them survive in their environment. Yet at the same time they may be quite ignorant of species or processes that do not directly affect their lives.

For example, in the Vatthe CA the local people had very little knowledge of the diversity and ecology of the abundant reptile fauna (particularly the nocturnal species) because such animals have no practical use, and they were fascinated to learn what was happening in their forests. It is therefore risky to rely on local knowledge and local people for monitoring programmes without carefully assessing their ability to undertake the work. To get the best possible benefit from participatory biological monitoring local people running the project and the science advisors should work together so that each can learn from the other. These comments are not a reflection of Pacific islanders' knowledge of their environment — exactly the same situation occurs in New Zealand, and elsewhere in the world, where commonly the biological knowledge of people on the land, such as farmers or foresters, is wildly different from the scientific knowledge of the same ecosystems.

5.2.7 Key points

The whole approach to biophysical monitoring can really be summarised as:

a) Beware of 'pseudoscience'

b) Make certain that:
   - the reasons for doing the monitoring are valid;
   - the methodology is appropriate;
   - the methodology is statistically robust; and
   - the project can be defended if challenged.

c) When choosing what to monitor, the underlying guidelines are to select what is:
   - most at risk;
   - most sensitive and broadly applicable as an indicator;
   - most representative; and
   - something about which a lot is known.

d) The monitoring method should be:
   - the simplest;
   - easiest to implement; and
   - able to answer the questions posed.

5.3 Methods for biological monitoring

There are many levels of monitoring. At its very simplest biological monitoring is merely taking notes of things in the natural environment, preferably by writing them down. If a village elder recalls that flying foxes are not as common now as they were when he was a young man it is 'monitoring' in the sense that it is documenting change over time. However, it is unlikely that it could be interpreted in a meaningful way. The lowest level participatory monitoring in biology would be a written record of what is happening within the CA, including perhaps walking the boundaries once a year to check on gross changes or encroachment, an approximation of harvest or use of the area, and comments on key species and processes. Such data would be subjective and qualitative, and thus difficult to analyse, but could still warn of changes requiring management intervention.

An advance over this simplest level of monitoring is to have a 'diary' of biological data that is collected and maintained in a slightly more systematic way. This is still qualitative, but hopefully less subjective. Observations should be recorded in a notebook or exercise book used specifically for the purpose and should include the observer's name, the date, time and duration, the place, the observation, the weather, and an indication of the effort required to collect the data (the latter is important for interpretation).

Beyond this level are the systematic and objective methods of collecting monitoring data. As was made clear in the earlier sections, the range of methods that can be used and their applications are enormously varied. This section will, therefore, just touch briefly on some of those that are more generally applicable (further detail can be obtained from the extensive literature on the subject). Keep in mind the earlier comments on site selection and size, sample size and frequency, randomisation, the need for consistency, accuracy and precision, and so on, and above all, please remember it is wise to seek advice on methodology and statistical analysis before starting a monitoring project to ensure that the data collected is interpretable and meaningful.

5.3.1 Ecosystems and habitats

5.3.1.1 Generalist monitoring

At its simplest this could be visiting the CA at regular intervals and making notes on what is present. This is not quantitative but it can provide a measure of change provided detailed notes are kept or, better still, a checklist is used to standardise what is noted.

5.3.1.2 Aerial photos

The easiest way to monitor changes in the distribution and extent of habitats is by mapping them directly from aerial photographs (or satellite images for large scale areas). B&W, colour or infrared photographs can be used, and ground control surveys are needed to interpret or verify what is recorded from the photographs. The cost of air photos can be high but to obtain similar levels of accuracy from ground-based methods can be much more expensive.

5.3.1.3 Photopoints

For measuring habitat or ecosystem changes on a smaller scale, photopoints (photographs from a set position) are a quick and efficient method of collecting data. It is very important to permanently mark the sites from which the photographs are taken and to record in detail the direction and angle, the lenses used, film type, date, time and weather. Photopoints can also be used for monitoring plant or animal populations.

5.3.2 Plant species and vegetation

5.3.2.1 Composition, species density and distribution

a: Plots (quadrats)

Plots are probably the most commonly used method for determining composition, density, or recruitment in plant (and in some animal) studies. The plot size and location is determined by what is being monitored and where. If, for example, a diverse vegetation type is being assessed, nested plots — within plots — can be used (e.g. random 1 x 1 m within a 20 x 20 m forest plot). Plots are usually square or rectangular [but note that the treatment of data from a transect (see below) means it is really a very long thin plot]. The amount and type of data to be collected will be determined entirely by the questions being asked: whether the study is concerned with a single species or all species; one life-stage or all; one vegetation layer or all; whether additional data on height, basal area (DBH), foliage volume (biomass), or recruitment is required. If it is important to know distribution as well as density the positions of the target species within the plots will have to be mapped. The main advantage of using plots for monitoring is the amount of data they can produce. The disadvantage is the time they take to set up and measure.

b: Plotless methods

There is a variety of plotless methods for sampling vegetation.

Transects

Sometimes it is easier or more preferable to do a line transect than a plot. For example, to walk 400 m through forest counting all ferns within 1 m either side of the line is much easier to do than to set up and measure eight 10 x 10 m plots. The width of a transect will be determined by what is being recorded; often it is just plants which intersect the 'line'. The start and end of transects must be clearly marked and the line tagged in some way to make it clear where it lies. Line transects should sample a homogeneous area — if there is a risk they will cross a cline (e.g. an altitudinal gradient) they should either be set parallel to it or at right angles.

Point-Centre Quarter method (PCQ)

The PCQ is a randomised method of recording more detailed information from a transect. At preselected points along the transect line (e.g. 10 m intervals) an imaginary line is drawn at right angles to the transect and the nearest tree/plant in any/all categories (canopy–ground layer) in one or more of the 'quarters' is recorded. Additional data could include the distance to this plant, its height, its DBH, and so on.

Point sampling

This is merely spot sampling of vegetation to determine species composition or cover. The methods by which the sampling points can be selected is enormously variable but they should be randomised in some way.

5.3.2.2 Other

a: Biomass

Determining biomass (productivity) of plants can be quite difficult. In habitats such as grassland it is literally possible to cut all foliage from a plot and weigh it. In forested habitats, traps (trays) which collect fallen leaves and twigs can be used. Height-frequency transects (which measure the amount of foliage intercepts with the imaginary transect) are a widely used sampling method that does not require the collection of plant material.

b: Exclosure plots

The most effective way to monitor the impact of browsing or grazing animals, or seed predators, is with exclosure plots — plots from which the study species are excluded to remove their effect. Exclosure plots often provide dramatic and very visual results but accurate interpretation of the data invariably requires the use of control plots (duplicate plots from which the study species are not excluded) and exclosure studies are often very long term.

c: Plant phenology (life history)

Plant life-histories vary widely from year to year both in terms of timing (early or late) and occurrence (many plants flower and fruit intermittently, sometimes many years apart). In many monitoring programmes it is important to know what the plants are doing. Phenological monitoring records the life-stages of plants (e.g. flowering, fruiting, germination). It can be done using simple observation or through quantitative methods such as counting or weighing flowers and fruit, or using plots for determining seedling abundance.

