

# Future Research Directions in Coral Reef Management<sup>1</sup>

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## Introduction

At the International Consultative Workshop on Economic Valuation and Policy Priorities for Sustainable Management of Coral Reefs, 10-12 December 2001, Penang, Malaysia, participants were divided into three working groups to discuss the future research directions for sustainable management of coral reefs. The groups focused on one of the following three themes: (i) economic valuation; (ii) policy analysis; and (iii) community participation. This paper is based on the outputs resulting from the group discussions.

## Future research directions for economic valuation of coral reefs

The group discussions paralleled the ideas expressed by the International Coral Reef Action Network (ICRAN), stressing the importance and influence of economic valuation in coral reef management and protection. The working group noted that such studies could contribute to:

1. *Increased efficiency* – by showing the maximum net benefits to society, for instance in the choice between reef-related tourism and commercial fishing;
2. *Effective advocacy* – by providing the so-called “power of numbers”, quantifying and demonstrating to decision-makers the full costs of using public goods;
3. Better understanding of the stakes involved in multiple stakeholder problems, thereby providing crucial information for decision-making processes in tropical coastal zone management, and building solid partnerships among the business community, the public sector and the consumer society;

4. Insight into how local communities and governments can capture (appropriate) the net benefits from healthy tropical coastal ecosystems.

In its strategic vision, ICRAN sees the use of economic valuation and cost-benefit analysis in economic and ecological research relating to reef areas and threats as a priority. It also sees the need for guidelines to be developed and variables to be selected so as to enable the estimation of the economic values of coral reefs. Finally, ICRAN encourages the development of standard methodologies and protocols for conducting economic valuation studies.

## Recommendations by topic

The group suggested that research related to the economic valuation of coral reefs focus on the following nine areas.

1. **The need to understand better the impact of changes in management on biophysical characteristics and social welfare. The following chain is seen as important:**

Change in management → Change in biophysical characteristics → Change in welfare

### Recommendations:

- Change the economic focus by comparing the change in welfare with the change in the cost of management in cost-benefit analyses; focus also on the cause-effect relationship between management and biophysical characteristics to arrive at a more accurate cost-benefit analysis.

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- Conduct research to explore the general (as opposed to solely site-specific) effects of Marine Protected Areas (MPA) management on reef health, and the impact of land-based pollution on the growth of various reef species.
- Explore the effects of management on coral reef ecosystem health.

**2. The need for a standard in coral reef valuation techniques and an agreed methodology to compare values across sites.**

**Recommendations:**

- Conduct economic valuation studies to determine the total economic values of coral reefs.
- Market valuation should be used for fish production, tourism and coral extraction, as well as producer surplus and resource rents.
- Use stated preference techniques or choice modeling techniques to establish non-use values.
- Conduct indirect use valuation using productivity change, replacement cost or related techniques.
- Conduct partial value calculations to arrive at a lower boundary of the economic value of coral reefs if funds are limited.

**3. The need for valuation of coral reef management options.**

**Recommendations:**

- Conduct valuation studies and cost-benefit analyses in non-MPA areas as well as in MPAs.
- Develop techniques to deal with the difficulties in the appropriation of values outside MPAs.

**4. The need to appropriate value in practical terms (actual money flows) to the beneficiaries of positive reef management strategies.**

**Recommendations:**

- Disseminate results of valuation studies in understandable terms to potential beneficiaries.
- Explore mechanisms for appropriating these values to local populations, reef managers, and local, provincial and national governments.

- Explore opportunities for exploiting further the value of reefs, through user-fees, marine park trusts, bio-prospecting, or other relevant systems.

**5. The need for rational use of reef ecosystems and sustainable management options.**

**Recommendations:**

- Explore options for sustainable reef use and encourage sustainable management regimes.
- Conduct research on the carrying capacity for tourism, and the effects of different scales of extractive activity.
- Conduct research on mechanisms to promote sustainable use of coral reefs, for example a zoning system for differential use of the resources.
- Explore options for the optimal use of reef ecosystems both from ecological and economic perspectives.

**6. The need for stakeholder analysis to identify and consider all groups that will be affected by coral reef management decisions.**

**Recommendations:**

- Identify and analyze all the stakeholder groups that will be affected by the management plan or policies for particular coral reefs.
- Conduct research on the values placed on different management options by different stakeholder groups.
- Conduct research on the incentives to different stakeholder groups under different management decisions and determine the possibility of compensation for these groups.

