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Managing non living resources in the Pacific through economics

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ABSTRACT

While development of natural non living resources such as minerals and water can better the lives of Pacific islanders, it needs to be managed to ensure a safe and healthy environment. And as any resource manager today knows, to manage resources we need to manage the people who use them. A number of projects in the Pacific have recently turned to economic tools to help manage the way people use non living natural resources. In this paper selected case studies will be used to:

- demonstrate the different ways that economic tools are helping to improve the governance of a variety of non living natural resources in the Pacific; and
- consider the prospects for using these tools more generally in the Pacific in the future.

To highlight the ways in which economic tools can improve the governance of non living natural resources, a simple project cycle is used. A number of case studies including the following are used to show how economic tools are improving management of non living natural resources in different sectors including water, disasters, oceans, minerals and energy. Details of case studies are provided in the paper accompanying the presentation. Following discussion of the case studies, the implications for using economic analysis to support the management of non living resources in the Pacific is discussed.

INTRODUCTION

Of the many similar definitions given to economics, probably the one most relevant to resource management is that economics is 'the science of human behaviour as a relation between scarce means having alternative uses' (Robbins 1932). In other words, economics is a way of viewing how people choose to use scarce resources which have competing uses. This definition of economic is as relevant in the Pacific today – if not more so – as when it was first coined in over 70 years ago. Rapidly growing populations, a movement towards consumerism and a shift from the subsistence to the cash economy are placing increasing pressure on scarce natural resources in the Pacific.

This is particularly important where the increasing demand is for non living natural resources since these are slow to replenish naturally. Examples of non living resources which are under increasing demand in the Pacific include water (for drinking, washing and waste removal), aggregates (sand, gravel, rocks and shells used for construction) and other minerals (land or maritime).

Early use of non living resources in the Pacific and elsewhere focused around their exploitation or 'development' as a means to fuel economic growth and increase the well being of citizens. However, there is now an accepted recognition that resource development cannot occur unmanaged. There is ample evidence to demonstrate that unmanaged exploitation of non living resources in the Pacific has:

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- Led to increased risk of natural disaster – for example, excessive extraction of aggregates from the coasts of Kiribati has exposed some of those areas to greater risk from flooding as critical beach structures are degraded (see Webb 2005); and or
- Led to pollution and consequent health risks – for example, excessive use of freshwater courses or coastal areas as a sink for household waste or sewerage has resulted in nutrient enrichment of drinking/swimming water and the contamination of fisheries resulting in health problems such as diarrhoea and worms (see for example, Hajkowicz and Otakai 2005, Lal et al. forthcoming).

To achieve sustainable development, the Pacific faces the challenge of determining how to exploit resources in a way that increases wealth but is not so excessive or inappropriate as to harm health or welfare. Managing resources in this way ultimately means managing the behaviour of the people who exploit those resources. This can be partly achieved through the strategic use of economic tools.

ECONOMICS AND HUMAN BEHAVIOUR

By focusing on the question of how to allocate scarce resources, economics emphasises the importance of the triggers or ‘values’ that motivate people. In subsistence economies, economic values that trigger resource use may reflect the importance that communities place on traditional customs or the importance of the Church. For instance, when key Church celebrations occur (First Holy Communions, Christmas etc.), there may be a flurry of fishing in preparation for feasts or certain areas may be taboo at certain times of year for cultural reasons. Whatever the value is, it creates the triggers for the ways in which people use resources.

More commonly today, the shift in the Pacific towards cash economies means that the trigger for people to use natural resources is money. Consequently, the higher the price for aggregates, the more likely people are to extract them with the result that very high prices could threaten coastal landscapes. (See Webb 2005 for more information.) Likewise, the more money people can get for tourism, the more burees or faleas they are likely to build and the more water they will divert in a catchment to that use.

Information on the values that people associate with natural resource use can be used to improve natural resources governance in several ways.

