



CORDIO Asia Final Report

Management of Climate Change Impacts on Coral Reefs and Coastal Ecosystems in Tsunami-affected Areas of the Andaman Sea and South Asia



IUCN Global Marine Programme

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Executive Summary

The tsunami of 26 December 2004 had a major impact on countries around the Indian Ocean. In many areas the devastation was extreme, but overall the effects on human settlements, infrastructure as well as ecosystems were patchy. In many ways it highlighted and exacerbated existing problems, such as coral reef degradation due to climate change driven coral bleaching and over fishing, and associated loss of livelihoods. Evidence quickly emerged that indicated more severe impacts from the tsunami in areas that had seen more severe degradation of natural ecosystems and resources, as well as in societies under strain.

The project “Management of Climate Change Impacts on Coral Reefs and Coastal Ecosystems in Tsunami-affected Areas of the Andaman Sea and South Asia” was developed by IUCN’s Global Marine Programme and supported by the Ministry for Foreign Affairs of Finland through a grant to IUCN. Taking a holistic approach to addressing tsunami impacts in the context of preexisting processes and trends, the project worked towards three objectives: (i) to improve the management of coastal ecosystems such as coral reefs, mangroves and other key environments, specifically in relation to the impacts of climate change; (ii) to develop alternative livelihood projects for families in coastal areas that no longer can support themselves due to the deterioration of the coastal environment; and (iii) to improve the education and awareness of the impacts of human activities on coastal ecosystems and strengthen the capacity of local resource users and managers to mitigate those impacts.

Three of the most severely tsunami-affected countries were chosen as primary targets: Indonesia (Aceh), the Maldives and Sri Lanka, but several regional activities also involved other countries around the Bay of Bengal. Originally approved as a two-year intervention 2006-2007 the project was extended until 28 February 2009.

The project was successfully implemented through a partnership with over 30 organizations and directly involving over 100 individuals in activity development, implementation as well as capacity building. In particular the close association with the International Coral Reef Action Network (ICRAN) and a regional EU funded project on Marine and Coastal Protected Areas augmented the financial support available and greatly increased project reach and impact. It is estimated that several thousand individuals benefited directly or indirectly from engagement in the project, through livelihood enhancement and diversification, socioeconomic monitoring, ecological research, management advice, education and awareness and related training. The project has produced over 30 significant technical outputs (these are listed at the end of this report).

Project outcomes were achieved as planned, in some cases through moderate reformulation of activities. Examples of major activities and results under each of the projects objectives are provided in brief below.

Objective 1. *“to improve the management of coastal ecosystems such as coral reefs, mangroves and other key environments, specifically in relation to the impacts of climate change”*

The project contributed significantly to increasing knowledge of ecosystem impacts of the tsunami and related processes, as well as how environmental stresses interact. Results are presented in technical publications, including nineteen articles in the CORDIO Status Report 2008 and several stand-alone reports. This includes new findings on a number of important themes such as small-scale fisheries and coral reef resilience science, including reef fish spawning aggregations. A significant contribution was made to the development and field testing of a protocol for assessing coral reef resilience to climate change. The project has disseminated outputs broadly as well as conducted dedicated training to increase impact in the longer term. There is already evidence of policy and management level impacts of the project through reformulated fisheries management schemes as well as amended monitoring strategies. Evaluations of activities by participating institutions indicate a very high success rate and significant buy-in from the target audience.

Objective 2. *“to develop alternative livelihood projects for families in coastal areas that no longer can support themselves due to the deterioration of the coastal environment”*

The livelihoods work under the project was implemented largely under the Coral Reefs and Livelihoods Initiative (CORALI), formed through the joint planning and implementation of activities with an EU funded project implemented by ICRAN, United Nations Environment Programme (UNEP), South Asia Cooperative Environment Programme (SACEP) and Integrated Marine Management (IMM) Ltd.

Among the most notable achievements was the development and implementation of a Sustainable Livelihoods Enhancement and Diversification (SLED) approach. Activities at local level directly involved and benefited 500 individuals at six sites around the region through 29 different livelihoods projects, ranging from training for acquisition of new and relevant skills, to value addition of existing livelihoods and products and introduction of new livelihoods. The activities also influenced the communities in which they were implemented, reaching thousands of coastal dwellers, and some of the projects are already being replicated and scaled up through initiatives by national and local governments and civil society organizations.

The success of the activities is owed in part to the thorough methodological development, building on detailed review as well as extensive consultation with and involvement of communities. This also enabled the development of guidance on socioeconomic monitoring, produced in several languages of the region in order to facilitate the use of monitoring to support livelihoods development.

Objective 3. *“to improve the education and awareness of the impacts of human activities on coastal ecosystems and strengthen the capacity of local resource users and managers to mitigate those impacts”*

Through the projects activities many valuable lessons with respect to management of coastal and marine ecosystems and resources and development among coastal dwellers were synthesized, and used to influence global, regional as well as national policy. This includes resolutions by the IUCN World Conservation Congress, the International Coral Reef Initiative, proceedings of the South Asia Coral Reef Task Force, as well as management policies and practices in target countries.

A South Asia Marine and Coastal Protected Areas management toolkit was developed with the direct engagement of over 50 international and regional experts, and a training on using the toolkit was organized. The toolkit has been very positively received by its target audience, as indicated by the training workshop evaluation, as well as among policy makers. Further, an educational toolkit entitled “Children’s Perception of the Environment” was produced, aimed at teachers, educational projects, environmental clubs and managers. To facilitate uptake the toolkit is being translated into seven languages of the target region: Bahasa Indonesia, Bengali, Dhivehi, Hindi, Malayalam, Sinhala and Tamil. Lastly, the project has enabled the initial development of a framework for social adaptation to climate change, expected to become a key resource to support building resilience to climate change among coastal populations and industries.

These and additional activities, outputs and impacts are presented in more detail in the sections below. Lessons learned and key recommendations for further work are also provided at the level of the overall project. More specific results and outcomes as well as recommendations for future work is provided in the many project outputs.

Introduction

Background

The tsunami of 26 December 2004 had a major impact on countries around the Indian Ocean, in particular India, Indonesia (Sumatra), the Maldives, Myanmar, Sri Lanka, and Thailand. With patchy but often devastating effects on human settlements, infrastructure and ecosystems a major international effort was initiated to meet the multiple challenges of securing human life in the short term, promoting recovery and restoration, and reducing vulnerability to future events.

The impact of the tsunami has been well documented, including in reports by United Nations Environment Programme (UNEP 2005) and the Global Coral Reef Monitoring Network (Wilkinson et al (eds) 2005), the compilation of both of which the project presented herein supported. These and similar national documents have also guided the tsunami response.

In many ways the impacts of the tsunami highlighted and exacerbated existing problems more than creating new ones. For example, while it is clear the impacts of the tsunami were enormous, its effect on the marine environment in large parts of the region were less severe than e.g. the El Nino induced coral bleaching in 1998. Similarly, among the communities that lost homes and livelihoods in the tsunami many were fishers or otherwise directly or indirectly dependent on reef resources. In these communities livelihoods were already being lost at an alarming rate due to e.g. resource depletion caused by destructive and over harvesting and climate change related perturbations such as the El Nino 1998. Evidence quickly emerged that indicated more severe impacts from the tsunami in areas that had seen more severe degradation of natural ecosystems and resources, as well as in societies under strain.

Recognizing that addressing only direct tsunami impacts would not adequately deal with the underlying problems, while addressing only pre-tsunami issues would mean many problems arising as a result of the tsunami would be left unmitigated, with significant implications for longer-term sustainability, an intervention was designed by IUCN's Global Marine Programme. The approach taken was seen as particularly valuable in the face of climate change, the effect of which are already being felt in the region and which will increasingly strain ecosystems as well as resources and communities.



The Project

The project “Management of Climate Change Impacts on Coral Reefs and Coastal Ecosystems in Tsunami-affected Areas of the Andaman Sea and South Asia” was developed by IUCN’s Global Marine Programme in response to the Indian Ocean Tsunami on boxing day 2004.

Conceived as a direct response to the tsunami and its impacts on people, livelihoods and the environment, the project sought to address these impacts in a holistic manner and in the context of preexisting processes and trends. Three of the most severely affected countries were chosen as primary targets: Indonesia (Aceh), the Maldives and Sri Lanka. However, recognizing that many of the issues the project set out to address were equally applicable to other countries in the region and would benefit from a regionally coordinated response, additional countries were included as partners. This applied most notably to India, but also Thailand, and in some instances Bangladesh.

The project aimed to strengthen monitoring and management of coral reef ecosystems and development among communities that depend on them in the Andaman Sea region and South Asia, with three primary objectives: (i) to improve the management of coastal ecosystems such as coral reefs, mangroves and other key environments, specifically in relation to the impacts of climate change; (ii) to develop alternative livelihood projects for families in coastal areas that no longer can support themselves due to the deterioration of the coastal environment; and (iii) to improve the education and awareness of the impacts of human activities on coastal ecosystems and strengthen the capacity of local resource users and managers to mitigate those impacts.

The needs and priorities of the project were defined based on assessments in the countries and areas targeted, an in line with the geographic and thematic focus for tsunami assistance identified by the Government of Finland, which supported the project through a EUR 620,000 grant to IUCN. A summary of the full project proposal as approved by the Ministry for Foreign Affairs of Finland is enclosed in Annex 1.

Originally approved as a two-year intervention 2006-2007, the project sought and was granted three no cost extensions. The project was closed 28 February 2009.

Partnerships

The project was implemented jointly by the IUCN Global Marine Programme and the Coastal Oceans and Research and Development in the Indian Ocean (CORDIO) programme in collaboration with numerous international, regional, national and local partner institutions, including governmental and non-governmental organizations. In total over 30 institutions and agencies were directly engaged in project implementation. A full list of partners is provided below.

Lead partners

- IUCN - International Union for Conservation of Nature; IUCN Global Marine Programme, IUCN Asia Ecosystems and Livelihoods Group
- CORDIO - Coastal Ocean Research and Development in the Indian Ocean

Regional/international implementation partners

- United Nations Environment Programme (UNEP)
- UNEP World Conservation Monitoring Centre (UNEP-WCMC)
- South Asia Cooperative Environment Programme (SACEP)
- International Coral Reef Action Network (ICRAN)
- Integrated Marine Management (IMM) Ltd.
- Mangroves For the Future (MFF)
- The Nature Conservancy (TNC)
- IUCN’s International Working Group on Climate Change and Coral Reefs (IUCN CCCR)

National implementation partners

Indonesia

- Syiah Kuala University, Aceh, Indonesia
- PUGAR Foundation (Centre for People's Movement and Advocacy), Aceh, Indonesia.
- Wildlife Conservation Society (WCS), Aceh, Indonesia

Maldives

- Foundation of Eydhafushi Youth Linkage (FEYLI), Maldives
- Atoll Ecosystem Conservation Project (AEC), Maldives
- Marine Research Centre (MRC), Maldives
- Environment Research Centre (ERC), Maldives

Sri Lanka

- Community Help Foundation (CHF), Sri Lanka
- National Aquatic Resources Research Agency (NARA), Sri Lanka
- University of Ruhuna, Sri Lanka
- IUCN Sri Lanka Country Office

Affiliate organizations

- Marine Life Alliance, Bangladesh
- Centre for Action Research on Environment, Science and Society (CARESS), India
- Nature Conservation Foundation (NCF), India
- Bombay Natural History Society (BNHS), India
- Peoples Action for Development (PAD), India
- Suganthi Devadason Marine Research Institute (SDMRI), India
- Andaman and Nicobar Islands Environmental Team (ANET), India
- Covenant Centre for Development (CCD), India
- National Biodiversity Authority (NBA), India
- Lakshadweep Administration, India
- Gulf of Mannar Man and the Biosphere Reserve Trust (GOMBRT), India
- Andaman and Nicobar Administration, India
- Karen Youth Association, India
- Phuket Marine Biological Station (PMBC), Thailand

This Report

This is the project completion report of the IUCN Global Marine Programme project “Management of Climate Change Impacts on Coral Reefs and Coastal Ecosystems in Tsunami-affected Areas of the Andaman Sea and South Asia”, funded by the Ministry for Foreign Affairs of Finland. The report constitutes a final technical review of project implementation, results and outcomes, and covers implementation of activities from the inception of the project in 2006, up until the end of February 2009.

Detailed information is presented in sections on each project objective, and an overall assessment of impact and lessons learned is provided, along with key overarching recommendations. Project outputs are also listed in detail. These are available from IUCN and CORDIO, on the web (www.iucn.org/marine and www.cordioea.org) or on request.

Project Implementation

The following sections provide detail on project implementation, outputs and results. The matrix in Annex 2 provides a very brief synthesis of project components, activities and outputs.

1. Reef Resilience to Climate Change

Objective 1: To improve the management of coastal ecosystems such as coral reefs, mangroves and other key resources, specifically to increase resilience to climate change and other external factors.

Activities towards achieving Objective 1 of the project were implemented under three components: 1. Develop Resilience and Climate Change Indicators; 2. Develop and Implement Targeted Research Projects; and 3. Capacity Building. Details on each activity is provided below.

The activities implemented under these components contributed to the growing body of knowledge on how coral reefs and other marine and coastal ecosystems adapt to external shocks such as climate change. The targeted research identified and tested practical tools that resource managers can use to increase reef resilience to such shocks through the development of specific climate change-related indicators and incorporating these into monitoring programs, building on existing initiatives and institutions in the countries.

Targeted research projects were developed to identify geographic areas, ecosystems, natural resources or livelihoods particularly vulnerable or sensitive to climate change, and tools for improving their resilience. Training and capacity building was provided to partner institutions to undertake activities, including training seminars and field workshops.

The results from targeted research and demonstration projects were fed directly into local and national resource management frameworks. In addition, using its regional and international network of experts, IUCN and CORDIO channelled results to regional and international fora such as the International Coral Reef Initiative (ICRI). In this way, the project contributed to bridging the gap between science, management and policy.

Reef Resilience Workshop

The South Asia Reef Resilience Workshop, held in Bentota, Sri Lanka, 15-18 January 2007, brought together coral reef scientists, managers and policy makers from South Asia and the Bay of Bengal. The workshop involved 18 participants from Indonesia, India, Maldives, Sri Lanka and Thailand, and six resource persons representing organizations in the global resilience partnership.

The main objectives of the workshop were to provide coral reef managers with a learning opportunity to better understand coral reef resilience and the tools available to them; to facilitate the incorporation of resilience into coral reef management and planning; to provide managers with innovative approaches and tools that lead to practical solutions for coral reef management in the face of global change; to facilitate an exchange between coral reef managers in South Asia and the Bay of Bengal; and initiate a global communication forum for managers working to incorporate resilience at their sites.