Recording the amount of seeds or fruits produced is important for understanding plant species ecology, or for measuring the availability of food for animals or the impact of seed predators. This can be done by harvesting directly from the plant but it is much easier with most species to get quantitative data by measuring seed rain in seed traps (standard-sized trays). With studies of this nature it is also important to check seed viability.

5.3.3 Animals

In most studies that deal with animals it is important also to measure various weather parameters (e.g. temperature, cloud cover, wind speed, rainfall) as they can greatly influence the number of animals present or recorded. If the effect of certain weather variables on the behaviour or conspicuousness of the target animal species is known it may be necessary to set limits on when to record data with respect to the prevailing weather.

5.3.3.1 Population density

a: Absolute population density (census)

Direct counts

The absolute abundance or population density of animals — a census — can be obtained by counting individuals over a known area. However, this is rarely easy and there are several important considerations to take into account:

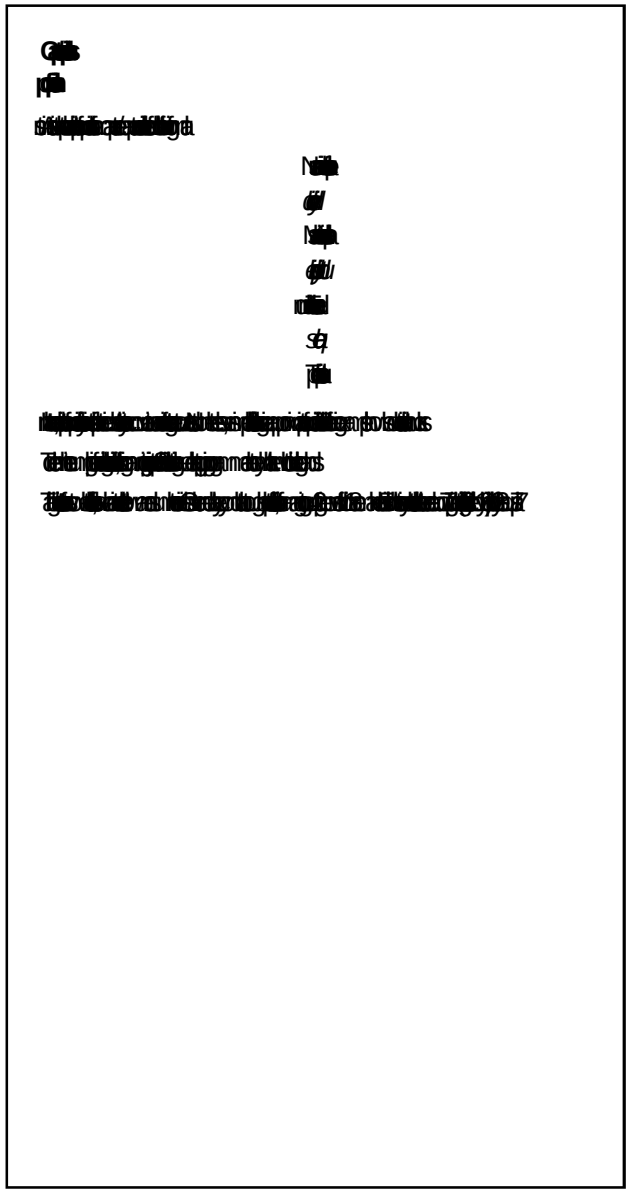
- during the period of the census the number of animals counted must not be significantly affected by immigration or emigration from the study area nor by significant births or deaths;
- the same individual animals must not be counted more than once; and
- the observer's presence must not affect the number of animals counted.

For some species the counts have to be done as quickly as possible; for others cumulative counts over a longer period of time are possible (e.g. breeding pairs of birds).

Indirect methods

When direct counts are not possible, population densities of animals can be derived with a high degree of accuracy by a variety of other methods. The most commonly used technique is capture/recapture (or mark/resight) where the proportion of marked individuals in subsequent samples can be related to the cumulative total number of marked animals to estimate the total number present. The major drawback of such techniques is that the animals usually have to be captured in the first place so that they can be marked and then for many species, recaptured later to determine if they are marked. There are general rules which apply to these kinds of calculations such as:

- all captures must be random with respect to the total population;
- dispersal of marked animals must be random with respect to the total population;
- immigration and emigration, and births and deaths must be negligible; and
- the marking must not affect the subsequent likelihood that any individual will be sampled.



However, different methodologies and statistical treatments can be applied to overcome many of the problems that are encountered.

One significant advantage of capture/recapture studies where animals are individually marked is that they can provide important information on population dynamics, and on the biology and life-history of individual animals.

b: Relative population density

Often it is not possible to count or calculate how many animals are in a population (absolute density) but important comparative information between sites on the same site over time can be derived from indices of relative abundance.

Encounter rates

The number of animals counted over a predetermined time or route, caught in traps or counted as they visit a particular food source will provide encounter rates or catch per unit effort (CPUE). Provided such surveys are standardised with respect to weather variables, observer ability, and no on, they can provide for valid comparisons. When using traps it is useful to reduce the CPUE to a standard figure, typically the number/100 trap days (where a trap day is one trap set for 24 hours).

Indirect evidence

Indirect methods for deriving relative indices of abundance can be used when it is not possible to deal directly with the animals themselves. These include assessments of the abundance or the extent of:

- relatively persistent natural sign, such as animal droppings (e.g. droppings counts along transects for feral cats; frequency (spacing) and size (number) of pellet piles for rabbits, deer), chew marks, pig wallows, or bird scratchings;
- transient indicators, such as counting calls or call frequency at set intervals of time or spacing (e.g. five-minute bird counts, bat passes on bat detectors); and
- induced sign, such as the use of chew sticks or bait loss for rodents, or tracking tunnels which record animal movements.

5.3.3.2 Distribution

Important information on changes in animal populations can be derived from simply mapping their occurrence (presence/absence) within arbitrary grid squares over the area of interest. On a broad scale it is possible to use data derived from a variety of methods and sources to map distribution to a suitable scale on published topographical maps (typically to the standard 1000 or 10,000 m grid squares).

5.3.3.3 Biology

Monitoring methodology which detects changes in life-histories of animals (e.g. survival, fecundity, recruitment, diet) is so dependant on the target species, and so varied and complex that it is beyond the scope of a generalised paper. If such studies are contemplated it is important to consult the relevant literature and seek expert advice.

5.4 Selected Further Reading:

Bibby, C.J., Burgess, N.D, and Hill, D.A. 1992. Bird census techniques. Academic Press, London.

Goldsmith, B. 1991. '*Monitoring for conservation and ecology*'. Chapman and Hall, London.

Spellerberg, I. 1991. '*Monitoring ecological change*'. Cambridge University Press, Cambridge.

Sutherland, W.J. (Ed.) 1996. *Ecological census techniques: a handbook*. Cambridge University Press, Cambridge.

6. Monitoring of Coral Reef Environments

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6.1 Why do monitoring?

The activities of humans can stress the animals and plants that make up the coral reef. Sometimes the coral reef is stressed to the point where it starts to die. The process of death may either take a long time or it may happen quickly.