ECONOMICS AND GOVERNANCE

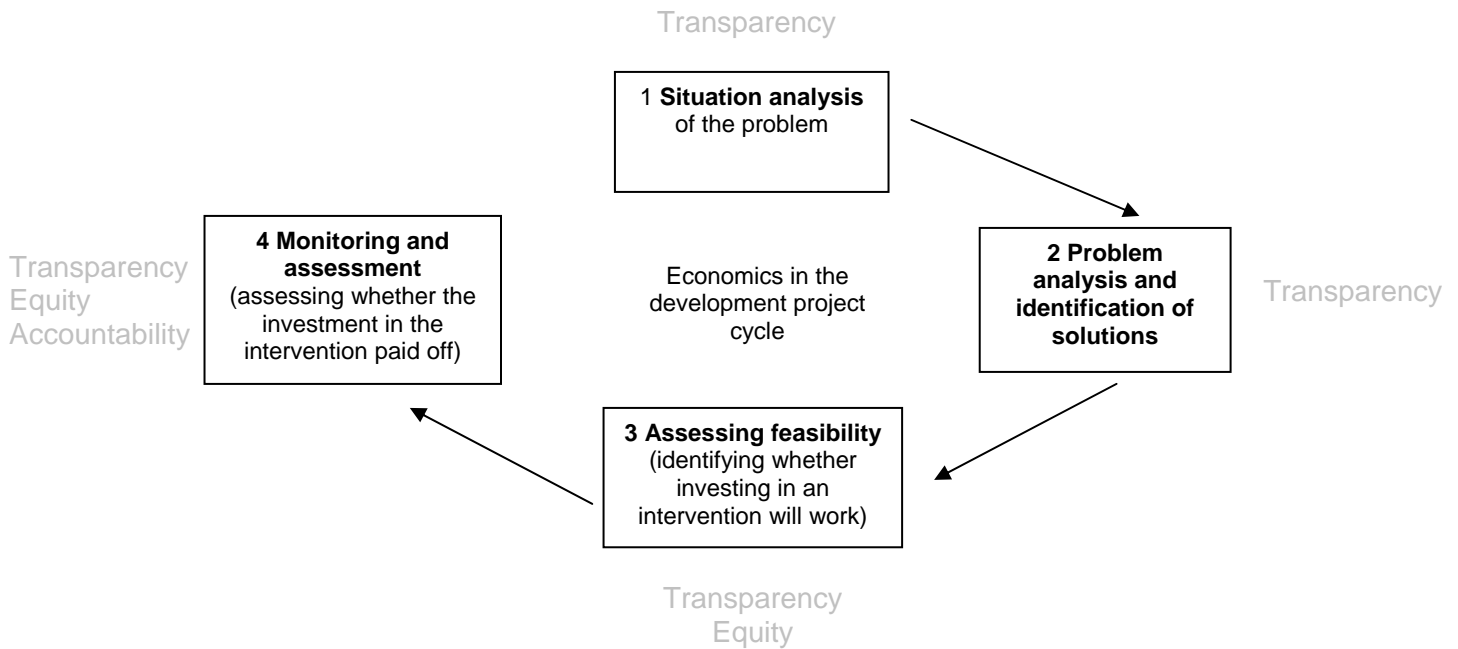
The Pacific Islands Forum Secretariat (PIFS) defines governance as the ‘transparent, accountable and equitable management of all resources’ (PIFS 2005). By focusing on the values that motivate people, economic tools can enhance:

Transparency	the information enables stakeholders (householders, private sector and governments) to better understand the losses or gains related to current resource use. It also enables decision makers to compare the valued communities could gain from using resources in one way (eg., commercial production) compared to another (eg., conservation of environmental services). In other words, information on economic values can enable decision makers to make more informed decisions about what use of resources would make a community best off. (See the Tuvalu and Kiribati examples in section 5 below);
Equity	by sharing the information on the value of resources in alternative uses, stakeholders in resource use have the ability to argue more effectively their case for or against allowing their resources to be used in one way rather than another. (See, for instance, the Cook Islands example in section 5 below as an example);
Accountability	by sharing the information on the value of resources in alternative uses, decision makers are more likely to need to justify to stakeholders why they may choose to allow resources to be used one way rather than another. (The Tuvalu case below is a good example.)

THE PROJECT CYCLE

These three components of governance – transparency, equity and accountability – have relevance at different stages in resource management. Ideally, interventions in resource management come (or should do) after assessing the current situation, identifying the cause of problems and possible solutions, weighing up alternative solutions (eg., different policy options) and then assessing the success of the solutions implemented. In its simplest form, such a project cycle might appear as in figure 1. Governance issues related to the different stages are highlighted in grey.

Figure 1 Simplified project cycle



A number of case studies follow that show how economic tools are being used in the Pacific throughout the project cycle to help improve the governance of non living resource management.