**7. The need to apply other research methods, such as benefit transfer, to estimate the value of coral reefs in a broader perspective.**

**Recommendations:**

- Conduct meta-analysis research on existing coral reef valuation studies to build models and parameters useful for benefit transfer.
- Explore the gaps that meta-analysis research will reveal in the existing literature on coral reef valuation.
- Ensure that results are accessible to all those who are unable or under-funded to do an all-encompassing total economic value study based on local data.

8. **The need for a systematic method for conducting coral reef valuation studies, which could be provided in an economic valuation manual.**

**Recommendations:**

- Explore the commonalities between valuation studies and the benefits of varying kinds.
  - Develop a standard valuation technique, so that comparisons across studies can more easily be made.
9. **The need to choose representative study sites for the economic valuation research in the ICRAN plan.**

**Recommendations:**

- Determine where to spearhead large-scale economic valuations of coral reefs to represent best the diversity of coral reef locations and situations around the world. These will be based on: socioeconomic factors – social, economic, and cultural; MPA designation – whether a reef area is an MPA or non-MPA zone; biophysical characteristics – reef type, species diversity, species richness, resource productivity, water conditions, habitat quality and intensity of use; type of marine tenure; and proximity to markets.

### **Future research directions for analysis of coral reefs policy**

The results of the working group discussion indicated future research related to policy analysis and instruments would be likely to follow an issue-driven policy agenda. This would address the main issues affecting coral reefs, which the working group identified as:

1. Pollution from various sources;
2. Illegal and destructive activities that cause habitat degradation, such as certain types of fishing, mining, tourism activity and other coastal development;
3. Coral bleaching caused by global warming and climate change; and
4. Over-exploitation of coral reef resources.

After identifying the important causes of the key problems, the working group discussed the future research directions needed to overcome these problems at local, national and global levels.

### **Recommendations by topic:**

The group suggested that research related to the analysis of coral reefs policies focus on the following six areas, which are presented in no particular order. Comparative case studies at national or local levels should be used to provide regional or global synthesis of major issues confronting sustainable management of coral reefs.

1. **The need for better governance and legal systems for fisheries, marine ecosystems and coastal management as, currently, lack of legal support, overlapping legal mandates and decentralization of management result in inefficient management and pollution of coastal resources.**

**Recommendations:**

- Create well-established governance and legal systems with a focus on reducing pollution, and illegal and destructive activities, such as certain types of fishing, mining and habitat degradation.
  - Conduct research on the effectiveness of marine protected areas (MPAs) and on coastal management zones, trade issues and climate change.
  - Include in MPA studies research on community management, legal mandates, linkages between levels of government, institutional arrangements and comparisons of MPAs in different countries and continents.
  - Incorporate case studies focusing on comparative analyses across countries and between developed and developing countries, on consistencies of policies at national and local levels, and on laws affecting revenue collection.
  - Conduct research on trade issues with a focus on the sustainability assessment of macro-policies and on climate change adaptation strategies and policies.
2. **The need to increase awareness among coastal resource users of the importance of promoting sustainable use of coastal resources.**

**Recommendations:**

- Research the use of standard certification and ecolabeling to identify products generated

from natural resources by way of environmentally friendly production methods.

- Conduct research on the definition and operation of ecotourism and ecolabeling. Incorporate case studies on the effectiveness of national marine parks, with special focus on ecologically representative MPAs or on successful traditional practices.
  - Analyze the effectiveness of MPA management through a rating system that qualifies the best-managed MPAs.
  - Market MPA areas and explore the application of user fees as incentives (and disincentives for over use).
  - Highlight examples of positive ecolabeling, such as the label currently being established under the Marine Aquarium Council (MAC), whereby areas in buffer zones of MPAs are set aside for sustainable ornamental fisheries to prevent cyanide fishing and general over-fishing.
- 3. The lack of resources and information to ensure that coastal resources are maintained in sustainable conditions.**

**Recommendations:**

- Acquire sufficient information on the conditions of reef ecosystems over time, and on vulnerabilities, such as damage due to coastal development, pollution, and climate change.
  - Conduct research, and include case studies, on the effectiveness of capacity building and institutional strengthening (training, etc.) mechanisms for information dissemination in localized MPAs, and education of enforcement agencies and the judiciary.
  - Explore the potential for acquiring and allocating various resources, such as financial, physical and human capital, necessary for coral reef resources to be managed in a sustainable manner.
- 4. The lack of information on the distribution of equity, especially among primary and secondary stakeholders whose livelihoods depend on coral reef resources.**

**Recommendations:**

- Analyze the issue of equity, keeping in mind that coastal communities depend on coral reefs for income, employment and subsistence.