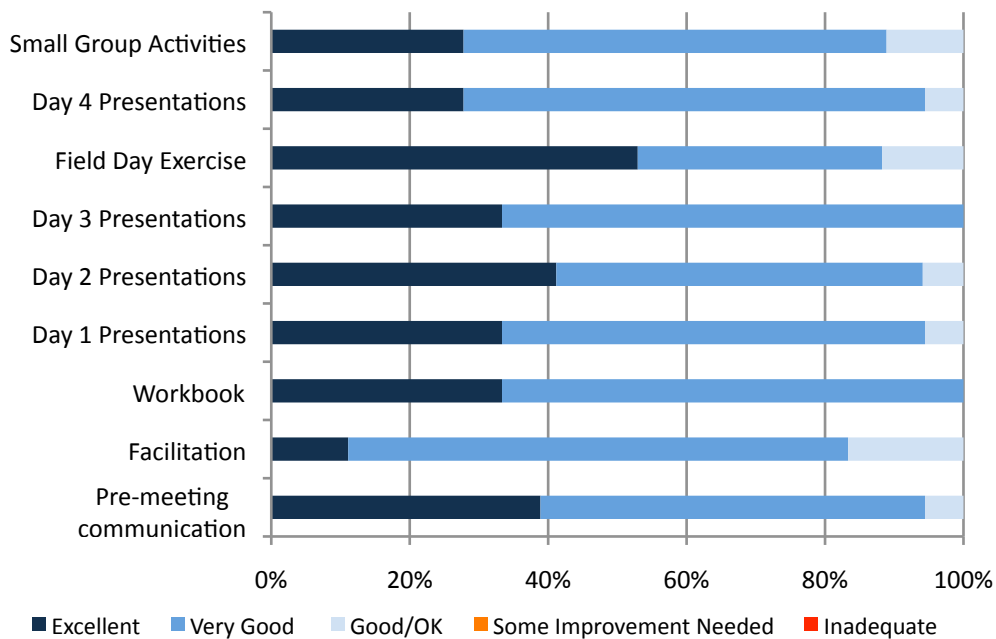
Over the three days of the workshop participants were given insight into the state of coral reef resilience research and management adaptations internationally, and through facilitated discussion regional needs and priorities were identified. Learning and exchange of information was promoted through practical group exercises. Detailed workshop materials in the form of a workbook, presentations and relevant literature were provided to participants in hard copy as well as on CD. This included resources recently developed through major international collaborations, such as the R2 Resilience Toolkit developed by the Resilience

Partnership and the Manual for the Study and Conservation of Reef Fish Spawning Aggregations published by the Society for Conservation of Reef Fish Aggregations (SCRFA).

Recommendations made by the workshop included the following:

- Resilience principles should be applied in the creation, zoning and/or management of Marine Protected Areas (MPAs) as well as in the establishment of networks of MPAs.
- Coral reef monitoring programmes in the region should be further strengthened, and encouraged to incorporate variables, as practical, that measure resilience as well as climate change impacts;
- MPA and coral reef management strategies and approaches should be adaptive, and responsive to results and findings from monitoring programmes as well as science findings;
- Capacity should be built in the region to strengthen coral reef resilience science and management applications, through the Resilience Partnership, its members, and other institutions as appropriate.
- Countries should develop supportive policies for adaptive management of marine ecosystems and the resilience approach, to facilitate the use of resistance/resilience principles in the design and management of MPAs, MPA networks, and their related marine resources

The workshop was evaluated by participants through a structured questionnaire at the end of the workshop, with highly positive feedback. A summary record from the workshop synthesizes proceedings and provides recommendations.



Coral Reef Experts Group

The Coral Reef Experts Group Meeting was organized 19-20 January 2007 in Bentota, Sri Lanka, under the theme “Resilience of ecosystems and natural resource dependent coastal communities in the face of climate change and large-scale perturbations”. The objectives of the meeting were to facilitate peer-to-peer exchange on applying resilience principles in management among key coral reef experts in the region; as well as to develop, define and prioritize regional and national/local resilience projects for implementation.

Focusing on two major elements of reef resilience theory: 1. Coral reef resilience and resistance to bleaching and other stresses; and 2. Coral reef fish spawning aggregations (FSAs), the Experts Group Meeting brought together eleven scientists and managers from five countries in South Asia and the

Andaman Sea: Indonesia, India, Maldives, Sri Lanka, and Thailand. The meeting was facilitated by Dr. Melita Samoilys, IUCN, Dr. David Obura, CORDIO, Mr. Jerker Tamelander, IUCN/CORDIO.

Resolutions from the meeting included the following (key outputs and recommendations are synthesized in a summary record):

- Resilience classification of monitoring sites should be carried out to assist in assessing vulnerability as well as in determining if the present network of reef monitoring sites and MPAs fully encompass the range of bleaching vulnerability and resilience.
- Coral Recruitment and Size Class Structure studies will be incorporated into regular monitoring programmes to provide information on population dynamics and recovery.
- Studies of herbivory will be carried out in order to understand relationships between algal assemblages and herbivores.
- Adoption of a regional project to determine species, sites and seasonal patterns of Reef Fish Spawning Aggregations, as well as to determine the level of awareness of spawning aggregations among fishers and sensitize fishers and marine resource personnel in South Asia on reef fish spawning aggregations and their implications to conservation and sustainable fisheries. The project should also provide recommendations for management of FSA sites and policy advisories.

Resilience Assessment Methodology

Through collaboration with IUCN's Working Group on Climate Change and Coral Reefs, a detailed methodology for assessing, documenting and monitoring resilience of coral reefs with respect to climate change was developed. The methodology, described in more detail by Obura and Grimsdich 2008, comprises six assessment components: 1. Benthic cover, using photo transects; 2. Coral community structure by assessment of relative abundance of genera; 3. Coral size class distributions and recruitment recorded in belt transects and quadrates; 4. Coral condition, including bleaching, disease, other conditions and mortality; 5. Fish-herbivory and abundance of other key functional groups using belt transects; and 6. Indicators for site resistance and resilience, with 45 variables assessed on a semi-quantitative scale.

The methodology serves two primary purposes:

1) To provide simple methods that are applicable in a wide variety of developing country settings. A large percentage of the world's coral reefs is located in developing countries with low resources and capacity available for management and monitoring. Although monitoring of resistance and resilience indicators can greatly improve coral reef management in the face of climate change, these parameters are related to oceanographic phenomena and ecological community characteristics that are relatively expensive and time-consuming to study in detail. The assessment methods are suitable for low-resource scenarios and can be used effectively in coral reefs areas around the world.

2) To provide a first assessment of outcomes in coral reef conservation. Although Marine Protected Areas (MPAs) cannot prevent the stresses that cause coral bleaching, it is possible that they could improve resistance and resilience of coral reefs by protecting them from other stresses (for example fishing pressure) and thus minimizing coral mortality and/or allowing the community to recover from bleaching events. However, to date the success of MPA management practices in influencing bleaching resistance and resilience has not been systematically quantified on larger scales. The method thus seeks to aid an assessment of the effectiveness of coral reef conservation measures in the face of climate change.

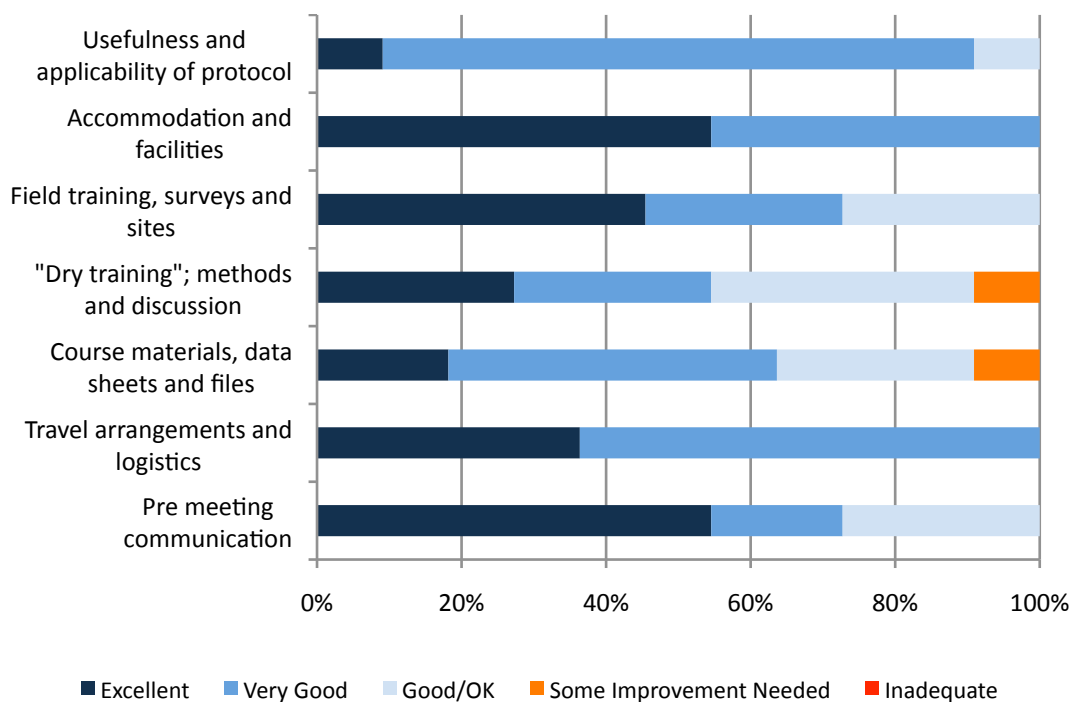
The methodology has been extensively field tested around the Indian Ocean through site-based initiatives and involving numerous governmental and non-governmental organizations, including through training and dedicated surveys in the Maldives carried out under this project (see below).

Resilience Assessment Training

A Coral Reef Resilience Field Training for South Asia and the Andaman Sea, with the title Assessing and monitoring resilience of ecosystems in the face of climate change and large-scale perturbations, was organized 7-13 January 2008, on board the diving boat M/Y Gaaviya in the Maldives. The training involved 12 participants from national research institutions and line agencies as well as civil society organizations and one resource person/instructor. The opening ceremony of the training was presided over by Deputy Minister of the Environment of the Maldives, the Hon. Abdullahi Majid.

The training covered reef areas of Ari, North Male and South Male Atolls, and through lectures and with a particular focus on in-water training, worked towards three objectives: 1) increased capacity to plan and undertake coral reef resilience monitoring among participants, and increased capacity to apply results; 2) testing and adapting as necessary the coral reef resilience monitoring methodology; and 3) establishing a South Asia Resilience Assessment network.

The training was well received among participants. Results from a participants evaluation of the training are presented in the graph below. Findings from the training survey have been collated in a report, to be published alongside data from surveys of high-value reef fish (see below).



Research Projects and Site-based Resilience Surveys

The extent of damage to coral reefs from the tsunami was largely synthesized in the GCRMN publication "Status of Coral Reef in Tsunami Affected Countries 2005" (Wilkinson et al 2006), and further elaborated in "Status of Coral Reefs of the World 2008" (Wilkinson et al 2008) which contain reports synthesized from the work of IUCN/CORDIO and their partner institutions in South Asia, and coauthored by several of the collaborators under this initiative. These reports indicated comparatively limited tsunami impact on coral reefs in most parts of the region.

However, Aceh in Indonesia and the Andaman and Nicobar islands in India, the areas closest to the epicenter of the earthquake and highly affected by the tsunami were surveyed through collaborations with Syiah Kuala University and Wildlife Conservation Society in Aceh, Indonesia, and with Reef Watch Marine

Conservation in India. Reports of surveys in Aceh have been published as stand-alone reports in English as well as Bahasa Indonesia. Synthesis reports of the surveys have also been published in the CORDIO Status Report 2008.

The project provided direct financial support and/or technical support to numerous research initiatives in the region, including work related to tsunami impacts, reef degradation and recovery, coastal fisheries, fish reproductive patterns, unsustainable or destructive resource use, livelihoods and socioeconomic development, and education and awareness activities. A total of 17 research papers from this work are presented in the CORDIO Status Report 2008 entitled "Ten years after bleaching – facing the consequences of climate change in the Indian Ocean" (Obura, D.O., Tamelander, J., & Linden, O. (Eds) 2008) and published by CORDIO.

This research has greatly contributed to the pool of knowledge of reef dynamics and the interrelations between human communities and natural resources, and has provided many valuable recommendations on what this means for development and management, as well as further research needs.

Regional Reef Fish Spawning Aggregation Survey

The reef resilience research projects developed through the Experts Group meeting focused primarily on Reef Fish Spawning Aggregations (FSA) in view of the critical importance of FSAs for reef resilience, health of fish populations and consequently for human communities dependent on reef resources. As it was recognized that there are critical knowledge gaps with respect to fish spawning aggregations in the Bay of Bengal - the only previous work on this topic in the entire region is from one location in the Maldives - as well as present reef fishery trends, a regional survey project was designed.

The project was implemented through national and local partner agencies in Indonesia, Sri Lanka and the Maldives as well as in Thailand and India, covering many of the regions major coral reef areas. Interview surveys were conducted among fishers in order to determine the level of awareness of spawning aggregations, to identify aggregation sites and species, and to assess fishing pressure on and status of spawning aggregations.

Preliminary results were presented in national reports as well as synthesized in the CORDIO Status Report 2008. A poster on the project findings was presented at the 11th International Coral Reef Symposium, and a manuscript has been accepted for publication in the symposium proceedings.

Results showed low awareness of spawning aggregations throughout the region except in the Maldives where fishers relying on visually aided hook-and-line fishing reported in-water observation. 91 spawning aggregation sites corroborated by several fishers were identified in four atolls in the Maldives, including those of *Epinephelus fuscoguttatus*, *E. lanceolatus*, *E. polyphkadion*, *Plectropomus areolatus*, *P. pessuliferus* and *Lutjanus bohar*. This is the first record of spawning aggregations of the *P. pessuliferus*.

The survey provided useful information for fisheries management. One of the main threats to high value reef fish populations in the Bay of Bengal is the expanding market for chilled and live reef fish in East and Southeast Asia. A precautionary approach to settings export quotas as well as other restrictions could help prevent the over exploitation of fish spawning aggregations seen in Indonesia. However, further study is recommended to document in more detail spawning aggregations in the Bay of Bengal, at a higher resolution than in this initial survey. Such information is critical for fisheries as well as MPA management planning. Sensitizing policy makers, managers and fishers regarding reef fish spawning aggregations, their conservation and management, remains a high priority for the region.

High-value Reef Fish Survey, Maldives

The marine aquarium trade of Maldives is believed to have started in 1979. The fishery has been closely monitored by the government, which has established a species-based quota system formulated in the early 90s and conducted monitoring of the trade. However, the quota system, while based on export data as well as tolerance of species to captivity, has largely relied on anecdotal or out-dated demographic information of species such as rarity in the natural environment. The fishery has spread significantly since it started, while there have been major changes in reef health. Thus on request of the government of the Maldives a survey was designed to provide current information on resource status to facilitate review and redefining export quotas as necessary.

In addition, a need for a resource status assessment of the species associated with the grouper fishery was identified as a high priority. The grouper export fishery in the Maldives has grown steadily, and trends in exports show a decrease over time, but implementation and enforcement of a grouper management plan from 2007 has been limited. Generating knowledge of the status of grouper resource species populations was identified as a priority in order to facilitate establishment and introduction of management steps such as quota-based exports.

Resource status assessment surveys targeting the fish species associated with the aquarium and grouper fisheries were carried out in collaboration with the Marine Research Centre (MRC), Maldives, 8-20 June 2008. The surveys were carried out from a chartered diving boat and conducted using standard under water visual assessment techniques, while also applying elements of the Resilience Assessment Protocol (see above). The field team involved staff from IUCN, MRC, the National Aquatic Resources Research and Development Agency (NARA, Sri Lanka) and ICRAN.

Data on status of target species of aquarium and grouper species was gathered at 28 sites in five atolls, covering the central part of both the western and eastern atoll chains. Findings indicate revision of export quotas of ornamental fish is advisable, including imposing restrictions on numbers exported of certain species currently not regulated. The data on grouper species clearly shows that fishing has impacted population size, and reducing fishing effort through both setting export quotas and limiting catch is recommended.