ECONOMICS AND NATURAL RESOURCE GOVERNANCE: CASE STUDIES

The case studies discussed in this paper represent very brief summaries of detailed analyses. For details of the studies, please refer to the source documents.

Economic cost of watershed degradation on Rarotonga

Details on the findings of the valuation of watershed degradation on Rarotonga are to be presented in a separate session in this meeting (Holland and Parakoti 2006). The valuation was undertaken through the SPREP executed International Waters Project to raise the profile of watershed degradation nationally and with communities. The study generated information on the value of financial losses to Rarotonga from the current degradation of the island's watersheds. In this sense, it forms part of the situation analysis, or phase 1 in the project cycle above. However, by raising the profile of the problem, it also aims to move stakeholders closer to actually addressing the problem.

The valuation revealed that watershed degradation on Rarotonga alone was resulting in negative impacts on water quality, fisheries, health and tourism among other sectors (see Hajkowicz and Otakai 2005). The total financial losses arising from watershed degradation on the island were estimated at around NZ\$ 7.4 per year, not including the loss of intangible benefits such as harm to biodiversity.

The information caused quite a stir in Rarotonga and directly contributed to the subsequent establishment of a private sector committee on Rarotonga aimed at targeting improved environmental management (IWP personal communication). It has also been used in the government's awareness raising campaign to encourage communities to protect their watersheds and save money.

Economic cost of disasters (SOPAC/USP)

This study was commissioned by the Australian Agency for International Development (AusAID) as a joint research project by the South Pacific Applied Geoscience Commission (SOPAC) and the University of the South Pacific (USP). The project was intended to develop a framework that Pacific Island Countries could use to make more efficient investment decisions on Disaster Risk Management (DRM). The researchers developed:

- a framework to assess the impact of future natural disasters in Pacific Island Countries; and
- a model to assess the effectiveness of various DRM measures. (See McKenzie et al. 2005).

In addressing these issues, this study trialled the framework by assessing the costs to Pacific island economies of disasters that had already happened. In this respect, the work conducted valuations that could also be used in a situation analysis of those disasters.

Examples of the costs of disasters estimated included:

- Cyclone Ami and related flooding on the agriculture and education sectors in Fiji (table 1);
- Cyclone Heta on the tourism sector in Niue (table 2).

Table 1 Cyclone Ami and related flooding on the agriculture and education sectors in Fiji

Economic loss	Fj\$ millions
Loss of 60-80 percent of subsistence crops	0.921
Direct damage to commercial crops such as dalo, yaqona, and copra cost Fiji	39.3
Direct damage to sugar industry (loss of sugarcane and direct damage to Fiji Sugar Corporation's infrastructure and equipment)	13.6
Loss of sugar production	11.2
Estimated extra personnel costs to help with the clear up and repair work generally	0.884
Estimated cost of debris clearing (excluding extra personnel costs) in the sugar sector specifically	0.115
TOTAL (does not include other impacts such as damage to non sugar agricultural equipment or land etc)	66.02

Source: McKenzie et al. (2005)

Table 2 Cyclone Heta on the tourism sector in Niue

Economic loss	NZ\$ millions
Direct Impacts Damage to tourist accommodation and infrastructure (needs repairs)	0.30
Destruction of tourist accommodation and infrastructure (needs total replacement)	2.75
Damage to scenic sites and access roads	0.29
Loss of income in tourist revenue	0.10
Cost of development and certification programme for new dive sites	0.20
TOTAL (does not include costs of demolition and debris removal, additional tourism operating costs or damage to environment e.g. Huvalu forest conservation area)	3.64

Source: McKenzie et al. (2005)

The framework developed in this project is now being used to inform the development of national action plans (eg. In awareness raising activities) for DRM in the Pacific.

Benefit cost analysis of extending maritime boundaries

This study is being undertaken to support Pacific Island Countries in technical aspects of maritime boundaries delimitation as well on extended Continental Shelf issues.

The purpose in the economic component involves:

- assessing the non-living marine (and benthic living) resource potential of areas relevant to any claim for extended continental shelf beyond 200 nautical miles by the Federated States of Micronesia, Vanuatu, Kiribati, Tuvalu and or the Solomon Islands. In this sense, the study contributes to a situation analysis of the extension of maritime boundaries (phase 1 of the project cycle);
- conducting a benefit cost analysis of a general Pacific application to extend maritime boundaries by comparing the value of the potential with the costs of applying. In this sense,, the study falls under phase 3 of the project cycle in that it is intended to assist PICs to decide whether to pursue extension. (If the potential is assessed as great enough, countries may deem it worthwhile investing in the application.) (SOPAC 2006).

