UNEP/GEF Implementing the Strategic Action Programme for the South China Sea and Gulf of Thailand (SCS SAP Project)

OUTPUTS ON ECONOMIC VALUATION OF THE SCS PROJECT

First Meeting of the Regional Task Force on Economic Valuation
Teleconference, 26 June 2024

Valuation of annual production and 'service' in US dollars, per hectare, per annum

The challenge in 1999 was that the only economic "ecosystem values" readily available were those of Costanza *et al.*

The Project Steering Committee composed of participating government representatives, in approving the draft SAP and SCS GEF Project insisted that the project up-date the SAP and determine ***regionally applicable values*** for environmental goods and services.

The SCS Project established in 2003 a Regional Task Force of nine economists charged with this task which was completed successfully in March 2007.

Identifying the goods and 'services' - biologists, fisheries scientists, foresters

Assemble and evaluate empirical data for economic values of goods and 'services' - economists

Standardise the data from seven countries:

Across years – Consumer Price Index
Across Currencies – US dollar

Problem: 'Farm gate' prices for environmental goods vary within countries reflecting both the local supply and the demand

Solution: Weight individual values according to the stock or area

Weighted Mean National Value

The summation of each price (value) multiplied by the stock to which it relates; divided by the total stock for which prices were available in the country

WEIGHTED MEAN REGIONAL VALUE

$$RvA_1Kg =$$

$$[(S_{Ca}*MV_{Ca})+(S_{Chi}*MV_{Chi})+(S_{In}*MV_{In})+(S_{Ma}*MV_{Ma})+(S_{Ph}*MV_{Ph})+(S_{Th}*MV_{Th})+(S_{Vi}*MV_{Vi})]$$

$$(S_{Ca} + S_{Chi} + S_{In} + S_{Ma} + S_{Ph} + S_{Th} + S_{Vi})$$

S_{Ca} = Stock in Cambodia

MV_{Ca} = Standard Mean Value in Cambodia

Tabulate Weighted National & Regional Mean Values
DIRECT USES

Mangrove Goods	Cambodia	China	Indonesia	►7 countries
Timber	779.95	137.07	73.55	
Firewood	17.35	0.00	65.06	
Poles	0.00	0.00	0.00	
Charcoal	71.39	0.00	15.85	
Leaves/palm fronds (Thatch, fodder)	13.66	0.00	0.00	
Fruit/propagules	0.00	100.78	0.00	

►24 goods

Weighted National Mean Value $\sum_{Ca}$ $\sum_{Chi}$ $\sum_{In}$

Tabulate Weighted National & Regional Mean Values
SERVICES – INDIRECT AND NON-USE VALUES

Mangrove Services	Cambodia	China	Indonesia	►7 countries
Ecotourism	0.00	0.00	59.79	
Nursery Function	0.00	1,274.00	782.00	
Coastal Protection	0.00	1,044.00	421.56	
Aesthetic Value	0.00	1,867.00	0.00	

► **9 "services"**

Weighted National Mean Value $\sum_{Ca}$ $\sum_{Chi}$ $\sum_{In}$

Total Economic Value
of the habitats bordering the South China Sea is the summation of the regionally weighted values of the annual production of goods and 'services' per hectare.

Total Economic Value for the entire area of each habitat is the product of this value multiplied by the total area of the habitat bordering the South China Sea

VALUE OF ANNUAL PRODUCTION IN THE SOUTH CHINA SEA

	Area ha	US$/ha	Total US$
Mangroves	1,799,136	2,872	5,167,568,376
Coral reefs	750,307	1,542	1,157,393,566
Seagrass	73,769	1,181	87,164,713

Cost benefit analysis in implementing the SAP

Regional Working Groups

Identified regional level actions to ensure co-ordination of national level actions in the implementation of the Strategic Action Programme.

Estimated the costs based upon experiences with the implementation of the SCS Project

COSTS DO NOT INCLUDE the costs of actions in the National Action Plans that contribute towards the achievement of the regional targets of the Strategic Action Programme (SAP).