A short report with findings from the survey and taking into account findings from the regional survey of reef fish spawning aggregations has been compiled, including recommendations for appropriate management responses in view of findings, and handed over to the Government of Maldives.

2. Enhancing Coastal Livelihoods

Objective 2: To develop alternative livelihood projects for families in coastal areas that no longer can support themselves due to the deterioration of the coastal environment.

Activities towards achieving Objective 2 of the project were implemented under five components: 1. Livelihoods Review; 2. Participatory Livelihoods Scoping; 3. Implementation of Livelihoods Pilot/Demonstration Projects; 4. Socioeconomic profiling and monitoring; and 5. Vocational Training for Livelihoods.

One way to increase reef resilience to climate change is to minimize the direct impacts of human activities. Due to the high levels of poverty in coastal areas of the target region, alternative, non-destructive livelihoods need to be identified in order to allow households to meet their basic needs. Thus the component focused on assisting local communities and partners in identifying and implementing sustainable alternative or supplemental livelihoods, in order to help local communities diversify from destructive livelihood activities, while at the same time increasing livelihood diversity and security. This, in turn, is expected to in the longer term reduce vulnerability to unforeseen shocks, a major component in reducing poverty.

Review of past livelihood enhancement programmes and present projects under implementation in and outside the region formed the basis for identification of approaches to identification of livelihood activities that are both resilient and sustainable through participatory scoping. Pilot demonstration activities in selected communities developed supplemental livelihood activities among key stakeholder groups, e.g. reef resource dependent populations, with particular emphasis on long-term sustainability and providing models that can be replicated across the region. This also included capacity building, e.g. vocational training for livelihood activities among target communities, as well as among other relevant stakeholders on how results of livelihood activities fit into local legal and regulatory frameworks.

The Enhancing Coastal Livelihoods element under this project was to some extent reformulated in view of complementarities with the livelihoods enhancement and diversification element under the project "Institutional Strengthening and Capacity Development for the Long-term Management and Conservation of MCPA's encompassing Coral Reefs in South Asia" funded by the EU to United Nations Environment Programme. Through a close twinning arrangements between the projects a combined livelihoods intervention was developed and implemented under the name "Coral Reefs and Livelihoods Initiative", or CORALI. Lead partners in CORALI were IUCN, CORDIO, UNEP, ICRAN and IMM Ltd. Detail on activities is provided below.

Inception

An inception meeting was held on 29 September 2006 bringing project lead partners together to discuss and plan activities. Outputs were agreed upon collectively to ensure that the project reflected the goals and perspective of all partners while meeting the requirements of either regional project and their donors. Partner implementing organizations in the region were identified and selected through consultations with regional experts.

The activity progressed according to schedule and was completed in January 2007. The selection of pilot-site partner organizations was particularly successful, with high levels of commitment exhibited by all partners throughout the project.

Desk Review of Global and Regional Experiences of Livelihoods Development

Two literature reviews examining experiences with livelihood enhancement and diversification at the (a) global and (b) regional level were produced. The global review was presented in the publication “Systematic approaches to livelihoods enhancement and diversification: A review of global experiences”. As part of this review, research was conducted into the issues driving successes and failures in livelihood enhancement and diversification initiatives using a series of case studies from around the world, including on rural community development support, livelihood change, and staff development and enterprise growth. The regional review was presented in the paper titled “Livelihoods enhancement and diversification: A review of experiences from South Asia”. This review focused more narrowly on using the sustainable livelihoods framework to analyze specific implementation-level issues experienced by initiatives that have been documented in countries in South Asia.

Both publications provided lessons learned and key advice on the development and implementation of livelihood enhancement and diversification activities. 1000 printed copies of the global review were produced and distributed internationally in 2008. The regional review was developed as an electronic publication and has been made available on the CORALI web site under the MCPA web portal tool. Findings from the two reviews were also showcased in the CORDIO Status Report 2008.

Review Consolidation and Process Planning

The Sustainable Livelihoods Enhancement and Diversification (SLED) process was developed using a collaborative approach involving field teams in the both design and application of the approach. A summary of the key steps of this development process is provided below:

Phase 1. Discovery: The initial stages of the SLED were developed during the fourth quarter of 2006, and preliminary process guidance was finalized for the first CORALI/SLED workshop held in Tuticorin, India, January/February 2007. Material compiled for the global and regional reviews was used to inform the development of the SLED process and pinpoint areas for attention, and the material was also reviewed by field teams during the first phase of field work. The first CORALI/SLED workshop allowed the field teams and the facilitators to review initial guidance, based on which more refined guidance was produced and shared with the field teams electronically to assist them in the first phase of fieldwork.

Phase 2. Direction: Planning was carried out to support training and guidance for field teams during the second CORALI/SLED workshop, which was held in June 2007. Based on the findings from the second CORALI/SLED workshop as well as feedback and ideas from field teams, guidance for the second phase of the SLED process was refined. This guidance was shared with the field teams in late June for the field teams to use in the second phase of field work.

Phase 3. Doing: Based on the review of phase two field work during the third CORALI/SLED workshop in October/November 2007, initial planning for the implementation phase of the pilot activities was carried out with the field teams. A proposal format for defining pilot activities was developed and shared with the teams in November 2007.

Evaluation planning: Evaluation guidance for the SLED process was initially discussed with the field teams at the third SLED workshop, refined based on feedback received and disseminated to the field teams in April 2008. The evaluation guidance was used to evaluate work that had been implemented to date.

Socioeconomic Monitoring - Review and Development of Methods

The development of a socioeconomic monitoring programme was carried out in a participatory manner, drawing on the feedback and experience of the field teams. The project manager attended a Training of Trainers workshop on SocMon for the Western Indian Ocean region, held in the Seychelles between the 8-10 January 2006 in order to learn from experiences and better guide the development of a socioeconomic monitoring protocol for South Asia. Socioeconomic monitoring methods and needs were discussed with participants in the first CORALI/SLED workshop, which decided that a monitoring protocol would be developed jointly in response to findings from the first phase of field work and the second CORALI/SLED workshop, for implementation during the second phase of fieldwork.

During the second CORALI/SLED workshop in June 2007, field teams discussed the needs for socioeconomic monitoring and how this could be integrated into a more people-focused and participatory form of monitoring. A basic framework (Reef Changes and Action from the Peoples Perspective (RECAPP)) was designed during this workshop. Its purpose was to act as a simple monitoring tool for fieldworkers to learn about the changes that are taking place on coral reefs and among people who depend upon them. This socioeconomic monitoring framework was used during the second phase of SLED fieldwork. Technical support visits to field teams reviewed the issues faced and, with feedback from the field teams, was used to refine the approach during the third SLED workshop. At this workshop participants also discussed the development of a more comprehensive socioeconomic monitoring manual in the style of the GCRMN SocMon manuals, and it was agreed that the refined methodology should be integrated into a broader SocMon framework that would benefit from and integrate with the global SocMon network.

The SocMon South Asia protocol was developed in collaboration with field teams over the first quarter of 2008. One field team leader, Dr. Vineeta Hoon, was contracted to assist in the coordination and development of a manual and overseeing other field teams. A meeting was held with members of the three Indian CORALI/SLED field teams (i.e. Lakshadweep, Andaman Islands, Gulf of Mannar) in March 2008 to carry out a collaborative review of existing SocMon manuals and to consider the integration of the basic RECAPP framework into a South Asia SocMon Manual. A first draft manual was developed and circulated for comments among CORALI/SLED field teams in South Asia. The final SocMon protocol was developed and published in the last quarter of 2008, and is being translated into Hindi, Dhivehi, Sinhala and Tamil.

At the onset of project activities the development and implementation of a detailed socioeconomic monitoring activity was envisioned to be conducted in parallel with and integrated into the SLED field work. However, as the SLED fieldwork planning was developed, it became apparent that it would have been counterproductive to carry out detailed socioeconomic monitoring activities in tandem with activities designed to build trust with the community through an emphasis on open-ended community exploration. It was therefore a deliberate decision to postpone the full application of the South Asia SocMon protocol. In order to support participatory monitoring and the expression of community perspectives, socioeconomic monitoring activities carried out during the second phase of the SLED field work used the RECAPP framework.

The final integration of the RECAPP into the South Asia SocMon protocol was carried out in order to provide field-level implementers in the region with comprehensive socioeconomic monitoring guidelines that can be utilized for systematic monitoring, whether through participatory and community driven initiatives or through monitoring by resource managers and development workers.

Piloting Sustainable Livelihoods Enhancement and Diversification (SLED)

SLED pilot field work was implemented in 3 phases: (1) the "Discovery" or scoping phase, (2) the "Direction" phase, to decide on activities to be implemented and (3) the "Doing" phase, which focused on the implementation of livelihood activities. Each phase was supported by a regional workshop to provide training for field teams in the theory behind the SLED process, as well as facilitating the development and application of the SLED methodology as a collaborative effort. Following the completion of field activities, a

self-evaluation process was conducted among field teams to assess impacts of the pilot livelihood activities as well as the utility of the SLED process as a whole. A fourth and final SLED workshop was used as consolidation activity, reviewing evaluations and synthesizing these to understand the key lessons learned.

Phase 1: Discovery: The first CORALI/SLED workshop was held in Tuticorin, India between 27 January and 3 February 2007, with participants representing the 5 maritime countries of South Asia and Indonesia. In addition to 12 participants from the 6 pilot sites in India, Indonesia, Maldives and Sri Lanka, there were 4 participants from Bangladesh and Pakistan. All participants were given training in the theory and tools underpinning SLED and were facilitated to share experiences and findings on livelihood enhancement and diversification. The 12 participants representing the field sites were supported to develop a phase 1 SLED implementation methodology appropriate and applicable to their sites. Field teams were provided with small grants to carry out Phase 1 activities. Field work was conducted successfully during February-May 2007 by all teams and results were presented and synthesized during the second CORALI/SLED workshop.

Phase 2: Direction: The second CORALI/SLED workshop was held in Sri Lanka during 4-10 June 2007, attended by 12 participants from the 6 pilot sites in India, Indonesia, Maldives and Sri Lanka. As well as reviewing the activities carried out under phase 1 of fieldwork, the field teams had the chance to review core concepts and discuss their experiences and challenges in the field. Participants developed activities for the second phase of field work, against which small implementation grants were provided. Phase 2 implementation commenced in August 2007, and was successfully conducted by all field teams, with the exception of one team in the Gulf of Mannar, India, which was forced to pull out due to unforeseen circumstances. Results were presented and synthesized during the third CORALI/SLED workshop.

Phase 3: Doing: The third CORALI/SLED workshop was held in Sri Lanka 30 October - 6 November 2007, and was attended by 17 participants comprising members from the 6 pilot sites in India, Indonesia, Maldives and Sri Lanka, as well as additional participants from Bangladesh and Sri Lanka. Participants discussed experiences and challenges and developed plans for pilot activities during phase 3 of SLED field work in the form of proposals, based on which small grants were provided for implementation between December 2007 and May 2008.

Phase 3 of SLED field work was conducted successfully, with pilot livelihood enhancement and diversification activities implemented at all 6 field sites. Results were presented and synthesized during the



fourth CORALI/SLED workshop, held in Maldives during 2-7 June 2008. The workshop included 10 representatives from all 6 pilot sites. Participants presented experiences along with results from evaluation exercises, and lessons for policy makers and managers were synthesized from this.

Development of Guidance Materials and Vocational Training

Guidance material was produced systematically throughout the project in order to fully support SLED and Socioeconomic Monitoring activities that were developed. Following the first three CORALI/SLED workshops, guidance material to assist field teams in their work were developed and disseminated, including guidance on evaluation.

A comprehensive manual entitled “Sustainable Livelihoods Enhancement and Diversification (SLED): A Manual for Practitioners” was produced, providing step by step guidelines on how to implement the SLED approach, as tested during the CORALI project. The manual was launched at the IUCN World Conservation Congress in Barcelona, Spain, October 2008, and has been distributed broadly in the region and internationally.

Vocational training and support was provided to field partners throughout the project, as part of the SLED workshops as well as through dedicated advice and guidance. Two site-level technical support visits were made.

Influencing Management Policy and Production of Policy Guidance Materials

A number of management and policy influencing activities were carried during the project to promote project findings and key learnings. These are elaborated below.

A management and policy forum was organized as a mechanism through which to disseminate the CORALI approach to audience the project’s target policy-level audience. The SLED field teams held a mock-policy session during the third CORALI/SLED workshop in November 2007, which allowed them to develop ideas and messages. The policy forum was held successfully over two days, 5 and 7 June 2008, as part of the fourth CORALI/SLED workshop. The forum began by exploring the connection between poverty, environment, conservation and reduced livelihood options, and went on to present findings and promote the utility of the SLED approach. The forum was attended by 22 individuals from all of the South Asian target countries, with a mix of site-level managers and higher policy makers.

SLED components were incorporated in the publication “Managing Marine and Coastal Protected Areas: a Toolkit for South Asia” in order to provide hands-on guidance to MPA management authorities and practitioners and mainstream livelihood considerations into protected area management. Two new theme sheets dealing with Poverty and coastal/marine ecosystems, and Livelihood enhancement and diversification, were developed and incorporated into the Toolkit. An academic manuscript on CORALI and SLED was published in the CORDIO 2008 status report.

A dedicated session on SLED as a tool for MPA management was organized during the Marine and Coastal Protected Area Manager’s Training which was held in the Maldives 4-7 June 2008, attended by 22 site level managers and policy makers. The Toolkit has been distributed to over 400 individuals in the region.

SLED was presented to the South Asia Coral Reef Task Force (SACRTF) at its first coordination meeting on 21st December 2007. The meeting was attended by high-level government officials from across the region and served as a valuable first step towards creating support for SLED among policy makers. A set of SLED fact sheets aimed at a policy-level audience were produced and distributed to members of SACRTF, and detailed presentations on the SLED process and how the Task Force can facilitate the scaling up of the approach were given. Information was also provided about the policy forum organized as part of the fourth SLED field workshop.

This was followed up by a half-day side-event entitled “Showcasing products and partnerships for MCPA management and livelihoods enhancement in South Asia”, organized at the third meeting of SACRTF, 16-17 December 2008, Chennai, India. The event sought to highlight that poverty and natural resource dependence are among the key constraints to sustainable natural resource management and biodiversity conservation in South Asia, but are nevertheless not firmly integrated into conservation and management processes. Using experiences from implementation of SLED, it illustrated how empowering people to make informed and sound livelihoods decisions can strengthen their capacity to take an active and meaningful role in management, while improving food security and income. In this context the event also discussed how MCPAs present an invaluable tool in meeting the challenges of natural resource dependence and biodiversity degradation in South Asia.

SLED and the South Asia SocMon Manual were presented to the GCRMN Management Group Meeting and SocMon coordination meeting held in association with the 11th International Coral Reef Symposium in Fort Lauderdale, Florida, USA, in July 2008. The meetings were attended by numerous collaborating partners from the region, three funded through the project.

Many of the projects livelihoods related outputs were launched at IUCN’s World Conservation Congress (WCC), in Barcelona, Spain, October 2008, including Livelihoods enhancement and diversification: A review of experiences from South Asia, Systematic approaches to livelihoods enhancement and diversification: A review of global experiences, Sustainable Livelihoods Enhancement and Diversification (SLED): A Manual for Practitioners, and Managing Marine and Coastal Protected Areas: a Toolkit for South Asia. The event was attended by policy makers, managers, conservationists and community workers from around the world. The publications have been distributed to managers from across the target region, and were also provided as materials for a Regional Coastal Managers Training Course, organized by the GEER Foundation in Gujarat, India, October 2008.

