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Editorial

The South China Sea Project: a multilateral marine and coastal area management initiative

Since its creation in 1990, the Global Environment Facility (GEF) has invested in excess of one billion US dollars in projects related to “international waters”. In the context of the GEF, the term “international waters” has a meaning very different from the legal context of the UN Law of the Sea, where international waters are deemed to be those areas of the world’s oceans that lie beyond national jurisdiction. International waters in the GEF sense includes transboundary water bodies, i.e., those areas of fresh and marine waters that are shared by more than one state. During the pilot phase of the GEF from 1990 to 1994, investments were limited to a few very large projects implemented by UNDP and the World Bank. One such project in China was to build port reception facilities for ballast water and oily wastes that was implemented in parallel with a world-bank loan to develop these same ports. The use of GEF funds as supplements to World-Bank loans was heavily criticised in the independent evaluation of the pilot phase. During subsequent phases of the GEF there has been a tendency to move away from such large investment projects and, in 1996, the GEF and its three implementing Agencies (UNDP, UNEP and the World Bank) developed three operational programmes within which future GEF interventions in international waters were supposed to fit.

Currently, the GEF remains the largest single source of funds for projects and programmes in the management of the environment and its associated resources. The GEF exists primarily to fund activities in support of the global conventions for which it serves as the designated financial mechanism and not to fund environmental actions *per se*. In the case of the international waters focal area, however, unlike the biodiversity, climate change, land degradation and persistent organic pollutants focal areas, the GEF does not serve as the financial mechanism for any international convention. In part, this reflects the fact that there is no single all-encompassing global water convention. Although the UN Convention on the Law of the Sea exists, it is confined to marine areas. There is a plethora of other international conventions covering various anthropogenic activities in marine and coastal areas and numerous regional conventions, treaties and agreements covering a variety of freshwater and marine areas of the world. This means that the GEF Council, in deciding upon appropriations for the international waters portfolio, is faced with no single strong voice having right of access to these financial resources in relation to water related issues.

1. The South China Sea Project

One of the operational programmes developed by the GEF in 1996 focussed on collaboration among neighbouring states in the management of shared water bodies. It was under this operational

programme, and in the same year, that the UNEP project entitled “Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand” was proposed (referred to in this issue as the “SCS project”). The idea was that preparatory work would be undertaken that would lead ultimately to some form of stable long-term agreement among the riparian countries on the management of the South China Sea. It was envisaged that the countries involved in the initial development of a transboundary diagnostic analysis would come to agree on the nature and causes of environmental problems of their shared marine environment and, ultimately, approve the actions necessary to mitigate or stop completely the causes of these problems. The GEF operational programme envisaged an orderly progression of events with countries first identifying, agreeing and prioritising the problems of the marine environment of the South China Sea in the form of a Transboundary Diagnostic Analysis (TDA) (Pernetta and Bewers, 2011). This was to be followed by a further intervention that would develop a Strategic Action Programme (SAP) for the SCS region, i.e., a programme of actions needed to address the identified, agreed and prioritised problems.

One major issue facing countries in dealing with the GEF is that it was established to fund the costs of achieving “global environmental benefits” despite such benefits having nowhere been defined. This concept of achieving global environmental benefits has, of course, implications for the use of GEF funding. If an action results in national level benefits then, clearly, the cost of achieving those benefits should not be supported by the GEF but by the government receiving the benefits. This led to the concept of “incremental costs” such that if a government wished to invest in some form of activity that led to national benefits, the GEF was interested in how much additional money would be needed to expand or change the project activities in order to achieve global environmental benefits? This increased cost was considered the “incremental cost” necessary to achieve the global environmental benefit. For some GEF focal areas, such as climate change, calculating incremental costs is comparatively easy. Building one type of power station at a cost of x billion dollars results in y tonnes of carbon emissions whilst building a second type at a cost of $2x$ billion dollars results in $<y$ tonnes. The additional cost of the second option could be considered incremental and the reduction in carbon emissions can be valued at so much per tonne. Making similar comparisons and deriving similar ratios in biological diversity or international waters interventions is far less straightforward to the point where the GEF has all but abandoned the concept of incremental cost and requires only “incremental reasoning” in the justification for grant funds.



Introduction to the special issue of coastal and ocean management entitled the South China Sea project: a multilateral marine and coastal area management initiative

The South China Sea (Fig. 1) is a strategic body of water surrounded by nations that are currently at the helm of industrialization and rapid economic growth in the Asia-Pacific region. Bordered by the People's Republic of China to the north, the Republic of the Philippines to the east; Malaysia, the Republic of Singapore, the Republic of Indonesia and the Sultanate of Brunei Darussalam to the south, and the Kingdoms of Thailand and Cambodia, and the Socialist Republic of Viet Nam to the west, the South China Sea has always been central to issues of economic and political stability in Southeast Asia and adjacent regions. Today, it is central to defining environmental sustainability and food security for its coastal nations. The coastal sub-regions of these nations are home to 270 000 000 people or 5% of the world's population. About 122 major rivers drain 2.5 10^6 km² of catchments and deliver materials, including suspended sediments, nutrients and pollutants, to the South China Sea.

