

Economic Instruments for Thai Marine Rehabilitation

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Abstract. Seven economic instruments including property right regime, tradable permit, bond and deposit refund, liability, fiscal instrument, financial instrument, and charge system were considered for rehabilitations of coastal resources including mangrove, coastal water, coral, sea grass and seaweed, tourism, and fishery resources. Criteria on selective economic instruments were previous practice, management administration, technique including flexibility and efficacy, acceptability, and revenues. For mangrove, recommended instruments were fiscal and financial instruments providing the coordination among relevant agencies. For waste waters and garbage disposal in coastal areas, pollution charge was recommended while revenues should be transferred to strengthening management capability of locals. Liability system was recommended for coral through collaboration with local community in monitoring on resource abundance. Charge system on visiting quota could be applied in order to earn revenues for the operating cost. In case of sea grass and seaweed, liability system, conservation incentive, soft loan and subsidy could be applied. Charge system and the establishment of reasonable fee were recommended for Thai marine tourism. Tradable tourism quota should be in accordance with the environmental carrying capacity. Financial instrument could be applied and be paid for local environmental management cost. For small scale fisheries, community based fisheries management was recommended on the condition that suitable geographical location to accommodate exclusive right in local fisheries be identified. Priority should be given to fishing community with strong and capable community organization. Government could take part in co-management to strengthen community capacity and enforcement. Successful pilot project was the key of success. Individual transferable quota was recommended only for commercial fisheries provided improvement on landing and its regulation. Fishing fee should be adjusted to reflect true value of fishery resources.

Keywords: economic instruments, coastal resources, fishery resources

1. INTRODUCTION

Economic problem concerning Thai Sea management could be grouped into three categories: market failure, lack of property right, and externalities. These problems led to overexploitation of and adverse environmental impact on coastal and marine resources. In this study seven economic instruments including property right regime, tradable permit, bond and deposit refund, liability, fiscal instrument, financial instrument, and charge system were considered for rehabilitations of Thai marine resources including mangrove, coastal water, coral, sea grass and seaweed, tourism, and fishery resources.

2. PROBLEMS IN THAI SEA REGULATION

Rapid coastal development along the 2,614 km Thai coastlines led to adverse environmental impact on Thai Sea. Coastal areas had been converted for coastal community development as well as shrimp farming and other agricultural activities. Deterioration in coastal resources and environment resulted in degradation of coastal resources abundance. Overexploitation of coastal areas could be observed from the lower coastal water quality, deteriorated coastal land including mangrove areas, and lower catches from coastal waters.

To combat the problems of degraded water quality, Thai government put effort on regulation of water discharge from industrial plants along the coastlines. Waste water must be treated to meet the requirement before discharging. Waste water treatment system was promoted. Standards for coastal water quality was established and regulated. Coastal land use had been planned according to their environmental carrying capacity to minimize adverse environmental impact. People participation was encouraged for effective enforcement and monitoring. Sewage and garbage disposal system were developed to reduce adverse impact from rapid coastal community development. For mangrove, existing mangrove area would be maintained. Activity with adverse impact on mangrove would not be allowed. Research and development on mangrove rehabilitation had been undertaken.

For coral including sea grass and seaweed, the emphases were on education to encourage public awareness on resource values, rehabilitation and conservation regulation.

Fishery resources in Thai Sea had been deteriorated. Catch per unit effort had been decreasing. Coastal fishermen, in lack of alternatives for other fishing ground had been mostly impact from resource degradation. Highly destructive fishing gears including trawl, motorized push net, and anchovy purse seine worsen the conditions. Problems of being multi-species and multi-gear fisheries and scatter landing points increased problems in effective regulation.

Most of the existing regulations were command and control. Long coastlines, limited budget, and limited manpower on monitoring and enforcement resulted in less effective management. Thai Sea resources were degraded. This study attempted to investigate the possibility of adopting economic instruments for Thai Sea rehabilitation as a mean to increase capacity in resource management at a lower cost of administration.

3. ECONOMIC INSTRUMENTS FOR THAI SEA REHABILITATION

Economic instruments were recommended to alleviate problems of market failure, lack of property right and externalities. They included market creation, bonds and deposit refund system, granting property right regime, liability system, fiscal instrument, financial instrument, and charge system.¹ These economic instruments were considered for management regulation on coastal resources and environment including mangrove, beach, coral, sea grass and seaweed, tourism resources, and fishery resources.