These activities have helped bring the project and the approaches and tools developed to a broad and diverse group of people in the region and beyond. Feedback has by and large been positive and requests for and interest in the materials is increasing.



Implementation of Livelihoods Enhancement Projects

Implementation of the three SLED phases was successfully carried out at all 6 sites. The Discovery phase was carried out between February and June 2007. The field teams spent 4 months exploring factors that help or inhibit livelihoods change, in partnership with the communities. The Direction phase, which was conducted between July and November 2007, allowed the field teams to consolidate this knowledge and build a consensus for livelihoods change through visioning exercises, and build the partnerships and institutional foundations for pilot activities. The Doing phase focused on implementing the visions developed. During this phase, the field teams supported the implementation of small-scale livelihood activities in communities. The full scope and impact of these activities are reported on in the detailed evaluation reports. The table below provides an overview of the activities implemented at the 6 pilot sites.

SLED Field Projects Implemented	Number of Participants
Andaman Islands, India	
Enhancing tailoring and embroidery skills, plus provision of machines	20
Specialized carpentry tools for furniture and craft manufacture - licensing of carpenters and use of facilities and tools as a group	20
A piggery unit to produce piglets for sale	4
Training in mushroom cultivation - certification on completion of training course, and setting up production units at home or as groups	30
Desktop computer and printer for the Community Based Organization KBCA office	6
Display of photographs depicting the community at community halls for community appreciation of skills, strengths and culture	Community
Lakshadweep Islands, India	
Wood crafts - enhancing skills	2
Training nature guides	6
Training in marketing and product presentation, accounting	20
CBO Maliku Development Society capacity building	20
Glass bottom boat	10
Gulf of Mannar, India	
Barefoot rearing training	20
Ornamental fish cultural training	5
Crab and lobster fattening training	20
Skill training – Palmyra leaf product	20
Hygienic fish handling	30
Mobile fishers training	30
Sea safety training	35
Tamil Nadu Government welfare scheme	30
Microsoft Unlimited Potential Programme	5
Baa Atoll, Maldives	
Skills training (fabric painting, screen printing, business skills)	30
Market scoping - enterprise development training course	30
Developing business plans - enterprise development training course	30
Bar Reef, Sri Lanka	
Home garden improvement	10
Sea-weed farming (15 cages)	2
Sea-bass culture (4 cages- 1000 fingerlings)	2
Red Tilapia farming (1 Pond Culture-1000 fingerlings)	1
Professional diving training	5
Aceh, Indonesia	
Small enterprise support through micro-credit and training for women's group	30

3. Enhancing Knowledge

Objective 3: *To improve the education and awareness of the impacts of human activities on coastal ecosystems and strengthen the capacity of local resource users and managers to mitigate those impacts.*

Activities towards achieving Objective 3 of the project were implemented under two components: 1. Support and Influence Policy; and 2. Awareness and Outreach. Details on each activity is provided below.

Policy Support

At the onset of the project a review was internally commissioned to analyze the efficacy of CORDIO's approach to dispensing policy advice in South Asia and to identify opportunities for increased support to policy formulation as needed. The evaluation was conducted in June-September 2006 in Maldives, Sri Lanka and India, where CORDIO has been operating since 1999. The final report (Samoilys 2006), was published in September 2006. The report included a set of recommendations that have been used to guide the implementation of the project. The review was revisited during implementation of other project activities in order to guide interventions and to evaluate the impact of project activities in achieving key objectives and delivering outputs.

Consequently results and outputs from activities under components on Reef Resilience to Climate Change and Enhancing Coastal Livelihoods were used to support and influence national and regional policy formulation through provision of targeted policy briefs, general information and seminars, as detailed above. Through the close collaboration with national line agencies in target countries pathways and mechanisms to channel results into local and national policy and management frameworks were established, and results were similarly communicated to regional and international policy fora such as the South Asia Cooperative Environment Programme (SACEP), the South Asia Coral Reef Task Force (SACRTF) and the International Coral Reef Initiative (ICRI) both through the project itself and national partner institutions. In addition, several policy seminars or sessions were organized in association with other project activities.

The project contributed directly to the development of international policy, including through the development and negotiation of the International Tropical Marine Ecosystems Management Symposium (ITMEMS 3) Statement on Coral Reefs and Climate Change as well as the South Asia Regional Caucus Statement, approved at ITMEMS 3 in Cozumel, Mexico, 16-20 October 2006. This gave rise to the ICRI Resolution on ITMEMS 3, the ICRI Resolution on Coral Reefs & Climate Change and an ICRI Recommendation on Acidification and Coral Reefs, approved at the ICRI General Meeting in Tokyo, Japan, 23-24 April 2007.

Further, the project initiated and facilitated the approval of the ICRI statement on Coral Reef Fish Spawning Aggregations, and contributed to the development and approval of the Decision on Socioeconomic Monitoring, and a Resolution to Declare 2008 the International Year of the Reef, approved at the ICRI General Meeting in Cozumel, Mexico, 22-23 October 2006. Many project partners subsequently organized International Year of the Reef 2008 activities. The project was also engaged in the development of an IUCN World Conservation Congress Resolution on Resilience, approved by IUCN's membership at WCC in Barcelona, Spain, October 2008.

Lastly, in addition to policy support and specific capacity building elements under components on Reef Resilience to Climate Change and Enhancing Coastal Livelihoods, training, education and awareness enhancing activities were implemented targeting several key stakeholders, including schools, marine and coastal protected area managers and policy and decision makers. This included development of a toolkit for marine protected area managers and dedicated training on the application of the toolkit, the production of a school teachers guide to strengthening environmental awareness among school children, and the development of a framework for social adaptation to climate change.

Teachers' Toolkit

A teachers' toolkit entitled "Children's Perception of the Environment" was produced with the aim of helping teachers, educational projects, environmental clubs and managers create awareness among schoolchildren about coastal ecosystems through the use of creative, investigative approaches. The Toolkit allows the local school systems to make the local environment relevant and interesting to children in coastal communities across South Asia and Indonesia.

The toolkit was developed through a collaboration between IUCN and Centre for Action Research on Environment, Science and Society (CARESS) and in close partnership with several site-based organizations, including: ANET (Andaman Islands, India); Peoples Action for Development (Gulf of Mannar, India); CARESS (Lakshadweep Islands, India); PUGAR and the Wildlife Conservation Society (Indonesia, Aceh); Coastal Conservation Department (Bar Reef, Sri Lanka); and FEYLI (Baa Atoll, Maldives). The toolkit was further reviewed by local education institutions and officials in India, where it was pilot tested.

This activity builds on a successful trial pilot conducted in India and is based on extensive experience in working with school teachers and children on the site level. The initial draft of the toolkit was developed with 5 distinct sections tackling various angles related to coastal and marine ecosystem management, with interactive activities and exercises proposed for each section. The toolkit was then field tested in the Andaman Islands in October 2008 under a complementary project under the Covenant Centre for Development (CCD), an Indian NGO. Revisions and improvements were made to the toolkit in response to feedback from teachers who had used the product. The final document was submitted for editing, translation, and printing in December 2008.

The toolkit is being translated into seven languages of the target region: Bahasa Indonesia (Aceh), Bengali (Andaman Islands), Dhivehi (Maldives), Hindi (India), Malayalam (Lakshadweep Islands), Sinhala (Sri Lanka) and Tamil (Sri Lanka and Tamil Nadu in India). A dissemination list of key target institutions was drawn up including NGOs, research centers as well as schools and educational institutions.

Co-financing for this activity was leveraged from a local Indian NGO, Covenant Centre for Development (CCD), as well as UNEP-WCMC, which supported educational activities conducted, including the October 2008 field testing of the toolkit in the Andaman Islands.

Marine and Coastal Protected Area Managers' Toolkit

"Managing Marine Protected Areas: A Toolkit for Managers in South Asia" (South Asia MCPA Toolkit) was prepared based on the toolkit developed for the Western Indian Ocean in 2004 through a partnership led by IUCN (the "WIO Toolkit"). Development of the South Asia Toolkit, as well as printing and training, were mainly financed by ICRAN through a grant from the European Union, with cofinance from IUCN through a grant from the Ministry for Foreign Affairs of Finland.

Development of the South Asia MCPA Toolkit, led by ICRAN and IUCN, followed a thorough process whereby the WIO toolkit was assessed in detail for applicability to the South Asia region, while the content was reviewed in particular considering new information since the publication of the WIO Toolkit. Amendment needs were identified and a list of contributing experts as well as reviewers from within the South Asia region and beyond was drawn up. Experts from across the region were requested to contribute and indicate preferred areas of contribution. UNEP-WCMC compiled the MCPA data tables and maps. 73 theme sheets and corresponding case studies were allocated to reviewers for updating in December 2007.

An advanced draft of the Toolkit was prepared in time for a regional training programme (see below). Feedback on the usefulness, completeness and applications of the Toolkit were gathered from participants. The full workshop report captures the key observations and feedback from regional participants. This information was compiled alongside the recommendations and feedback from the WIO experiences, and used to improve the quality and content of the South Asia MCPA Toolkit.

The feedback provided led to the inclusion of three additional theme sheets in Toolkit, and the further revision and updating of the maps. Following the incorporation of feedback into the advanced draft, the Toolkit was circulated for an external review by 16 regional and international experts. In total, over 50 international and regional experts contributed to the development of the Toolkit over a period of 15 months.

The Toolkit, produced in a ring binder format to allow easy access to theme sheets and the personalization with local information where required, was launched internationally at the World Conservation Congress in Barcelona in October, and regionally at a showcasing event for the South Asia MCPA Project held in Chennai, India during December 2008. 500 copies of the Toolkit have been printed and are being disseminated across the South Asia region. Additionally, a CD ROM version has been prepared and 500 copies will be disseminated widely. The Toolkit will also be made available online via the South Asia MCPA Portal, a regional information portal linked to the Protect Planet Ocean site.

MCPA Toolkit Training

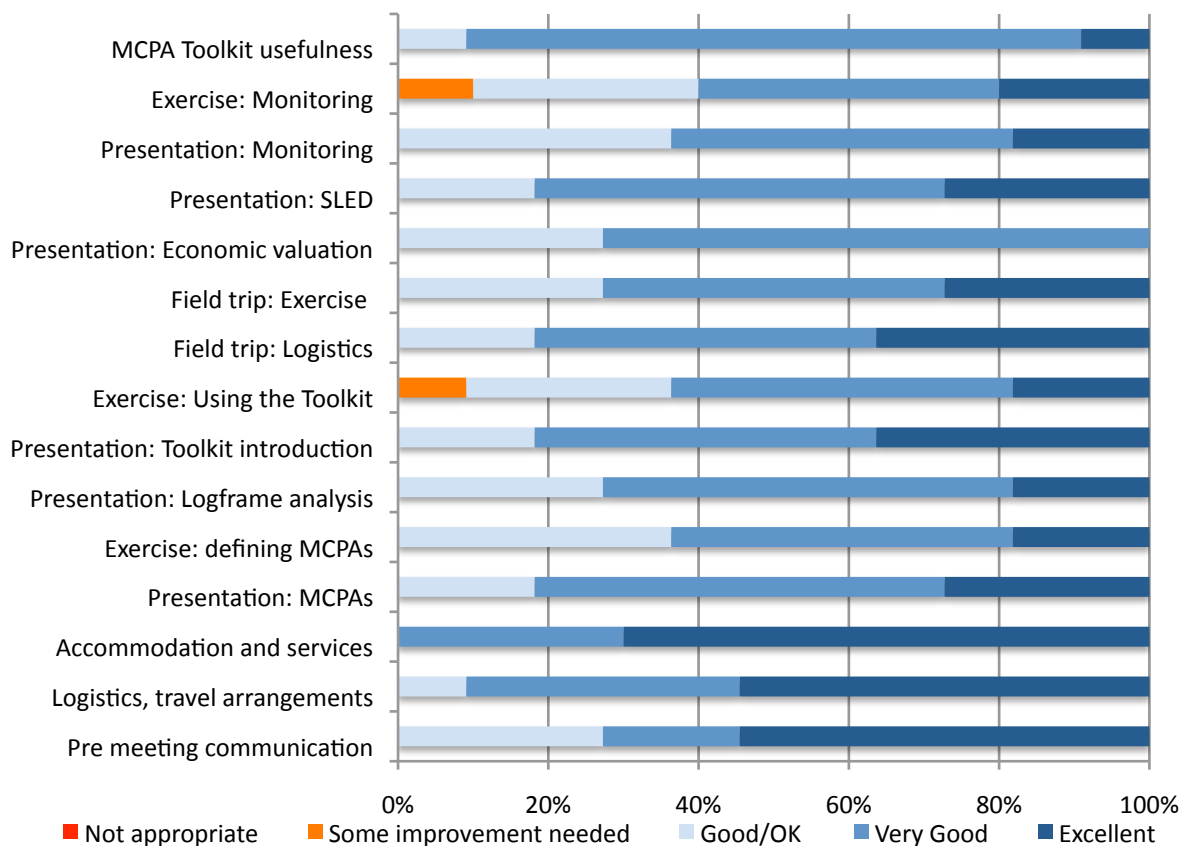
With the support of South Asia Coral Reef Task Force (SACRTF) members and assistance from the Marine Research Centre (MRC) in the Maldives, participants for a regional South Asia MCPA Toolkit training workshop were identified, including MCPA managers, scientists as well as dive operators and hoteliers.

The four-day training programme took place on 4 – 7 June at the Paradise Island Resort, Maldives. A total of 21 participants from 5 countries participated in the 4-day programme. Additionally, 9 participants of the Coral Reefs and Livelihoods Initiative were invited to present their experiences and findings based on their field activities to highlight the issues and national activities to the managers and facilitate networking between these groups of practitioners.

Designed to introduce participants to the South Asia Toolkit and facilitate its use, the training included lectures combined with a series of hypothetical and actual MCPA management scenarios, both theoretical and field-based, that required participants to use specific theme sheets and resources contained within the Toolkit. In this manner, participants were able to become familiar with the content of the Toolkit while evaluating the completeness, usefulness, and user-friendliness of the information.



The feedback received was very positive (summarized in the graph below) and highlighted the toolkit as a useful resource for managers, especially in remote locations where access to current and consolidated information is limited, as documented in the full workshop report. The South Asia Toolkit has subsequently been used to guide an MCPA managers exchange training programme hosted by the GEER Foundation in November 2008 for 30 participants from across the region.



A Framework for Social Adaptation to Climate Change

In close collaboration with IUCN's Working Group on Climate Change and Coral Reefs, the foundation for a publication to define a framework for social adaptation to climate change was developed, building on resilience theory and processes that seek to enhance the capacity of people and societies to cope with or adapt to change.

By reviewing existing information and knowledge, the publication defines social sensitivity and vulnerability, adaptation mechanisms and adaptive capacity, and how these interrelate with "social resilience". It discusses how this can be measured, and lays the foundation for a conceptual framework that can underpin the application of resilience principles in social adaptation to (climate) change. This publication seeks to review and harmonize the many to some extent overlapping and to some extent disparate processes, methodologies and tools that touch on this, as well as to fill gaps. It provides recommendations with respect to how the framework can guide activities to measure and strengthen social resilience and enhance climate change adaptation, and identifies possible tools to this end.