At the International Coral Reef Initiative meeting of Pacific island countries in December 1995, many of the participants were concerned that too many coral reefs in the Pacific are dying as a result of human activity. In many instances it is not known what is causing the coral reefs to deteriorate. It was recommended that responsible management agencies monitor their reefs to appraise the status and behaviour of the organisms that make up the coral reef ecosystem, both in the presence and in the absence of human activity, over time.

Monitoring can be carried out for a number of reasons. Monitoring can detect trends in the resource and uses of the resource over time. Monitoring can be used to see whether certain rules and regulations or other prescriptive management strategies are being followed. Well-designed monitoring programmes can measure impacts and quantify the levels and types of activity in an area with reasonable accuracy. This information can, in turn, be used to evaluate the success of management practices and make well-informed decisions. To date, however, monitoring the status of marine protected areas and the effectiveness of management strategies within those areas has not been a high priority in the Pacific.

6.2 Marine monitoring design considerations

6.2.1 The differences in monitoring of marine and terrestrial environments

It is important to take into account the differences in the characteristics of the marine and terrestrial environment (see table 1). For these reasons, the design and conduct of a monitoring programme in sea water will be different to that of a monitoring programme designed for terrestrial environments.

Table 1: Generalised differences between the marine and terrestrial environments

CONSERVATION AREA	COUNTRY	AREA	LEAD AGENCY
Takitumu	Cook Islands	155 ha	Ministry of Works, Environment and Physical Planning
Uafato	Samoa	1400 ha (terrestrial area only)	O Le Siosiomaga (a Samoan NGO)
Ngaremaduu Bay	Palau	At least 859 ha	Division of Conservation and Entomology, Bureau of Natural Resources and Development
Funafuti	Tuvalu	4000 ha	Environment Unit, Ministry of Natural Resources
Arnavon Islands	Solomon Islands	8270 ha (incl 3100 ha core conservation area)	Environment and Conservation Division, Ministry of Forestry, Environment and Conservation
Ha'apai	Tonga	10,000 sq km	Land and Environmental Planning Unit, Ministry of Lands, Survey and Natural Resources
Utwa/Walung	FSM	n/a; Utwa-Walung Channel extends for more than 8.1 km in length	Division of Tourism, Department of Commerce and Industry
Komarindi	Solomon Islands	19,300 ha	Environment and Conservation Division, Ministry of Forestry, Environment and Conservation
Vatthe	Vanuatu	approx 2276 ha	Environment Unit, Ministry of Home Affairs
Koroyanitu	Fiji	2984 ha (core); potentially may be extended to cover 19,000 ha	Land Use Planning Section, Native Land Trust Board
Sa'anapu/Sataoa	Samoa	75 ha (core); potentially may be extended to cover 12,000 ha	Division of Environment and Conservation, Department of Lands, Surveys and Environment
Pohnpei	FSM	10,600 ha	Department of Resource Management
Huvalu Forest	Niue	5400 ha	Environment Unit, Community Affairs Department
North Tarawa	Kiribati	2150 ha (terrestrial area) plus 3500 ha (marine area)	Ministry of Natural Resources

6.2.2 Noise and signals

Spatial and temporal variation on coral reefs is particularly high. Changes in the marine environment may be natural and/or human-induced, random or periodic in both space and time. For example, there will be significant spatial variation between the front and back areas of the reef as well as significant temporal variation such as depth, time of day, tide, zone, substratum and sea state. In addition, some species look different at different depths and zones and in different environments. Species may also change physiologically from one biogeographic area to another east to west across the Pacific, as a result of genetic or environmental variation.

The biggest challenge in marine environmental monitoring is to separate the "noise" from the "signal". For this reason, it is unlikely that small or even moderate effects of management strategies, human use, or natural perturbations will be reliably detected as spatial pattern without considerable expense (Mapstone et al., 1995) For example, in an intensive and long-term monitoring study of 42 organisms on the Great Barrier Reef in Australia, there were no candidate organisms that provided sensitive measures of impacts (Mapstone et al., 1995). The optimum allocations of effort, sample sizes and statistical power are highly variable (Mapstone et al., 1995), implying that the success or failure of management strategies should only be judged on large variations in pattern. However, this does not mean that impacts of a smaller magnitude are unimportant, though they may be difficult to detect.

6.2.3 What to monitor?

The choice of variables to monitor depends on why the monitoring is done. It may be the beauty of the reefscape and the coral and fish which are important to tourism. On the other hand, the physical appearance of the reef and details of benthic communities may be irrelevant unless they can be shown to influence the reef's capacity to produce human protein (Done, 1996). In any case, the coral reef community has a significant role in providing services which peoples from Pacific islands rely on, such as more sustainable fish harvests and protection of shorelines from erosion. They also have high intrinsic or existence value, and potentially provide a basis for economic advancement.

Typical questions about the monitoring programme include: How many species should be monitored? What are the optimum sizes of sampling units? What are the resources available for the programme? It should be designed so that it is needs driven, is not too broad and responds to specific questions. It should take into account alternative and existing sources of data such as remotely sensed imagery.

It is important also to be selective about the variables under consideration (i.e. don't measure everything) and to consider the appropriate scale of change and the possible sources of variation. If impacts are to be detected, both impact and control sites will need to be carefully chosen. It may be preferable to establish more than one baseline to get a better idea of the changes pre-and post-intervention. The number of replicates should also be carefully considered to capture as much of the change as possible, but also to avoid pseudo-replication. If the design is complex, a pilot study may be warranted.

6.2.4 When to monitor?

In the coral reef environment, assessment of specific impacts and issues of reef use are typically addressed at local scales, (e.g. within reefs) and over short time-scales (one to five years). To detect change in the resource status, regular repetition is important. Monitoring should be conducted frequently, i.e. sub-annually or annually, to provide more sensitive tests of the effects of management regimes on reef organisms. It should also be carried out at the same time of the year. The same staff should conduct the surveys if possible to minimise observer bias.

6.2.5 What do we do with the results?

If an undesirable change is detected, a plan of action is needed. There must be one or more mechanisms for ensuring that monitoring results are fed back to management and are thus able to influence management decisions.

6.3 Which techniques to use?

The preceding argument has established that the monitoring programme must be carefully planned so that the limits of detectable change match the level of change that is acceptable and useful to management. The scientific rigour should be in relation to the nature of the questions asked and the skills level and resources available. Two sets of methods may be appropriate for Conservation Areas in the Pacific, depending on circumstances: standard procedures and a modification of these for presence/absence monitoring

6.3.1 UNEP-IOC-WMO-IUCN standard procedures

Standard procedures for monitoring coral reefs have been defined by the United Nations Environment Programme–Intergovernmental Oceanographic Commission–World Meteorological Organization–World Conservation Union (UNEP–IOC–WMO–IUCN) and developed by the Australian Institute of Marine Science (see English et al. 1994). These techniques have been adopted by SPREP for training Pacific island countries in coral reef survey and monitoring techniques. Three of those methods widely used for monitoring of coral reef benthos are manta tow, line intercept transect and video. About two weeks' training is needed to competently use these techniques.

