REVERSING ENVIRONMENTAL DEGRADATION TRENDS IN THE SOUTH CHINA SEA AND GULF OF THAILAND
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Science for Management at Mu Koh Chang, Thailand

UNEP/GEF Project on Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand

Specialised Executing Agency (SEA) : Coral Reefs-Thailand
Ramkhamhaeng University

Coral Reef Demonstration Site, Mu Koh Chang, Thailand

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- about 60 islands, 16 km^2 of coral reefs
- Mu Koh Chang Marine National Park was established in 1982.
- A new tourism destination in Thailand.
- A Special Administrative Zone since 2002.
- A coral reef demonstration site under UNEP/GEF SCS Project.

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Coral Reef Demonstration Site: Mu Koh Chang, THAILAND

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The main objective of the project was to remove or reduce the causes of coral reef degradation in Mu Koh Chang

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A new model of co-management in the area and restoring certain deteriorated areas for education and tourism purposes

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What can "Science" provide for management?

SCIENCE

↓

Knowledge and Information

↓

Solution, Interventiom

"Good management relies on good knowledge and information"

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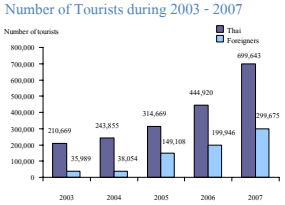
Due to the dramatic growth of tourism in the area, there is potential for the degradation of natural resources by
- Coastal development
- Marine tourism

Number of Tourists during 2003 - 2007



At the same time, fisheries related threats and natural disturbance, coral bleaching and storm, still occurred in the area

Documented Threats	Consequences	Management Tools
Man-made Coastal Development	↓ Reduce coral base services ↓ Public health ↑ Coral disease	-Self assessment for coastal management -Control land-based pollution
Marine Tourism	↓ Reduce coral base services	-Tourism fee for reef management -Carrying capacity study -Snorkeling trail -Coral reef monitoring program
Fisheries	↓ Reduce coral base services ↓ Biodiversity and ecosystem function ↑Economic hardship for fishers	-Socio-economic study -Artificial reef - Coral reef monitoring program
Natural disturbances Coral Bleaching	↓ Reduce coral base services ↑ Coral disease	-Coral reef monitoring program
Storm	Area of extensive coral mortality Reduced resilience of reef locally	-Demonstration site for coral rehabilitation -Coral reef monitoring program

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Development of self-assessment questions for success in coastal management

- Efficiency and appropriateness of self-assessment questions were tested
- The questions were tested with selected coastal management projects in Thailand.

The results indicated that…

- Coastal management requires participation from all related stakeholders
- Dissemination and building public awareness are needed and this will lead to stakeholders' acceptance

"A manual for self assessment of coastal management"

….a tool to help assess project implementation following steps of the project management cycles, beginning from the initiation to the completion of the projects. This will also be used as guidelines for further project planning and training …

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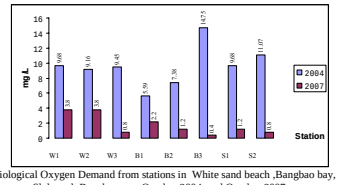
Monitoring and Control of Land-Based Pollution

Aimed at quantifying pollution of coastal waters from land-based sources on Koh Chang

Ten (10) water quality parameters were measured, pH , Temperature, BOD, DO, Ammonia-Nitrogen, Nitrite , Nitrate, Orthophosphate Phosphorus, total Coliform bacteria ,Fecal Coliform Bacteria



Biological Oxygen Demand from stations in White sand beach ,Bangbao bay, and Slukpetch Bay between October 2004 and October 2007

It is important to have practical land based pollution management plans in order to control pollution from the growing tour-business in Koh Chang.

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Study to determine tourist fee for coral reef management purposes

"If the Park increases its entrance fee to _____ Baht per visit, would you still choose to come to Ko Chang?"

- Employed CVM (contingent valuation method): technique that allows the value of environmental goods and services to be estimated by asking people directly to determine an entrance fee for visiting reef sites at Ko Chang National Park.

A visitor's willingness to pay the entrance fee was estimated as 161.52 Baht per visit.

Economic valuation of the benefits of coral reefs can provide information for the design of coastal area management plans

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Carrying capacity study for tourism in Mu Koh Chang

Study of Koh Yak Lek

-**Physical Capacity**
→ *128 tourists at one time*

-**Facility Carrying Capacity**
→ *212 tourists at one time*
→ *6 boats or 18 speed boats at one time*

-**Psychological Carrying Capacity**
→ *204 tourists at one time*

- **Ecological Carrying Capacity**
→ *Limit of Acceptable Change (LAC)*

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An underwater snorkeling trail with underwater notes on coral reef organisms and best practice for snorkellers

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SOCIO-ECONOMIC STATUS OF THE LOCAL COMMUNITY THAT USE CORAL REEFS AS FISHING GROUNDS

- Studied general socio-economic status of local community and their opinions on coral reef conservation matters
- Studied fishing activities of fishermen, and the costs and returns from fishing

Conclusions

- Fishermen conduct fishing activities in every season and use all gear types
- Most fish caught in coral reef areas are Milk Spotted Puffer, Parrot fish and Damsel fish. More than half of all production is sold in local markets.
- Most fishermen agreed that current fish production is lower than in the past.
- Tourism development provides options for alternative livelihoods, although most fishermen prefer to continue fishing.

Artificial Reefs

-Provision of fishing ground for local fishermen
- Can reduce degradation of coral reefs

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Coral Composition at Koh Yak

Category	Percent Coverage
Live Coral	**14.8 %**
- *Fungia* spp.	12.4
- *Favites* sp.	1.0
- *Porites* sp.	0.6
- *Porites lutea*	0.4
- *Pocillopora damicornis*	0.4
Dead Coral	**61.6 %**
Rubble	**7.8 %**
Sand	**14.2 %**
Other	**1.6 %**
- Sea anemone	

Monitoring of coral reef conditions: both ecological and socio-economic characteristics

- *LIT*
- *Permanent quadrat*
- *Coral recruitment experiment*

and mapping of additional coral reef areas

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- GIS Database for Coral Reef and Marine Organisms

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Demonstration of coral reef restoration

-Potential benefit for ecotourism, education, raising public awareness, ecosystem restoration and research.

-Involvement of local communities, government agencies, the private sector and NGOs.

-Natural coral fragments were used in order to increase the survival of natural coral fragments.

-Provide artificial substrates for coral recruitment.

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Demonstration of coral reef restoration

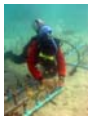
Four coral restoration methods were shown at the demonstration site:

i) additional substrate for coral recruitment by using clusters of cylindrical concretes lay in triangle model;

ii) attaching branching *Acropora* spp. with screws to designed PVC pipe frames in the coral nursery area;

iii) additional substrate for coral recruitment and attaching coral fragments by using clusters of concrete blocks fused in horizontal and vertical directions;

iv) attaching branching fragments to dead branching corals by means of plastic straps.



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"Science-based management , together with bolstering governance and local participation in management are essential to be effective under the challenges imposed by local and global stresses. "

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