Since the publication aims to construct a conceptual framework it is global in scope, addressing social resilience and adaptation at a level not specific to developing or developed countries. It does, however, look at multiple scales, at the individual/local level and at the community/industry level. It pays particular attention to societies in and around coral reef, mangrove and seagrass areas, building on and establishing linkages to previous Resilience reports.

The publication is targeted primarily at environmental and development organizations, including NGOs and IGOs, as well as national policy makers. It should also be useful to academics as well as managers.

The project presented herein has supported the development of the bulk of the Framework for Social Adaptation publication, i.e. its introductory chapter as well as chapters on Definitions; Measuring social resilience; and Applying resilience concepts. The final chapter, a framework for social adaptation to climate change that can be used to immediately guide and support adaptation planning and implementation, will be prepared through IUCN's work with CCCR partners during the first half of 2009.

4. Coordination and Communication

The coordination and communication component of the project was designed to secure project outcomes and impact. This allowed for close project oversight and management, engagement and continued involvement of partner institutions and dedicated support to them, including technical advice, on-site training, consultations, facilitation of project development and implementation.

Institutional Collaboration

Extensive communication and liaison especially during the inception of the project enabled the development of close and productive institutional partnerships. This greatly enhanced the overall impact of the project, and in particular the engagement of IUCN on a global and regional level, and the twinning arrangement with an EU funded project led by ICRAN in collaboration with UNEP, SACEP and IMM Ltd., leveraged significant cofinancing for the Enhancing Livelihoods and Enhancing Knowledge components. This augmented the initial implementation plan through allowing for further geographic reach, the closer engagement of technical experts, and also helped ensure a consistently high standard of outputs produced.

Further, the engagement of national and local government and non-government organizations in project activities was facilitated. The number and diversity of collaborative partners - over 30 partner institutions (see list of partners above) - attest to the success of this, and the overall response from partners in the region, including national governments, has been highly appreciative. Together with the dedicated capacity building activities under the project this has greatly aided in strengthening and empowering civil society in the target countries to participate meaningfully in research, management and policy formulation, and has also enabled governments to make use of such civil society collaboration.

International Networking

Significant support to partner institutions was provided in order to facilitate participation in national, regional and global technical fora on science, management and policy, including e.g. International Coral Reef Symposia (ICRS), the third International Tropical Marine Ecosystems Management Symposium (ITMEMS 3), and training courses such as on Coral Reef Crime Scene Investigation (CRCSI).

A special session for the CORDIO programme was organized as part of the 5th Western Indian Ocean Marine Science Association (WIOMSA) Scientific Symposium. Held in Durban, South Africa, 26 October 2007, the session brought together CORDIO collaborating institutions from around the Indian Ocean. With the region on a clear trajectory of increasing threat from human population growth and development and climate change, the session looked at a more holistic approach to human and environmental issues in the coastal zone, with coral reefs as a model ecosystem. The session was used to highlight the work of Asian CORDIO projects as a complement the Western Indian Ocean focus of the Symposium, synthesizing key lessons from work to date, and identification of key foci for future development of CORDIO's activities. The CORDIO Status Report 2008 was also previewed and further developed. The session was attended by 6 participants from South Asia and the Andaman Sea.

Networking for information sharing and coordination within the region and among project partners provided linkages to operational networks under the International Coral Reef Initiative (ICRI) such as the Global Coral Reef Monitoring Network (GCRMN), including its Socioeconomic Monitoring initiative (SocMon), and the International Coral Reef Action Network (ICRAN). Further, project partners were introduced to and involved in the global Resilience Practitioners Network, managed by The Nature Conservancy (TNC) and IUCN's International Working Group on Climate Change and Coral Reefs (IUCN CCCR).

Meetings, Workshops and Seminars

The project has enabled participation in numerous international symposia, workshops and seminars focusing on various aspects of science, management and policy. A list of events is provided below. These have been attended by project management staff and a total of over 20 individuals from the target area of the project, often with direct contributions to proceedings through presentations and other materials submitted.

- Three International Coral Reef Initiative (ICRI) General Meetings: Cozumel, Mexico, 21-13 October 2006; Washington DC, USA, 22-25 January, 2008; and Fort Lauderdale, USA, 12-13 July, 2008.
- Global Coral Reef Monitoring Network (GCRMN) Management Group and Node Coordinators Meetings held in association with ICRI General Meetings.
- GCRMN SocMon Advisory Committee Meetings, held in association with ICRI General Meetings.
- International Coral Reef Marine Protected Area Network Meeting/4th ICRI East Asia Regional Workshop, 17-19 November 2008.
- Third International Tropical Marine Ecosystems Management Symposium (ITMEMS 3); 16-20 October 2006, including several presentations in sessions on Disaster Preparedness and Reduction, Rehabilitation and Restoration.
- Coral Reef Crime Scene Investigation (CRCSI) training workshop, Cozumel, Mexico, 21-25 October 2006.
- IUCN World Conservation Congress (WCC), and its World Conservation Forum, held in Barcelona, Spain, 5-14 October 2008, including three workshops on coral reef resilience science, management and policy and two events dedicated to the products of this project.
- SocMon WIO Training of Trainers Workshop, held in the Seychelles, 8-12 January 2007.
- R2 Reef resilience workshop for the Western Indian Ocean, Malindi, Kenya, 9-12 May 2006.
- R2 Reef resilience workshop for South Asia, Bentota, Sri Lanka, 15-18 January 2007.
- South Asia Coral Reef Group of Experts meeting, Bentota, Sri Lanka, 19-20 January 2007.
- Western Indian Ocean Marine Science Association (WIOMSA) 5th Scientific Symposium, 22-26 October 2007, Durban, South Africa.
- CORDIO Special Session during WIOMSA 5, 26 October 2007.
- Three South Asia Coral Reef Task Force (SACRTF) meetings: 21 December 2007, Colombo, Sri Lanka; 31 August 2008, Male, Maldives; and 16-17 December 2008, Chennai, India.
- 21st Annual Meeting of the Society for Conservation Biology and Reef Resilience Symposium, 1-6 July, 2007, Port Elizabeth, South Africa.
- Managing Marine Protected Areas: A Toolkit for Managers in South Asia Training Workshop, 4-7 June, Maldives.
- 11th International Coral Reef Symposium (ICRS), 7-11 July, 2008, Ft. Lauderdale, Florida USA

Project Impact and Lessons Learned

The successful implementation of the project has ensured outputs of a consistently high quality on a broad range of issues, from natural and social science to management and development support and related policy (see previous section). This was in part made possible through the partnership approach taken, involving and including national and site partners in project design and giving them a primary role in project delivery, while providing an extensive international network for technical support and facilitation. By building on existing networks and collaborations, such as the CORDIO and GCRMN structures in place since the late 1990s and IUCN's offices in the region, the project has benefited from well-established institutional coordination structures, and in doing so also broadened and strengthened these networks.

The success of the project and the quality of its outputs are also testament to the dedication of the institutions and individuals involved.

Outcomes

Project outcomes as per the original proposal have been achieved, in some cases through moderate reformulation of activities such as the inter-project collaboration that led to the development of the Coral Reefs and Livelihoods Initiative. The following sections give some highlight of project results and impacts under each of the three primary objectives.

Objective 1. Reef Resilience to Climate Change

“to improve the management of coastal ecosystems such as coral reefs, mangroves and other key environments, specifically in relation to the impacts of climate change”

The project has contributed significantly to increasing knowledge of coral reef ecosystem impacts and processes in South Asia, as evidenced through numerous technical reports presented e.g. in the CORDIO Status Report 2008. Much knowledge has been gathered on the impact of the Indian Ocean tsunami in 2004 and the longer-term implications of it in terms of coral reef ecology. New data has also been generated and presented on small-scale fisheries, characteristics, trends and socioeconomic importance. A significant contribution has been made to coral reef resilience science, including through new findings on reef fish spawning aggregations, their occurrence and people's awareness of them around the Bay of Bengal, and contributions to the development and application of a protocol for assessing coral reef resilience.

The project has also improved access to such knowledge among people and institutions in the region through broad dissemination and making outputs available on the web. Training as part of project research activities has allowed for increased absorption of concepts among target groups. The evaluations of training courses implemented indicate a very high success rate and significant buy-in from the target audience.

The importance of reef fish spawning aggregations, a phenomenon previously virtually unknown among scientists as well as managers and policy makers in South Asia (with some notable exceptions), is now more broadly recognized, and further research on the topic is being carried out or planned. Monitoring programmes have in several instances been able to absorb and regularly apply, partially or fully, the resilience assessment protocol, including in the Gulf of Mannar, India, as well as in Thailand and the Maldives.

These activities has made possible the provision of detailed information to support management decisions. While such decision making ultimately is the responsibility of national and local government, the project has facilitated the application of findings in management and policy through direct involvement of relevant

institutions such as line agencies, departments and ministries, and through the provision of dedicated support in the form of advisories, training and technical advice through consultation, communication and networking. Thus the Maldives has amended or is amending export quotas of high-value fish species, and developing additional reef fishery management provisions based on reef resilience and other survey data.

In total over 100 individuals representing more than 20 institutions have directly been involved in and benefited from project activities relating to coral reef and resilience research, management and policy support and capacity building under this project. The number of recipients of project findings and outputs, through dedicated dissemination as well as through learning about the work through other means is estimated to be over 1000 individuals and institutions.

Objective 2. Enhancing Livelihoods

“to develop alternative livelihood projects for families in coastal areas that no longer can support themselves due to the deterioration of the coastal environment”

The Coral Reefs and Livelihoods Initiative (CORALI) was unique in many ways, including in its creative partnerships, and its pooling of resources to achieve common goals and thus also greatly increase impact. Among the most notable achievements was the development and implementation of creative livelihoods enhancement and diversification projects. Activities at local level directly involved and benefited 500 individuals at six sites around the region through 29 different livelihoods projects, ranging from training for acquisition of new and relevant skills, to value addition to existing livelihoods and products and introduction of new livelihoods. The activities further influenced the communities in which they were implemented, reaching more than 5,000 coastal dwellers.

It is envisaged that these pilot projects will increasingly be replicated by project partners as well as scaled up by other institutions, most notably governments. This process is already underway in Bar Reef area of, Sri Lanka, on Baa Atoll in the Maldives and in Tamil Nadu, India, a clear indication of the success of the approaches developed.

The pilot projects were made possible through the participatory development of approaches for Sustainable Livelihood Enhancement and Diversification, which have been broadly disseminated in the region as well as globally. The methodology builds on detailed review of past experiences as well as building on the strengths and capacities of communities in order to improve prospects for success and sustainability. The methodology has been warmly received among communities involved in developing and piloting it. This activity presents one of the most coherent and detailed attempts to learn from (as attested by the two desk reviews carried out) and address past problems and issues with development and the livelihood implications of change, whether driven by environmental degradation and climate change or by introduction of natural resource management schemes.

Another major achievement of the project is the development of socioeconomic monitoring guidelines that are targeted at the South Asia Region and suitable for use in a variety of situations and users, including managers as well as development workers. Developed in close collaboration with field practitioners and most importantly with the communities the methodology is designed to “measure”, it allows for different levels of intensity and resolution, ranging from basic perception surveys to more detailed surveys of quantitative variables recorded at the household-level.

The methodology is linked with the GCRMN SocMon initiative in order to facilitate exchange of best practices and lessons learned. Consequently it has been designed to act as a complement to and link with ecological monitoring. This will enable a greater use of monitoring data in supporting development and management, a precondition for facilitating adaptation both in management approaches and among communities.

Recognizing that English frequently is not well understood by rural communities in the target region, and to ensure maximum penetration and application of the methodology, the manual has been translated into

several of the major languages of the region, including Malayalam, Hindi, Bengali, Tamil, Sinhala, Dhivehi, and Bahasa Indonesia.

Through the projects review of past experiences with livelihoods development, and the development and field testing of approaches to sustainable livelihood enhancement and diversification as well as socioeconomic monitoring, many valuable lessons with respect to management of coastal and marine ecosystems and resources and related policy have been learned.

These have been communicated to policy makers around the region and beyond through a series of targeted products and events, including at the meetings of the regional South Asia Coral Reef Task Force as well as at IUCN's World Conservation Congress in 2008. It is estimated that c. 50 senior policy/decision makers from governments in the region and a similar number of officials and managers in local administrations have directly taken part in policy events organized through the project. The number of recipients of policy products and materials is estimated to be at least twice that. This has led to a broad recognition of the SLED approach and, as mentioned above, further scaling up of SLED activities through national interventions or other projects.

Objective 3. Enhancing Knowledge

“to improve the education and awareness of the impacts of human activities on coastal ecosystems and strengthen the capacity of local resource users and managers to mitigate those impacts”

Through learning from project activities and synthesizing targeted information documents based on lessons learned the project contributed directly to the development of international policy. This included six resolutions, decisions and statements on various aspects of reef resilience, socioeconomic development and awareness, adopted by the International Coral Reef Initiative, as well as a Statement on Coral Reefs and Climate Change and a South Asia Regional Caucus Statement, approved at the Third International Tropical Marine Ecosystems Management Symposium (ITMEMS 3). These internationally agreed mandates have guided many of the worlds' governments and non-governmental organizations in the work on coral reefs.

Based on a successful product from the Western Indian Ocean, a South Asia Marine and Coastal Protected Areas management toolkit was developed with the direct engagement of over 50 international and regional experts, who contributed content in the form of theme sheets and case studies, and helped review the text. A training on using the toolkit was attended by 21 participants from 5 countries. To date 500 copies of the Toolkit have been printed and disseminated across the South Asia region. Additionally, a CD ROM version has been prepared, which will also be available on the web.

The South Asia MCPA toolkit has been very positively received by its target audience, as indicated by the training workshop evaluation, as well as among policy makers. The third meeting of the South Asia Coral Reef Task Force found the toolkit to be very useful and relevant for managers in the region, and SACRTF consequently facilitated the organization of an additional toolkit training workshop in India. A recommendation was also made that countries work towards the translation of the toolkit into local languages to facilitate its use and wide uptake across the South Asia region.

Recognizing that a longer term impact on human activities that negatively affect coastal and marine natural resource use can be achieved through working with children, an educational toolkit entitled “Children's Perception of the Environment” was produced. Aimed at teachers, educational projects, environmental clubs and managers, the toolkit helps create awareness among schoolchildren about coastal ecosystems through the use of creative, investigative approaches, as verified during pilot testing activities. The Toolkit allows the local school systems to make the local environment relevant and interesting to children in coastal communities across South Asia and Indonesia.

To facilitate use of the toolkit in coastal areas around the region and especially in the often remote and relatively poor areas where the toolkit is needed the most but where english is spoken the least, the toolkit

is being translated into seven languages of the target region: Bahasa Indonesia, Bengali, Dhivehi, Hindi, Malayalam, Sinhala and Tamil. The toolkit has been disseminated broadly to schools and educational institutions as well as MPAs, NGOs and research centers.

Lastly, this project has also enabled the initial development of a framework for social adaptation to climate change. A publication is being finalized and is expected to become a key resource to support building resilience to climate change among coastal populations and industries.

Key Lesson Learned

The project has generated many valuable lessons learned, synthesized briefly below. More detail can be found in many of the projects' outputs.