The pace of economic development in these countries has not been without environmental cost and, in 1981, the ASEAN countries of Southeast Asia formed the Coordinating Body for the Seas of East Asia as a forum in which environmental problems could be discussed and actions planned to mitigate the adverse environmental consequences of rapid economic development. In October 1996, UNEP, as an Implementing Agency of the Global Environment Facility (GEF),¹ approached the GEF Secretariat with a proposal to develop a GEF-funded project encompassing the South China Sea that forms only part of the geographic coverage of the Coordinating Body for the Seas of East Asia (COBSEA). This approach was based on a request from the member governments of COBSEA that a GEF project be developed for the region to address regional environmental management. At that time, the GEF was unwilling to fund activities of the Regional Seas Programme of UNEP directly as it did not wish to be seen as funding the activities of regional seas conventions and action plans. Accordingly, UNEP, through its then Coordinating Office for the GEF, developed a proposal for a GEF project in the South China Sea, including the Gulf of Thailand. This proposal conformed to the GEF approach to funding activities addressing environmental problems in large marine ecosystems.

The GEF provided a project preparation grant in the amount of three hundred and fifty thousand US dollars on the understanding that this would be used by UNEP and the seven governments

concerned to develop a transboundary diagnostic analysis (TDA) of environmental problems of the South China Sea. This was intended to identify the environmental problems of the region, quantify them where possible, and prioritise them for future intervention by securing the agreement of all bordering countries to work together to resolve their common problems. The GEF Secretariat further requested that a framework Strategic Action Plan (SAP) be developed outlining future interventions. In developing these documents, the countries each produced a national report outlining the nature of their water-related environmental problems (UNEP, 1998a–1998g). A consolidated transboundary diagnostic analysis was also produced (Talaue-McManus, 2000) that encapsulated the identified issues and problems that had been prioritised during a regional experts meeting called to review all the documents and consider types and forms of intervention.

The initial Strategic Action Programme, produced in 1998 and published in 2000 (UNEP, 1999), formed the basis for UNEP to draft a full project proposal that was discussed by COBSEA and agreed at a meeting of all parties. In order to secure GEF funds, it was necessary for the GEF Focal Points in each country to formally endorse the project proposal. Six of the seven countries signed the document in December 1998. It took a further 18 months to secure the agreement of all seven countries to participate. The background to this is explained in the first of the papers contained in this special issue (Pernetta and Jiang, 2013). Following endorsement by all seven riparian countries, the project was accepted into the work programme of the GEF in December 1999. Development of the full project proposal therefore took a total of five years, a period that was considered by the GEF to be excessively long, so long in fact that, at one point, they were on the verge of cancelling the project due to the length of time taken to secure countries agreement to participate.

Despite these initial problems, following the approval of the project proposal by the GEF Council, it took only twelve months to develop the full project document including the legal agreements between UNEP and the seven governments concerned and for signature of the 38 Memoranda of Agreement between UNEP and the national agencies and institutions that would undertake the work of the project. The final operational project document² was submitted to the GEF Secretariat in December 2001 and the project commenced in January 2002 following the transfer of a senior UNEP staff member from Nairobi, Kenya, to head the project

¹ The Global Environment Facility was initially founded in 1990 by a group of donor countries as a mechanism to provide a new and additional source of aid for developing countries to address environmental issues and problems. Following its restructuring in 1994, it became the financial mechanism for a number of Global Environmental Conventions. It remains the single largest source of funding globally for addressing environmentally related issues and problems.

² An "operational project document" is one in which all the necessary legal agreements are signed and included, rather than being a document that contains merely a description of the project activities and components together with the anticipated outputs, and outcomes that constitutes a project proposal.



Environmental cooperation in the South China Sea: Factors, actors and mechanisms



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ABSTRACT

Although it remains one of the most volatile maritime areas of the world, the South China Sea has witnessed an increasing level of environmental cooperation since the 1990s, culminating in the development and implementation of the South China Sea Project, an inter-governmental project implemented by the United Nations Environment Programme (UNEP) and funded by the Global Environment Facility (GEF). This paper seeks to explain why environmental cooperation occurred in such a sensitive and contentious region and contends that UNEP played a critical role in facilitating and brokering environmental cooperation. Through an analysis of the motivations, strategies and interactions among the three main actors, namely UNEP, China and the Association for Southeast Asian Nations (ASEAN), this article argues that environmental cooperation was deemed an instrument to facilitate the exchange and sharing of information not only for environmental protection but also for political purposes. While countries were trying to consolidate their sovereign claims, they still shared a desire to sustain a peaceful regional environment to promote the kind of prosperous economic development that the region has enjoyed in recent decades. Countries were actively looking for less sensitive “issues” in which they could cooperate without jeopardizing any sovereignty claims. Marine environmental problems provided such an issue.