Manta tow

Manta tow survey is used to count organisms (e.g. Crown of thorns starfish), roughly estimate coral cover, identify bottom types and for incidental observations (e.g. coral bleaching, *Drupella*, giant

clams, reef aesthetics). In this procedure an observer is towed behind a boat parallel to the reef crest. After two minutes, the observer stops to record his or her observations on a printed sheet. The procedure is repeated until the entire length of the reef has been surveyed. The principal advantages of the method are that large areas of the reef can be surveyed in a short time with minimal equipment. The principal disadvantage is that it can only detect gross changes, especially where there is a lot of topographic complexity. It also cannot be used where there is low visibility.

Line Intercept Transects

Line intercept transects are used for quantitative estimates of coral cover as life-forms, composition of benthos, relative abundance and colony sizes. There are several variations of the procedure depending on the question being asked and the skills level of the observer. In general, the procedure involves haphazardly laying five transects of 20m length over shallow and deep coral communities. The observer then moves slowly along the tape or line recording lifeforms under the tape. This method has been proven to be one of the most reliable and efficient sampling methods for obtaining quantitative estimates (see Mapstone et al., 1995). However, it can be difficult to standardize some of the life-form categories.

Video

Video can be used for quantitative estimates of coral cover, composition of benthos, relative abundance, species lists and species richness and community structure. Video can be taken for general reconnaissance work or along line intercept transects. However, less detailed spatial information is collected. The camera is held about 20–30 cm away from the benthos as the observer swims from one end of the transect to another. The principle advantage of the method is the ease of use. The main disadvantage is the amount of time and equipment needed such as underwater video housing, sampling frame grabber, video camera, film etc.

6.3.2 Presence/absence monitoring techniques

This form of monitoring concentrates on obtaining reliable identification and easy measurement of key species or resources of importance (e.g. economic significance, endangered or threatened species etc.). The results can be used mainly as an early warning signal to alert specialists of signs of deterioration in the reef such as significant mortality of juveniles or adults of conspicuous species (e.g. giant clams); appearance of pathological symptoms (e.g. >10% coral bleaching); and presence/absence of particular organisms from an area (e.g. disappearance of seagrass communities, changes in feeding, breeding or migratory behavior of species whose biology is known). However, in order to detect gross trends simply, it is important to look at only a few variables.

There are few published case studies of presence/absence monitoring programmes. In Australia, tour operators are currently trialling a simple monitoring programme. Under this programme, tour vessel operators and crews are trained to record the abundance of coral life forms and other non-motile plants and animals (algae, sponges and corals) every 20 cm along a transect. This sort of programme is very simple and is based on the assumption that change in abundance indicates change in environmental conditions.

6.4 Where to from here?

It is clear that monitoring in the marine environment can be a challenge and requires careful consideration of the questions to be answered and the resources at hand. It also requires at least a basic minimum of training in techniques that have been proven to reliably detect changes in the marine environment over time, both in the presence and absence of human activity.

Please contact the Coastal Management and Planning Programme of SPREP for further information regarding training in marine survey and monitoring.

6.5 References

Done, T.J., 1996. Ecological criteria for evaluating coral reefs and their implications for managers and researchers. Paper in prep for *Science and Management*. Ed B.E Brown. 32 pp.

English, S., Wilkinson, C., and Baker, V (Eds.), 1994. *Survey Manual for Tropical Marine Resources*. Australian Institute of Marine Science: Townsville. 368 pp.

Mapstone, B.D, Ayling A.M., and Choat J.H., 1995. *Scales and Magnitudes of Variation in Population Densities of Some Coral Reef Organisms: Stage II in the Development of Long Term Monitoring Procedures.* A Report to the Great Barrier Reef Marine Park Authority, August 1995.

7. Hawksbill Turtles in the Arnavon Marine Conservation Area, Solomon Islands: a case study in participatory monitoring and evaluation

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7.1 Introduction

This workshop session used experience gained from monitoring turtles in the Arnavon Islands for an exercise in using a species monitoring programme to obtain the information a community would need to manage a key resource. Participants were given the key background facts and information and told they should consider themselves as the resource monitors. They were asked how they would use the information with the communities concerned, as part of meeting the goals of a community-based conservation area.

7.2 Key turtle facts and background information

- Hawksbill turtles are a long-lived highly migratory species.
- Female Hawksbills take at least 20 years to reach reproductive maturity.
- Hawksbill turtles are listed by IUCN as an endangered species.
- Nesting populations of these turtles are largely discrete within an area, with animals returning to the same beach or a beach nearby to lay eggs. Hawksbills nesting in the Arnavons will not be breeding with other nesting populations from other Pacific islands or from other parts of the Solomon Islands—if you lose a nesting population you have probably lost it forever. The Arnavon Islands nesting population is believed to be the largest and most significant remaining in the Solomon Islands and perhaps the South West Pacific.
- We can't see or easily measure turtles during their life cycle, but we can fairly easily monitor nesting females and egg production. The number of nesting females each year is a useful indicator of the abundance of the population as a whole.
- Hawksbill meat and shell has been and is important to the three communities using the Arnavon Islands for cultural, subsistence and commercial uses. There have been disputes between the three communities (2 Solomon Islands communities, 1 Gilbertese community) regarding access and use of resources, especially turtles.
- Overharvest of these turtles, throughout their migratory range, is believed to be the primary cause of observed declines in the nesting population over the last 15 years or so.
- A protected area initiative in the early 1990s, aimed at conserving the declining sea turtle population, failed—primarily due to the lack of local community involvement and support.
- Turtles in the Arnavons (including small populations of other species e.g. green turtles), have been regularly surveyed and monitored since the early 1990s with support from SPREP's Regional Marine Turtle Conservation Programme.
- In 1995 the three communities in partnership with the Government of the Solomon Islands declared the Arnavon Marine Conservation Area (AMCA), with support from SPREP's SPBCP and The Nature Conservancy (TNC). The AMCA contains a core area in which the harvest of turtles is banned. Local conservation officers undertake turtle monitoring and enforcement with assistance from the Ministries of Fisheries and Environment.
- Today, turtle monitoring in the Arnavon Marine Conservation Area (AMCA) is largely undertaken by representatives of the three communities and key government staff (including John Pita (CASO), Peter Ramohia (Fisheries)) along with research and monitoring input and assistance from Australia and from SPREP.

In summary, Hawksbill turtles are an important and often disputed resource for local communities and a resource that has been observed to be in severe decline, most likely due to overharvest, predominantly by these communities. There has been a community and government response to this situation, most recently with declaration of the Arnavon Marine Conservation Area and increased protection for turtles.

7.3 Questions posed to workshop participants

- Given the biological constraints of turtles (long-lived, slow to breed) what are the monitoring data telling managers?
- What consequent action needs to be taken?
- Are the conservation measures likely to succeed in the short, medium, long term?
- If the data indicate that the measures will probably not succeed, what is the best way for these findings to influence a community-based management regime?
- What would you do as CASO in AMCA?

Participants were then given results from species monitoring initiatives for Arnavon Hawksbill turtle populations and details of community-based conservation measures taken in the AMCA, and asked what follow-up work should be carried out. They were cautioned that the data and analysis were preliminary and a comprehensive analysis of the AMCA information is going to be carried out.

