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Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand

REPORT

Third Meeting of the Regional Task Force on Economic Valuation

Fangchenggang, China, 18th – 21st April 2005

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UNEP/GEF
Project Co-ordinating Unit,
United Nations Environment Programme,
UN Building, 2nd Floor Block B, Rajdamnern Avenue,
Bangkok 10200, Thailand
Tel. +66 2 288 1886
Fax. +66 2 288 1094
http://www.unepscs.org

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Cover Illustration: Outline of the Framework for Valuing the Impacts of Land-based Pollution, John C. Pernetta.

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Report of the Meeting

1. OPENING OF THE MEETING

1.1 Welcome Address

1.1.1 The Project Director, Dr. John Pernetta, welcomed participants to the Third Meeting of the Regional Task Force on Economic Valuation (RTF-E), and officially opened the meeting on behalf of Dr. Klaus Töpfer, the Executive Director of the United Nations Environment Programme (UNEP), and Dr. Ahmed Djoghlaf, Assistant Deputy Executive Director of UNEP and Director, Division of Global Environment Facility Co-ordination (UNEP/DGEF).

1.1.2 The Project Director noted that the UNEP/GEF South China Sea Project had been under implementation since early 2002 and that, the two Task Forces had been created by the Project Steering Committee in December 2002. The fourth meeting of the Project Steering Committee in, Guilin, China, in December 2004, had decided to allocate financial resources to the two Task Forces to undertake relevant activities in the second phase of the Project. The Project Director noted that, a major item for discussion during the meeting was to be the finalisation of the details of the Memoranda of Understanding between UNEP and members of the Task Force. If it were possible, to finalise these agreements during the meeting this would ensure timely transfer of the funds for members to undertake activities related to environmental economic valuation.

1.1.3 The Project Director apologised for the fact that the Project Co-ordinating Unit (PCU) had been unable to follow up the activities closely following the last meeting, which had resulted from the fact that the PCU has been operating under severe staffing constraints. He informed the meeting that the Executive Director of UNEP had recently approved the appointment of two professional staff members to the PCU, and he expected that the full staffing of the PCU would improve execution of activities under the Task Force.

1.2 Introduction of Participants

1.2.1 The Project Director noted, with regret that Dr. Thanwa Jitsanguan from Thailand, and Dr. Nguyen Huu Ninh from Viet Nam, were unable to be present in the meeting and that they had nominated Dr. Nuchanata Mungkung and Dr. Nguyen The Chinh as alternate members respectively. In addition, Dr. Herminia A. Francisco had informed the PCU that as of June 2005 she would assume the post of Deputy Director of the Economy and Environment Program for Southeast Asia and as such she would be unable to participate in the work of the RTF-E in her personal capacity.

1.2.2 Participants were invited to introduce themselves to the meeting. There followed a *tour de table* during which the meeting participants introduced themselves to the meeting. The list of participants is attached as Annex 1 to this meeting report.

2. ORGANISATION OF THE MEETING

2.1 Designation of Officers

2.1.1 Members were reminded that the Rules of Procedure (UNEP/GEF/SCS/RTF-E.1/Inf.4) for the RTF-E state, *"The Chairperson, Vice–Chairperson and Rapporteur shall hold office until the subsequent meeting of the Task Force. They shall be eligible for re-election no more than once. No officer may continue to hold office once the National Technical Focal Point terminates their membership of the Task Force for the Project."*

2.1.2 Members noted that during the first meeting of the RTF-E convened in Phuket, Thailand September 2003 Dr. Matius Suparmoko, Dr. Thanwa and Dr. Khalid were elected as Chairperson, Vice-Chairperson and Rapporteur respectively. During the subsequent meeting held in Cambodia in June 2004 these officers were re-elected consequently they were no longer eligible for re-election to the same offices.

2.1.3 In accordance with the Rules of Procedure, members were invited to nominate individuals to act as Chairperson, Vice-Chairperson and Rapporteur for the inter-sessional period to the next meeting. Dr. Suparmoko nominated Dr. Noel Eusebio Oyardo Padilla as the Chairperson, and Dr. Tridoyo Kusumastanto nominated Dr. Li Kaiming, and Mr. Sy Ramony as Vice-Chairperson and Rapporteur respectively. There being no other nominations, Dr. Padilla, Dr. Li and Mr. Ramony were duly elected as Chairperson, Vice-Chairperson and Rapporteur for the meeting.

2.2 Documentation Available to the Meeting

2.2.1 Ms. Sulan Chen, Secretary to the meeting briefly introduced the discussion and information documents available to the meeting and apologised for their late dispatch to members. The list of documents is contained as Annex 2 to this meeting report.

2.3 Programme of Work

2.3.1 Ms. Chen briefed participants on the administrative arrangements for the conduct of the meeting, and the proposed organisation of work (UNEP/GEF/SCS/RTF-E.3/Inf.3). Formal sessions of the meeting would be conducted in English, and in plenary as far as possible.

2.3.2 Ms. Chen noted that time might be set aside to finalise Memoranda of Understanding between UNEP and members of the Task Force, and on the last day of the meeting the Project Document for the Fangchenggang mangrove demonstration site would be signed between UNEP and the Specialised Executing Agency of the mangrove sub-component. This would involve a short formal ceremony during which various news agencies would be present together with representatives of the Provincial and local governments and Xindi Company.

3. ADOPTION OF THE MEETING AGENDA

3.1 The Chairperson introduced the provisional agenda prepared by the PCU as document, UNEP/GEF/SCS/RTF-E.3/1, and the annotated provisional agenda prepared as document UNEP/GEF/SCS/RTF-E.3/2 and invited members of the RTF-E to propose any amendments or additional items for consideration, prior to the adoption of the agenda.

3.2 No additional agenda items or amendments to the provisional agenda were proposed by the members, and the meeting adopted the provisional agenda without change. The adopted agenda is attached as Annex 3 to this report.

4. THE REPORT ON THE ECONOMIC VALUATION OF THE IMPACTS OF LAND-BASED POLLUTION

4.1 Members recalled that during the previous meeting it had been agreed that Dr. Francisco's research associate would conduct a literature review on existing studies on economic valuation of the impacts of land-based pollution. The report had been previously circulated to members and was now available for consideration by the RTF-E as contained in document UNEP/GEF/SCS/RTF-E.3/4.

4.2 The Chairperson invited the Associate Expert to introduce document UNEP/GEF/SCS/RTF-E.3/4, which summarises the content of the report. The Associate Expert briefly outlined the background to the commissioning of this review. She noted that the existing literature covered by the report does not provide a comprehensive framework for valuing the impacts of land-based pollution, and that no specific valuation methods or techniques are suggested for the valuation of particular types of impact resulting from land-based pollution.

4.3 Ms. Chen pointed out that the literature review suggested that most studies in the region were theoretical, and few studies have been conducted to obtain the monetary value of the impacts of land-based pollution. She further commented that the majority of cases included in the report were from China, Philippines, Indonesia and Thailand. No studies had been reviewed in Cambodia, Malaysia and Viet Nam. The two cases reviewed in China were for inland cities, in Wuhan and Wuxi, which were geographically distant from the South China Sea marine environment. In addition, the cases in the report focused on the loss of fisheries from the land-based pollution and ignored other major impacts resulting from land-based pollution, such as for example loss of amenity value (particularly tourism), reduction in aquaculture production and human welfare.

4.4 The report provides an overview of some of the existing frameworks and methodologies for valuing the impacts of land-based pollution, however, the report did not propose a comprehensive framework for the economic valuation of the impacts of land-based pollution. The Associate Expert invited members to formulate an appropriate framework, along with supporting methodologies and techniques for the valuation of the impacts of land-based pollution.

4.5 There followed a lengthy discussion on the various impacts of land-based pollution and differing sources of pollution. Members initially attempted to categorise various types of impacts, i.e. direct or indirect impacts, and tangible and intangible impacts. It was noted that the impacts of land-based pollution were complex, and some of the impacts were mixed, and reflected impacts consequent on both land-based and sea-based pollution. The Task Force noted that indirect impacts were complex, and to some extent very difficult to value. It was agreed that the valuation framework should focus on three types of direct impacts, i.e. productivity, amenity value and human welfare.

4.6 Several members mentioned the importance of identifying the sources of land-based pollution. It was then pointed out by the Project Director that it would be more useful to identify the types of pollutants and their possible impacts on coastal habitats, since the valuation would focus on the impacts of land-based pollution on habitats, disregarding the sources of the pollution. To formulate the framework for valuing the impacts of land-based pollution on coastal habitats, the Task Force agreed to identify types of pollutants, the impacts resulting from each type of pollutant, and to categorise these impacts under the three classes of changes to production, amenity value and human welfare. Table 1 of Annex 4 presents a checklist of the impacts of land-based pollution in the four habitats considered by the project.

4.7 The Task Force identified and discussed various types of pollutants, their possible impacts, and applicability of these impacts to ecological habitats. Following a consideration of the types of impacts, the Task Force proceeded to formulate procedures to be used in valuing the impacts including data needs, and appropriate valuation techniques. Annex 4 of this report contains the tables of frameworks and procedures for valuing the impacts of land-based pollution, Tables 2.1 to 2.4 outline the impacts of land-based pollution on mangroves, coral reefs, seagrass and wetlands according to the three classes of changes to economic value; and Tables 3.1 to 3.4 include detailed procedures to be used in undertaking the valuation of these impacts.