- Conduct research, including case studies, to improve the understanding of equity distribution among primary and secondary stakeholders, poverty alleviation projects and their effectiveness, and alternative sources of livelihood.

**5. The limited information on economic values of coral reef ecosystems, and policy decisions made without consideration of the total economic value of reef resources.**

**Recommendations:**

- Highlight the increasingly important role of economic valuation in natural resources management decisions.
- Conduct valuation studies on resources, as well as on the livelihoods in coastal communities in particular, to understand better the value of livelihoods dependent on coral reef ecosystems.

**6. The lack of economic incentive for stakeholders to conserve resources.**

**Recommendations:**

- Highlight that, in order to manage coastal zones sustainably, the economic incentives of all stakeholders in the area need to be known and in line with the objectives of the management strategy.
- Conduct research on financial resources, or sustainable financing sources arising from various forms of economic incentives for the different stakeholders.
- Encourage legitimacy and compliance by highlighting the economic efficiency and individual benefits created by the strategy.

**Future research directions for community participation in coral reef management**

The working group identified information gaps in the existing literature relating to community participation in coral reef areas. The discussion was more process-oriented than the other working groups. Some general areas of economic valuation and policy instruments related to coral reef research were taken into account in developing recommendations. Gaps that need to be addressed in the management of coral reef areas include:

1. Participatory research
2. Social/cultural capital/values
3. Distributional/equity issues
4. Citizen jury approaches
5. Livelihood dependency on reefs

#### Recommendations by topic:

The group suggested that research related to the analysis of coral reefs policies focus on the following four areas.

#### 1. The need for participatory research in valuation and policy.

##### Recommendations:

- Conduct research on the benefits to valuation studies and policy research by following a participatory process and identify the appropriate methods of participation.
- Elucidate success stories demonstrating strategies that worked and why they worked.
- Conduct research on and evaluate the range of participatory models that have been used.
- Outline successes and failures of the participatory approach to identify best-case practices.

#### 2. The need to address distributional and equity issues when conducting valuation studies and developing policies.

##### Recommendations:

- Address issues concerning the difference between willingness to pay and ability to pay in order to arrive at more accurate valuation estimates.
- Address distributional issues, such as skewed resource considerations.
- Consider the effects of management decisions on all stakeholders and mitigate possible increases in income equality.

#### 3. The need for the valuation of social/cultural capital and values for more complete valuation analyses.

##### Recommendations:

- Conduct valuation research on social-cultural values and capital as well as on economic capital in order to arrive at a more complete cost-benefit picture.

- Assess and consider the economic values embodied in the participatory process itself, as it relates to the manifestation of social capital.
- Consider the strength of community values versus individual social values before their inclusion in valuation studies.
- Conduct research on the relative importance of values – for example, considering what they are and from whom they come.

#### 4. The need to understand and recognize that there is livelihood dependency on coral reefs.

##### Recommendations:

- Assess the importance of valuing livelihoods themselves as distinct from the values that the livelihoods produce.
- Explore opportunities for changes in livelihood, especially for situations where alternatives are scarce.

## Conclusions

The outcomes of the group discussions indicate the utility of economic valuation research in assisting policy changes leading to better management of coral reefs. Notwithstanding, research on the economic value of coral reefs at present lacks comprehensiveness. Many suggestions of ways to fill in gaps in the current literature were made by the working groups. The main areas on which future research efforts should be focused are summarized below.

Research conducted with the participation of users should highlight their concerns and better assess values beyond those that directly relate to livelihood, such as social and cultural values. Equity distribution needs to be researched in order to understand livelihoods dependant on coral reefs and encourage compliance by primary and secondary stakeholders. Valuation of ecological function, along with direct economic benefit, should be assessed in order to give a more holistic view of the real worth of coral reefs. Value appropriation and the perception of value by different stakeholders needs attention and should be addressed through stakeholder analysis. The discussions expounded the need for the development and implementation of standard valuation techniques to enable better comparisons between reefs at different locations. Government interventions with economic incentives or disincentives, and improvement in governance

and legal systems are necessary for more efficient management of coral reefs. Better resources, more information and increased awareness among reef users are important for improving reef management. Users should have access to information in order to understand better the value of their environment.

Although the literature relating to the total value of coral reefs is currently sparse, there are many areas to which we can look to fill in the gaps in order to have a better idea of the worth of the reefs. Participatory research should be conducted to assess the variety of values of coral reefs. The core research foci should be on filling in the gaps of coral reef valuation; understanding and valuing the livelihoods dependent on reef resources; and strengthening government and legal systems to ensure policies will be effective. This work will give policy-makers a more thorough base from which to make informed decisions, and the institutions required to implement them.