7.4 Annual nesting population estimates from surveys

Key points:

- early data — reports from local people of up to 100 nesting female turtles a night;
- late 1970s first reports of significant declines. Annual nesting population estimated at 350–400 females (McKeown, 1977);
- mid 1980s annual nesting population estimated at 200–250 females;
- annual nesting population of 120–200 females (Leary & Laumani 1989);
- annual nesting population of 70 females (Leary 1992) (noted possible effects of Cyclone Bekko);
- annual nesting population of 298 females (Ramohia 1992);
- 1994, 1995, 1996 — peak nesting population of 30 females/equates to estimated annual nesting populations of 40–50 turtles (Ramohia and Pita 1996); and
- 1997 data not available at the time of the workshop.

Note that not all data are perfectly comparable due to differences in methodologies. In addition, natural disasters, eg cyclones are thought to have significant impact on nesting populations. However, these data can be used as an indication of significant overall decline. There are also natural variations in these types of data as female Hawksbills do not nest every year and thus Hawksbill nesting at any one site will vary — but still there is an overall trend. Local people are certainly aware of and concerned about the declines. The size of females nesting has also declined; this indicates that the animals nesting are younger animals.

7.5 Turtle tagging data

In the last five nesting season surveys, 146 turtles have been tagged. None of these turtles has been observed returning to breed in a later season. This is unusual as Hawksbill turtles return to breeding areas and breeding usually occurs every two to three years. In addition, it would be extremely unusual if this was due to an extraordinary rate of tag loss. This lack of subsequent tagged turtle reports is most likely caused by harvest in the immediate area, as feeding grounds are more dispersed.

7.6 Research on harvested turtles

Biopsies on harvested turtles show that the majority are first-time breeders. Thus, turtles being eaten in the area do not complete even one breeding cycle before they are harvested. This result is supported by the survey work which indicates a decrease in the average size of female turtles nesting. Such a high proportion of first time breeders in a nesting population of turtles is very unusual. Breeding populations of turtles are usually dominated by older animals with a past breeding history. We can therefore conclude that most older females are gone; killed or harvested. In other words, we may be seeing the last remnants of a breeding population.

These first-time nesters are from eggs laid at the Arnavons at least 20 years ago — probably longer. Only now are the effects of harvest showing up, with only 40–50 turtles nesting each year. Remember, these are long-lived animals, slow to reach reproductive maturity. Likewise, if you protect turtle young the real success of management intervention can only be evaluated in 20 or more years' time when these turtles come to breed and thus make their first contribution to the survival of these populations.

7.7 Preliminary conclusions from monitoring and survey work—piecing the jigsaw together

- The Arnavon Islands turtle population is in significant decline and is probably down to the last few series of first-time nesters.

- We could easily see further declines, due to past harvest, in the next few years.
- Eggs protected now will not result in increases in the population for at least 20 years. If this breeding population of turtles is to survive, it is likely that a complete cessation of harvesting is needed.

7.8 Sustainable harvest

Based on accepted population models of these turtles, to keep a stable population you can harvest no more than 10% of the turtles throughout their migratory range. If we assume that the annual nesting population is now ~50 females, then to maintain 50 nesting turtles you need to have at least 500 turtles swimming in the sea. Recruitment (the rate at which new animals are added to the population) is usually modelled at ~10% (an optimistic estimate). This means that each year you can harvest no more than five reproductively mature females and a total of no more than 50 turtles out of the total Arnavon Islands Hawksbill turtle population.

This is not a lot of turtle to harvest between three communities, all of whom want to continue to harvest turtles.

In addition, these turtles will, during their migration, forage in other waters of the Solomon Islands and perhaps in those of adjacent countries. They are also likely to face harvest pressure during their time away from the Arnavons.

7.9 Community-based conservation measures taken for turtles in the Arnavons

The AMCA has a key goal of conserving the Hawksbill turtle population. This includes a core area where turtles may not be harvested. However, outside this area turtles may be taken in accordance with national laws.

This community support for turtle conservation is the result of extensive consultation and education and is an important decision by the communities concerned. However, given the above results from survey and monitoring which indicate a far more serious depletion in the turtle population, these community-based measures may not be enough.

In addition, when female turtles nest they use adjacent offshore areas (inter-nesting habitat) to rest and produce the next batch of eggs. They are often found 'sleeping on the reef' at this time, especially at night. The advent of snorkelling gear and underwater torches in recent years now makes these turtles extremely vulnerable to harvest. The AMCA core conservation area may not be large enough to adequately conserve nesting female turtles, as it does not cover their inter-nesting habitat.

7.10 Impact of survey results on communities

Participants then discussed the outcomes of the Arnavon surveys and analysis. They were asked to consider how they might follow through with the community on the results of the monitoring and how this might affect the management of the area. Questions posed included:

- Will local communities experience disillusionment with AMCA if in two years, five years, 10 years, 15 years there is no increase in turtles nesting in the area—or even if there are further decreases?
- How should we get this message from the research and monitoring across to the communities?
- What is the community's expectation about utilisation of their turtle resources?
- What are their expectations of turtle population recovery?
- What is their vision for turtle resources based on the knowledge and experience of the old people, today's hunters and what they want for their children?
- If full investigation of the data confirms the above preliminary conclusions, it is likely that a complete and effective ban will be necessary to protect this turtle population. Is this going to be acceptable to any of the communities concerned?

7.11 Lessons learned and next steps

Participants concluded that this example from the Arnavons showed:

- Monitoring of resources is important to communities in Conservation Areas;
- A participatory approach i.e. community involvement in resource monitoring is important;
- Feedback to the wider community is necessary once monitoring results are known;
- Interpretation of results based on the biology of these key species must also be communicated to the community;
- A long-term commitment to the recovery of a depleted population is essential; and
- Stakeholders need to set a vision for use of resources which is grounded in the basic population biology of the species concerned.

7.12 Arnavon next steps

Participants were then told Solomon Islands Government agencies, the CASO, SPREP and associated researchers plan the following next steps for the AMCA:

- A comprehensive look at all data by project partners to confirm the above conclusions, identify gaps; and
- Assist CASO to raise this issue with the CACC and with communities so that monitoring results can influence the decision-making process in AMCA.

7.13 Conclusion

While it is important to use outside assistance in a monitoring programme, it is essential to ensure that decision-making power remains firmly within the local community. Therefore it is very important to build partnerships between local people, management agencies and outside specialists.

It is important to consider what the expectations are of use of resources within a Conservation Area. This should include defining what is realistic from a scientific point of view. It must also include consideration of ways conservation area workers can facilitate communities' ability to find socially workable solutions.

8. Practical Exercises and Group Discussions

Sango Mahanty and Tony Whitaker

8.1 Practical exercises

In the socio-economic area, the workshop did practical exercises on two methods commonly used in socio-economic monitoring: interviewing and running community meetings/workshops.