5. DEVELOPMENT OF A MANUAL TO SUPPORT THE FRAMEWORKS AND PROCEDURES OF ECONOMIC VALUATION

5.1 Members recalled that during the second meeting of the RTF-E it had been agreed that a manual of procedures and techniques would be developed for use in valuing coastal habitats. It was further agreed that a draft outline/contents was to have been produced and circulated by the end of June 2004, at which time members would indicate their willingness to draft particular sections with a view to producing a final draft by the end of October 2004. Dr. Padilla had drafted an outline of such a manual and circulated to the RTF-E members according to the original agreement, regrettably no follow up actions had been undertaken.

5.2 The Chairperson introduced the draft outline for the manual, contained in document UNEP/GEF/SCS/RTF-E.3/8. Members considered, amended and adopted the outline as included in Annex 5 of this meeting report.

5.3 The meeting further discussed and agreed upon the individual responsibilities for drafting the various sections of the manual. Dr. Pernetta indicated that he would circulate a draft introduction to the Task Force within ten working days of the closure of the meeting. Individual members volunteered to take the lead in drafting various sections of the manual, as indicated in Annex 5. It was agreed that all members would circulate their inputs no later than the end of July 2005 following which there would be one month for member's response and comments and a further month for finalisation of the text prior to its publication in time for distribution during the Regional Scientific Conference.

6. DETERMINING ECONOMIC VALUES FOR COASTAL HABITATS AND RESOURCES FOR USE IN THE COST BENEFIT ANALYSIS OF ACTION COMPARED WITH NON-ACTION CONTAINED IN THE STRATEGIC ACTION PROGRAMME

6.1 Review of the Elements of Economic Valuation Contained in the Demonstration Site Activities

6.1.1 The Chairperson invited the Project Director to introduce document UNEP/GEF/SCS/RTF-E.3/5, which provided an overview of the typical elements of the demonstration site activities, which encompass the economic valuation of coastal environmental goods and services and the evaluation of alternative livelihoods. The Project Director noted that likely outputs from these activities would include economic valuations conducted at a site level according to the agreed frameworks and procedures recommended by the RTF-E. Consequently, the Task Force could expect to obtain a set of values collected according to the same regionally agreed frameworks and procedures that might serve as a yard-stick for comparison of other empirical values.

6.1.2 The meeting noted that in the past two years the expertise of the Task Force had not been fully utilised by the Specialised Executing Agencies. The meeting took note that the economic valuation activities included in the demonstration site project documents should follow the frameworks and procedures formulated by the Task Force, and that the execution of these activities should involve directly the expert members of the Task Force. The Project Director noted that in the case of the Trat Province mangrove demonstration site, Dr. Thanwa was directly involved in the study of alternative livelihood in Trat Province. The Project Director indicated he would continue to encourage the Specialised Executing Agencies to utilise the expertise of members of the Task Force, and in appropriate cases members should be financially compensated for their time spent on executing specific activities.

6.1.3 It was noted that members of the Task Force should be directly involved in the economic valuation component of the demonstration site activities, and the costs of this work should be paid for from the demonstration site budget.

6.2 Discussion of the Procedures and Actions Required to Assemble, Empirical Data on Resource Valuations at National and Regional Levels

6.2.1 The Chairperson invited the Project Director to introduce document UNEP/GEF/SCS/RTF-E.3/6, which presented alternative approaches to developing a regional database of empirical economic values for coastal goods and services for discussion and decision by the RTF-E. Dr. Pernetta noted that one important task of the RTF-E was to develop regionally applicable valuations of coastal habitats, using empirical data collected in the region and standardised approaches taken by the demonstration sites.

6.2.2 The RTF-E had already agreed on the need to develop a regionally acceptable “value” for particular habitats as the basis for determining the economic benefits of action compared to non-action as previously attempted in the draft Strategic Action Programme. The Regional Task Force, during its’ second meeting, held preliminary discussion of the need for, and possible alternative approaches to aggregating local economic values at national level, and national values at the regional level. It was agreed that an initial step would be the preparation of a database of existing economic values from the region, although the manner in which this was to be assembled was not finalised. Members were therefore invited to consider the activities and manner in which such data might be aggregated.

6.2.3 The Project Director pointed out that values used in the previous cost-benefit analysis had been taken from studies conducted in other regions. The meeting agreed that a regional database should be developed to compile values collected in the existing studies undertaken in this region using local net price.

6.2.4 Members' attention was drawn to a proposed format for the compilation of data and values taken from valuation studies conducted within the region. The meeting discussed, revised and agreed on the proposed format for the compilation of data and information on values obtained in various studies and this format, is included as Table 1 of Annex 6 of this meeting report, which would provide

guidance to members in compiling data and information for determining regional values of coastal habitats. The meeting took note that the format provided in Table 1 was specifically designed to compile information on mangrove valuation. The Task Force should take this format, and based on the frameworks for valuation of the other habitats, including coral reefs, seagrass and wetlands, adapt the format for the compilation of data and information on values of the resources and uses of these other coastal habitats.

6.2.5 The Project Director noted that the Project Steering Committee, during its fourth meeting in Guilin, China, December 2004 had agreed to allocate financial resources to the execution of the work of the two Regional Task Forces and it was proposed that Memoranda of Understanding be signed between UNEP and the members of the RTF-E on behalf of their Institutions that would permit members to hire research assistants to compile the required national data under their supervision. Document UNEP/GEF/SCS/RTF-E.3/6 contained a proposed text of a framework Memorandum of Understanding, which was adopted by the meeting without changes, and is contained in Annex 6 to this meeting report.

6.2.6 The Project Director informed the meeting that each member should propose a budget based on the activities to be undertaken during year 2005-2006. The maximum funding for the proposed activities was set at US$13,000. Members were encouraged to submit their proposed budgets as promptly as possible, preferably during the meeting of the RTF-E so that a Memorandum of Understanding could be signed to ensure the transfer of funding from UNEP to the institute or agency of the Task Force members as promptly as possible.

6.2.7 The Project Director further noted that another addition to the MoU would be the agreed work plan and timetable that would be finalised under the next agenda item.

7. WORK PLAN FOR THE REGIONAL TASK FORCE ON ECONOMIC VALUATION

7.1 The Chairperson invited the Associate Expert to introduce document UNEP/GEF/SCS/RTF-E.3/6, *Draft Work Plan for the Regional Task Force on Economic Valuation*. Members considered, amended and agreed on the work plan and timetable for the Regional Task Force, which is attached as Annex 7 to this meeting report.

8. ANY OTHER BUSINESS

8.1 The Chairperson invited members to consider and discuss any additional items of business.

8.2 Dr. Suparmoko inquired whether budgets could be used to support meetings or travel by the members of the RTF-E, for collecting the data and information needed to compile the regional database of economic value. The Project Director drew members' attention to the budget table of the Project, included in document UNEP/GEF/SCS/PSC.3/3, and invited members to review the project budget in order to understand what the available funds could be used for.

8.3 In response to an inquiry raised by members regarding the purchase of equipment with UNEP funds, Dr. Pernetta indicated that the title of any equipment purchased with UNEP funding for the execution of activities in the Memorandum of Understanding rests with UNEP. In the case of the project, the Project Director noted that title to such equipment could be transferred to the Institutions upon completion of the project.

9. DATES AND PLACE OF THE NEXT MEETING OF THE TASK FORCE

9.1 The Chairperson invited members to consider and agree upon the dates and location of the next meeting of the Regional Task Force on Economic Valuation. In doing so, members should take into consideration the decision made by the Project Steering Committee that all future regional meetings take place in potential demonstration sites. The Task Force considered appropriate dates for the next meeting, and decided that the dates for the fourth meeting of the Task Force will be 27th – 30th March 2006.

9.2 With respect to the venue of next meeting, the Chairperson recalled that during the second meeting of the RTF-E, Seam Reap, Cambodia, Dr. Ninh had issued an invitation to hold the third

meeting of the RTF-E in Viet Nam. The Project Director indicated that he would liase with Dr. Ninh to find out whether the invitation still stood for the next meeting of the RTF-E. The Task Force considered some appropriate places, including Phu Quoc Island and Balat Estuary in Viet Nam as a possible venue for the next meeting, and considered that Phu Quoc Island would be the most suitable.

9.3 In the event that it would not be possible to hold the meeting in Viet Nam, Dr. Khalid indicated his willingness to host the meeting in Malaysia.

10. ADOPTION OF THE REPORT OF THE MEETING

10.1 The Rapporteur, Mr. Ramony, presented the draft report of the meeting, which was considered, amended, and adopted as it appears in this document.

11. CLOSURE OF THE MEETING

11.1 The Chairperson invited members to make any final comments and/or remarks prior to calling for a formal motion to close the meeting. Members expressed their appreciation to the hard work of the Chairperson and the PCU members, and the hospitability of Fangchenggang local government and people.