If the environmental targets of the SAP are met then various economic benefits might be gained in terms of the avoidance of economic losses consequent upon the loss and degradation of coastal habitats.

SAP COSTS COMPARED WITH VALUE OF ANNUAL PRODUCTION SAVED

- Mangroves 2.99 million US dollars compared with 5.1 billion US dollars of annual production;
- Coral reefs 3.96 million US dollars compared with 1.1 billion US dollars of annual production;
- Seagrass 1.58 million US dollars compared with 87.2 million US dollars of annual production;
- Wetlands 5.99 million US dollars compared with 1.2 billion dollars of annual production.

COSTS AND BENEFITS OF MANGROVE INTERVENTIONS IN THE SAP [FIRST FIVE EYARS]

Costs 2007 values
2,994,073

Benefits 2007 values
1,479,382,085

Net Benefits
1,476,388,012

Valuing the impacts of land-based pollution

The Regional Task Force on Economic Valuation has developed a framework for the valuation of land-based pollution impacts on coastal habitats that includes:

- a checklist of the impacts of land-based pollution on coastal habitats, specifying types of pollutants and their specific impacts on the four major habitats [mangroves, coral reefs, seagrass, and wetlands];

- a framework for valuing the impacts of land-based pollution on the four habitat types, categorising the various specific impacts in the checklist into three categories, i.e. productivity, amenity, and human welfare;

- procedures to undertake valuation of impacts of land-based pollution on the four habitat types

Checklist of the impacts of land-based pollution on coastal habitats

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

Types of Pollutants	Impacts	Mangroves	Coral Reefs	Seagrass	Wetlands
Heavy metals	• Water quality • Reduced reproductive capacity in molluscs • Contamination of human food sources • Bio-accumulation	v v v v	v v v v	v v v v	v v v v
Organic matter	• Water quality	-	v	v	v
Nutrients	• Eutrophication • Algal blooms and/or overgrowth • Anoxia – fish kills • Fish/shellfish poisoning	- - - -	v v v v	v v v v	v v v v
Oil and hydrocarbons	• Contamination/tainting of aquaculture and wild fish • Extreme spills smothering organisms • Water quality	v v v	v v v	v v v	v v v
Sediments	• Smothering of mangroves, coral reefs and seagrass • Reduced light penetration from increased turbidity leading to reduced primary production • Water quality • Change of water depth • Change of species composition of benthonic communities	v - v v v	v v v v v	v v v v v	- v v v v
POPs	• Water quality • Contamination of seafood • Reduced fish production	v v v	v v v	v v v	v v v
Solid waste (plastics)	• Smothering of organisms • Loss of amenity value • Biosorption of plasticizing agents	v v v	v v v	v v v	v v v
Thermal pollution	• Reduced productivity • Loss of species	v v	v v	v v	v v
Bacterial contamination	• Loss of amenity value • Contamination of human food sources	v v	v v	v v	v v
Acid Pollution	• Change of water and sediment quality • Loss of bio community	v	-	v	v

See details at Annex 4 to the report of the 4th meeting of the RTF-EV in March 2006

Table 2 Framework for Valuing Impacts of Land-based Pollution on Coastal Habitats