The interview exercise was based around a role play of a "bad interview". After discussion with the facilitator, two of the workshop participants (Nathaniel and Alma) conducted an interview which highlighted problems and inappropriate ways to behave in an interview situation. The group then discussed what went wrong and how it could have been improved. Key points which came up in discussion included:

- timing of the interview should be convenient to the interviewee;
- introduction of the purpose of the interview, and the person doing the interview, are important;
- the approach (e.g. greeting) should be appropriate;
- the way questions are asked is important. You should not ask leading questions, too many yes/ no questions, insensitive questions. Questions should allow time for the interviewee to think and respond;
- the language in which the interview is conducted should be understood by the interviewee;
- physical position (body language) should be appropriate; and
- keep in mind gender issues (e.g. difference in interviewer and interviewee) and how they affect the responses.

The group meeting exercise was based around a role play of a community meeting. The participants were divided into community groups (leaders, women, sceptics, general community members), a facilitating team (CASO, community members, external adviser) and observers. The scenario was that the CASO and monitoring team were reporting monitoring findings to the community (pigeon numbers had been decreasing because of harvesting pressure) and trying to facilitate the community's discussion of a management strategy.

Key points in the discussion following the role play included:

- the need to be aware of the process as well as the content of a meeting;
- the need to organise meetings well — introductions, why the meeting is happening, talk to leaders first;
- presentation of information — needs to be appropriate to community/audience;
- important to know the leaders;
- how to deal with difficult people — do not alienate them, acknowledge what they are saying, talk to them, perhaps talk to them separately;
- dealing with special groups e.g. women — asking their opinions, perhaps hold separate meetings, small group sessions within the workshop;
- presentation of monitoring findings — get support from resource users, visual information;
- evidence which people can "see", stories from other places;
- knowing the cultural environment;
- important to move from presenting information to inviting community to look at strategies/ solutions;
- working out responsibilities for running the meeting; and
- engaging young people and supporters in the process.

The practical exercise in biophysical monitoring was undertaken in modified rainforest on the lower slopes of Mt. Vaea, south of Apia. The group was given the scenario that a road had been put through an area of primary rainforest in a CA, and a short time after its construction the CASO noticed a new shrubby weed species growing alongside the road, presumably brought in by earthmoving machinery. (For the purposes of the exercise the walking track to the summit of Mt. Vaea was treated as the imaginary road.) They were then asked what monitoring they would implement to answer the management question: is this a problem that needs management intervention?

The group identified several separate issues and used different monitoring methods to address them — the extent of the weed population and its rate of spread were measured using transects along the

roadway; the growth of the weeds and their effect on natural regeneration following earthworks was assessed using photo-points; and the potential impact of the weed on the natural environment through its spread into surrounding forest was determined from plots (effects on composition and regeneration in relation to percentage cover of weed along the gradient away from the road).

The two important key points to arise from this exercise were:

- several different methods may be required to address one management question; and
- standard monitoring methods may need to be modified to fit a particular situation.

8.2 Group work

The group work exercise aimed to take workshop participants through the process of defining monitoring questions and assessing appropriate methods for monitoring in SPBCP projects. Three projects were selected by the workshop: Utwa-Walung (coastal marine) Conservation Project in FSM, Vatthe (lowland rainforest) Conservation Area in Vanuatu, and Pohnpei (upland rainforest) Conservation Area in FSM. The participants were divided into three groups and worked through two main processes.

Firstly, the groups clarified project objectives and activities, and their likely impacts. These were used to define monitoring questions (both biophysical and socio-economic) for the project. Each group then reported back to a plenary session. The next session involved taking one or two of the monitoring questions, and assessing appropriate methods for monitoring. This was also reported back (see the following Table 2 for example).

Some important issues which emerged included:

- the importance of distinguishing between baseline data, monitoring, and management. The purpose of monitoring is to gather information, while management involves making a decision or taking an action to deal with a problem or concern which monitoring has identified;
- since many projects are at an early stage of developing a monitoring programme, some of the groups tended to focus on building a baseline picture of the conservation area and participating communities rather than on monitoring per se; and
- the groups tended to have a strong focus on socio-economic issues. With SPBCP projects having an objective of biodiversity conservation, it will also be important to monitor the effectiveness of resource management activities.

Table 2: Group Work: Vatthe Conservation Area, Vanuatu — example of designing a monitoring programme

Objectives	• to protect the low-lying forest and to provide other sources of income for the communities. • establish a community-based management structure.
Programme elements	• ecotourism • nut harvesting • revive wildlife stocks • alley cropping • education/awareness
Impacts	• better income for villagers • knowledge and skills to communities • pest species (i.e. bullocks, pigs, bats, vines) numbers increasing • changes in gardening practices - alley cropping • commercial harvesting i.e. pigeons • livelihood activities affected from ecotourism • distribution of benefits • religious/cultural conflicts - from ecotourism • infrastructure development i.e. water supply, toilets, transport
Questions for Monitoring	• pest species - what are they, how many, their biology? • income - increase/decrease • knowledge and skills - what sorts of skills, are they appropriate? • gardening - does it meet the food needs, is it appropriate, will it affecting the traditional systems of gardening? • commercial harvesting of resources (coconut crab, pigeon etc.) - which resources are used commercially, • what is their biology? • livelihood activities - how do people spend their time, how does the project affect their other commitments? • distribution of project benefits - who, what, when and how much? • religious/cultural - what are the changes and conflicts? • infrastructure development - what are they, how are they impacting on the environment?
Methods	Focus on bullocks - what is a sustainable population of bullocks in the CA to meet biodiversity objective and people's needs? I Biophysical • secondary data sources - what is known about the impact of cattle on vegetation? • population census (to find out how many cattle) • hunting diaries and questionnaires (level of use) • exclosure plots (effects of cattle on environment) II Socio-economic - especially monitoring effects of population growth; including whether people move in to take advantage of CA project (is population growing, what are the impacts?) • census • questionnaire (to work out where people are coming from) • observation of social harmony and cohesiveness (e.g. fights, divisions in community, documenting community ventures and events) • indicators e.g. change in the area under cultivation (indicator of impact on environment), number of new buildings (e.g. houses)

9. Workshop Evaluation

Workshop participants were asked to complete two questionnaires to assist with evaluation of the workshop. The first of these, which covered preliminary arrangements (participant selection, travel, etc.), views on the role of monitoring in SPBCP Conservation Areas and participants' objectives in attending the workshop, was distributed before the workshop started. The second questionnaire, which covered workshop structure, content and presentation techniques, was distributed at the end of the workshop. The two questionnaires, with summaries of the results obtained, are included as Annex 3.

The key findings of these questionnaire surveys were as follows:

- Many participants (41%) did not receive enough notice of the workshop. Virtually all participants (94%) did not receive enough information about the workshop before they left home;
- Most people (76%) were happy with the travel arrangements. The concerns which were expressed about travel arrangements related to lack of advance notice of the dates of the workshop, lack of early confirmation of acceptance, and some confusion on arrival in Western Samoa. (This comment probably applies to the three participants who were mistakenly taken to the wrong hotel and left without directions about how to find the workshop venue). Almost everybody (94%) was satisfied with the standard both of their accommodation and the workshop venue;
- A majority thought that the workshop presenters were well-informed on their subject areas, although 27% did not agree. Almost everybody (81%) felt that the style of presentation was neither too formal nor too informal. However, many (35%) felt that there was not enough opportunity to express their opinions and ask questions. A quarter (25%) would have liked more opportunity to talk with their colleagues outside the formal workshop sessions.