UNEP, with its distinctive symbolic power as a United Nations agency, played an instrumental and inductive role in mediating and facilitating environmental cooperation in the region. On the one hand, UNEP has played an instrumental role in promoting regional cooperation by helping countries to address common marine environmental problems and promoting confidence building measures between ASEAN countries and China. On the other hand, by framing environmental protection as a neutral and apolitical issue, UNEP has been able to induce the neighbouring countries to the negotiating table. This has internationalized environmental protection in the South China Sea, making non-participation in these cooperative efforts potentially problematic because it could reduce the prominence of a country's territorial claims. In this sense, UNEP has been able to play an inductive role to foster cooperation. The paper attempts to identify the sources of UNEP's influence, and give an account of the various roles and functions of UNEP that made environmental cooperation a reality under conditions that originally appeared untenable.

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1. Introduction

Connecting China and Southeast Asia is one of the world's busiest and most volatile maritime areas, the South China Sea. This sea is also the global centre of shallow water marine biological diversity. In recent decades, the growing economies, increasing population and technological advances have made it possible to exploit the region's natural resources at an unprecedented rate. The

South China Sea is experiencing profound environmental changes, increasing scarcity of natural resources, and has suffered serious environmental degradation, especially in coastal habitats.

The South China Sea is defined by the International Hydrographic Organization (IHO) as the semi-enclosed body of water stretching in a southwest to northeast direction, whose southern border is three degrees south latitude between South Sumatra and Kalimantan (Karimata Straits), and whose northern border is the Strait of Taiwan from the northern tip of Taiwan to the Fukien coast of China (IHO, 1953). The South China Sea includes more than 200 small islands, rocks and reefs, with the majority located in the Spratly and Paracel archipelagos. The countries bordering the South China Sea are

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Managing multi-lateral, intergovernmental projects and programmes: the case of the UNEP/GEF South China Sea project



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ABSTRACT

The management of comprehensive and extensive, multi-lateral and multi-national programmes and projects in the field of coastal and ocean management poses numerous organisational problems encompassing co-ordination between: the actions of individual participating countries at the regional level; the national level actions of institutions from different sectors; and actions that are designed to address issues as diverse as: biological diversity conservation and sustainable use; fisheries management; maritime transport; and the control of land based pollution. Most large multi-lateral projects focus on sound scientific knowledge and information, and pay less attention to the design of a management structure that will ensure coherence and co-ordination of the interventions once the programme or project is under implementation. The project entitled “Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand” was complex since it addressed three priority areas of concern namely the loss and degradation of coastal habitats, over-exploitation of fisheries in the Gulf of Thailand, and land-based pollution. It is suggested that the success of the management framework reflects the following key design elements:

- The framework permitted and encouraged both “horizontal” (inter-country) and “vertical” (intra-country) interactions and networking between individuals at all levels of project implementation and execution;
- Inclusion of a body (the Regional Scientific and Technical Committee) that served as a forum for reconciling both sectorial and national interests and priorities;
- The clear separation between discussions of scientific and technical matters from discussions dealing with policy and principles at both the national and regional levels;
- The framework facilitated the incorporation of sound scientific and technical advice and information into politically based decision-making;
- The use of regional experts and consultants from the participating countries fostered “ownership” of the activities and outputs;
- Restriction of the membership of the Project Steering Committee to government representatives only, and exclusion of observers from regional and international agencies and institutions other than UNEP; and,
- The framework allowed for adaptive management and was not a rigid unchanging structure.

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1. Introduction

The management of comprehensive and extensive multi-lateral and multi-national programmes and projects in the field of coastal and ocean management poses numerous organisational problems encompassing co-ordination: among the actions of individual

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Status and trends in coastal habitats of the South China Sea



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ABSTRACT

The South China Sea is an area of globally significant biological diversity. The Transboundary Diagnostic Analysis prepared for this marine basin identified the issue of coastal habitat degradation and loss as a key priority issue for action. The UNEP/GEF project entitled “Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand” (SCS project) focused on these concerns through implementing a series of activities under the component on habitat degradation and loss. Important outputs of this project component were national reports on coastal habitats. This paper reviews and analyses available information from these reports and recent studies to present a review of the status and trends in coastal habitats of the South China Sea. This includes a technical summary of the best available information relating to the: distribution and extent of the dominant coastal habitats of mangroves, coral reefs, and seagrass; richness of habitat building species and hotspots of biodiversity; ranking of threats and the related rates of coastal habitat degradation and loss; and the state of coastal habitat management regimes. The use of this information in developing National Action Plans for habitats and the Strategic Action Programme for the South China Sea is reviewed. It is concluded that the science-based planning fostered by the SCS project was essential in reaching multi-lateral agreement on the regional targets and priority actions for coastal habitat management in this transboundary water body.

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1. Introduction

The South China Sea, including the Gulf of Thailand, is a global centre of shallow water marine biological diversity providing environmental goods and services critical to Southeast Asian economies. The coastal sub-regions of the nations bordering the South China Sea are home to 270,000,000 people, or 5% of the world's population, many of whom depend on the South China Sea for food and income. The high biological diversity and productivity of this globally significant marine basin is threatened by continuation of the current unsustainable patterns of use. It has also been seriously degraded in the recent past as a result of poorly planned coastal development.