Partnerships

Continuity and sustained participation can be a challenge when a process is spread out over a large geographic area and over a time of several years. Despite this, participation has been remarkably consistent throughout the project, and the vast majority of participants have continued to be involved, reflecting their commitment and interest as well as the success of the partner selection process. It is clear that partner selection should be carried out with a full appraisal of the history of each partners' activity and commitment at the site level. Failure to do this will undermine activities. Maintaining regular communication with all project partners can greatly contribute to ensuring continued engagement and commitment.

Project partners and especially site implementers were at different stages of "development" at the onset of the project, with some working extensively on livelihoods issues with communities and others only just initiating this kind of work. This required the project to be flexible and accommodating to their needs, giving some partners more support and guidance than others and allowing the participants to adapt activities to their local capacity and experience. However, it also allowed the project to provide an opportunity for practitioners to network, share ideas and learn from each other, which partners found valuable. Networking and communication should thus be supported and valued actively in interventions of this kind, including through dedicated funding.

Linking the project with other projects in the same area and with similar or complementary mandate has been an effective way of improving reach as well as supporting the longevity of project results. Overall the project has benefitted from exceptionally good rapport between the project partners and the good and personal relations that have been maintained between the project implementers and the field teams.

Project Management

The integration of project activities under two separate large regional interventions (ICRAN and IUCN projects funded by the EU and Finland respectively) worked very well, but could have been made even stronger if the complementarities and overlap between project components had been more formally recognized and institutionalized at the design stage.

The initial time frame of the project was over-optimistic. The project over-ran the initiation date by several months, in part as a result of delays in funds disbursement. However, it also became clear that while activities on a technical level were highly appropriate and well formulated, timelines were unrealistic, in part due to the implementation constraints at the local level. At the same time it is clear that impact was felt to be greater where activities were allowed to progress at an appropriate pace to teams to absorb the knowledge and concepts, to build full consensus and capture lessons learned. Allowing sufficient time for this is strongly recommended for similar future interventions, especially as they relate to community and livelihoods development.

Project Evaluations

The evaluation exercises undertaken as part of several project activities have been seen as particularly valuable. While expert opinion can often be sufficient to evaluate technical or scientific rigor, evaluations by target audience and project participants was found to be a very useful way of extracting clear guidance, lessons learned and feedback from field teams to further inform and improve the process. It is recommended that an evaluation activity should be incorporated into the SLED process as a matter of routine where adopted by projects.

For example, evaluations found that holding a final SLED workshop bringing field teams together after implemented of activities had been completed was important as it allowed the space for the field teams to reflect on the process and to share experiences with each other. Evaluations also highlighted that the very extensive guidance notes for each SLED phase required some careful tweaking prior to introducing the process to beneficiaries and partners in the field, in order for ideas to be conveyed in a more succinct format that is easier to conceptualize.

Similarly, the coral reef resilience assessment methodology was well received and highly appreciated by project participants. It was highlighted that its complexity is appropriate, although it limits use of the methodology to relatively well trained or experienced researchers. However, the data analysis modules were viewed as somewhat lacking. This indicates two things: the data analysis modules require further enhancement for the method to be used more broadly, a process which is well underway, and there is a pressing need for further training in data management, analysis and interpretation among scientists as well as managers in the region.

Influencing Policy

The policy review carried out at the onset of the project proved highly valuable in its recommendations, many of which were specifically addressed through the project. For example, the engagement in the South Asia Coral Reef Task Force, hosted by South Asia Cooperative Environment Programme, has improved the impact on regional policy by reaching out to senior level policy makers. Further, the project has been widely regarded as a conduit to and a vehicle for continued engagement in global networks and processes such as the Global Coral Reef Monitoring Network (GCRMN) and the International Coral Reef Initiative (ICRI).

Integration of specific policy advisory activities in the project have also been beneficial. The one day policy session during the third SLED workshop brought the very specific challenges associated with communicating to the policy level into focus, and allowed the team to refine the scope of the planned policy workshop. It was also a very useful preliminary exercise for exposing the field teams to the challenges of communicating with a policy-level audience.

The SLED policy forum as well as deliberations in the South Asia Coral Reef Task Force revealed a keen interest in the SLED approach and resilience-based management, in order to strengthen the adaptive capacity of communities and ecosystems. The direct interaction between community representatives, managers and decision makers facilitated this, and is recommended as an approach in future interventions. The forum also helped identify areas where SLED can practically support spatial management, a synthesis of which is provided in the table below. Using strategic events such as WCC and ICRS, as well as targeting more specific regional training activities has further assisted broad and effective dissemination of lessons learned.

Contribution of SLED to MCPA management	Specific characteristics of SLED that support this contribution
Providing knowledge about the environment, people and institutions	Discovery and direction phases supported by systems for joint learning produce both broad and in-a depth information about livelihoods and people relationships with the natural resource base that is otherwise frequently insufficiently compiled and considered.
Building understanding and appreciation of the environment; Building consensus for change	A key part of the discovery phase is the process of building awareness and appreciation of peoples relationships with the marine environment. This is a continuous activity throughout SLED that feeds into the process of building a consensus for livelihood change. The process can be used to support MCPA planning and establishment as well as in implementation of adaptive comanagement.
Visioning futures that harmonize conservation and livelihoods objectives	By developing visions that reflect the complexity of their livelihoods people are in a better position to understand how best to harmonize often competing objectives, such as between natural resource dependence and biodiversity conservation, or in response to regulatory change.
Reducing and resolving conflicts	A key element in the discovery and direction phases (in particular the visioning process) is creating a dialogue within the community about the needs and aspirations of the different groups. This process can help avoid and resolve conflict.
Increasing compliance and Reducing pressure on resources	SLED contributes to building compliance with regulations by helping people to understand the need for a change in resource use; by building peoples relationships with government institutions; by developing their understanding of their rights and responsibilities; and helping them to identify opportunities for changing their livelihoods.
Helping to plan the future of MCPAs	The early stages of SLED are designed to build up the capacity of different groups within a community to participate in planning processes. Both the time that people are given to think and the skills to participate will help people to participate in MCPA planning. These individual skills are supported by helping both interest groups and the community to come together to voice common aspirations. Again this experience will directly assist people to participate in MCPA planning and management.
Building capacity to innovate in the future	SLED building confidence and capacity among communities to identify choices, make choice and take action, and facilitates these processes. SLED ensures that people are well placed to respond and adapt to changes.

Sustainability and Replicability

The project has consistently entrenched activities and outputs in partner institutions, which has improved prospects for sustaining benefits arising directly from the project as well as for replication and scaling up of approached, tools and skills introduced. This applies to ecological and socioeconomic research and monitoring activities as well as to the toolkits produced. In particular, there is great scope for field teams and other partners to build on and expand the activities that have been carried out at the pilot-level. This is explored in the site-level SLED evaluation reports.

The linkages forged between institutions and individuals in the region and global and regional institutions, processes and networks such as GCRMN and SocMon, Resilience Practitioners Network, IUCN CCCR, ICRI, SACRTF and others, will help ensure that activities receive advice and support beyond the life of this project. It will also serve as a basis from which add-on a activities can be developed, including through proposals to donors as well as national governments. Several such activities have been identified and taken forward by project partners.

The findings and outputs of the project will be made available through several mechanisms to ensure dissemination does not end with the donor funded activities. All outputs are available through IUCN at the regional and global level, as well as through ICRAN and other key project partners. The CORALI website (www.coralionline.org) has been incorporated into the South Asia MCPA Portal (www.southasiamcpaportal.org), and which is a component of the Protect Planet Ocean portal of the IUCN World Commission on Protected Areas (WCPA) - Marine.

Recommendations

The following overall recommendations based on project findings and made in order to bring further benefits from the project to the region and its environmental custodians, whether governments, civil society or local communities. Several recommendations also serve to bring project findings to stakeholders outside the project target area and to a global audience. Additional specific recommendations on application of project findings, including further research, facilitation and policy needs, are provided in the various technical outputs of the project

1. Broader application of resilience principles in ecological monitoring and research. The project has provided clear examples of the utility of resilience-based assessment and how it can be applied. Scaling this up through further and more detailed surveys, more comprehensive integration into ongoing research and assessment activities, and dedicated capacity building is necessary. While this requires continued commitment of the countries and partner institutions of this intervention, the support of IUCN GMP, CORDIO, IUCN CCCR and other key institutions in the resilience partnership is elemental.
2. Immediate follow-up on project findings or outcomes related to reef resilience is recommended where particular windows of opportunity or exceptional needs exist. This includes continued support to the government of the Maldives in its work towards revising and implementing policy on the high-value reef fish industry, including its newly regulated shark fishery. Based on findings from this project and through the use of tools and approaches developed through this project a development that secures ecosystems and resources as well as social wellbeing can be achieved. It will also serve to meeting internationally agreed policy recommendations.
3. Scaling up the use of the Sustainable Livelihoods enhancement and Diversification Approach (SLED). The project has clearly demonstrated that SLED provides a framework that is both accessible and acceptable to a range of communities and produces results on the ground in terms of livelihood outcomes as well as increasing adaptive capacity. This offers an opportunity to proactively respond to global as well as regional economic trends and in particular the growing threat of climate change in combination with resource and ecosystem degradation driven by local stress. Importantly it provides a means to address the needs of the many poor and vulnerable people in South Asia.
4. Broad applications of the socioeconomic monitoring protocol developed is recommended, in particular as part of initiatives related to livelihoods development e.g. through SLED, but also through mainstreaming the methodology into initiatives implemented by development and aid agencies in coastal areas. The protocol can inform preparation and planning of interventions, measure impact, and support adaptive implementation and management. In addition, use of the protocol as part of existing or new resource management schemes will help address the multiple effects these tend to have on communities and industries.
5. The framework for social adaptation to climate change, the basis of which has been prepared through this project, and which builds significantly on using tools developed such as SLED and SocMon by organizing these in an adaptation framework, should be packaged as a practically applicable guidance tool and brought to a global audience, and also be incorporated into or linked to existing tools such as the R2 Toolkit. While this can largely be led by IUCN and its Working Group on Climate Change and Coral Reefs partnerships with the Resilience Network and other key institutions is necessary. This can greatly promote and provide information for vulnerability assessments and adaptation planning.
6. Targeted training and seminars focusing on the Educational Toolkit for school teachers prepared through the project is recommended, to further facilitate its absorption into national or local curricula and increase awareness among students. The organization of national or sub-national teacher training workshops, using the different language versions of the toolkit, is recommended. These should be initiated and organized through IUCN, working in close collaboration with national or local associations and organizations with a mandate for or specializing in environmental education.

7. The MCPA Toolkit has been well received by its target audience, but translation into languages of the region and organization of further dedicated training sessions modeled on the regional training carried out under this project would significantly increase the pool of able natural resource managers. By extending the training to a broad range of stakeholders a greater sense of ecosystem and resource stewardship can be built among key industries and communities. Further application of management effectiveness concepts remains a need, both at marine protected areas and in other resource management or conservation initiatives, and extensive training and awareness raising is recommended.
8. The project has developed and tested many approaches and tools that may be of high relevance to other tropical coastlines and communities around the world and in particular around the Indian Ocean. Identifying the scope for the use of project outputs and tools in other areas, including potential amendment or further development needs, in close association with regional and national partners in potential target regions and countries, is strongly recommended. Using IUCN, CORDIO, GCRMN, SocMon and ICRAN networks in the first instance would build on and further strengthen existing and tested institutional partnerships.
9. Increased consideration of policy and management implications of scientific findings and especially assessments of ecological and socioeconomic resilience to (climate) change, as well as livelihood development and management effectiveness activities, whether under this project or through other activities, is beneficial. This requires concerted action on a national level, including through improved inter-ministerial and cross-sectoral integration in formulating policy responses. Regional bodies such as the South Asia Cooperative Environment Programme and the South Asia Coral Reef Task Force have a key role to play, alongside global organizations and networks including IUCN and CORDIO.



List of Outputs

The project has given rise to over 30 technical publications, either as a direct result of project activities or through the projects facilitation of ongoing activities. The project has also produced a broad range of advisories, outreach and training materials. Project activities have ben documented through progress and workshop reports. These are listed in the sections below.

Major publications

- Ardiwijaya, R.L., T. Kartawijaya, F. Setiawan, E. Muttaqin, R. Prasetya, Y. Herdiana, R.A. Wijaya, S. J. Campbell. 2008. Technical Report – Coral Reef Ecology Survey: Weh Island and Aceh Islands – 2008. Wildlife Conservation Society – Indonesia Marine Program. Bogor, Indonesia.
- Hoon V., Hemal Kanvinde, and Gayathri Sriskanthan 2008. Children's Perception of the Environment - A teacher's toolkit for Investigating Coastal & Marine Ecosystems in Asia. IUCN and CORDIO 2008. (in English; translated into Bahasa Indonesia, Bengali, Dhivehi, Hindi, Malayalam, Sinhala and Tamil).
- Hoon V, Sriskanthan G, Townsley P, Cattermoul B, Bunce L, and Pomeroy B 2008. Socioeconomic Monitoring Guidelines for Coastal Managers of South Asia, SocMon South Asia. IUCN/CORDIO. 102pp. (in English; translated into Bengali, Dhivehi, Hindi, Malayalam, Sinhala and Tamil).
- IMM 2008. Sustainable Livelihoods Enhancement and Diversification (SLED): A Manual for Practitioners. IUCN, Gland, Switzerland and Colombo, Sri Lanka; CORDIO, Kalmar, Sweden; and ICRAN, Cambridge, UK.
- IMM 2008. Systematic approaches to livelihoods enhancement and diversification: A review of global experiences. IUCN, Gland, Switzerland and Colombo, Sri Lanka; CORDIO, Kalmar, Sweden; and ICRAN, Cambridge, UK.
- IUCN 2008. Livelihoods enhancement and diversification: A review of experiences from South Asia. IUCN, Gland, Switzerland and Bangkok, Thailand; CORDIO, Kalmar, Sweden; and ICRAN, Cambridge, UK.
- IUCN, CORDIO and ICRAN 2008. Managing Marine and Coastal Protected Areas: A Toolkit for South Asia. IUCN, Gland, Switzerland and Bangkok, Thailand; CORDIO, Kalmar, Sweden; and ICRAN, Cambridge, UK.
- Marshall N, Marshall P, Tamelander J, Obura D, Cinner J and Malleret-King D 2009. Sustaining Tropical Coastal Communities & Industries: A Framework for Social Adaptation to Climate change. IUCN 2009.
- Obura, D.O. and Grimsdith, G. (2009). *Resilience Assessment of coral reefs – manual*. IUCN working group on Climate Change and Coral Reefs. IUCN, Gland, Switzerland. 44 pp
- Obura, D.O., Tamelander, J., & Linden, O. (Eds) (2008). Ten years after bleaching – facing the consequences of climate change in the Indian Ocean. CORDIO Status Report 2008. CORDIO (Coastal Oceans Research and Development in the Indian Ocean)/Sida-SAREC. Mombasa. <http://www.cordioea.org>. 457pp
- and the following reports therein:
- Arthur R. Patterns of Benthic Recovery in the Lakshadweep Islands
- Arunothai N., Paladej Na Pombejra, & Jeerawan Buntowtook. Additional and Alternative Occupations for the Urak Lawoi Sea Nomads of Phuket, Thailand
- Campbell S.J., Tasrif Kartawijaya, Rizya L. Ardiwijaya, Ahmad Mukmunin, Yudi Herdiana, Edy Rudi, Ayie Nurvita & Robby Andar V. Fishing Controls, Habitat Protection and Reef Fish Conservation in Aceh
- Cattermoul B., G. Sriskanthan, & J. Campbell. The Coral Reefs and Livelihoods Initiative (CORALI) - Building an Improved Approach to Livelihood Enhancement and Diversification with Coral Reef Users in South Asia and the Andaman Sea
- Chansang H and Ukkrit Satapoomin. Andaman Sea - Summary