Participants felt that the most useful presentations were those on:

- basic principles of monitoring and evaluation; and
- the process of developing a monitoring and evaluation system and monitoring and evaluation techniques.

As these were the core sessions of the workshop, this is considered a very positive result. Participants felt that the least useful sessions were:

- the Western Samoa fisheries management presentation;
- the session on SPBCP objectives and the project cycle; and
- the biophysical monitoring practical session.

Three measures were used to determine whether or not the workshop was successful. The results of these measures were:

- Half (50%) the participants felt that their knowledge of monitoring and evaluation was a little higher than before, and 50% felt that their knowledge was a lot higher than before. Everybody (100% of respondents) now felt they could run a local workshop on monitoring and evaluation in their project area, although 43% said that they would require assistance from a specialist. Most people (73%) had changed their plans as a result of what they had learned at the workshop, and now expected to do additional or different things when they returned home.

All three measures suggest that the workshop provided useful information and skills to participants in the area of monitoring and evaluation.

Asked to rank seven possible topics for a future workshop, participants chose the following three areas, in order of priority:

- ecotourism planning, development and management;
- design and production of awareness-raising materials; and
- other income-generating activities (e.g. handicraft production and marketing).

Specific suggestions which were made by participants about how to improve any future workshop included:

- ensure that participants receive at least a brief outline of the workshop before they leave home;
- give participants prior notice about how they will get from the airport into town, where they will stay and when per diems will be paid;
- presenters should stay at the same hotel as the participants;
- the venue for the next workshop could be an atoll country, in an effort to compensate for a

perceived focus by SPBCP on high island countries;

- the workshop should be based around a case study;
- there should be more group exercises; and
- there should be more practical sessions, but these "must be linked to problems that actually affect our communities".

The facilitators considered these results, and put forward the following recommendations for any future workshop:

1. There is some doubt about the effectiveness of regional workshops such as this. It may be more effective instead, and quite possibly more cost-efficient, to provide on-the-job training in-country. This would allow training to be tailored to the needs of the individual/project area concerned, and facilitate follow-up assistance to the project.
2. If further such workshops are to be conducted, consideration should be given to running several workshops, rather than trying to run a single workshop for 13 projects facing very different circumstances. Each workshop could group Conservation Areas at similar stages of development, or Conservation Areas facing similar types of problems.
3. If a regional workshop is to be held, consideration should be given to holding it in a more central location. A country such as Fiji has a wider range of conference venues, and a long-established Conservation Area which is suitable for use as a case study site, in fairly close proximity to the international airport at Nadi. Such a location would also reduce the duration and cost of air travel for participants. The greater frequency of flights to Nadi would provide more flexibility in scheduling the workshop.
4. More time should be allowed at all stages of the process of organising a workshop. This means more time to develop the workshop objectives, more time to select the presenters, more time to design the programme, more time for the presenters to prepare material, and more time for the participants to review and digest pre-circulated material.
5. Facilitators should be asked to provide advice on what are achievable objectives for the workshop, who might most usefully attend, and how those objectives might most usefully be achieved within a workshop format.
6. Consideration should be given to bringing the workshop presenters and the workshop organiser together for several days, some time in advance of the holding of the workshop, to plan the programme in detail.
7. Because of the need to link the workshop to the multi-partite review meeting, several of the people at the workshop were not directly involved with the management of Conservation Areas. The presence of participants who do not have a need for the information and skills being presented at a workshop can make it difficult to get discussion going, particularly in small groups. As a general rule, participants at workshops should be selected solely on the basis of whether or not they are likely to be able to utilise the information and skills gained at the workshop.
8. The workshop facilitators, all participants and (if the workshop is held at a location outside Samoa) the SPBCP workshop organiser should be accommodated together in the same place. This will maximise the opportunity for exchange of information outside formal sessions.
9. A larger and more varied meeting space would have been preferable. The small size of the meeting room relative to the number of participants, and the lack of adjacent meeting areas, meant that there was not enough flexibility for small group work.
10. A less formal set-up was considered more appropriate. Venues for future workshops should offer a range of large and small meeting spaces.
11. It is important to ensure that the role of the workshop organiser and the role of the workshop facilitators is clear, well in advance of the workshop.
12. The workshop organiser, workshop facilitators and a representative of the administrative staff should have a session immediately at the end of each day's proceedings, to debrief and plan the programme for the following day.
13. It is important that basic teaching resources be available in all venues, even for practical sessions. The facilitators saw basic resources as including ample supplies of "butcher's paper", a range of marker pens, and the facilities to make their own overhead transparencies on-site.
14. The language level was appropriate for the participants at this workshop. However, if future workshops include local Conservation Officers or other members of CACCs who have a lower level of English competency, then a less formal and less technical level of English may be appropriate.

Annex 1: Agenda

South Pacific Regional Environment Programme (SPREP)
South Pacific Biodiversity Conservation Programme (SPBCP)

Participatory Monitoring and Evaluation Workshop

2–5 December 1996
Apia, Western Samoa.

Monday 2 December–DAY ONE

Session	Item	Speaker/Facilitator
Opening of Workshop		
8.30–8.35	Welcome by SPBCP Programme Manager	Mr Iosefatu (Joe) Reti
8.35–8.40	Opening Prayer	Pastor Kanela Alefaio
8.40–8.50	Opening remarks by UNDP	Mr Tony Patten
8.50–9.00	Opening remarks by SPREP	Mr Don Stewart
9.00–9.20	Opening remarks by Government of Western Samoa	Hon. Tuala Sale Tagaloa Kerslake
9.20–9.30	Official Photographs	
9.30–10.00	Morning tea	
Session 1: SPBCP recap		
10.00–10.30	Introductions by participants	
10.30–10.45	Outline of workshop	Mr Michael McGrath
10.45–11.15	SPBCP Recap	Mr Iosefatu (Joe) Reti
11.15–12.00	Questions and answers	
12.00–13.30	Lunch Break	
Session 2: Basic principles of participatory Monitoring and Evaluation (M&E)		
13.30–14.10	What is monitoring? Why do we need to monitor? Factors to consider in developing monitoring systems.	Mr Michael McGrath
14.10–14.30	Questions and Answers	
14.30–14.50	Case study: Pohnpei CA	Mr Valentine Santiago
14.50–15.00	Questions and Answers	
15.00–15.20	Afternoon tea	

Session 3: Steps in developing a participatory Monitoring and Evaluation programme

15.20–16.10	Developing a participatory monitoring and evaluation system for your Conservation Area	Ms Sango Mahanty and Mr Tony Whitaker
16.10–16.30	Questions and Answers	
16.30–16.50	Case Study: Arnavon Islands CA	

Tuesday 3 December–DAY TWO

Session 4: Tools for gathering M&E data; Fisheries case study

8.30–9.30	Tools for socio-economic monitoring and monitoring of terrestrial environments	Ms Sango Mahanty and Mr Tony
9.30–10.00	Tools for monitoring of marine environments	Mr James Aston
10.00–10.20	Morning tea	
10.20–12.00	Developing a Community Action Plan: The Western Samoa Village Fisheries Extension Programme	Western Samoa Fisheries Division
12.00–13.00	Lunch Break	

Session 5: Socio-economic Practical session: Pasefika Inn

13.30–16.30	Monitoring socio-economic change in village communities	Ms Sango Mahanty

Wednesday 4 December–DAY THREE

Session 6: Biophysical Monitoring and Evaluation Practical Session: Mt. Vaea Scenic Reserve

8.00–12.00	Demonstration of terrestrial monitoring techniques: Bird monitoring Vegetation monitoring	Mr Tony Whitaker
12.00–13.30	Lunch Break	

Session 7: Developing a Monitoring and Evaluation Plan: Practical Examples

13.30–15.00	Developing a Monitoring and Evaluation Plan for SPBCP Conservation Areas: Group Discussions	
15.00–15.30	Afternoon tea	
15.30–16.30	Developing a Monitoring and Evaluation Plan for SPBCP Conservation Areas: Group Discussions (continued)	

Thursday 5 December–DAY FOUR

Session 8: Developing a Monitoring and Evaluation Plan: Practical Examples (cont.)