The Transboundary Diagnostic Analysis (TDA) prepared for this marine basin identified the issue of coastal habitat degradation and loss as the key priority issue for action (Talaue-McManus,

2000). The UNEP/GEF project entitled “Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand”³ focused on these concerns through implementing a series of activities as part of the project component entitled “Habitat Degradation and Loss”. This component comprised four sub-components, addressing the four priority habitats in the region, namely mangroves, coral reefs, seagrass, and coastal wetlands. It is important to note that the scope of the SCS project was limited to the South China Sea and Gulf of Thailand. Hence project activities, data and information collection focussed only on the South China Sea coastlines of the riparian countries. Coastal areas of participating countries that lay outside the South China Sea were excluded from consideration.

National-level project activities of each habitat sub-component included the establishment or re-vitalisation of National Committees or technical working groups to compile and review national information and data on the science and management of coastal habitats. Information and data from past and on-going research and publications were used to develop overall descriptions of the distribution and diversity of coastal habitats, define the threats to the quality and expanse of habitats, quantify rates of coastal habitat loss

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³ Hereafter referred to as the ‘SCS project’.



Developing a consensual information base for identifying priorities for intervention in the South China Sea



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ABSTRACT

The medium-term objective of the UNEP/GEF project entitled “Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand” was “to elaborate and agree at an intergovernmental level, the Strategic Action Programme encompassing specific targeted and costed actions for the longer-term, to address the priority issues and concerns”. This paper first describes the approach taken by the riparian countries of the South China Sea marine basin to arrive at a consensus on a common baseline of information and data to establish threats and to agree on priorities for intervention in the South China Sea. Case examples from the mangrove, fisheries and land-based pollution components of the South China Sea Strategic Action Programme (SAP) are provided to demonstrate the importance of establishing a consensual information base in: refining SAP targets; planning interventions for local benefit and high transboundary impact; and in developing analytical tools to inform the prioritisation of options for intervention in a shared water body. Initial priority problems and options for intervention contained in the Transboundary Diagnostic Analysis and framework SAP prepared between 1996 and 1999 are compared with those contained in the SAP endorsed in 2008. It is concluded that without the development of such a consensual information base there would have been no objective way of ensuring that the selected issues and priorities for intervention in the South China Sea are of any significance from the perspectives of the countries involved, the water body itself, or of potential transboundary or global benefits.

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1. Introduction

The 1996 Operational Strategy of the Global Environment Facility (GEF) defined the objective of its international waters focal area as “to contribute primarily as a catalyst in the implementation of a more comprehensive, ecosystem-based approach to managing international waters and their drainage basins as a means to achieve global environmental benefits” (GEF, 1996). Central to this strategy and its operational programmes was the recognition that, as a first step, countries would require support in joint fact-finding in order to develop the information base required to plan sectoral reforms and investments needed to mitigate or reverse transboundary environmental degradation of specific water bodies. Accordingly, the first set of GEF operational programs for international waters made reference to the “conduct of a transboundary diagnostic

analysis (TDA) to identify priority environmental concerns”² and the formulation of “a Strategic Action Program”³ (SAP) of actions each country needs to take to address priority transboundary concerns.” The underlying rationale for this TDA and SAP approach was that, once the root causes of transboundary concerns had been identified and key threats to the given transboundary water system established, countries would collaborate in determining and agreeing upon the collective and national-level actions needed to address priority concerns. Definitions of the key attributes of the TDA and SAP approach used in the GEF international waters focal area are provided by Pernetta and Bewers (2012).

The United Nations Environment Programme (UNEP) implemented project entitled “Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand”⁴ supported seven riparian countries of the South China Sea through this TDA-SAP

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² GEF, 1997. Operational Programs, page 8-3 para 8.9 sub-para (a).

³ The spelling “program” has necessarily been used in verbatim quotations from American language sources. In normal text, the correct English spelling “programme” is used and, in all cases, assumes the same meaning.

⁴ Hereafter referred to as the SCS project.



Determining regionally applicable economic values for coastal habitats and their use in evaluating the cost effectiveness of regional conservation actions: the example of mangroves, in the South China Sea



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ABSTRACT

This paper outlines the process of: assembling an empirical data set relating to the values of resource ‘goods and services’¹ derived from coastal habitats bordering the South China Sea; standardising these data as production values per hectare per annum; converting local currencies to US dollars; and converting these values to a standard year (2007) by means of the consumer price index. In order to address the problem of the wide variation in prices within one country, the data were weighted to determine a ‘Weighted Mean National Value’ that reflected **both** the prices for the same resource at each location and the ‘stock’ of that resource at the same locations. This results in a national value that reflects the totality of the national stock rather than being a simple arithmetic average of all values. The determination of weighted mean regional values was undertaken in a similar manner to the computation of weighted mean national values but using data and information concerning the total stock (or area) in each country and the weighted mean national values. These weighted regional mean values were subsequently used in a cost benefit analysis of actions to conserve regional coastal habitats.