- Kulkarni S., Vardhan Patankar & Erika D'souza. An Education and Awareness Program on Coral Reefs in the Andaman and Nicobar Islands
- Kulkarni S., Vardhan Patankar & Erika D'souza. Status of Earthquake and Tsunami Affected Coral Reefs in the Andaman and Nicobar Islands, India
- Obura D, Jerker Tamelander, Rolph Payet, Carl Gustav Lundin & Olof Linden. Ten Years After Bleaching – Moving Into the Next Decade
- Patterson Edward J.K., G. Mathews, Jamila Patterson, R. Ramkumar, Dan Wilhelmsson, Jerker Tamelander & Olof Linden. Status of Coral Reefs of the Gulf of Mannar, Southeastern India
- Patterson J., J.K. Patterson Edward, V. Deepak Samuel, Dan Wilhelmsson, Jerker Tamelander & Olof Linden. The Role of Alternate Livelihoods and Awareness Creation in Coral Reef Conservation in the Gulf of Mannar, Southeastern India
- Phongsuwan N, Chaimongkol Yamarunpattana, Sathika Paokanta & Papangkorn Areechon. Status of Coral Reefs in the Surin and Similan Archipelagos, Thailand
- Pradeep Kumara P.B.T, W.A.A.U. Kumara, H.A.A. Sandaruwan, R.G.A. Iroshanie, H.B.L. Upendra & P.R.T. Cumarantunga. Impacts of Reef Related Resource Exploitation on Coral Reefs: Some Cases from Southern Sri Lanka
- Rajasuriya A. Status of Coral Reefs in Northern, Western and Southern Coastal Waters of Sri Lanka
- Rudi E., S.A. Elrahimi, S. Irawan, R.A. Valentino, Surikawati, Yulizar, Munandar, T. Kartawijaya, Y. Herdiana, F. Setiawan, S. Rizal & S.T. Pardede. Post Tsunami Status of Coral Reef and Fish in Northern Aceh
- Sakoolthap S. , Wannee Wannapruk, Sirichai Issarschote, Jamlong Boonsiri, Porntip Ngansakul, Krissanon Chindamaikul, Nitiya Sangkhanan, Pahol Rongkul, Wiwaewan Tapabut, Sineenart Puangmanee, Siwat Somluk & Nirut Sukkasem. Teacher Training for Education on Marine Resources Conservation in Thailand
- Satapoomin U. & Kanlaya Chawanon. The Small-scale Reef Fishery at Phuket Island, Thailand Andaman Sea Coast
- Tamelander J. South Asia - Summary
- Tamelander J., S. Sattar, U. Satapoomin, S. Campbell, J.K. Patterson Edward, V. Hoon, M. Chandi, R. Arthur, S. Adam & M.Samoilys. Reef Fish Spawning Aggregations in South Asia and the Andaman Sea: Preliminary Findings from Local Knowledge
- Tamelander J.& V. Hoon. The Artisanal Reef Fishery on Agatti Island, Union Territory of Lakshadweep, India
- Rudi E, Sayyid Afdhal El Rahimi, Surya Irawan, Roby Anandra Valentino, Surikawati, Syamsul Rizal, Yulizar, Munandar, Tasrif Kartawijaya, Yudi Herdiana, Fakhrial Setiawan, Shinta T. Pardede, Stuart J. Campbell 2008. Post Tsunami Status of Coral Reef and Fish in Northern Aceh. IUCN, CORDIO, Center for Marine and Fishery Studies of Syiah Kuala University, Banda Aceh and Wildlife Conservation Society Indonesian Program, Bogor, Indonesia. 20pp
- Rudi E. et al 2008. Status Terumbu Karang dan Ikan Karang Pasca Tsunami di Perairan Utara Aceh. IUCN, CORDIO, Center for Marine and Fishery Studies of Syiah Kuala University, Banda Aceh and Wildlife Conservation Society Indonesian Program, Bogor, Indonesia. 20pp (Indonesian version)
- Samoilys M 2006. Evaluation of CORDIO South Asia: Relevance to and impact on regional and national coral reef policy formulation and implementation. IUCN Global Marine Programme and Eastern Africa Regional Programme 2006. 30pp
- Tamelander J, Sattar S, Campbell S, Hoon V, Arthur R, Patterson Edward JK, Satapoomin U, Chandi M, Rajasuriya A and Samoilys M 2009. Reef Fish Spawning Aggregations in the Bay of Bengal: Awareness and Occurrence. Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, 7-11 July 2008. Session number 22 Coral Reef Associated Fisheries, Submission ID: 314
- Tamelander J, Marie Saleem, Hussein Zahir et al 2009. Maldives High-value Reef Fish Survey. Marine Research Centre (MRC) of Maldives and IUCN Global Marine Programme 2009.

Tamelander J 2008. Reef resilience assessment in the Maldives - Regional training workshop and preliminary findings. IUCN Global Marine Programme and Marine Research Centre (MRC) of Maldives 2008.

Tamelander et al 2008. GCRMN Status of Coral Reefs of South Asia 2008. Excerpts from Status of Coral Reefs of the World 2008. Leaflet 6pp.

Major publications to which the project has contributed significantly include:

Loper C, Robert Pomeroy, Vineeta Hoon, Patrick McConney, Maria Pena, Arie Sanders, Gaya Sriskanthan, Sheila Vergara, Michael Pido, Ron Vave, Caroline Vieux, Innocent Wanyonyi 2008. Socioeconomic Conditions along the World's Tropical Coasts 2008. NOAA, GCRMN and CI. 56pp

Tamelander J and Rajasuriya A 2008. Status of Coral Reefs in South Asia – Bangladesh, Chagos, India, Maldives and Sri Lanka. In: Wilkinson, C. (2008). Status of coral reefs of the world: 2008. Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre, Townsville, Australia, 296 p.

Wilkinson Souter and Goldberg: Status of Coral Reefs in Tsunami Affected Countries: 2005. GCRMN/ Australian Institute of Marine Science, Townsville, Queensland, Australia

and the following reports therein:

Gunawan C A, Gerry Allen, Giorgio Bavestrello, Carlo Cerrano, Ayu Destari, Bob Foster, Annelise Hagan, Ibnu Hazam, Zeehan Jaafar, Yan Manuputty, Nishan Perera, Silvia Pinca, Ivan Silaban And Yunaldi Yah. Status Of Coral Reefs In Indonesia After The December 2004 Tsunami

Patterson Edward JK, Sarang Kulkanri, R Jeyabaskaran, Sri Lazarus, Anita Mary, K Venkataraman, Swayam Prabha Das, Jerker Tamelander, Arjan Rajasuriya, K Jayakumar, Ak Kumaraguru, N Marimuthu, Robert Sluka, And J Jerald Wilson. The Effects Of The 2004 Tsunami On Mainland India And The Andaman And Nicobar Islands.

Rajasuriya A, Nishan Perera, Chaminda Karunarathna, Malik Fernando And Jerker Tamelander. Status Of Coral Reefs In Sri Lanka After The Tsunami

Zahir H, William Allison, Geoff Dews, John Gunn, Arjan Rajasuriya, Jean Luc Solandt, Hugh Sweatman, Jerker Tamelander, Angus Thompson And Mary Wakeford. Post-Tsunami Status Of The Coral Reefs Of The Islands And Atolls Of The Maldives

Policy, awareness and other guidance materials

- Sustainable Livelihood Enhancement and Diversification through the Coral Reefs and Livelihoods Initiative (CORALI) - Case Studies. 17pp
- Policy brief – Lakshadweep pilot site
- Policy brief – Andaman Islands pilot site
- Policy brief – Gulf of Mannar pilot site
- Policy brief – Baa Atoll pilot site
- Policy brief – Bar Reef pilot site
- Policy brief – Aceh pilot site
- World Conservation Congress (WCC) Product Launch Presentations
- Presentations made to the South Asia Coral Reef Task Force (SACRTF)
- South Asia Reef Resilience Workshop Summary Record - Key messages
- Coral Reef Experts Group Meeting Summary Record - Recommendations
- Management policy statement based on coral reef ecological surveys of Aceh and Weh (Sabang) Islands (also in Indonesian: “Pernyataan Kebijakan Pengelolaan”)
- SLED Guidance material for phase 1 – Discovery

- SLED Guidance material for phase 2 – Direction
- SLED Proposal format for phase 3 – Doing
- SLED Guidance material for evaluation
- MCPA Toolkit Training materials, presentations, and field exercises
- R2 Workshop CD, workbook, exercises, presentations and collated literature
- Extensive photo documentation of project activities

Workshop and meeting reports

- South Asia Reef Resilience Workshop 15-18 January 2007, Summary Record
- Coral Reef Experts Group Meeting 19-20 January 2007, Summary Record
- SocMon Training of Trainers workshop report
- SLED Inception Report October 2006, 20pp
- SLED Process development Workshop 1, 27 January – 3 February 2007. Report
- SLED Approach - Development Workshop 2. 3-10 June 2007. Report
- SLED Approach - Development Workshop 3. 30 October - 6 November 2007. Report
- SLED Review Workshop & SLED Management and Policy Forum 2-7 June 2008. Report
- SLED Training Materials Dissemination Strategy
- SLED Evaluation Report Lakshadweep, India, 20 pp
- SLED Evaluation Report Baa Atoll, Maldives, 12 pp
- SLED Evaluation Report Bar Reef, Kalpitya, Sri Lanka, 34 pp
- SLED Evaluation Report Andaman Islands, India, 12pp
- SLED Evaluation Report Gulf of Mannar, India, 12 pp
- SLED Evaluation Report Aceh, Indonesia, 15 pp
- Lakshadweep, India SLED pilot site report
- Andaman Islands, India SLED pilot site report
- Gulf of Mannar, India SLED pilot site report
- Bar Reef, Sri Lanka SLED pilot site report
- Baa Atoll, Maldives SLED pilot site report
- Aceh, Indonesia SLED pilot site report
- Technical support visit report: Andaman Islands
- Technical support visit report: Gulf of Mannar
- Managing Marine and Coastal Protected Areas: A Toolkit for South Asia. Training Workshop 4-7 June 2008 Report, 69pp
- Report on CORALI-related activities during WCC
- Report on field testing of teachers' toolkit
- South Asia Coral Reef Task Force (SACRTF) First Meeting, 21 December 2007, Colombo, Sri Lanka. Meeting Report
- South Asia Coral Reef Task Force (SACRTF) Second Meeting, 31 August 2008, Male, Maldives. Meeting Report
- South Asia Coral Reef Task Force (SACRTF), Third Meeting 16 December 2008, Chennai, India. Meeting Report

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Annex 1. Project Proposal Brief

Project Title:	Management of Climate Change Impacts on Coral Reefs and Coastal Ecosystems in Tsunami-affected Areas of the Andaman Sea and South Asia
Total Cost:	€ 620,000
Donor:	Ministry for Foreign Affairs of Finland
Duration:	2 years, 2006-2007
Contact Person:	Jerker Tamelander Programme Coordinator, Indian Ocean Region/CORDIO IUCN Global Marine Programme jerker.tamelander@iucn.org

Summary

The project aims to improve environmental and social resilience in coral reef areas of the Andaman Sea and South Asia. The primary objectives are to (i) to improve the management of coastal ecosystems such as coral reefs, mangroves and other key environments, specifically in relation to the impacts of climate change, the Indian Ocean tsunami and other large scale hazards; (ii) to increase social resilience through development of alternative livelihood projects for coastal communities that no longer can support themselves due to the deterioration of the coastal environment; and (iii) to improve the education and awareness of the impacts of human activities on coastal ecosystems and strengthen the capacity of local resource users and managers to mitigate those impacts. The project is implemented by the IUCN Global Marine Programme and CORDIO over 2 years and will form a substantial part of the work plan for the CORDIO South Asia node and the new CORDIO node for the Andaman Sea.

Background

The Indian Ocean tsunami in December 2004 had a major impact on environment and the livelihoods of coastal communities in Sri Lanka, India, the Maldives, Thailand, Indonesia (Sumatra) and Myanmar. The macroeconomic effects were also significant as key productive sectors – tourism, fishing, aquaculture, agriculture and small enterprise – were all seriously affected. Notably, ecosystems where human use and global climate change has left natural resources degraded seemed to fare worse in the tsunami than healthy ones, and recovery is expected to be slower. At the same time natural resource dependence remains high among coastal populations throughout the affected region.

In many ways the impacts of the tsunami highlighted and exacerbated existing problems rather than created new ones. For example, while it is clear the impacts of the tsunami were enormous, at the same time its effect on the marine environment in large parts of the region were less severe than e.g. the El Nino induced coral bleaching in 1998. Similarly, among the communities that lost homes and livelihoods in the tsunami many were fishers or otherwise directly dependent on reef resources. In these communities livelihoods were already being lost at an alarming rate before the tsunami due to e.g. resource depletion caused by destructive and over harvesting and climate change related perturbations such as the El Nino 1998. Evidence also emerged of more severe impacts from the tsunami in areas that have seen more severe degradation of natural ecosystems and resources, as well as in societies under strain. Consequently activities under this project focus on addressing key issues and problems that may have existed before the tsunami, with a special focus on areas and situations where they have been exacerbated by the tsunami, and specifically aiming at increasing the resilience of both natural ecosystems and human coastal societies. This approach also particularly valuable in the face of climate change effects, which are already being felt in the region and which will increasingly strain ecosystems and resources as well as humans.

Geographic Scope

The project covers South Asia and the Andaman Sea, with a particular focus on Indonesia (Sumatra), the Maldives and Sri Lanka. It will also build further on activities underway in India and Thailand, and establish linkages with initiatives underway in Malaysia and Myanmar.

Indonesia: Aceh Province in Indonesia was by far the most adversely affected part of the region, both in terms of loss of human lives, infrastructure, livelihoods and environment. The area was struck both by the severe earthquake and the subsequent tsunami, causing massive losses and devastation to mangroves,

seagrass beds, shallow coral reefs and other coastal systems on which people rely for many basic resources and a livelihood. The extent of damages to coastal ecosystems and the natural resource base will have implications for human populations and livelihoods for years to come.

Sri Lanka: Coastal areas in the southwest, south and east of the country were severely affected by the tsunami, with seawater reaching up to several kilometers inland and infrastructure reduced to rubble over large areas. The human death toll in Sri Lanka was the second highest in the affected region after Indonesia. Assessments also indicate severe impacts on coastal and marine environments, many of which were already under considerable strain due to intense resource use, destructive practices and poor implementation of coastal planning and management. Large parts of the tsunami-impacted areas lie in the provinces directly affected by the conflict in Sri Lanka, further straining areas already marginalized.

Maldives: Although in absolute numbers seemingly less affected than many other parts of the region, the Maldives sustained severe damages in the tsunami. It was the only country where the effects were felt across the entire country. Of the 198 inhabited islands, 53 suffered severe damage and 10% of the islands were totally destroyed in terms of infrastructure and vegetation. Assessments of the coral reefs have not identified extensive damage arising directly from the tsunami. However, the Maldives was severely affected by the mass coral bleaching in 1998, with a loss of 90% of its coral cover.