Types of Pollutants	Impacts	Mangroves			Coral Reefs			Seagrass			Coastal Wetlands		
		Prod.	Amenity	Human welfare	Prod.	Amenity	Human welfare	Prod.	Amenity	Human welfare	Prod.	Amenity	Human welfare
Heavy metals	• Water quality	v	v	v	v	v	-	v	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	-	-	v	-	-
Organic matter	• Water quality	-	-	-	v	v	-	v	v	-	v	v	v
Nutrients	• Eutrophication	-	-	-	v	-	-	v	-	-	v	v	-
	• Algal blooms and/or overgrowth	-	-	-	v	-	-	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	-	-	v	-	-	v
	• Extreme spills smothering of organisms	v	v	-	v	v	-	v	v	-			
	• Water quality	v	v	v	v	-	-	v	v	v	v	v	-
Sediments	• Smothering of benthic communities	v	v	-	v	v	-	v	v	-	v	v	-
	• Reduced light penetration from increased turbidity leading to reduced primary production	-	-	-	v	v	-	v v	v v	v -	v v	- -	- -
	• Water quality	v	v	-	v	v	-						
	• Change of water depth	v	v	-	v	v	-	v	v	-	v	v	-
	• Change of species composition of benthic communities	v	v	-	v	v	-	v	v	-	v	v	-
POPs	• Water quality	-	-	v	v	-	-	v	v	-	v	v	v
	• Contamination of seafood	-	-	v	-	-	v	-	-	v	-	-	v
	• Reduced fish reproductive capacity	v	-	-	v	-	-	v	-	-	v	-	-
Solid waste (plastics)	• Smothering of organisms	v	v	-	v	v	-	v	v	-	v	v	-
	• Biosorption of plasticizing agent	v	-	v	v	-	v	v	-	v	v	-	v
Thermal pollution	• Reduced productivity	v	-	-	v	-	-	v	-	-	v	-	-
	• Loss of species	v	v	-	v	-	-	v	v	-	v	v	-
Bacterial contamination	• Reduced use as bathing area	-	-	-	-	v	-	-	v	-	-	v	-
	• Contamination of human food sources	v	-	v	-	-	v	-	-	v	-	-	v
Change in pH Acid Pollution	• Change of water and sediment quality	v	-	-	v	-	-	v	v	-	v	-	-
	• Loss of species (fish)	v	v	-	v	v	-	v	v	-	v	v	-

See details at Annex 4 to the report of the 4th meeting of the RTF-EV in March 2006

Table 3 Procedures to Undertake Valuation of Impacts of Land-based Pollution on the Productivity of Coastal Habitats and Resources.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
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) • Quantities of products harvested, sold, given away and used (before and after) • Total areas under consideration (before and after) • Concentration level of heavy metals • Exchange rates and the years of data collected **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.
	Reduced reproductive capacity	On site sale value for human food sources using net price	Loss of income due to decreased production of food sources	• Prices before and after pollution • Change in production before and after heavy metal pollution	Change of productivity is caused only by heavy metals
	Contamination of human food sources	On site sale value for human food sources using net price	Drop in price due to the decrease in demand	• Prices before and after pollution • Quantities of products harvested, sold, given away and used (before and after)	• People are aware of the polluted food sources • Market price changes reflect the changes in demand • All externalities are identified and included in the price.
	Bio-accumulation	On site sale value for marine food products	Drop in price due to the decrease of demand	• Prices of marine food before and after pollution	• People are aware of the bio-accumulation of marine food products • Market price changes reflect the changes in demand

See details at Annex 4 to the report of the 4th meeting of the RTF-EV in March 2006

Table 4 Procedures to Undertake Valuation of Impacts of Land-based Pollution on the Amenity Value of Coastal Habitats and Resources.

Types of Pollutants	Impacts	Valuation Technique	Indicator of Measurement	Data Needed	Notes and Assumptions
Heavy metals	**Water quality**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey (before and after water contamination) • Socio-economic variables • Geographic origin • Time spent travelling • Expenditures incurred in visiting the site • Frequency and duration of visits • Number of visitor-days for the site	Assumptions • Access to the site is available to all • Visits have a single purpose • Demand function relationship can be specified • No factors aside from travel cost influence site use • Market prices used in valuation are not distorted
		Contingent valuation: willingness to pay for good water quality	Recreational value of the site as valued by willingness to pay by users (US$) 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
		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
Organic matter	**Water quality**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey (before and after water contamination) • Socio-economic variables • Geographic origin • Time spent travelling • Expenditures incurred in visiting the site • Frequency and duration of visits • Number of visitor-days for the site	Assumptions • Access to the site is available to all • Visits have a single purpose • Demand function relationship can be specified • No factors aside from travel cost influence site use • Market prices used in valuation are not distorted
Oil and hydrocarbons	**Contamination /tainting of aquaculture and**	Travel cost: Amount of money and time spent on the site	Annual recreational value of the site (US$)	Data from visitors survey (before and after water contamination) • Socio-economic variables • Geographic origin • Time spent travelling	Assumptions • 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

See details at Annex 4 to the report of the 4th meeting of the RTF-EV in March 2006

Table 5 Procedures to Undertake Valuation of Impacts on Human Welfare of Land-based Pollution of Coastal Habitats and Resources.