What has resulted from this work is a standardised method for calculating national and regional weighted mean values of resource ‘goods and services’ that can be applied more widely in handling and manipulating economic valuation data from multiple locations across any time span. The method can be applied in any region where multiple currencies, varying exchange rates and widespread inter-location variations in farm gate prices are found. The specific targets of the revised Strategic Action Plan for the South China Sea have been valued or, more specifically, the incremental benefit derived from achieving the SAP target has been valued. The values saved by achieving the targets are then compared with the costs of implementing the actions defined in the regional SAP through a cost benefit analysis.

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1. Introduction

The work reported in this paper represents an outcome from the project entitled “*Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand*” funded by the Global Environment Facility (GEF) and implemented by the United Nations Environment Programme (UNEP) in partnership with seven states bordering the South China Sea.² The Project was complex as it addressed three priority areas of concern identified in the

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¹ The term ‘goods and services’ is used in this paper to encompass all the elements normally evaluated as part of the process of determining total economic value.

² Cambodia, China, Indonesia, Malaysia, Philippines, Thailand and Viet Nam.



Selection of demonstration sites in the face of conflicting demands and financial limitations



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ABSTRACT

Following an allocation of limited financial support from the GEF for three demonstration projects in each of the SCS project's habitat sub-components (mangroves, coral reefs and seagrass), it was necessary to examine the range of potential demonstration sites in the region and formulate a procedure to select those sites having the highest priority for intervention.

This paper describes the process developed to select priority demonstration sites in a scientifically sound and objective manner. The procedure was based on a mutually-agreed set of indicators and criteria and involved consensus building with all focal points such that all parties fully understood the procedure and accepted the outcome. The outcome of the project was originally anticipated as being nine regional priority demonstration sites, three focussing on each sub-component (i.e., mangroves, seagrass and coral reefs). Additional outcomes not envisaged during project design included:

1. Regionally prioritised listings of potential demonstration sites as follows:
 - 26 mangrove sites;
 - 43 coral reef sites;
 - 26 seagrass sites; and
 - 40 wetlands sites (15 estuaries; 12 inter-tidal mudflats; 7 coastal lagoons; and 6 swamp forest sites).
2. Draft proposals for interventions in 23 sites across all habitat types;
3. An inter-governmentally agreed procedure for determining regional priorities that could be used to rank sites both nationally and regionally in the future;
4. A regional GIS database having a large number of sites characterised in geographical and environmental, including biological, terms;
5. Application of the approach at national level in two countries to determine national priorities for intervention; and
6. A procedure and process that serves as a potential model for replication elsewhere when choices between alternative sites for intervention must be made to satisfy financial limitations.

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1. Introduction

1.1. Background

The project entitled “Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand” was complex since it addressed three priority areas of concern identified in the



Mangrove ecofarming in Guangxi Province China: an innovative approach to sustainable mangrove use



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A B S T R A C T

Following 7 years of field trials conducted in the mangrove areas of Guangxi Province, China, between 2007 and 2012, a mariculture system has been developed that greatly enhances natural productivity. This system is based on the installation of underground tubes and has resulted in annual mean production values of between 27 000, and 45 000 US\$ per hectare¹ per annum without requiring cutting or conversion of mangrove vegetation. This article provides details of the system, its construction, operation, economics and production.

Consisting of a network of underground tubes, erect pipes and management chambers, this system is based on enhancing the spatial heterogeneity of the benthic environment by burying plastic pipes in the mangrove soils, thus providing refuges for economically important fish with minimal disturbance to the mangrove root system. Landward shrimp ponds can be used as reservoirs to oxygenate the water in the system during low tide. Molluscs are raised on mudflat surfaces within the habitat. The ecofarming site is accessed by boardwalks that also facilitate ecotourism and public education. This ecofarming system is environmentally friendly because no enclosures are constructed and there is no industrial feed input. The bulk of the system is buried within the mangrove soils consequently it is resistant to storm and tidal surges, is easy to control and has low management cost, whilst the products are of high quality and have high recapture rates. To date, ten indigenous species have been tested, and five of them have been successfully raised and harvested. The underground tube ecofarming system is unique and not derived from any similar system currently in operation elsewhere in mangrove ecosystems.²

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1. Why do we need mangrove ecofarming?

1.1. Mangrove loss along the Chinese coast of the South China Sea and its causes

Valiela et al. (2001) estimated that, globally, between 20% and 35% of mangrove area had been lost since approximately 1980. In 2000, the global estimate for mangrove area was around 15 million ha of which a third was found in Southeast Asia (Wilkie and Fortuna, 2003). The drop from 18 million ha in the early to mid-1990s (Spalding et al., 1997) reflects a drastic mangrove decline

worldwide. Globally, mangrove areas are disappearing at the rate of approximately 1% per year (FAO, 2007). The anthropogenic causes of such loss have included over-exploitation by coastal communities and conversion to settlements, tourist resorts, agriculture (rice and coconut plantations), salt pans, industrial development, including port construction, and brackish water aquaculture. Along the margins of the South China Sea, the rates of mangrove loss have declined somewhat from losses of 1.67% per annum during the period 1980–1990, to a rate of 1.04% per annum between 1990 and 2000 (UNEP, 2008).