Regional: Certain activities relevant to the objectives of this proposal will be implemented on the regional rather than the national level. In particular, this includes many of the capacity building, information and knowledge sharing, networking and outreach initiatives. However, regional strategic research projects and review studies are also envisaged to support the initiatives on country level. Countries for regional collaboration include Bangladesh, India, Pakistan and Thailand.

Activities

Component 1. Reef resilience to climate change: The project will contribute to the growing body of knowledge on how coral reefs and other marine and coastal ecosystems adapt to external shocks such as climate change. The targeted research will identify and test practical tools that resource managers can use to increase reef resilience to those shocks. Results from targeted research and demonstration projects will feed directly into local and national resource management frameworks. In addition, results will be channeled to regional and international fora such as the IPCC. In this way, the project serves to bridge the gap between science and policy/management

This component focuses on the following activities:

1.1 Develop Resilience and Climate Change Indicators

- Regional experts workshop to identify suitable climate change and resilience indicators, with participants from Bay of Bengal rim countries and representation of bio-physical, resource, resource use, socio-economic, livelihoods programmes
- Preparation of guideline document on climate change and resilience indicators and how these can be incorporated in monitoring

1.2 Develop and Implement Targeted Research Projects

- Convene regional group of experts to develop research projects (also review, update and further develop project list prepared by the CORDIO network)
- Undertake field assessments to study compounded effects of the tsunami, climate change and other potential catastrophes such as extreme weather events, flooding etc. as well as vulnerability
- Implement targeted research projects through collaborative arrangements with national and regional partner institutions

1.3 Capacity Building

- Development of training modules for integration of resilience and climate change indicators in monitoring and research and linking this with ecosystem work (cf. targeted research above)
- Site based training, seminars and demonstrations

Component 2. Enhancing Coastal Livelihoods: One of the best ways to increase reef resilience to climate change is to minimize the impacts of human activities. Responding to the high levels of poverty in coastal areas of this region, this project component will focus on assisting local communities in diversifying their livelihoods by identifying and implementing sustainable alternative or supplemental livelihoods projects, thus reducing destructive activities while at the same time increasing the diversity and security of livelihoods as well as socio-economic resilience in societies. This will also to reduce vulnerability to unforeseen shocks, a major component in reducing poverty. The component will be implemented jointly implemented with the EU funded project "Institutional Strengthening and Capacity Development for the Long-term Management and Conservation of MCPA's encompassing Coral Reefs in South Asia" implemented by South Asia Cooperative

Environment Programme (SACEP) together with the International Coral Reef Action Network (ICRAN), UNEP Coral Reef Unit, IMM Ltd, and national and regional partners.

This component focuses on the following activities:

2.1 Livelihoods Review

- Review study on previous or present alternative/supplemental livelihood initiatives in the region, approaches, successes, failures and lessons learned (building on and scaling up previous CORDIO work in e.g. Sri Lanka), with specific emphasis on sustainability and resilience
- Production of report and guiding principles that will be used to develop activities under Component 2 below. The report will also be widely distributed for the benefit of other initiatives

2.2 Participatory Livelihoods Scoping

- Regional or sub-regional fora convened to present and discuss the review report compiled in sub-component 1.4 above as well as experiences and results from livelihood diversification initiatives
- Identification of sustainable and realistic interventions for implementation under sub-component 2.3 and development of detailed descriptions and implementation plans

2.3 Implementation of Livelihoods Pilot/Demonstration Projects

- Implementation of livelihood diversification projects in natural resource dependent communities in Indonesia, Sri Lanka and the Maldives that were affected by the tsunami and that are at risk of adverse impact from climate change effects
- Support to ongoing CORDIO initiatives elsewhere in the region to integrate the lessons learned from activities under component 1 and sub-components 2.1 and 2.2

2.4 Socio-economic profiling and monitoring

- In target communities identified under 2.2, conduct socio-economic surveys to gather baseline data and to support formulation of livelihoods projects
- Technical support to undertake socio-economic monitoring in target communities using internationally recognized SocMon methodologies, in order to track progress and evaluate impact of livelihoods projects
- Build necessary capacity among relevant institutions to undertake regular socio-economic monitoring

2.5 Vocational Training for Livelihoods

- Site based training sessions and courses for beneficiary communities
- National or regional training course for managers and policy makers on the use of livelihoods diversification in management of natural resources, increasing the capacity to utilize these tools

Component 3. Enhancing Knowledge: One of the major obstacles to sustainable natural resource use and management is a lack of awareness and knowledge among several, if not most, stakeholders. The project will address this through targeted activities, including identifying and establishing pathways and mechanisms to channel results into local and national policy and management frameworks, as well as regional and international fora (e.g. IPCC, UNFCCC). Further, awareness, outreach and educational materials will be prepared targeting a broad range of key stakeholders.

3.1 Support and Influence Policy

- Review of how and to what degree CORDIO results and outputs to date, as well as those of national partner institutions, have been fed into policy and management processes and frameworks, and identify shortcomings and possibilities for improvement
- Repeat/update

3.2 Awareness and Outreach

- Production of outreach materials targeting local communities, managers, local, national and regional decision makers
- Production of educational materials for use in schools, including e.g. training packages for secondary schools a teachers guide, student kits and mobile exhibitions (building on existing materials), translated into local languages, and integrated into the official school syllabus as possible

Component 4. Coordination

The project is coordinated by the IUCN Global Marine Programme, in close collaboration with CORDIO and its partner institutions throughout the Indian Ocean. CORDIO is implementing activities in Sri Lanka and the Maldives since 1999 through local partners both among government institutions and civil society. The fourth project component on Coordination, Networking, and Communication will ensure linkages and networking between partners and participants, with the project coordination mechanism functioning as a conduit for information sharing. Materials and products developed under the project will be disseminated to a broad

audience. This will be facilitated by building on IUCN as a membership organization. At the end of the project project products, implementation and impact will be reviewed.

Relevance to Internationally Agreed Targets

United Nations Framework Convention on Climate Change (UNFCCC)

Activities under this proposal respond to commitments under UNFCCC Article 4.1, which, *inter alia*, calls for measures to facilitate adequate adaptation to climate change (b) and cooperation between nations in preparing for adaptation to the impacts of climate change; developing and elaborating appropriate and integrated plans for coastal zone management and for the protection and rehabilitation of areas affected by floods (e). The article further states that parties shall take climate change considerations into account in relevant social, economic and environmental policies and actions, and employ appropriate action with a view to minimizing adverse effects on the economy, on public health and on the quality of the environment, of projects or measures to mitigate or adapt to climate change (f).

Article 2.3 of the Kyoto Protocol urges implementation of policies and measures that can minimize adverse effects of climate change, including social, environmental and economic impacts. Several current UNFCCC agenda items address vulnerability and adaptation, with particular attention to e.g. scientific and technical aspects. Importantly, topics such as education, training and public awareness, and research and systematic observation are also stressed. Developed nations party to the convention are obligated to assist developing country parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects under article 4.4.

The Convention on Biological Diversity (CBD)

CBD adopted the Jakarta Mandate on Marine and Coastal Biological Diversity in 1995. A programme of work, aiming to assist its implementation at the national, regional and global level, was adopted in 1998 and reviewed and updated in 2004. It identifies key operational objectives and priority activities within the five key programme elements, namely: integrated marine and coastal area management, marine and coastal living resources, marine and coastal protected areas, mariculture and alien species and genotypes.

Notably, the Elaborated Programme of Work on Marine and Coastal Biological Diversity, as adopted in Decision VII/5 of the Conference of Parties, in its specific work plan on coral bleaching, recognizes the urgent need to implement action to manage coral reefs for resistance and resilience to, and recovery from, episodes of raised sea temperatures and/or coral bleaching. It also recognizes the urgent need to supplement coral reef information gathering and monitoring schemes with focused management activities and the need to assist, support and enable such activities.

In this regard, it identifies as highest priority action "Support and expand existing projects that assess the impacts of coral bleaching on communities dependent on coral reefs, such as the CORDIO project in the Indian Ocean" and also support to ongoing assessment and monitoring initiatives, including CORDIO. Further, it notes that some projects within the CORDIO programme in the Indian Ocean region focus on determining the socio-economic impacts of coral mortality and options for mitigating these through management and development of alternative livelihoods. It also acknowledges that CORDIO offers reporting opportunities on the status of the reefs for Indian Ocean countries and that dissemination of this information through CORDIO has facilitated further communication and coordination on local impacts.

The Plan of Implementation of the World Summit on Sustainable Development restates the need to implement Chapter 17 of Agenda 21, and calls for support for the sustainable development of aquaculture, including small-scale aquaculture, given its importance for food security and economic development (30h). It also calls for capacity building in marine science, information and management (34 c).

Millennium Development Goals (MDG)

The proposed activities, through the livelihoods component, will also contribute to meeting targets of the MDG, most notably Targets 1 and 2 on reducing poverty and improving food security and Target 9 on integration of sustainable development principles into country policies and programmes and reversing the losses of environmental resources.

Annex 2. Project Implementation Matrix

Component	Activity	Implementation	Output
1. Reef Resilience to Climate Change			
1.1 Develop Resilience and Climate Change Indicators	1. Regional Experts Wshp. Resilience and CC indicators	Held in Bentota, Sri Lanka in January 2006.	Workshop CD with presentations and other materials; summary record
	2. Preparation of Resilience and CC indicators guidelines	Methodology developed with IUCN CCCR	Obura and Grimsditsch (eds) 2008
1.2 Develop and Implement Targeted Research Projects	1. Regional group of experts to develop research projects	Held in Bentota, Sri Lanka in January 2006,	Summary record, projects developed on resilience assessment, FSA surveys
	2. Field assessment of compounded ecosystem impacts	Assessments carried out by national CORDIO partner institutions	CORDIO Status Report 2008; stand-alone reports from Indonesia 2006 and 2007
	3. Implementation of research projects	Regional reef fish spawning aggregations survey; national research projects	CORDIO Status Report 2008; proceedings of 11ICRS; stand-alone reports
1.3 Capacity Building	1. Development of resilience and CC indicators training materials	Methodology and training materials developed with IUCN CCCR	Obura and Grimsditsch (eds) 2008; presentations used at training workshops
	2. Training in including resilience and CC indicators in monitoring	Resilience field training, Maldives, January 2008	Report from surveys conducted during the training
2. Enhancing Coastal Livelihoods			
Activities implemented as the "Coral Reefs and Livelihoods Initiative" (CORALI) in collaboration with ICRAN, SACEP and national partners. Reformulation of programme, main activities, outputs and geographic focus unchanged, some modification to timelines and methodologies.			
2.1 Livelihoods Review	1. Undertake livelihoods review	Prepared with IMM Ltd, IUCN ELG and ICRAN	Systematic approaches to livelihoods enhancement and diversification: A review of global experiences; and Livelihoods enhancement and diversification: A review of experiences from South Asia published in October 2008
	2. Preparation of livelihoods guidelines	Prepared with IMM Ltd, IUCN ELG and ICRAN	Sustainable Livelihoods Enhancement and Diversification (SLED): A Manual for Practitioners published
2.2 Participatory Livelihoods Scoping	1. Regional livelihoods forum	Three regional CORALI/SLED training workshops organized, in February 2007, June 2007 and November 2007; a fourth workshop for evaluation and with a specific policy forum held June 2008; side event at SACRTF meeting	Workshop and meeting reports; policy briefs; presentations and handout materials

	2. Development of livelihoods projects	Pilot projects developed in association with six site partners during workshops	Pilot project proposals
2.3 Implementation of Livelihoods Pilot/ Demonstration Projects	1. Implementation of livelihoods projects	Pilot projects implemented at six sites in South Asia and the Andaman Sea through site-based organizations	Implementation and evaluation reports from pilot sites
	2. Support to ongoing CORDIO livelihoods projects	Ongoing CORDIO projects included among the six pilot sites	Implementation and evaluation reports from pilot sites
2.4 Socio-economic profiling and monitoring	1. Socio-economic profiling and baseline surveys	Socioeconomic profiling and methods development conducted as part of pilot projects at six sites	South Asia SocMon manual published in 2008
	2. Socio-economic monitoring technical support	Provided as part of four CORALI/ SLED training workshops	South Asia SocMon manual, SLED pilot site reports
	3. Capacity building in socio-economic monitoring	Provided as part of four CORALI/ SLED training workshops	South Asia SocMon manual, SLED pilot site reports
2.5 Vocational Training for Livelihoods	1. Livelihoods training for target communities	Three regional CORALI/SLED Training Workshops , training provided in association with pilot projects and technical support missions	Reports of the workshops and technical support missions
	2. Livelihoods training for managers and policy makers*	CORALI/SLED Workshop with specific policy forum held June 2008; side event at SACRTF meeting December 2008; SLED management and policy session at MCPA Toolkit Training in Maldives June 2008	Workshop, meeting and training reports as well as presentations and handout materials
3. Enhancing Knowledge			
3.1 Support and Influence Policy	1. Review of uptake of results into policy	Internally commissioned, conducted by IUCN EARO	Final report September 2006 (Samoilys 2006)
	2. Preparation of report on influencing policy	Internally commissioned, conducted by IUCN EARO	Final report September 2006 (Samoilys 2006)
	3. Update report on policy influencing	Reformulated: Evaluation workshop as part of CORALI/SLED; assessment of policy uptake in project final technical report	CORALI/SLED 4th workshop report and associated materials; CORDIO Asia Final Technical Report 2009
3.2 Awareness and Outreach	1. Production of outreach materials	Reformulated: Organization of event on showcasing products and partnerships for MCPA management and livelihoods enhancement in South Asia as part of the high level South Asia Coral Reef Task Force Meeting in December 2008; and development of a CORALI website	SACRTF 3rd Meeting Report; CORALI website at URL: www.coralionline.org

	2. Production of educational kits	Produced through close collaboration with ICRAN, SACEP and numerous partners in the region	Managing Marine Protected Areas - A Toolkit for South Asia published Oct 2008; Children's Perception of the Environment: A Teacher's Toolkit for Investigating Coastal and Marine Ecosystems in Asia published February 2009
	3. Dissemination of outreach and educational materials	Outputs disseminated broadly in hard copy through mail as well as electronically through email and making all outputs available on the web	Dissemination lists
4. Coordination			
4.1 Coordination, Networking, Communication	1. Networking: coordination of project partners	Liaison and communication by email and through meetings, partner participation in international fora, including ITMEMS3, 11ICRS, ICRI meetings, CSI Workshops etc	Project final report; Over 30 partners engaged in activities
	2. Networking: integration and interagency coordination	Liaison and communication by email and through meetings, establishment of project management and coordination committee with IUCN, CORDIO, ICRAN, UNEP-WCMC, SACEP	Project final report; Successful project implementation
	3. Project Coordination (IUCN/ CORDIO)	Project management, excluding technical input to specific activities	Project final report as well as regular progress reports
4.2 Project Evaluation	1. Project evaluation	Project to be audited by IUCN Finance Unit May 2009	Project final technical report and final audit report

IUCN, International Union for Conservation of Nature

Founded in 1948, IUCN (International Union for Conservation of Nature) brings together States, government agencies and a diverse range of non-governmental organizations in a unique world partnership: over 1000 members in all, spread across some 160 countries.

As a Union, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

IUCN builds on the strengths of its members, networks and partners to enhance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels.



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