Market creation concerned tradable permits on pollutant emission, catch, land, water share, resource share, and development. Tradable permit could be issued for control of emission which had adverse environmental impact. Polluter would have to pay, thus increasing cost of his activity which would reduce the activity and control the environmental impact. It could also be employed in case of fisheries and tourism in order to control the activities at optimum level taking into account their environmental impact. Government could earn revenue from selling tradable permit. In case of transferable, efficient producer could buy out the less efficient one. Nevertheless, management administration cost could be high. Permit must be clearly defined. In case of environmental impact, the impact must be assessable. Cost of monitoring was required to control activity within the permission.

Bond and deposit refund system was an instrument in reducing adverse environmental impact by collecting fee on activity which could have adverse impact in advance. Entrepreneur could be reimbursed afterward in proportion to the adverse impact caused by his activity. Reimbursement would be in full amount in case of non-adverse impact. Disadvantage of this system were low acceptability among the entrepreneurs, difficulty in proving adverse impact and its measurement, and difficulty in applying with numerous small polluters.

Granting property right regime was an instrument in correcting lack of property right. Once the property right had been defined, the owner would bear the cost of exploiting such property. He would try to maximize return from his property, equating marginal revenue to marginal cost. Resources would be less exploited. Nevertheless there was still problem of deadweight loss and thus under exploitation which could adversely impact the consumers. There was also problem on equity in granting common property resources to specific individual or groups of individuals.

Liability system brought about environmental responsibility. Once there was environmental degradation, polluter would have to pay. Effective enforcement and justified fee were keys of success for this instrument.

Taxation could be employed in correcting market failure in order to allow “true” value of resources, thus reducing the overexploitation on Thai Sea resources. Nevertheless there were problem of acceptability and flexibility. Subsidy, on the contrary, could be employed in order to encourage activities which were environmental friendly, provided budget availability.

Unlike fiscal instrument, financial instrument had starting fund which could be available from soft loan or other sources of funding. The trust fund would provide expenses on activities in resource rehabilitation providing incentives on relocating activities which had adverse environment impact on Thai Sea resources or on activities

¹ UNEP(1997).

which were environmental friendly. Nevertheless when financial instrument was applied, polluters were not forced to pay and government had to provide the fund and bear cost of management administration.

Charge system collected payment from the exploitation on Thai Sea resources, thus corrected the market failure. Charge system was considered more direct than taxation since exploiters would realize the impact caused by their activities. It was expected to be effective in adjusting exploitation behaviour. Charge could be on pollutant emission (e.g. on waste water discharge from industrial plant), on entrance fee (e.g. to marine park), and on renewing environmental condition. Charge system could be more flexible than taxation but there were still difficulties in setting the basis of charge, the charge rate, and management administration cost.

Aforementioned economic instruments could be employed individually or together. This study considered five criteria on the use of those economic instruments. The criteria were the practicality, management administration, technique, social acceptability, and government revenue. The practicality was considered from the former application of such instrument. Management administration was considered from management data and information requirement, enforcement and monitoring, and cost. Technique included flexibility and efficacy. Social acceptability put the emphasis on relevant policy makers and communities. Upon these criteria application of the seven economic instruments were considered for Thai Sea resources. Plausible instrument were categorized in to three groups: highly recommended (A), moderately recommended (B), and less recommended (C). In case where it was not possible to clearly identify the plausibility, it would be categorized as relevant (r), indicating that it was possible to be applied and irrelevant (i), indicating that it should not be applied. In case that the instrument had never been used before but there was a possibility to be employed, it would be grouped in to a category of never been employed but possible (p). Details were in Table 1.

Table 1 Criteria of economic instruments for selected Thai marine resources

Item	Practice	Management Administration				Technique		Acceptability		Revenue
		Data	Enforcement	Monitoring	Cost	Flexibility	Efficacy	Policy maker	Community	
Mangrove										
Fiscal instrument	r	B	B	B	C	C	B	C	B	r
Financial instrument	C	B	C	C	C	B	B	B	B	p
Community waste water										
Tradable permit	p	A	A	A	A	A	A	B	B	p
Granting right	p	C	C	C	p	A	A	C	r	p
Fiscal instrument	B	B	C	B	B	C	B	B	C	r
Financial instrument	C	C	C	C	C	i	i	A	B	p
Charge system	r	A	A	A	C	B	B	B	C	r
Industrial waste water										
Tradable permit	p	A	A	A	A	A	A	B	B	p
Fiscal instrument	p	B	A	A	B	C	B	B	C	r
Financial instrument	C	C	C	C	C	i	i	A	B	p
Charge system	A	B	A	A	C	B	B	B	C	r
Garbage										
Tradable permit	p	A	A	A	A	A	A	B	B	p
Bond and deposit	r	C	C	C	C	B	C	A	A	p
Fiscal instrument	p	B	C	B	B	C	B	B	C	r
Financial instrument	C	C	C	C	C	i	i	A	B	p
Charge system	A	B	A	A	C	B	B	B	C	r

Note: Indicators for possibility and suitability are A= High, B= Moderate, C=Low, r = available/relevant but difficult to determine the level of A/B/C, i= Irrelevant or not suitable, and p = Not available yet but possible to be applied.