11.2 The Chairperson officially closed the meeting at 17:00 on the 21st of April 2005.

ANNEX 1

List of Participants

Government Designated Members

Cambodia

Mr. Sy Ramony, Chief
National Park and Wildlife Sanctuary Office
Department of Nature Conservation and Protection,
Ministry of Environment
#48 Samdech Preah Sihanouk
Sangkat Tonle Bassac, Khan Chamkarmon
Phnom Penh, Cambodia

Mobile: (855) 12 832 933
Tel/Fax: (855 23) 211 381
Email: Ramony@online.com.kh

Indonesia

Dr. Matius Suparmoko
Faculty of Economics
Jenderal Soedirman University
Kampus Grendeng, PO. Box 109
Purwokerto 53122
Central Java, Indonesia

Tel: (62 281) 37970 (O); (62 21) 733 4623
Fax: (62 281) 40268; (62 21) 733 4623
E-mail: rmoko@cbn.net.id;
suparmoko@yahoo.com

Philippines

Dr. Noel Eusebio Oyardo Padilla
Development Management Officer V
Policy Studies Division
Planning and Policy Studies Service
Department of Environment and Natural
Resources, DENR Compound
Visayas Ave., Diliman,
Quezon City, Philippines

Tel: (632) 925 1183; 929 6626-35 local 2046
Fax: (632) 925 1183
E-mail: nopadilla@yahoo.com

Viet Nam

Dr. Nguyen The Chinh, Ass. Prof. Dr
Senior Economist
Dean of Faculty of Environmental Economics
Hanoi University of Economics
Duong Giai Phong, Hanoi, Viet Nam

Tel: (844) 854 0376; (84) 09 1330 7559
Fax: (844) 869 8231
Email: thechinh@fpt.vn

People's Republic of China

Dr. Li Kaiming, Vice President
South China Institute of Environmental
Sciences, SEPA
7 West Yuancun Road
Guangzhou 510655
Guangdong Province, China

Tel: (86 20) 8554 1496
Fax: (86 20) 8552 4450
E-mail: kmli@scies.com.cn;
k_m_li@yahoo.com

Malaysia

Dr. Khalid Abdul Rahim, Professor
Faculty of Economics and Management
University Putra Malaysia
43400 UPM, Serdang, Selangor, Malaysia

Tel: (603) 8946 7653
Fax: (603) 8948 6188
E-mail: khalid@pop.jaring.my;
khalid@econ.upm.edu.my

Thailand

Dr. Nuchanata Mungkung, Lecturer
Department of Agricultural and Resource
Economics, Faculty of Economics
Kasetsart University
50 Phahonyothin Rd., Chatujak
Bangkok 10900, Thailand

Tel: (662) 942 8649-51 ext. 131;
Mobile: 06 904 2780
Fax: (662) 942 8047; 942 8525
E-mail: feconnm@ku.ac.th

Expert Member

Dr. Tridoyo Kusumastanto
Professor of Marine Economics Policy
CCMRS - Bogor Agricultural University
Jl. Sedap Malam II/20
Taman Yasmin, Bogor 16310, Indonesia

Tel: (62 251) 624 815; (62) 81 611 33170
Fax: (62 251) 621 086
E-mail: tridoyo@indo.net.id

Project Co-ordinating Unit Member

Dr. John Pernetta, Project Director
UNEP/GEF Project Co-ordinating Unit
United Nations Environment Programme
2nd Floor, Block B, United Nations Building
Rajdamnern Nok Avenue
Bangkok 10200, Thailand

Tel: (66 2) 288 1886
Fax: (66 2) 288 1094
E-mail: pernetta@un.org

UNEP/GEF Project Co-ordinating Unit

Ms. Sulan Chen, Associate Expert
UNEP/GEF Project Co-ordinating Unit
United Nations Environment Programme
2nd Floor, Block B, United Nations Building
Rajdamnern Nok Avenue
Bangkok 10200, Thailand

Tel: (66 2) 288 2279
Fax: (66 2) 288 1094
E-mail: chens@un.org

Ms. Sriskun Watanasab, Secretary
UNEP/GEF Project Co-ordinating Unit
United Nations Environment Programme
2nd Floor, Block B, United Nations Building
Rajdamnern Nok Avenue
Bangkok 10200, Thailand

Tel: (66 2) 288 2608
Fax: (66 2) 288 1094
E-mail: watanasab@un.org

ANNEX 2

List of Documents

Discussion documents

UNEP/GEF/SCS/RTF-E.3/1	Agenda
UNEP/GEF/SCS/RTF-E.3/2	Annotated Agenda
UNEP/GEF/SCS/RTF-E.3/3	Report of the Meeting
UNEP/GEF/SCS/RTF-E.3/4	Economic Valuation of the Impacts of Land-based Pollution in the South China Sea
UNEP/GEF/SCS/RTF-E.3/5	Overview of Demonstration Site Activities, Which Involve the Economic Valuation of Coastal Environmental Goods and Services and the Evaluation of Alternative Livelihoods
UNEP/GEF/SCS/RTF-E.3/6	Alternative Approaches to Developing a Regional Database of Empirical Economic Values for Coastal Goods and Services
UNEP/GEF/SCS/RTF-E.3/7	Draft Work Plan for the Regional Task Force on Economic Valuation for 2005-2006
UNEP/GEF/SCS/RTF-E.3/8	Manual for the Valuation of Ecosystems that are of Interest to the South China Sea Project: Proposed Outline

Information documents

UNEP/GEF/SCS/RTF-E.3/Inf.1	List of Participants
UNEP/GEF/SCS/RTF-E.3/Inf.2	List of Documents
UNEP/GEF/SCS/RTF-E.3/Inf.3	Draft Programme
UNEP/SCS/SAP Ver. 3	Strategic Action Programme for the South China Sea (Draft Version 3, 24 February 1999) East Asian Seas Regional Coordinating Unit. 69pp.
UNEP/GEF/SCS/PSC.4/3	Fourth Meeting of the Project Steering Committee for the UNEP/GEF Project *"Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand*". Report of the Meeting. Guilin, China, 13th – 15th December 2004 UNEP/GEF/SCS/PSC.4/3.
UNEP/GEF/SCS/RSTC.5/3	Fifth Meeting of the Regional Scientific and Technical Committee for the UNEP/GEF Project *"Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand*". Report of the Meeting. Fangchenggang, China, 9th – 11th December 2004 UNEP/GEF/SCS/RSTC.5/3.

The following documents are provided in published form.

UNEP/GEF/SCS/RTF-E.2/3	Second Meeting of the Regional Task Force on Economic Valuation for the UNEP/GEF Project *"Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand".* Report of the Meeting. Siem Reap, Cambodia, 31st – 2nd June 2004 UNEP/GEF/SCS/RTF-E.2/3.
UNEP/GEF/SCS/PSC.3/3	Third Meeting of the Project Steering Committee for the UNEP/GEF Project *"Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand*". Report of the Meeting. Manila, Philippines, 25th – 27th February 2004 UNEP/GEF/SCS/PSC.3/3.
UNEP/GEF/SCS/RSTC.4/3	Fourth Meeting of the Regional Scientific and Technical Committee for the UNEP/GEF Project *"Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand*". Report of the Meeting. Pattaya, Thailand, 15th – 17th February 2004 UNEP/GEF/SCS/ RSTC.4/3.

ANNEX 3

Agenda

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6. DETERMINING ECONOMIC VALUES FOR COASTAL HABITATS AND RESOURCES FOR USE IN THE COST BENEFIT ANALYSIS OF ACTION COMPARED WITH NON-ACTION CONTAINED IN THE STRATEGIC ACTION PROGRAMME

- **6.1 Review of the Elements of Economic Valuation Contained in the Demonstration Site Activities**
- **6.2 Discussion of the Procedures and Actions Required to Assemble, Empirical Data on Resource Valuations at National and Regional Levels.**

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ANNEX 4

Framework and Procedures to Value Impacts of Land-based Pollution on Coastal Habitats

Background

During the first meeting of the Regional Task Force on Economic Valuation (RTF-E), Phuket, Thailand, 11th -13th September 2003, the Task Force agreed on a framework to value coastal habitats in the South China Sea. The Regional Working Group on Land-based Pollution subsequently sought assistance from the Task Force in formulating a framework for the valuation of the impacts of land-based pollution. During the second meeting of the Regional Task Force on Economic Valuation, held in Siem Reap, Cambodia, 31st May – 2nd June 2004, it was agreed that the Project Co-ordinating Unit would commission on behalf of the Task Force a literature review of existing studies of the economic valuation of the impacts of lad-based pollution.

In July 2004, the Project Co-ordinating Unit engaged a consultant and two drafts of the report were circulated to members of the Task Force for their comments before the finalisation of the report. The final report was received and circulated to members in December 2004, and included in the documents available to the meeting.

Framework and Procedures to Value Impacts of Land-based Pollution on Coastal Habitats

During the Third Meeting of the RTF-E in Fangchenggang, China, 18th – 21st April 2005, the Task Force reviewed the consultant report on existing literature, and considered alternative approaches to formulate a framework and procedures to value the impacts of land-based pollution on coastal habitats.

The meeting agreed that the types of pollutants, to some extent, determined the types of impacts on the coastal habitats, hence it was important to identify types of pollutants and their impacts on coastal habitats. Table 1 provides a checklist of possible impacts of various pollutants on coastal habitats relevant to the UNEP/GEF South China Sea Project, mangroves, coral reefs, seagrass and wetlands. The Task Force recognised that the impacts of land-based pollution on coastal habitats were complex and intertwined, hence the Task Force decided to narrow down the scope of impacts for economic valuation, and agreed to include three types of impacts, i.e. productivity, amenity and human welfare. Tables 2.1 – 2.4 provide a framework for valuing the impacts of land-based pollution on the four coastal habitats, in terms of productivity, amenity and human welfare.

To assist the technical people working in the demonstration sites to value the impacts of land-based pollution on coastal habitats, the Task Force decided to outline specific procedures to provide guidance to technical staff in following the frameworks. The Chairperson took the lead in drafting the procedures overnight, the meeting reviewed, considered and adopted the procedures, included in Tables 3.1 – 3.4 to value impacts on mangroves, coral reefs, seagrass and wetlands respectively.

Table 1 Checklist of the Impacts of Land-based Pollution on Coastal Habitats.