In China, the estimated original area of 250 000 ha of mangrove had been reduced to around 50 000 ha by the 1950s. By 2001, the remaining area was just over 22 000 ha (He et al., 2007). The majority of this loss resulted from conversion to paddy fields, shrimp ponds and the construction of coastal infrastructure, including ports, harbours and urban infrastructure. In part, this loss and conversion reflect a failure to economically value mangrove goods and services adequately. This results in the under-valuation of

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¹ Currency exchange rate: 1 USD = 6.35 China Yuan.

² An application for a Chinese patent on the system was granted in September 2012.



Use of degraded coastal wetland in an integrated mangrove–aquaculture system: a case study from the South China Sea



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ABSTRACT

The coastal wetlands of the South China Sea are highly productive and, in 2004, the capture fishery and aquaculture of this area contributed around 8% and 54% of world production, respectively. However, the coastal zone is characterized by high population density and rapid development such that mangrove conversion and reclamation is one of the main threats to coastal wetlands. Globally, about 26% of the mangrove has disappeared since the 1980s much of it being converted to aquaculture ponds. In an attempt to achieve the target of combining mangrove conservation and aquaculture, the Integrated Mangrove Aquaculture System (IMAS) was established in 2002 in southern China. This system was directed towards three goals: mangrove replanting; water purification; and more ecologically friendly aquaculture. Different aquaculture ponds were planted with one of four mangrove species and the aquaculture production, water quality and mangrove growth and survival were compared with control ponds.

It has been found that the mangrove species *Aegiceras corniculatum* is the best for planting in aquaculture ponds given its high tolerance of long-term inundation and its effectiveness in purifying the aquaculture water body in both laboratory and *in situ* experiments. Following planting with mangrove, the aquaculture ponds can become self-purifying through nutrient uptake by the mangrove.

Aquaculture harvests of some mangrove-dependent species, such as red drum (*Sciaenops ocellatus*), and oyster (*Crassostrea rivularis*), were increased by over 10% in the presence of mangroves. The food chain, traced by stable isotope analyses, indicates that mangrove litterfall contributes between 1 and 26% of the diet of cultured fishes. The two replicated trials implemented in Shantou and Shenzhen displayed similar results of water purification. Further replication of the use of the IMAS should be attempted at other sites of southern China.

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1. Introduction

1.1. Coastal wetland degradation and its causes in the South China Sea

Wetlands are defined as “areas of marsh, peatland or water, whether natural or artificial, permanent or temporary, with water

that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed 6 m” (Ramsar Convention, 1971). Wetlands are one of the most productive and biologically diverse habitats globally covering an estimated 5.7×10^8 ha (Keddy, 2000). The coastal wetlands of the South China Sea are highly productive. The capture fishery and aquaculture of this area contributed around 8% and 54% of world production in 2004 (UNEP, 2004). Despite the importance of wetlands in terms of biodiversity and resource conservation, however, coastal wetlands have still suffered degradation and loss during the last few decades. This is attributable to rapid population increase and agricultural and urban development. The major threats to coastal wetlands are conversion and reclamation but with over-exploitation of biological resources and land-based pollution contributing significantly (Chen et al., 2005).

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Fisheries *refugia*: a novel approach to integrating fisheries and habitat management in the context of small-scale fishing pressure



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ABSTRACT

Fisheries of the South China Sea, including the Gulf of Thailand, are characterised by high levels of small-scale fishing effort. Increasing fishing pressure, coupled with continued decline in the expanse and quality of coastal habitats critical to the life-cycles of most species, has raised serious concerns regarding the long-term sustainability of Southeast Asian fisheries. This paper reviews the development of a UNEP/GEF South China Sea Project initiative to address the regional need to improve the integration of fisheries and habitat management.

The concept of fisheries *refugia* was developed as a novel approach to the identification and designation of priority areas in which to integrate fisheries and habitat management in the context of high and increasing levels of small-scale fishing pressure in the South China Sea. Specific regional, national and local actions in establishing a regional system of fisheries *refugia* are outlined and discussed in terms of the effectiveness of the *refugia* concept in overcoming barriers to integrated management. The fisheries *refugia* approach is shown to provide an adequate platform for building partnerships and enhancing communication between the environment and fisheries sectors.

The *refugia* concept also appears to be a successful approach in addressing a significant barrier to the integration of fisheries and habitat management, namely the adverse reaction to the Marine Protected Area concept that is elicited from fishing communities and fisheries officers at the local and provincial levels. It is anticipated that the experiences gained from this novel approach to the use of spatial management tools in fisheries management will be suitable for scaling-up in the South China Sea and replication in other aquatic habitats. This experience is considered important because of the potential global fisheries and biodiversity conservation benefits associated with effective fisheries and habitat management at the local level. This is particularly relevant in Southeast Asia where the contribution of fisheries to food security and the maintenance and improvement of the livelihoods of coastal fishing communities is so substantial.