8.30–10.00	Developing a Monitoring and Evaluation Plan for SPBCP Conservation Areas: Group Discussions (continued)	
10.00–10.20	Afternoon tea	
10.20–12.00	Developing a Monitoring and Evaluation Plan for SPBCP Conservation Areas: Group Discussions (continued)	

Session 9: Developing a Monitoring and Evaluation Plan: Practical Examples (cont.)

13.30–15.00	Developing a Monitoring and Evaluation Plan for SPBCP Conservation Areas: Group Discussions (continued)	
15.00–15.20	Afternoon tea	

Session 10: Review of the workshop, outstanding issues and wrap-up

15.20–15.40	Summary of workshop	Mr Michael McGrath
15.40–16.10	Participants to complete post-workshop questionnaires	All participants
16.10–17.00	Discussion of workshop and workshop recommendations	Mr Iosefatu (Joe) Reti
17.00–17.15	Presentation of certificates	Mr Iosefatu (Joe) Reti

Evening Cocktail Reception

18.30–20.30	Lesina Restaurant

Annex 2: List Of Participants

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South Pacific Biodiversity Conservation Programme (SPBCP)

Participatory Monitoring and Evaluation Workshop

2–5 December 1996
Apia, Western Samoa.

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Mrs Ruta T. Couper
SPBCP Secretary

Mrs Sarona Stanley
Divisional Assistant—SPBCP

Annex 3: First Questionnaire

(distributed to participants at commencement of workshop)

1. Did you receive enough notice of the workshop?

   YES **9** NO **6**

2. Did you receive enough information about the workshop before you left home?

   YES **1** NO **14**

3. Were the travel arrangements (itinerary, availability of ticket, etc.) satisfactory?

   YES **11** NO **4**

4. Have you ever undertaken or been involved in any monitoring or evaluation work?

   YES **3** NO **12**

   If yes, please describe .....

   .....

   .....

5. Does your project currently undertake any monitoring activities?

   YES **5** NO **10**

   If yes, please describe .....

   .....

   .....

6. Has there ever been an evaluation of your project, or any aspect of your project?

   YES **1** NO **14**

   If yes, please describe .....

   .....

   .....

7. How important do you think it is to undertake monitoring and evaluation in your project at this time?

Not important	Slightly important	Quite important	Very important
1	**0**	**2**	**11**

8. Do you *honestly* think that during 1997 your project is likely to

   (a) commence development of, or undertake any further work on, a monitoring and evaluation system for your project?

   15 YES **0** NO

   (b) actually commence monitoring and evaluation in your project area?

   10 YES **1** NO

9. People have come to this workshop with a wide variety of objectives. What do you think is the most useful thing that you will achieve at this workshop? Rank the following possible objectives from **1** to **6**, with **1** for the most important and **6** for the least important.

   3 receive an update on the status of the SPBCP and likely future developments in the programme

2	get specific information you need for your Conservation Area project
1	learn how to design and implement monitoring and evaluation systems for your Conservation Area
4	exchange experiences with CASOs and project managers from other CA projects
5	find out about the range of materials and services available from SPREP as a whole

10. How useful are regional workshops such as this one for you in your everyday work?

Critically important	Useful	Interesting, but not useful	A waste of time
5	**8**	**0**	**0**

11. If the SPBCP were to hold another workshop next year, what should be covered in the workshop? Please rank the following options from **1** to **8**

2	train-the-trainer skills
4	contract writing, consultant selection and supervision
3	further training in monitoring and evaluation
6	design and production of awareness-raising materials
1	ecotourism planning, development and management
7	other income-generating activity (please specify)
5	business planning and development skills

12. If SPBCP were to hold another workshop next year, can you suggest any ways in which we could help to make the workshop more effective.

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Name (optional)

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Second Questionnaire

(Distributed to participants at the completion of the workshop)

1. Was your accommodation

Too high quality	A suitable standard	Too low quality
1	**16**	**0**

2. Was the workshop

Too long	About the right length	Too short
0	**13**	**4**

3. Were the workshop venue and working conditions

Suitable	Unsuitable
15	**1**

4. Was the style of presentation

Too formal	Suitable	Too informal
2	**13**	**1**

Any other comments on the style of presentation? .....

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.....

5. Were the workshop presenters

Well-informed on their subject areas	Not well-informed on their subject areas
11	**4**

Any other comments on the workshop presenters? .....

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6. Was there enough opportunity for you to contribute your knowledge, express your opinions and ask questions?

YES **11** NO **6**

7. Was there enough opportunity for you to talk informally with your colleagues from other Conservation Areas?

YES **12** NO **4**

8. What were the most useful sessions at the workshop? Rank the following sessions from **1** to **8**, with **1** for the most useful and **8** for the least useful.

7	SPBCP objectives and project cycle
1	Basic principles of monitoring and evaluation
2	Process of developing a monitoring and evaluation system
3	Monitoring and evaluation techniques
5	Case studies
8	Western Samoa fisheries management presentation
4	Socio-economic monitoring practical session
6	Biophysical monitoring practical session

9. Having completed the workshop, is your knowledge and understanding of monitoring and evaluation

The same as before	A little higher	Much higher
0	**8**	**8**

10. Would you feel confident enough to organise and run a workshop on monitoring and evaluation techniques for your CACC and other key people in your Conservation Area?

YES	YES, but only if I had help from a specialist	NO
8	**6**	**0**

11. When you return home, will you do anything extra that you were not planning to do before the workshop?

YES **11** NO **4**

If YES, what will you do that you weren't planning to do? .....

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13. How useful are regional workshops such as this one for you in your everyday work?

Critically important	Useful	Interesting, but not useful	A waste of time
7	**8**	**0**	**0**

14. If the SPBCP were to hold another workshop next year, what should be covered in the workshop? Please rank the following options from **1** to **8**

4	train-the-trainer skills
5	contract writing, consultant selection and supervision
7	further training in monitoring and evaluation
2	design and production of awareness-raising materials
1	ecotourism planning, development and management
3	other income-generating activity (please specify)
5	business planning and development skills

15. If SPBCP were to hold another workshop next year, can you suggest any ways in which we could help to make the workshop more effective?

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Name (optional):

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