Types of Pollutants	Impacts	Mangroves	Coral Reefs	Seagrass	Wetlands
Heavy metals	Water quality	v	v	v	v
	Reduced reproductive capacity in molluscs	v	v	v	v
	Contamination of human food sources	v	v	v	v
	Bio-accumulation	v	v	v	v
Organic matter	Water quality	-	v	v	v
Nutrients	Eutrophication	-	v	v	v
	Algal blooms	-	v	v	v
	Red tides	-	v	v	v
	Anoxia – fish kills	-	v	v	v
	Fish shellfish poisoning	-	v	v	v
Oil and hydrocarbons	Contamination/tainting of aquaculture and wild fish	v	v	v	v
	Extreme spills smothering of organisms	v	v	v	v
Sediments	Smothering of coral reefs and seagrass	-	v	v	-
	Reduced light penetration from increased turbidity leading to reduced primary production	-	v	v	v
POPs	Water quality	v	v	v	v
	Contamination of seafood	v	v	v	v
	Reduced fish reproductive capacity	-	v	v	v
Solid waste (plastics)	Smothering of organisms	-	v	v	v
	Loss of amenity value	-	v	v	v
Thermal pollution	Reduced productivity	v	v	v	v
	Loss of species	v	v	v	v
Bacterial contamination	Loss of amenity value	v	v	v	v
	Contamination of human food sources	v	v	v	v

Table 2.1 Framework for Valuing Impacts of Land-based Pollution on Mangroves.

Types of Pollutants	Impacts	Mangroves		
		Productivity	Amenity	Human welfare
Heavy metals	Water quality	v	v	v
	Reduced reproductive capacity in molluscs	v	-	-
	Contamination of human food sources	-	-	v
	Bio-accumulation	v	-	v
Organic matter	Water quality	-	-	-
Nutrients	Eutrophication	-	-	-
	Algal blooms	-	-	-
	Red tides	-	-	-
	Anoxia – fish kills	-	-	-
	Fish shellfish poisoning	-	-	-
Oil and hydrocarbons	Contamination/tainting of aquaculture and wild fish	-	-	v
	Extreme spills smothering of organisms	v	v	-
Sediments	Smothering of coral reefs and seagrass	-	-	-
	Reduced light penetration from increased turbidity leading to reduced primary production	-	-	-
POPs	Water quality	-	-	v
	Contamination of seafood	-	-	v
	Reduced fish reproductive capacity	-	-	-
Solid waste (plastics)	Smothering of organisms	-	-	-
	Loss of amenity value	-	v	-
Thermal pollution	Reduced productivity	v	-	-
	Loss of species	v	-	-
Bacterial contamination	Loss of amenity value	-	v	v
	Contamination of human food sources	-	-	v

Table 2.2 Framework for Valuing Impacts of Land-based Pollution on Coral Reefs.

Types of Pollutants	Impacts	Coral Reefs		
		Productivity	Amenity	Human welfare
Heavy metals	Water quality	v	v	-
	Reduced reproductive capacity in molluscs	v	-	-
	Contamination of human food sources	-	-	v
	Bio-accumulation	v	-	-
Organic matter	Water quality	v	v	-
Nutrients	Eutrophication	v	-	-
	Algal blooms	v	-	-
	Red tides	v	-	-
	Anoxia – fish kills	v	-	-
	Fish shellfish poisoning	-	-	v
Oil and hydrocarbons	Contamination/tainting of aquaculture and wild fish	-	-	v
	Extreme spills smothering of organisms	v	v	-
Sediments	Smothering of coral reefs and seagrass	v	v	-
	Reduced light penetration from increased turbidity leading to reduced primary production	v	v	-
POPs	Water quality	v	-	-
	Contamination of seafood	-	-	v
	Reduced fish reproductive capacity	v	-	-
Solid waste (plastics)	Smothering of organisms	v	v	-
Thermal pollution	Reduced productivity	v	-	-
	Loss of species	v	-	-
Bacterial contamination	Contamination of human food sources	-	-	v

Table 2.3 Framework for Valuing Impacts of Land-based Pollution on Seagrass.

Types of Pollutants	Impacts	Seagrass		
		Productivity	Amenity	Human welfare
Heavy metals	Water quality	v	v	-
	Reduced reproductive capacity in molluscs	v	-	-
	Contamination of human food sources	-	-	v
	Bio-accumulation	v	-	-
Organic matter	Water quality	v	v	-
Nutrients	Eutrophication	v	-	-
	Algal blooms	v	-	-
	Red tides	v	-	-
	Anoxia – fish kills	v	-	-
	Fish shellfish poisoning	-	-	v
Oil and hydrocarbons	Contamination/tainting of aquaculture and wild fish	-	-	v
	Extreme spills smothering of organisms	v	v	-
Sediments	Smothering of coral reefs and seagrass	v	v	-
	Reduced light penetration from increased turbidity leading to reduced primary production	v	v	-
POPs	Water quality	v	v	-
	Contamination of seafood	-	-	v
	Reduced fish reproductive capacity	v	-	-
Solid waste (plastics)	Smothering of organisms	v	v	-
Thermal pollution	Reduced productivity	v	-	-
	Loss of species	v	-	-
Bacterial contamination	Contamination of human food sources	-	v	v

Table 2.4 Framework for Valuing Impacts of Land-based Pollution on Wetlands.

Types of Pollutants	Impacts	Wetlands		
		Productivity	Amenity	Human welfare
Heavy metals	Water quality	v	v	v
	Reduced reproductive capacity in molluscs	v	-	-
	Contamination of human food sources	-	-	v
	Bio-accumulation	v	-	-
Organic matter	Water quality	v	v	v
Nutrients	Eutrophication	v	v	-
	Algal blooms	v	v	-
	Red tides	v	v	-
	Anoxia – fish kills	v	-	-
	Fish shellfish poisoning	-	-	v
Oil and hydrocarbons	Contamination/tainting of aquaculture and wild fish	-	-	v
	Extreme spills smothering of organisms	v	v	-
Sediments	Smothering of coral reefs and seagrass	v	v	-
	Reduced light penetration from increased turbidity leading to reduced primary production	v	-	-
POPs	Water quality	v	v	v
	Contamination of seafood	-	-	v
	Reduced fish reproductive capacity	v	-	-
Solid waste (plastics)	Smothering of organisms	v	v	v
Thermal pollution	Reduced productivity	v	-	-
	Loss of species	v	v	-
Bacterial contamination	Contamination of human food sources	-	-	v

Table 3.1 Procedures to Undertake Valuation of Impacts of Land-based Pollution on Mangroves.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Productivity					
Heavy metals	**Water quality** **Reduced reproductive capacity in molluscs**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after) Quantities of products harvested, sold, given away and used (before and after) Total areas under consideration (before and after) Concentration level of heavy metals For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour On site market price of each product (before and after degradation of water quality)	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
Oil and hydrocarbons	**Extreme spills smothering of organisms**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after release of oil and hydrocarbon) Quantities of products harvested, sold, given away (before and after) Total areas under consideration (before and after)	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
Thermal pollution	**Reduced productivity**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after thermal pollution) Quantities of products harvested, sold, given away (before and after) Total areas under consideration (before and after) For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected

Table 3.1 c*ontinued* Procedures to Undertake Valuation of Impacts of Land-based Pollution on Mangroves.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
	Loss of species	On site price for marketed products	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after thermal pollution) Quantities of products harvested, sold, given away (before and after) Total areas under consideration (before and after) For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
		Substitute price of products*		For substitute price approach: Price of equivalent goods Quantities of equivalent products harvested, sold, given away (before and after) For all approaches: Species identified before and after	Substitute material acceptable Market values not distorted
				Amenity*	
Heavy metals	**Water quality**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination)	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$) Total cost value	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences

Table 3.1 c*ontinued* Procedures to Undertake Valuation of Impacts of Land-based Pollution on Mangroves.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
		Replacement cost: cost to clean up heavy metals	Total cost value	Type of pollutants Sources of pollutants	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Oil and hydrocarbons	**Extreme spills smothering of organisms**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after oil/ hydrocarbon spill) Time spent travelling (before and after oil/ hydrocarbon spill) Expenditures incurred in visiting the site (before and after oil/ hydrocarbon spill) Frequency and duration of visits (before and after oil/ hydrocarbon spill) Number of visitor-days for the site (before and after water contamination)	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up oil and hydrocarbons	Total cost value	Type of pollutants Sources of pollutants Concentration level of oil and hydrocarbons	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Solid waste (plastics)	**Smothering of organisms**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after site contamination by solid waste) Time spent travelling (before and after site contamination by solid waste) Expenditures incurred in visiting the site (before and after site contamination by solid waste) Frequency and duration of visits (before and after site contamination by solid waste) Number of visitor-days for the site (before and after site contamination by solid waste)	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted

Table 3.1 c*ontinued* Procedures to Undertake Valuation of Impacts of Land-based Pollution on Mangroves.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up solid waste	Total cost value (US$)	Sources of solid waste Volume of solid waste	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Bacterial contamination	**Contamination of recreational areas**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after site contamination by bacteria) Time spent travelling (before and after site contamination by bacteria) Expenditures incurred in visiting the site (before and after site contamination by bacteria) Frequency and duration of visits (before and after site contamination by bacteria) Number of visitor-days for the site (before and after site contamination by bacteria)	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Prevention cost	Total cost to prevent bacterial contamination	Cost of constructing facilities for individual economic activities Cost of volumes of projected waste Size of impacted areas Sources of contaminants	

Table 3.1 c*ontinued* Procedures to Undertake Valuation of Impacts of Land-based Pollution on Mangroves.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Human Welfare*					
Heavy metals	**Water quality**	Cost of illness	Total l value of lost human labour (US$), and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels
	Contamination of human food sources	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food Duration and cost of finding new sources of food. Transport cost of new sources of food.	Equivalent and substitute food available Food consumed reaches minimum standards set by governments.
	Bio-accumulation	Cost of illness	Total value of lost human labour (US$), and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels
Oil and hydrocarbons	**Contamination /tainting of mariculture and wild fish**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food Duration and cost of finding new sources of food. Transport cost of new sources of food	Equivalent and substitute food available
POPs	**Water quality**	Cost of illness	Total l value of lost human labour (US$), and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels
	Contamination of seafood	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food Duration and cost of finding new sources of food. Transport cost of new sources of food.	Equivalent and substitute food available Food consumed reaches minimum standards set by governments.
Bacterial Contamination	**Contamination of recreational areas**	Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences

Table 3.1 c*ontinued* Procedures to Undertake Valuation of Impacts of Land-based Pollution on Mangroves.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
		Cost of illness	Total value of lost human labour (US$), and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels
	Contamination of human food sources	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food Duration and cost of finding new sources of food. Transport cost of new sources of food.	Equivalent and substitute food available Food consumed reaches minimum standards set by governments.