The draft report of the study is due in September 2006.

Benefit cost analysis of alternative aggregate extraction options in Kiribati

This analysis occurred as part of the SOPAC executed EDF project on Reducing vulnerability in Pacific ACP states. The Government of Kiribati has long been concerned that the traditional practice of sourcing aggregates (sand, gravel etc.) on Tarawa from the coastal area for construction and landscaping is eroding the coastline and exposing Tarawa residents to flooding by wave overtopping. (See Webb 2005.) Consequently, government proposed a package of measures involving the introduction of an island-wide ban on coastal mining, together with the establishment of a commercial state owned dredging enterprise which would conduct aggregate mining for the whole island from the lagoon.

An economic analysis was conducted to asses the economic and financial feasibility of the proposed intervention package. The analysis falls into phase 3 of the project cycle above as it assesses the feasibility of potential solutions.

The study indicated that the state owned dredging enterprise has the potential to make a healthy profit from the exploitation of the offshore resources, relieving the coastlines of significant pressure. However, the study also raises a number of issues that the Government of Kiribati would need to address in its design phase to ensure the fledgling company could survive once financial assistance to launch it ends. These include:

- the need to establish a mechanism to assist householders who, under the ban, would be no longer eligible to sell aggregates from the coastline; and
- the ability of the government to enforce an island wide ban given that (i) extraction by the household sector exceeds normal combined extraction of the commercial and public sector and (ii) there is increasing demand for aggregates from international donor companies and an increasing local population on Tarawa.

The Kiribati economic analysis is only the first of several economic analyses proposed under the SOPAC EDF project. At present, there is a 'wish' list of around 12 more studies to be conducted. Key assessments planned under the study include assessments of how much selected interventions conducted under the EDF project are actually benefiting countries. These analyses clearly fit under phase 4 of the project. They are important for demonstrating to other countries where particular interventions have real value – and may thus be of benefit to them.

Economic assessment of coconuts as a biofuel for rural electrification

This study was conducted in response to a request from the Government of Fiji. The Government of Fiji has developed a biofuel program to support its rural electrification activities in Fiji. Under this work, two community based biofuel projects were established in collaboration with the Secretariat of the Pacific Community (SPC) and the French Embassy to Fiji. The aims of the biofuel pilot projects were to demonstrate the use of coconut oil for electricity production, decrease energy dependence and reduce costs of imported diesel, and to raise rural living standards by creating opportunities for local copra production.

SOPAC was approached to conduct an independent evaluation of the existing biofuel projects. In this respect, the study fits in with phase 4 of the project cycle above since it assesses whether the investment in biofuel technology has paid off.

The study (given in Mario et al. forthcoming) identified that:

- biofuel technology was technically proven; and
- in theory, significant monetary benefits could be generated from its use through fuel savings. In a village without access to electricity prior to the project, the study identified that access to electricity also generated important social benefits by reducing the burden of women's work (through the use of electronic household appliances) and assisting children with study (through the use of fluorescent tube lights).

On the other hand, the study identified that many of the potential benefits of the biofuel failed to materialise due to weak management structures and poor economic incentives. This is demonstrated by the fact that neither of the community based projects is currently operating as planned, with one generator continuing to run on diesel rather than biofuel, and the other not operating at all.

The findings of the evaluation will be used by SOPAC and the Government of Fiji to identify villages where the potential benefits of local value adding to the existing copra production will have benefits to the community. In addition, recommendations have been formulated on how the appropriate management and maintenance of the biofuel systems can ensure sustainable electrification of remote communities.

At a regional level, a complementary economic study has been conducted on the import implications home-grown biofuel to reduce fossil fuel imports. In this, SOPAC (draft paper) has identified that Pacific island countries could ease the burden inflicted on their economies by moving to biofuel. However, it will be imperative that the right incentives are provided to an emerging biofuel industry and that governments take into account the total effect of reduce fossil fuel imports on their economy. These include a reduction in copra exports and the loss in excise duty and other taxes through concessions. SOPAC therefore promotes the establishment of biofuel industry with government incentives, provided the total impact of the economy is taken into consideration.