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1. Introduction

The South China Sea, including the Gulf of Thailand, is a global centre of shallow water marine biological diversity that supports significant fisheries that are important to the food security and



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Lessons learned in coastal habitat and land-based pollution management in the South China Sea



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ABSTRACT

The United Nations Environment Programme (UNEP)/Global Environment Facility (GEF) project entitled “Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand” developed and operated a regional network of 23 coastal habitat demonstration sites and land-based pollution pilot activities from 2002 to 2008. This network generated examples of best practice in coastal habitat and land-based pollution management that were documented, shared regionally, and used to inform the development of National Action Plans and the Strategic Action Programme for the South China Sea. Examples of these best practices include: strengthened cross-sectoral coordination and management; involvement of stakeholders in development of fisheries refugia; involvement of the private sector in coastal management; building capacity of local government and communities for law enforcement; changes in awareness and habits by local communities and industry participation in land-based pollution prevention; integration of traditional knowledge and practices into management planning; adoption of supplementary and alternative livelihoods as tools for improved habitat and resource management; promotion of sustainable tourism in coastal areas; rehabilitation of habitats and sustainable aquaculture practices; and bilateral cooperation for transboundary water resource management. Each of these best practices are reviewed and discussed from the perspectives of lessons learned and opportunities for their replication and scaling-up. The role of the network of demonstration sites in integrating local governments and communities within national and regional frameworks and in generating bilateral co-operation for natural resource and environmental management in the South China Sea marine basin is highlighted as a key innovation in transboundary water resource management that has potential for future application both in Southeast Asia and elsewhere.

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1. Introduction

The Transboundary Diagnostic Analysis for the South China Sea identified the degradation and loss of coastal habitats, the over-exploitation of fish stocks, and land-based pollution as the priority environmental concerns affecting this marine basin (Talaue-McManus, 2000). The framework Strategic Action Programme (SAP) for the South China Sea outlined a wide range of proposed regional and national actions to address these concerns (UNEP,

1999). One such action was the establishment and operation of demonstration sites and pilot activities focused on the generation of regionally applicable examples of good practice in coastal habitat and pollution management. Accordingly, the Global Environment Facility (GEF) funded the project entitled “Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand”³ aimed at *inter alia*: the execution of demonstration projects at three regional priority sites within each habitat class of mangroves, coral reefs, and seagrass; and trialling pilot management interventions at priority pollution hot spots. This project was financed by the GEF and implemented by the United Nations Environment Programme (UNEP) in partnership with the seven participating countries.⁴

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³ Hereafter referred to as the ‘SCS project’.

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Towards a new paradigm for transboundary water governance: implementing regional frameworks through local actions



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ABSTRACT

Large-scale international waters management projects usually focus on fostering formal inter-governmental cooperation processes, which often lead to limited on-the-ground impact. In contrast, community-based international waters projects are often local, individualistic and stand-alone projects, lacking regional linkages and perspectives. Consequently a gap exists between regional and local processes and their outcomes. Linking regional processes with local actions not only enhances the effectiveness of local actions in addressing international waters issues but also strengthens regional frameworks. The paper calls for adopting an integrated management approach to international waters management by incorporating local actions into regional international waters management frameworks.

This article draws experiences and lessons learnt from the partnership between the GEF Small Grants Programme (SGP) and the SCS project in the integration of regional and local actions. In particular, it evaluates the experiences derived from thirty one small grant projects at the community level that were specifically designed to address priority issues identified in the regional SCS/SAP and outlines the process used for their identification and selection. The paper highlights the critical importance of engaging local communities in regional environmental governance and presents the outcomes in terms of the extent to which these small local actions have contributed towards regionally-defined goals and targets. The paper advocates a paradigm shift on the part of international donors such as the GEF from focussing either on regional intergovernmental cooperation or on community actions at the local level to an approach that fosters the development of regional frameworks of action within which local actions can be identified and supported. The positive experiences of the SCS and SGP partnership suggest that this is a suitable model for replication in other shared water bodies.

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1. Introduction

Many of the problems of transboundary water body management result from the poor fit between national borders and ecosystem boundaries, and from the fact that freshwater flows ignore those borders. Marine waters are influenced by ocean current regimes that also do not recognize national boundaries; hence proper management of transboundary water bodies requires international cooperation among sovereign states. As

a consequence, to be effective transboundary water management must be international, at least regional, in the development and implementation of management actions. Many transboundary water systems are shared among countries with disputes; consequently international waters cooperation is highly politicised, and revolves around government actors.