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

See details at Annex 4 to the report of the 4th meeting of the RTF-EV in March 2006

PUBLICATIONS

- UNEP, 2007. Procedure for Determination of National and Regional Economic Values for Ecotone Goods and Services, and Total Economic Values of Coastal Habitats in the context of the UNEP/GEF Project Entitled: *"Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand".* South China Sea Knowledge Document No. 3. UNEP/GEF/SCS/Inf.3

- UNEP. 2007. Guidelines for Conducting Economic Valuation of Coastal Ecosystem Goods and Services. UNEP/GEF/SCS Technical Publication No. 8.

UNEP/GEF Implementing the Strategic Action Programme for the South China Sea and Gulf of Thailand (SCS SAP Project)

PLAN FOR IMPLEMENTATION OF THE SAP ON ECONOMIC VALUATION AND BLUE ECONOMY OF THE SCS SAP PROJECT, 2024-2026

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Outcome 2.1 Enhanced information-base for coastal habitat management, monitoring and action planning

2.1.3 Roles of coastal habitats for blue economy development in the South China Sea, and assessment of data/information needs for the blue economy

- Regional: Agreement on key principles for the development of the blue economy in the region, including the role of coastal habitat conservation in the blue economy
- National: Review of available data and information related to assessment of role of habitats, including all ecosystem services from coastal habitats/ecosystems (such as climate change adaptation, mitigation)

Execution: Consultancy work with participation of RTF-EV and national EV experts

2.1.4 Review of status and potential of blue economy in the region and linkages to coastal ecosystems

- Regional: Report on current status of Blue Economy in the region and linkages to coastal ecosystems.

Execution: Consultancy work with participation of RWG on habitats

Outcome 2.4 Updated Total Economic Values of coastal habitats for use in development planning and decision-making and blue economy

2.4.1 Expanded datasets and estimates of economic valuation information on the goods and services of SCS coastal ecosystems

- National: Desk reviews on economic valuation conducted in countries
- Regional: Report on the methodology and best practices on economic evaluations, updating the Economic Valuation carried out under Phase 1 (2002-2008) to include new data from the region, considering TEEB methodologies, blue economies, and blue carbon.

Execution: Consultancy work with participation of RTF-EV

2.4.2. Compilation of good examples, and identify recommendations to strengthen a blue economy (and circular economy) approach and innovative financing for pollution and habitat management

- Regional: Report on good examples and recommendations to strengthen blue economy (and circular economy) approach and innovative financing for pollution and habitat management

Execution: Consultancy work with participation of RTF-EV

Outcome 3.3 Relationships between central and local governments and the private sector strengthened and formalized

3.3.1 Review of current Blue Economy examples from the SCS region with private sector engagement as part gf blue economy strategies

- Regional: Compilation of ongoing private sector partnerships in blue economy, in parallel to output 2.4.2

Execution: Consultancy work in partnership with other regional organizations

3.3.2 Identification of blue economy and blue finance opportunities for private sector investment (e.g. fisheries, tourism, others) in implementation of the updated SAP

- Regional: Report on opportunities for private sector investment and long-term financing mechanism for the implementation of the updated SAP

Execution: Consultancy work in partnership with other regional organizations

3.3.3 Public-private partnerships and investment plan for the implementation of the updated SAP solidified through two blue economy partnership forums

- Regional: Partnership forum organized with commitments to support implementation of updated SAP

Execution: Consultancy work in partnership with other regional organizations

3.3.4. Updated and adopted National Investment Plans for land-based pollution and habitat management in the SCS

- National: National Investment Plans for land-based pollution and habitat management in the SCS

Execution: Consultancy work in cooperation with National economic experts

3.3.5. Identification of options for regional financial mechanism for land-based pollution and habitat management

- Regional: Prioritized List of Options for financing future implementation of land-based pollution mitigation and habitat management

Execution: Consultancy work in cooperation with RTF-EV