Table 3.2 Procedures to Undertake Valuation of Impacts of Land-based Pollution on Coral Reefs.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Productivity					
Heavy metals	**Water quality** **Reduced reproductive capacity in fish species (e.g. molluscs)** **Bio-accumulation**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after degradation of water quality) Quantities of products harvested, sold, given away and used (before and after degradation of water quality) Total areas under consideration (before and after) Concentration level of heavy metals For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected Heavy metals affect the functions of distance current and other physical variables
Organic matter	**Water quality**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after degradation of water quality) Quantities of products harvested, sold, given away and used (before and after degradation of water quality) Total areas under consideration (before and after) Concentration level of organic matters For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
Nutrients	**Eutrophication** **Algal blooms** **Red tides** **Anoxia – fish kills**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after eutrophication) Quantities of products harvested, sold, given away and used (before and after eutrophication) Total areas under consideration (before and after) Concentration level of nutrients For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected

Table 3.2 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Coral Reefs.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Oil and hydrocarbons	**Extreme spills smothering of organisms**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after spills/ release of oil and hydrocarbon) Quantities of products harvested, sold, given away (before and after spills/release of hydrocarbons) Total areas under consideration (before and after) Concentration level of oil and hydrocarbons in the water For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
Sediments	**Smothering of coral reefs**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after sedimentation) Quantities of products harvested, sold, given away and used (before and after sedimentation) Total areas under consideration (before and after) Level of sedimentation and sedimentation rate For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
	Reduced light penetration from increased turbidity leading to reduced primary production	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after increased turbidity) Quantities of products harvested, sold, given away and used (before and after increased turbidity) Total areas under consideration (before and after) Volume of suspended sediment in the water For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected

Table 3.2 *continued* Procedures to Undertake Valuation of Impacts of Land-based Pollution on Coral Reefs.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
POPs	**Water quality** **Reduced fish reproduction ability**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after) Quantities of products harvested, sold, given away and used (before and after) Total areas under consideration (before and after) Concentration level of POPs For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
Solid waste (plastics)	**Smothering of organisms**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after solid waste contamination) Quantities of products harvested, sold, given away and used (before and after solid waste contamination) Total areas under consideration (before and after) Volume of solid waste For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
Thermal pollution	**Reduced productivity**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after thermal pollution) Quantities of products harvested, sold, given away and used (before and after thermal pollution) Total areas under consideration (before and after) Temperature For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected

Table 3.2 *continued* Procedures to Undertake Valuation of Impacts of Land-based Pollution on Coral Reefs.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
	Loss of species	On site price for marketed products	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after thermal pollution) Quantities of products harvested, sold, given away (before and after) Total areas under consideration (before and after) For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
		Substitute price of products		For substitute price approach: Price of equivalent goods Quantities of equivalent products harvested, sold, given away (before and after) For all approaches: Species identified before and after	
				Amenity	
Heavy metals	**Water quality**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Concentration level of heavy metals	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up pollutants	Total cost of clean-up (US$)	Type of heavy metals Sources of heavy metals Concentration level of heavy metals	Technologies to clean up the pollutants are available and the cost of technologies is affordable

Table 3.2 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Coral Reefs.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Organic matter	**Water quality**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Concentration level of organic matters	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up organic matters	Total cost of clean-up (US$)	Type of organic matters Sources of organic matters Concentration level of organic matters	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Oil and hydrocarbons	**Extreme spills smothering of organisms**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after oil spill) Time spent travelling (before and after oil spill) Expenditures incurred in visiting the site (before and after oil spill) Frequency and duration of visits (before and after oil spill) Number of visitor-days for the site (before and after oil spill) Concentration level of oil and hydrocarbons	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up oil spills	Total cost of clean-up (US$)	Type of pollutants Sources of pollutants Concentration level of oil and hydrocarbons	Technologies to clean up the pollutants are available and the cost of technologies is affordable

Table 3.2 *continued* Procedures to Undertake Valuation of Impacts of Land-based Pollution on Coral Reefs.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Sediments	**Smothering of coral reefs**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after sedimentation) Time spent travelling (before and after sedimentation) Expenditures incurred in visiting the site (before and after sedimentation) Frequency and duration of visits (before and after sedimentation) Number of visitor-days for the site (before and after sedimentation) Sedimentation level and sedimentation rate	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up the sediments	Total cost of clean-up (US$)	Type of sediments Sources of sediments Sedimentation level and sedimentation rate	Technologies to clean up the pollutants are available and the cost of technologies is affordable
	Reduced light penetration from increased turbidity leading to degradation of biological diversity	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after turbidity) Time spent travelling (before and after turbidity) Expenditures incurred in visiting the site (before and after turbidity) Frequency and duration of visits (before and after turbidity) Number of visitor-days for the site (before and after turbidity) Volume of suspended sediment in water	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up the sediments	Total cost of clean-up (US$)	Type of pollutants Sources of pollutants Level of degradation of biological diversity	Technologies to clean up the pollutants are available and the cost of technologies is affordable

Table 3.2 *continued* Procedures to Undertake Valuation of Impacts of Land-based Pollution on Coral Reefs.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Solid waste (plastics)	**Smothering of organisms**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after solid waste contamination) Time spent travelling (before and after solid waste contamination) Expenditures incurred in visiting the site (before and after solid waste contamination) Frequency and duration of visits (before and after solid waste contamination) Number of visitor-days for the site (before and after solid waste contamination)	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up the plastics	Total cost of clean-up (US$)	Volume of solid waste Sources of solid waste	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Bacterial Contamination	**Contamination of recreational sites**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after bacterial contamination) Time spent travelling (before and after bacterial contamination) Expenditures incurred in visiting the site (before and after bacterial contamination) Frequency and duration of visits (before and after bacterial contamination) Number of visitor-days for the site (before and after bacterial contamination) Level of contamination	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to visit other areas to see the species	Total cost of going to alternative sites (US$)	Distance of other sites Cost of going to the site	Alternative location comparable/ accessible Market price used in valuation are not distorted

Table 3.2 *continued* Procedures to Undertake Valuation of Impacts of Land-based Pollution on Coral Reefs.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
			Human Welfare		
Heavy metals	**Contamination of human food sources found in coral reef habitat**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total value of lost human labour and total cost of hospitalisation and treatment (US$)	Total number of people affected Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels Market price used in valuation are not distorted
Nutrients	**Fish shellfish poisoning**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total value of lost human labour and total cost of hospitalisation and treatment (US$)	Total number of people affected Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels Market price used in valuation are not distorted
Oil and hydrocarbons	**Contamination/ tainting of mariculture and wild fish**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total value of lost human labour and total cost of hospitalisation and treatment (US$)	Total number of people affected Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels Market price used in valuation are not distorted
POPs	**Contamination of seafood**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total value of lost human labour and total cost of hospitalisation and treatment (US$)	Total number of people affected Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels Market price used in valuation are not distorted

Table 3.2 *continued* Procedures to Undertake Valuation of Impacts of Land-based Pollution on Coral Reefs.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Bacterial contamination	**Contamination of human food sources**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total value of lost human labour and total cost of hospitalisation and treatment (US$)	Total number of people affected Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels Market price used in valuation are not distorted

Table 3.3 Procedures to Undertake Valuation of Impacts of Land-based Pollution on Seagrass.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Productivity					
Heavy metals	**Water quality**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after degradation of water quality) Quantities of products harvested, sold, given away and used (before and after degradation of water quality) Total areas under consideration (before and after) Concentration level of heavy metals For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected Heavy metals affect the functions of distance current and other physical variables
	Reduced reproductive capacity in fish species (e.g. molluscs)	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after contamination by heavy metals) Quantities of products harvested, sold, given away and used (before and after contamination by heavy metals) Total areas under consideration (before and after) Concentration level of heavy metals For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected

Table 3.3 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Seagrass.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
	Bio-accumulation	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after bio-accumulation) Quantities of products harvested, sold, given away and used (before and after bio-accumulation) Total areas under consideration (before and after) Concentration level of heavy metals For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
Organic matter	**Water quality**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after degradation of water quality) Quantities of products harvested, sold, given away and used (before and after degradation of water quality) Total areas under consideration (before and after) Concentration level of organic matters For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
Nutrients	**Eutrophication** **Algal blooms** **Red tides** **Anoxia – fish kills**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after eutrophication) Quantities of products harvested, sold, given away and used (before and after eutrophication) Total areas under consideration (before and after) Concentration level of nutrients For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected

Table 3.3 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Seagrass.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Oil and hydrocarbons	**Extreme spills smothering of organisms**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after spills/ release of oil and hydrocarbon) Quantities of products harvested, sold, given away (before and after spills/release of hydrocarbons) Total areas under consideration (before and after) Concentration level of oil and hydrocarbons For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
Sediments	**Smothering of sea grass**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after sedimentation) Quantities of products harvested, sold, given away and used (before and after sedimentation) Total areas under consideration (before and after) Sedimentation level and sedimentation rate For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
	Reduced light penetration from increased turbidity leading to reduced primary production	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after increased turbidity) Quantities of products harvested, sold, given away and used (before and after increased turbidity) Total areas under consideration (before and after) Volume of suspended sediment in water For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected

Table 3.3 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Seagrass.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
POPs	**Water quality**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after degradation of water quality) Quantities of products harvested, sold, given away and used (before and after degradation of water quality) Total areas under consideration (before and after) Concentration level of POPs For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
	Reduced fish reproductive ability	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after POPs contamination) Quantities of products harvested, sold, given away and used (before and after POPs contamination) Total areas under consideration (before and after) Concentration level of POPs For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
Solid waste (plastics)	**Smothering of organisms**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after solid waste contamination) Quantities of products harvested, sold, given away and used (before and after solid waste contamination) Total areas under consideration (before and after) Volume of solid waste For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected

Table 3.3 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Seagrass.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Thermal pollution	**Reduced productivity**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after thermal pollution) Quantities of products harvested, sold, given away and used (before and after thermal pollution) Total areas under consideration (before and after) Water temperature For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
	Loss of species	On site price for marketed products Substitute price of products*	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after thermal pollution) Quantities of products harvested, sold, given away (before and after) Total areas under consideration (before and after) Water temperature For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour For substitute price approach: Price of equivalent goods Quantities of equivalent products harvested, sold, given away (before and after) For all approaches: Species identified before and after	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected Substitutes are acceptable
			Amenity		
Heavy metals	**Water quality**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Concentration level of heavy metals	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted

Table 3.3 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Seagrass.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up heavy metals	Total cost of clean-up (US$)	Type of heavy metals Sources of heavy metals Concentration level of heavy metals	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Organic matter	**Water quality**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Concentration level of organic matters	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up organic matters	Total cost of clean-up (US$)	Type of pollutants Sources of pollutants Concentration level of organic matters	Technologies to clean up the pollutants are available and the cost of technologies is affordable

Table 3.3 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Seagrass.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Oil and hydrocarbons	**Extreme spills smothering of organisms**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Concentration level of oil and hydrocarbons	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up oils and hydrocarbons	Total cost of clean-up (US$)	Type of pollutants Sources of pollutants Concentration level of pollutants	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Sediments	**Smothering of seagrass**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Level of sedimentation and sedimentation rate	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences

Table 3.3 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Seagrass.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
		Replacement cost: cost to clean up sediments	Total cost of clean-up (US$)	Type of pollutants Sources of pollutants Level of sedimentation and sedimentation rate	Technologies to clean up the pollutants are available and the cost of technologies is affordable
	Reduced light penetration from increased turbidity leading to degradation of biological diversity	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Volume of suspended sediment in the water	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up sediments	Total cost of clean-up (US$)	Type of pollutants Sources of pollutants Volume of suspended sediment in water	Technologies to clean up the pollutants are available and the cost of technologies is affordable
POPs	**Water quality**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Concentration level of POPs	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders

Table 3.3 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Seagrass.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
					No strategic bias/influences
		Replacement cost: cost to clean up POPs	Total cost of clean-up (US$)	Type of pollutants Sources of pollutants Level of concentration of pollutants	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Solid waste (plastics)	**Smothering of organisms**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Volume of solid waste	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up sediments	Total cost of clean-up (US$)	Sources of solid waste Volume of solid waste	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Thermal pollution	**Loss of species**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Water temperature	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted

Table 3.3 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Seagrass.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to visit other areas to see the species	Total cost of going to alternative sites (US$)	Distance of other sites Cost of going to the sites	Alternative location comparable/ accessible Market price used in valuation are not distorted.
Bacterial contamination	**Contamination of human food sources**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after site contamination by bacteria) Time spent travelling (before and after site contamination by bacteria) Expenditures incurred in visiting the site (before and after site contamination by bacteria) Frequency and duration of visits (before and after site contamination by bacteria) Number of visitor-days for the site (before and after site contamination by bacteria) Level of contamination	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Prevention cost	Total cost to prevent bacterial contamination (US$)	Cost of constructing facilities for individual economic activities Volumes of projected waste Size of impacted areas Sources of contaminants	Market prices used in valuation are not distorted
Human Welfare					
Heavy metals	**Contamination of human food sources**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted

Table 3.3 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Seagrass.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
		Cost of illness	Total cost of hospitalisation and treatment	Total number of people affected Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels
Nutrients	**Fish shellfish poisoning**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total cost of lost human labour and total cost of hospitalisation and treatment (US$)	Total number of people affected Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels Market prices used in valuation not distorted
Oil and hydrocarbons	**Contamination/ tainting of mariculture and wild fish**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total cost of lost human labour and total cost of hospitalisation and treatment (US$)	Total number of people affected Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels Market prices used in valuation not distorted
POPs	**Contamination of seafood**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total cost of lost human labour and total cost of hospitalisation and treatment (US$)	Total number of people affected Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels Market prices used in valuation not distorted
Bacterial contamination	**Contamination of human food sources**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total cost of lost human labour and total cost of hospitalisation and treatment (US$)	Total number of people affected Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels Market prices used in valuation not distorted

Table 3.4 Procedures to Undertake Valuation of Impacts of Land-based Pollution on Wetlands.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Productivity					
Heavy metals	**Water quality** **Reduced reproductive capacity in fish species (e.g. molluscs)** **Bio-accumulation**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after) Quantities of products harvested, sold, given away and used (before and after) Total areas under consideration (before and after) Concentration level of heavy metals For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected.
Organic matter	**Water quality**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after degradation of water quality) Quantities of products harvested, sold, given away and used (before and after degradation of water quality) Total areas under consideration (before and after) Concentration level of organic matter For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected.
Nutrients	**Eutrophication** **Algal blooms** **Red tides** **Anoxia – fish kills**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after) Quantities of products harvested, sold, given away and used (before and after) Total areas under consideration (before and after) Concentration level of nutrients For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected.

Table 3.4 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Wetlands.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Oil and hydro-carbons	**Extreme spills smothering of organisms**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after spills/ release of oil and hydrocarbon) Quantities of products harvested, sold, given away (before and after spills/release of hydrocarbons) Total areas under consideration (before and after) Concentration level of oil and hydrocarbons For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected.
Sediments	**Reduced light penetration from increased turbidity leading to reduced primary production**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after increased turbidity) Quantities of products harvested, sold, given away and used (before and after increased turbidity) Total areas under consideration (before and after) Volume of suspended sediment in the water For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
POPs	**Water quality** **Reduced fish reproduction ability**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after) Quantities of products harvested, sold, given away and used (before and after) Total areas under consideration (before and after) Concentration level of POPs For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected.

Table 3.4 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Wetlands.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Solid waste (plastics)	**Smothering of organisms**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after solid waste contamination) Quantities of products harvested, sold, given away and used (before and after solid waste contamination) Total areas under consideration (before and after) Volume of solid waste For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected
Thermal pollution	**Reduced productivity**	On site sale value for marketed goods using net price For directly used goods, use market values for equivalent goods. If not available use indirect opportunity cost approach (using wages forgone for harvesting goods)	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after thermal pollution) Quantities of products harvested, sold, given away and used (before and after thermal pollution) Total areas under consideration (before and after) Water temperature For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected

Table 3.4 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Wetlands.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
	Loss of species	On site price for marketed products	Total annual value of production for each product (US$)	For direct valuation: On site market price of each product (before and after thermal pollution) Quantities of products harvested, sold, given away (before and after) Total areas under consideration (before and after) Water temperature For indirect valuation: Price per unit for equivalent goods Cost of material inputs Time spent harvesting/gathering/ culturing product Equivalent local wage for labour Water temperature	Values prior to the impact to be determined. Market price can be adapted to account for seasonal and other price changes. Market price represents true market value within a competitive market at equilibrium (i.e. prices are not distorted). All externalities are identified and included in the price. Exchange rates and the years of data collected.
		Substitute approach: Price of products/raw materials*	Total cost of sourcing products/raw materials from other sites	For substitute price approach: Price of equivalent goods Quantities of equivalent products harvested, sold, given away (before and after) For all approaches: Species identified before and after	Substitute of product/raw materials available and acceptable Market prices used in valuation are not distorted
				Amenity	
Heavy metals	**Water quality**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Concentration level of heavy metals	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up pollutants	Total cost of clean-up (US$)	Types of heavy metals Sources of heavy metals Level of concentration of heavy metals	Technologies to clean up the pollutants are available and the cost of technologies is affordable

Table 3.4 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Wetlands.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Organic matter	**Water quality**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Concentration level of organic matters	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up pollutants	Total cost of clean-up (US$)	Type of pollutants Sources of pollutants Concentration level of pollutants	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Nutrients	**Eutrophication** **Algal blooms** **Red tides**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after eutrophication) Time spent travelling (before and after eutrophication) Expenditures incurred in visiting the site (before and after eutrophication) Frequency and duration of visits (before and after eutrophication) Number of visitor-days for the site (before and after eutrophication) Concentration level of nutrients	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up nutrients	Total cost of clean-up (US$)	Type of pollutants Sources of pollutants Concentration level of pollutants	Technologies to clean up the pollutants are available and the cost of technologies is affordable