Economic assessment of the aggregate mining in Majuro

This study was undertaken in response to a request by the Government of the Marshall Islands which has witnessed severe coastal erosion around Majuro over the past three decades. The Government of the Marshall Islands recognised that extensive aggregate mining activities (beach mining, nearshore dredging and reef quarrying) contributed significantly to coastal erosion and therefore approached SOPAC undertake a study of the economic costs of using alternative sources of aggregate. In this sense, the study contributes both to:

- a situation analysis of the problem of coastal erosion (phase 1 of the project cycle) by highlighting economic losses from current practices; and
- phase 3 of the project cycle – assessment of possible interventions (in this case, relocating aggregate extraction to other places).

The analysis (McKenzie et al. forthcoming) noted that coastal damage arising from aggregate mining meant that the government either had to tolerate the increased risk of flooding or, more commonly, respond by replacing coastal protection by artificial means (eg., sea walls). These latter costs were estimated to total between US\$ 88-373 million over 25 years (if erosion proceeds at its current rate).

When these costs are considered and added to existing production costs from extracting aggregate from beaches and nearshore areas, the study found that aggregates obtained from more environmentally sustainable offshore sources are actually less costly than coastal sources and are only marginally more expensive than overseas imports.

These findings from the study lend weight to the current proposed coastal management framework which includes the phasing out of lagoon dredging over a three year period.

Table 3 Summary of selected economic analyses of non living resources in the Pacific

Case study	How economics is being used to improve management	Economic tool	Stage in the project cycle	Source
Economic cost of watershed degradation on Rarotonga, Cook Islands	Advocacy (generate incentives to support water management initiatives)	Economic valuation	1, 2	Hajkowicz et al. (2005)
Economic cost of disasters in the Pacific	Advocacy (generate incentives for government to invest in disaster risk management strategies)	Economic valuation	1, 2	McKenzie <i>et al.</i> (2005)
Benefit cost analysis of extending maritime boundaries	Provide information on whether to pursue extension of maritime boundaries	Economic valuation	1, 3	Consultant contract
Benefit cost analysis of alternative aggregate extraction options in Kiribati	Assess the commercial and economic feasibility of extracting aggregates off shore	Benefit cost analysis	3	Greer (forthcoming)
Economic assessment of coconuts as a form of biofuel	Assess the economic value of an existing trial of coconut oil as fuel	Least cost analysis	4	Mario et al. (forthcoming); SOPAC (forthcoming)
Economic assessment of the aggregate mining in Majuro	Compare costs associated with current versus other sources of aggregate	Economic valuation	1, 3	McKenzie et al. (forthcoming)

6 ISSUES FOR THE PACIFIC

As economic tools gain more acceptability to inform resource management, what do these case studies mean for us in the Pacific?

A key issue is the dire lack of capacity in Pacific Island Countries to conduct economic analyses to support the development of management plans. Accordingly, all of the studies presented here had to be led by overseas experts either resident overseas or located within CROP agencies.

Some of the studies presented tried to overcome the lack of local capacity by including a mentoring component in which a local representative was guided in conducting the analysis so that there would be an understanding of what was done and why (eg., the Cook Islands study). The benefit cost analyses of investments undertaken in the SOPAC executed EDF project are intended to follow the same format. At the same time, formal training in economics is available at tertiary institutions such as the USP or University of PNG.

Nevertheless, there is a need for a strategic vocational training system in which decision makers such as government officials are trained on the job in the application of economics to resource management. Even

with such a scheme, there remains an interim gap in skills. It is possible that CROP agencies could be used as centres of excellence to support Pacific Island Countries to meet these gaps. However, such demands would need to be built systematically into work plans and budgets.

A second key issue for the Pacific is access to data to underpin economic analyses. Pacific government agencies frequently have insufficient resources (human, funding) to record resource use and assess impacts. For example, the economic analysis of extracting aggregates in Kiribati requires information on how much aggregates are currently being extracted. However, records on aggregate extraction on Tarawa are incomplete and unreliable. For instance, the Government of Kiribati does not keep records on the amount of aggregate used for their larger projects so it is not known what amount of aggregates it extracts in total. Not surprisingly, this created challenges in doing the analysis.

A third issue for Pacific island countries is the level of complexity in economic analysis. Limited economic expertise in the Pacific limits current analysis to simple analyses as these are easiest (not to mention cheapest) to execute and learn. This is appropriate in a region where the use of economics to manage natural resources is still in the nascent stages. However, if and as Pacific island decision makers adopt more widespread use of economics to guide resource management, there may be a need to apply new or more complex forms of analysis.

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