Table 1 Criteria of economic instruments for selected Thai marine resources (cont.)

Item	Practice	Management Administration				Technique		Acceptability		Revenue
		Data	Enforcement	Monitoring	Cost	Flexibility	Efficacy	Policy maker	Community	
Coral										
Tradable permit	p	C	A	A	A	A	A	B	B	r
Bond and deposit	p	A	A	A	A	C	B	B	B	p
Granting right	p	C	C	C	p	A	C	C	B	p
Liability system	p	A	A	A	A	C	B	B	B	r
Fiscal instrument	p	C	A	A	A	C	B	B	C	r
Financial instrument	C	C	C	C	C	i	i	A	B	p
Charge system	r	B	A	A	B	C	B	B	B	r
Fishery resources										
Tradable permit	p	C	B	B	B	A	A	B	B	p
Granting right	r	A	A	A	B	A	A	B	B	i
Liability system	r	C	C	C	C	A	A	B	C	p
Fiscal instrument	p	C	C	C	A	C	i	B	C	r
Financial instrument	C	C	C	C	C	B	i	B	B	p
Charge system	r	C	C	C	B	B	B	B	B	r

Note: Indicators for possibility and suitability are A= High, B= Moderate, C=Low, r = available/relevant but difficult to determine the level of A/B/C, i= Irrelevant or not suitable, and p = Not available yet but possible to be applied.

Coastal development including coastal aquaculture, agriculture, industrialization, port development, and coastal community development led to decreasing mangrove areas. Zoning had been determined but there was still problem on effective monitoring and enforcement. Recommended economic instruments for **mangroves** included **fiscal measures and financial measures** to provide incentives for reducing mangrove encroachment. Fiscal measures could be subsidy on activities outside mangroves area where exploitation was allowed and public utility provision in areas where activities were allowed to bring people out of conserved mangrove areas. Financial measures could be provision of low interest loan for legal activities in economic areas to attract people from encroaching conserved areas. Fiscal measures were preferable for mangroves. Differentiated royalty rate could be applied for legal activities in mangrove area, higher for the one that was more risky on mangrove deterioration. Data, enforcement and monitoring were moderately available, but there were still costs of management and administration. In term of technique, fiscal measures might not be flexible. Efficacy was considered moderate. Policy makers might not prefer fiscal measure since there was a need of budget while it was expected to be moderately welcome by community. Government revenue could be earned from royalties. Financial instrument was considered better than fiscal instrument only in term on acceptability from policy makers. If the fund had been provided, financial measures, making fund available for mangrove conservation seemed to be more acceptable among policy makers than fiscal instrument.

In employing fiscal and financial instruments for mangrove, it was important that relevant agencies must have unity on mangrove conservation. Mangrove utilization must be allowed only in economic zone. Local agency should take coordinating role in mangrove conservation.

Environmental degradation in Thai Sea and the coastal areas were mainly caused by water pollution and garbage disposal. Some economic instruments such as charge on garbage disposal had been in practice but not effective. Economic instruments which could be employed for controlling **community waste water discharge** were charge system, tradable permit, fiscal instrument, granting right, and financial instrument in that order. Tradable permit was not available yet but possible to be applied. It was highly appropriate in term of management administration and technique but moderately acceptable and possible to bring in government revenue. Nevertheless due to numerous communities, there could be high cost of management. Fiscal instrument was similar to charge system, with less flexibility. Financial instrument could provide fund for maintaining water quality but there was a need to administer loan payment. These two instruments needed effective monitoring and enforcement. Granting right on maintaining beach environment was possible but difficult to bring into practice, thus less recommended. **Charge system** could be most appropriate for coping with problem of community waste water. It was highly recommended in term of management administration, though there were costs involved, moderately appropriate in term of technique, moderately recommended among policy makers though less acceptable among communities, and could bring in government revenue. More important, it had been employed previously thus was most likely to be successful.

Charge system was also highly recommended for controlling **industrial waste water**.² Other possibilities were tradable permit and fiscal instrument while financial instrument was less recommended due to lack of fund.