Table 3.4 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Wetlands.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Oil and hydro-carbons	**Extreme spills smothering of organisms**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after oil spill) Time spent travelling (before and after oil spill) Expenditures incurred in visiting the site (before and after oil spill) Frequency and duration of visits (before and after oil spill) Number of visitor-days for the site (before and after oil spill) Concentration level of oil and hydrocarbons	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up the oil spill	Total cost of clean-up (US$)	Type of pollutants Sources of pollutants Concentration level of pollutants	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Sediments	**Increased difficulty of transportation in wetlands**	Replacement cost: cost to clean up sediments	Total cost of clean-up (US$)	Level of sedimentation Sources of sedimentation	Technologies to clean up the pollutants are available and the cost of technologies is affordable
POPs	**Water quality**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after water contamination) Time spent travelling (before and after water contamination) Expenditures incurred in visiting the site (before and after water contamination) Frequency and duration of visits (before and after water contamination) Number of visitor-days for the site (before and after water contamination) Concentration level of POPs	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences

Table 3.4 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Wetlands.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
		Replacement cost: cost to clean up pollutants	Total cost of clean-up (US$)	Type of pollutants Sources of pollutants Concentration level of pollutants	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Solid waste (plastics)	**Smothering of organisms**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after solid waste contamination) Time spent travelling (before and after solid waste contamination) Expenditures incurred in visiting the site (before and after solid waste contamination) Frequency and duration of visits (before and after solid waste contamination) Number of visitor-days for the site (before and after solid waste contamination)	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences
		Replacement cost: cost to clean up plastics	Total cost of clean-up (US$)	Volume of wastes Sources of wastes	Technologies to clean up the pollutants are available and the cost of technologies is affordable
Thermal pollution	**Loss of species**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey Socio-economic variables Geographic origin (before and after) Time spent travelling (before and after) Expenditures incurred in visiting the site (before and after) Frequency and duration of visits (before and after) Number of visitor-days for the site (before and after) Water temperature	Access to the site is available to all Visits have a single purpose Demand function relationship can be specified No factors aside from travel cost influence site use Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good vegetation	Recreational value of the site as valued by willingness to pay by users (US$)	Answers to valuation questions from survey/bidding game technique/ dichotomous choice	Subjects understand choices offered and give meaningful and honest answers Subject have sufficient information to give informed choices Sample is representative and captures the full spectrum of users who value the site No free riders No strategic bias/influences

Table 3.4 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Wetlands.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
		Replacement cost: cost to visit other areas to see the species	Total cost of going to alternative sites (US$)	Distance of other sites Cost of going to the site	Alternative location comparable/ accessible Market price used in valuation are not distorted
Human Welfare					
Heavy metals	**Water quality**	Cost of illness	Total value of lost human labour (US$) and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost Number of affected people	Health and productivity can be restored to previous levels Types of water use can be identified
		Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
	Contamination of human food sources	Cost of illness	Total value of lost human labour (US$) and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost Number of affected people	Health and productivity can be restored to previous levels Market price used in valuation are not distorted
		Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
Organic matter	**Water quality**	Cost of illness	Total value of lost human labour (US$), and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost	Health and productivity can be restored to previous levels Market prices used in valuation not distorted
Oil and hydrocarbons	**Contamination/ tainting of aquaculture and wild fish**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total value of lost human labour (US$), and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost Number of affected people	Health and productivity can be restored to previous levels Market prices used in valuation not distorted
POPs	**Water quality**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted

Table 3.4 *continued* **Procedures to Undertake Valuation of Impacts of Land-based Pollution on Wetlands.**

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
		Cost of illness	Total value of lost human labour (US$), and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost Number of affected people	Health and productivity can be restored to previous levels Market prices used in valuation not distorted
	Contamination of human source food	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total value of lost human labour (US$), and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost Number of affected people	Health and productivity can be restored to previous levels Market prices used in valuation not distorted
Solid waste (plastics)	**Breeding ground for disease**	Cost of illness	Total value of lost human labour (US$), and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost Number of affected people	Health and productivity can be restored to previous levels Market prices used in valuation not distorted
		Clean-up cost	Total cost of cleaning up solid waste	Amount of solid waste	
Bacterial contamination	**Contamination of human food sources**	Substitute price approach: cost of sourcing food elsewhere/cost of equivalent food	Total annual cost of sourcing food from alternative sites/equivalent food	Quantity of food consumed Price per unit quantity of food sourced elsewhere/equivalent food	Substitute food acceptable Market prices used in valuation not distorted
		Cost of illness	Total value of lost human labour (US$), and total cost of hospitalisation and treatment	Salaries/wages for labour Duration of illness and recovery (number of days lost) Hospitalisation and treatment cost Number of affected people	Health and productivity can be restored to previous levels Market prices used in valuation not distorted

ANNEX 5

Proposed Outline for a Manual on the Evaluation of Ecosystems that are of Interest to the South China Sea Project

I. INTRODUCTION (Dr. Pernetta)

This portion will deal with the importance of doing economic valuation of the ecosystems to the project. This will also deal with how general valuation framework and the ecosystem-specific valuation frameworks were arrived at/formulated.

II. COST BENEFIT ANALYSIS (Dr. Thanwa)

This portion will discuss the conceptual frameworks of ordinary and extended cost benefit analysis, and their major elements or components. It will include the definition of cost and benefit, formula, indicators and investment criteria (net present value, benefit-cost ratio, internal rate of return).

A. Ordinary cost benefit analysis
Net present value
Benefit-cost ratio
Internal rate of return
Payback period
Sensitivity analysis

B. Extended cost benefit analysis
External cost and benefit
Net present value
Benefit-cost ratio
Internal rate of return
Payback period
Sensitivity analysis

III. THE GENERAL OVERALL VALUATION FRAMEWORK (Dr. Noel)

This portion will discuss the various elements of the framework (total economic value) use value (direct, indirect, option), non-use value (quasi-option, bequest, existence). Included in the discussion is the definition of each element and their appropriate usage.

Total Economic Value

A. Use Value

1. **Direct Use (discuss also the types of direct uses i.e., extractive, non-extractive, etc.)**
2. **Indirect Use (discuss also the various indirect uses i.e., environmental services, biological diversity, etc.)**
3. **Option Use**

B. Non-Use Value

1. **Quasi-Option Use**
2. **Bequest Use**
3. **Existence Use**

III. THE VALUATION TECHNIQUES

This portion will discuss the various techniques and their appropriate usage. The outline for this section can be as follows:

A. Market Based Value (Dr. Tridoyo)

1. **Direct Value (On site value)**
2. **Indirect Value**
   - **a. Change in Productivity**
   - **b. Shadow Project**
   - **c. Defensive/Preventive Expenditure**
   - **d. Cost of Illness**
   - **e. Replacement Cost**

B. Surrogate Market Based (Dr. Suparmoko)

1. **Hedonic Price**
2. **Travel Cost**

C. Simulated Value Survey-Based (Mr. Ramony)

1. **Contingent Valuation**
2. **Choice Modelling**

IV. VALUATION OF ECOSYSTEMS

This portion will deal with how to arrive at the economic values of the various ecosystems (Mangrove, Seagrass, Coral Reef, Wetlands). Included in the discussions are the sources of values (based on the adopted framework for valuation of mangroves), data required (based on the agreed matrix) and techniques of generating the data. The outline for this section can be as follows:

A. Mangrove Ecosystem (Dr. Thanwa)

1. **Sources of values and method of computation**
   - **a. Direct Use (Extractive)**
     - i. Timber (what are they used for; how is the economic value computed?)
     - ii. Firewood (uses, e.g., domestic cooking, bakery, etc.; how is the economic value computed?)
     - iii. etc.
   - **b. Direct (Non Extractive)**
     - i. Tourism/Recreation (ways of enjoying the ecosystem; how is the economic value computed?)
     - ii. Research and education (types of undertakings; how is the economic value computed?)
   - **c. Indirect (Environmental Services)**
     - i. Shoreline protection (how do they protect?; how is the economic value computed?)

ii. Windbreak (how do they function as such?; how is the economic value computed?)
iii. ETC.

d. Indirect (Biological diversity)
i. Value of genes, etc. (computation of economic value)
ii. ETC.

e. Option (Dr. Chinh)

f. Bequest (Dr. Chinh)

g. Existence (Socio-cultural significance)
i. Religious/spiritual significance (how are they significant?; how is the economic value computed?)
ii. ETC.

2. Data required and techniques to generate them

This subsection will follow the outline of the previous subsection, this time identifying the various data requirements and the ways of generating the data to enable the researcher to compute for the economic value for a particular use.

B. Coral Reef Ecosystem (Dr. Suparmoko)

This section can likewise follow the previous section's outline and discussion elements.

C. Wetlands Ecosystem (Dr. Ninh)

This section can follow the outline of the previous section, including the elements of discussion.

D. Sea grass Ecosystem (Dr. Khalid)

This section can also follow the previous section's outline and the discussion elements.

V. VALUING THE IMPACTS OF LAND-BASED POLLUTION (Dr. Noel)

VI. CONCLUSION (Dr. Noel)

This will encourage the reader to apply the methods and techniques indicated.

ANNEX 6

Table 1 Draft Summary Table for Empirical Data Relating to Economic Valuation of Mangrove Extractive (direct) Uses.