Much of the past effort in international waters has focused on promoting international cooperation in transboundary water body management, emphasizing the development and adoption of international treaties and agreements. For example, 117 of the 263 international river basins have established formal management institutions (Giordano and Wolf, 2003). Almost all regional seas have some form of regional framework for cooperation either through regional conventions or UNEP's regional seas action plans. A review of these treaties and regional agreements reveals an overall lack of robustness because they often only state general

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Review of the legal aspects of environmental management in the South China Sea and Gulf of Thailand



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ABSTRACT

The mandate of the Legal Task Force established under the South China Sea project was to evaluate the present status of legal environmental instruments at national, sub-regional and regional levels with a view to exploring ways to strengthen regional co-operation in the environmental management of the South China Sea. This article provides an overview of: signatory states' obligations for regional co-operation under major global environmental conventions; the status of existing regional co-operative mechanisms and instruments, including regional agreements and 'soft' laws¹; national environmental legislation; and an analysis of national environmental legislation regarding major issues and themes of interest. This article demonstrates that, while the global and international conventions to which the countries of the South China Sea are parties convey obligations on the states to co-operate regionally, this obligation has generally not been met. In addition, there is no single legally-binding regional intergovernmental agreement on marine environmental protection that involves all the countries bordering the South China Sea. This review indicates that, while all countries have a suite of legal instruments designed to protect the environment and conserve natural resources, these are often not harmonised and integrated with national policies. Countries continue to be without an integrated coastal/marine management policy that sets clear priorities, principles and guidelines that can steer policy conflicts towards resolution and encourage government agencies and offices to see themselves as part of a larger effort towards proper management of coastal and marine habitats.

The article concludes with a review of potential mechanisms for future regional co-operation in environmental management and proposes alternative models. Lessons learned from the global community and regional programmes indicate a growing emphasis on the domestic implementation of global instruments via regional co-operative initiatives and maximising effectiveness. An emerging trend is the proliferation of calls to 'strategically' address these two needs. This suggests that an appropriate course of action for a region seeking to strengthen co-operation would be forging a legal agreement that suits regional needs and interests and, in so doing, incorporates 'effectiveness' into the design.

It is further concluded that the SCS region is in a unique and enviable position. Unlike most other regions, it has never adopted a legally-binding instrument and, consequently, it is free of precedent and other legal baggage. Regional co-operation is gaining momentum and South China Sea states are indicating a greater concern for environmental sustainability. There is also a growing recognition that the inefficient use of resources will only worsen without horizontal and vertical co-ordination and regional co-operation. It seems an appropriate time to consider an effective and region-appropriate course for long-term sustainability of the South China Sea and its resources, including consideration of a regional framework for co-operation, co-ordination and communication. Political commitment will determine whether any new co-operative framework becomes a paper tiger or an Asian tiger.

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1. Introduction

It can be argued that the South China Sea (SCS) littoral states face a set of common but differentiated environmental problems. The problems are common from a regional and, indeed, global perspective but different in how they affect the countries at national and local levels. This situation has resulted in the adoption of

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¹ Soft-laws are non-legally-binding instruments, such as Declarations, Guidelines and Action Plans. An example is Agenda 21. They are usually adopted where states will not or cannot agree on the terms for a legally-binding instrument.



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Outcomes of the SCS project and their applicability to multilateral cooperative initiatives for the management of coastal seas and marine basins



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ABSTRACT

This paper summarizes the benefits of experience gained through the execution of the South China Sea project that offer useful insights into the successful development and implementation of similar multilateral interventions for environmental protection and remediation in other coastal and regional sea waters. These benefits fall into several categories: political commitment, management framework, cooperative arrangements; transparency; and scientific veracity. Experience gained in each of these categories during the South China Sea project is outlined to provide an exemplar for the successful formulation and implementation of similar interventions in other regional marine areas.

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1. Introduction

The papers in this issue deal with various aspects of the GEF/UNEP project entitled “Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand”, hereinafter referred to simply as “the South China Sea Project” or, alternatively, the “SCS project”. This project was funded by the Global Environment Facility (GEF) and implemented by the United Nations Environment Programme (UNEP) in partnership with seven riparian states bordering the South China Sea, namely Cambodia, China, Indonesia, Malaysia, the Philippines, Thailand and Viet Nam. Project planning began in 1996 with the project becoming fully operational in February 2002 and formally closed at the end of January 2009. A brief history of project development is provided by Chen (2013) that highlights the way in which experiences during the six years of project development were used in developing the management framework of the project.

Both the subjects discussed in the individual papers in this issue and other project activities provided a wealth of experience in the establishment and execution of large multilateral ventures focussing on large marine basins. We deemed it appropriate to attempt to summarize the benefits of this experience as a guide to future

such ventures focussing on shared water bodies. This is the subject of this paper.

2. Benefits of Experience

The benefits of experience fall into several major categories: political, organizational, communication, transparency, capacity building and scientific independence and veracity. Each of these categories is discussed below as a means of summarizing the advantages offered by particular strategies and operational procedures in comparison with alternatives.

2.1. Experience at a policy level

Most GEF projects are implemented through an intermediate organization (referred to by the GEF as Executing Agencies), such as a regional commission or the regional office of an international agency or an NGO that becomes responsible for the contractual arrangements, fund management and due diligence monitoring of national-level actions. This project was somewhat atypical in that it was implemented by national institutions of the participating countries contracted directly to UNEP as the Implementing Agency of the GEF. As no regional commission exists with a specific mandate covering the environment of the South China Sea, UNEP dealt directly with the countries, thereby enhancing the countries influence and ownership of the project. This latter approach reduces the overall transaction costs and establishes a more direct relationship between the participating countries and the GEF

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