	Date of Valuation	Location	Total Area (ha)	Volume (per ha)	Unit Net Price[1]	Currency[2]	Value (per ha)	Valuation Method[3]
Timber								
Reference A								
Reference B								
Reference C								
Firewood								
Reference A								
Reference B								
Poles								
Charcoal								
Leaves/palm fronds (*Thatch, fodder*)								
Fruit/propagules								
Bark (*tanning & dyes*)								
Medicine								
Sap (*sugar, alcohol, Acetic acid*)								
Wood tar								
Fish capture								
Crab capture								
Prawn capture								
Shellfish collection								
Insect and larvae collection								
Worms								
Wildlife								
Zooplankton								
Jellyfish								
Honey & wax								
Algae								
Other uses (specify)								

[1] *Unit net price is the market price minus harvesting and production cost.*
[2] *Currency used in original studies, references or publications.*
[3] *The valuation methods should include details of prices used.*

ANNEX 7

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE UNITED NATIONS ENVIRONMENT PROGRAMME
AND
[Insert National Institute or Agency of the Members of the Task Force] ON THE EXECUTION OF ACTIVITIES ON ECONOMIC VALUATION FOR THE UNEP/GEF PROJECT ENTITLED: *"REVERSING ENVIRONMENTAL DEGRADATION TRENDS IN THE SOUTH CHINA SEA AND GULF OF THAILAND"*

(Ref.: UNEP/GEF/SCS/Cam/MoU###)

1. PARTIES. This Memorandum of Understanding is entered into between the United Nations Environment Programme (UNEP), and **[Insert National Institute or Agency of the Members of the Task Force]**, for the execution of activities on economic valuation under the framework of the UNEP/GEF Project entitled *"Reversing environmental degradation trends in the South China Sea and Gulf of Thailand".*

2. BACKGROUND. The UNEP/GEF Project Brief entitled *"Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand"* (hereafter called the South China Sea Project) was approved by the GEF Council in November 2000, following its approval by the 15th meeting and special session of COBSEA[4], held in Pattaya, Thailand, 11-12th September 2000. The project brief was endorsed by the GEF Operational Focal Point for [Insert country name] on behalf of the Government, [Insert date of endorsement].
The overall goals of the South China Sea Project are: to create an environment at the regional level, in which collaboration and partnership in addressing environmental problems of the South China Sea, between all stakeholders, and at all levels is fostered and encouraged; and to enhance the capacity of the participating governments to integrate environmental considerations into national development planning.

The Regional Task Force on Economic Valuation was established by the Project Steering Committee (PSC) during its second meeting, in Hanoi, December 2002, to serve as the principal source of economic advice and information to the PSC, the Regional Scientific and Technical Committee (RSTC), and Specialised Executing Agencies. To fulfil the tasks stipulated in the Terms of Reference of the Task Force, and provide the advice regarding economic valuation of coastal habitats and resources the Regional Task Force on Economic Valuation has developed valuation frameworks for use in the context of the demonstration sites that will be initiated during 2005.

The role of the members of the RTF-E is primarily to gather and consolidate information on the economic valuation of coastal environmental goods and services, and provide advice regarding regional values that can be applied in the framework of the Strategic Action Programme.

3. PURPOSE. Under this Memorandum of Understanding the [Insert National Institute or Agency of the Members of the Task Force] **agrees to make available the services of** [Insert Mr./Dr. Member of the Task Force] **in** [Insert Country]**. It is critical to the project that all RTF-E members from the participating countries function effectively if the overall goals of the project are to be met, hence the** [Insert National Institute or Agency of the Members of the Task Force] **agrees to release** [Insert Mr./Dr. Member of the Task Force] **for an estimated 10% of their time over the next year in order to fulfil the tasks and responsibilities detailed in this agreement.**

4. GENERAL CONDITIONS. The United Nations Standard Conditions for Memoranda of Understanding are attached as Annex I and form a part of this Memorandum.

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[4] *UNEP, 2000. Report of the Fifteenth Meeting of the Co-ordinating Body for the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan (Special Session for the UNEP GEF Project in the South China Sea) and Report of the Meeting of National Experts for the UNEP GEF Project in the South China Sea. UNEP(DEC)/EAS IG.11/3.*

5. TASKS BY DESIGNATED INSTITUTION. The Expert Member on behalf of the Institution, in close collaboration with the Members of the National Technical Working Group, and with the support of the National Technical Focal Point, agrees to carry out the tasks, outlined below and in accordance with the work plan, agreed during the third meeting of the RTF-E (Figure 2).

1. Engage the services, and direct the work of, a research assistant in compiling existing empirical data regarding the economic values of goods and services in accordance with the uses listed in the agreed frameworks for Mangroves, coral reefs, seagrass and wetlands and in the format attached as Annex 2 to this agreement.

2. Direct the work of the assistant in analysing the national information both published and un-published with a view to providing data regarding standardised values that can be compared between countries.

3. Produce a synoptic report on the outcome of the review of economic valuations of coastal resources and environments in **[insert name of country].**

6. TASKS BY UNITED NATIONS. UNEP agrees to perform the following tasks:

Provide the financial resources according, to the agreed schedule, detailed in Table 1 of this Memorandum, established between UNEP and **[Insert National Institute or Agency of the Members of the Task Force]**.

7. TRANSFER OF PAYMENTS AND RELEASE OF FUNDS. Transfer of payments and release of funds will be undertaken as follows:

i. Monetary contributions by UNEP will be made in US dollars by wire transfer to the following account:

Name of Account Holder:
Account number:
Name of Bank:
Address of bank:
Swift Code:

ii. The initial cash advance will be made upon final clearance of this agreement by the GEF and signature by UNEP.

iii. The Specialised Executing Agency shall report the end year expenditure accounts at 31 December, certified by a duly authorised official, but, in addition, UNEP requires that the end of year expenditure account should be reported in an opinion by a recognized firm of public accountants (for a government, by Government auditors), which shall be dispatched to UNEP by 31 March. In particular, the auditors should be asked to report whether, in their opinion:

- Proper books of account and records have been maintained;
- All project expenditures are supported by vouchers and adequate documentation; and,
- Expenditures have been incurred in accordance with the objectives outlined in the Memorandum of Understanding.

8. REFUND OF UNSPENT BALANCE. The Designated Institution will refund to UNEP in US dollars any unspent balance of the funds provided by UNEP within 30 days after completion of the final task. Such refund should be wired to:

Name of account holder:	ESCAP
Account number:	001-1-014313
Name of bank:	Chase Manhattan Bank
Address of bank:	New York
ABA number:	021000021

9. CORRESPONDENCE. All correspondence regarding this agreement should be addressed to:

In [Insert Country Name]:

To:
[Insert Co-ordinates of the Member of the Task Force]

Copied to:
[Insert the Co-ordinates of the National Focal Point]

In UNEP:

Project Director,
South China Sea Project Co-ordination Unit,
United Nations Environmental Programme,
United Nations Building, 2nd Floor, Block B,
Rajdamnern Nok Avenue,
Bangkok 10200, Thailand.
Tel: (662) 288 1886
Fax: (662) 288 1094

Copied to:

Chief, Budget and Financial Management Services,
United Nations Office at Nairobi (UNON)
P.O. Box 30552,
Nairobi, Kenya.
Tel: (254 20) 623 637, 623 632
Fax: (254 20) 623 755, 623 614

10. EFFECTIVE DATE. This Memorandum of Understanding shall enter into effect when signed in duplicate by the authorised persons below and shall expire on 31 December, 2006. Three months prior to the expiry of this agreement a new agreement may be negotiated taking into account the decisions of the Project Steering Committee regarding activities to be executed during the remainder of the project period.

_____	_____
Insert Co-ordinates of the Member of the Task Force	Project Director, South China Sea Project Co-ordination Unit, United Nations Environmental Programme, United Nations Building, 2nd Floor, Block B, Rajdamnern Nok Avenue, Bangkok 10200, Thailand.
Date:_____	Date:_____

ANNEX 8

Work Plan for the RTF-E (2005-2006) and Schedule of Meetings for the UNEP/GEF South China Sea Project

Table 1 Work Plan for the Regional Task Force on Economic Valuation for 2005-2006.

Year	2005									2006											
Month	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Second Regional Scientific Conference								X													
Fourth RTF-E Meeting												X									
1. Development of a framework and procedures to value the impacts of land-based pollution																					
1.1 Drafts to be completed during the 3rd RTF-E meeting																					
1.2 Comments or other inputs to be provided to the PCU prior to finalisation of the framework and procedures		3rd																			
2. Development of an economic valuation manual for use in the demonstration sites and pilot activities																					
2.1 Agree on the format and individual responsibilities	X																				
2.3 Draft sections circulated by members				X																	
2.4 Comments from RTF-E members					X																
2.5 Revision of drafts based on comments received						X															
2.6 Manual compiled into first draft for distribution during the second Regional Scientific Conference							X														
2.7 Final editing and clearance of the manual based on feedback from the Regional Working Groups										X											
3. Development of a regional database of empirical economic values for coastal goods and services																					
3.1 Agree on activities and budgets	X																				
3.2 Prepare and sign Memoranda of Understanding		X																			
3.3 Members undertake the agreed activities																					
3.4 First compilation of data submitted to the PCU and other members of the RTF-E						X															
3.5 Comments/discussion by Members on the first draft																					
3.6 Development of procedures for deriving “national” and regional values																					
3.7 Further amplification of data and procedures and compilation of second draft								X													
3.8 Discussion and agreement of procedures for deriving “national” and “regional” values																					
4. Inputs to the updating of the Strategic Action Programme												X									

Table 2 **Schedule of Meetings for 2005.** (RWG = Regional Working Group; -M = Mangroves; -CR = Coral reefs; -SG = Seagrass; -W = Wetlands; -F= Fisheries; LbP = Land-based Pollution; RTF-E = Regional Task Force on Economic Valuation; RTF-L = Regional Task Force on Legal Matters) (H = United Nations Holidays)

	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M
January							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
									H																		H											
February			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28								
											Chinese NY												RSTC EXCOM		H													
March			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					
			RTF-L-3																																			
April						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
											H							H					RTF-E-3															
May	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31							
																							H															
June				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30					
July						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
																							RWG-LbP-6															
August		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31						
		RWG-M-6											H										RWG-CR-6															
September						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
									RWG-F-6							RWG-W-6															RWG-SG-6							
October							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
											Ramadan																											
November			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						
			Ramadan			H										RSC-2																						
December						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
									H			RSTC-6				PSC-5													Xmas	H								