Charge system was also highly recommended for alleviating problem of **garbage disposal**. This instrument had been utilized but not effective. There would be a need to improve the efficiency of the system. Other instruments could also be employed such as fiscal instrument using tax differentiation for more polluted commodities. Deposit-refund could also be used.

Charge rate on pollution could be varied and could be fixed or varied. Analysis on cost was necessary such that the return from charge rate could cover the cost. There might require some changes in allocation of local revenue to support initial work on reducing the pollution. Responsible agency must be identified to undertake the role and set up the criteria and charge rate.

In case of **coral**, deterioration was caused by fishing and tourist vessels as well as water pollution. Existing conservation measures included buoyancies for coral areas and public awareness but they were not adequately effective. Coral were usually part of tourism area; economic instruments as applied for marine tourism could be applied to coral as well. All of economic instruments could be applied for coral but each had some limitation. Most appropriate one could be **liability system** which would be more flexible together with **granting right** system. Bond and deposit was less likely to be successful. Granting right system had a limited success since most of coral areas were already protected areas under state supervision. Financial instrument was limited by the

² Thai Environment Institute (1997)

fund availability. Fiscal instrument could be supporting instrument together with liability system and granting right, but it was less flexible and less acceptable among communities.

Sea grass and seaweed had an important role in food chain for marine livings. For conservation, the instruments could be those similar to mangroves, i.e. **fiscal and financial instruments** to provide disincentive in exploiting the areas.

In term of managing for conservation the instrument applied on coral, sea grass and seaweed would be similar to mangrove conservation. In case of management for marine tourism, quota on exploitation, a mean of **liability system**, could be applied. Number of visitors should not be beyond environmental carrying capacity, There could be quota fee to cover management administration costs. Enforcement and monitoring would be necessary. Revenues could be distributed to local agency in responsible for the resources.

In term of fishery resources, tradable permit had never been used in Thailand. Nevertheless in an attempt on reducing fishing effort, there was an interest in applying licensing on fishing vessels. Decision had not been reached due to problem of issuing the license and transferability. There was a need in better data in management though in terms of enforcement, monitoring and costs of management and administration it could be moderately recommended. Still, if the limited licensing required buying back, there were problem on costs of buying and monitoring to ensure that the fishermen would absolutely quit fishing. Tradable permit was considered highly flexible and effective but moderately acceptable among policy makers due to costs and enforcement while it was moderately acceptable among communities since some fishermen would have to stop fishing. There were problem on issuing the permit whether it would be free or paid by the fishermen. Both led to problem in basis of granting on one hand and consent of fishermen on the other. **Tradable permit** had been considered to be employed in **commercial fishing** where fishermen had better alternatives; still there was problem on cost and monitoring.

Granting right system was granting the right to fish. In Thailand there had been attempt on development of community based fishery management which was considered a type of granting right. For **coastal fishery** where data were also available from indigenous knowledge, enforcement and monitoring could be adopted from the collaboration between local organization and state, and provided budget on strengthening management capacity of local organization, granting right system could be recommended for coastal fisheries. It was considered to be highly flexible and efficacious. Nevertheless problem could be some what remained for policy makers in term of equity and among communities on their capacity. Once property right could be defined, fishermen would adjust their behaviour in fishery resource utilization, to maximize benefit from their ownership.³ Fishery resources could be renewal then.

Liability system had been employed but there were problems in data, enforcement and costs of management administration. In term of technique it was flexible and efficacious. Due to problem in management administration it was moderately acceptable among policy makers but less acceptable among communities being a regulation. Examples were closed areas which had been effective in resource renewal but difficult to manage. This instrument would not bring in government revenue unless there was violation which was not desirable. For effective enforcement the punishment on violation should be adequately high and monitoring should be efficient. Both were problems for fishery management in Thailand.⁴

Fiscal instrument would be difficult in Thai fishery especially in the period of resource degradation. Taxation was not welcome both by taxpayer and elected policy makers. It was considered not practical in case of Thai fisheries. Similarly, financial instrument would not be recommended due to lack of funding and problem of equity, though it seemed to be more acceptable among beneficiaries from the fund. Buyback program for fishing vessels was difficult to be undertaken due to lack of fund.

Charge system was considered better than the last three instruments. It had been employed but the rate was too low, not reflecting fishery resource cost and could not cover management administration cost. Provided the rational charge rate, it could be employed.

³ Ruangrai Tokrisna (1997)

⁴ Somporn Isvilanonda et al (1990)

4. POLICY RECOMMENDATION

In this section conclusion on policy recommendation on Thai Sea rehabilitation were as follows.

Resources	Activities
Mangroves	
Target	Reducing incentive in mangrove utilization while increasing incentive for other area utilization
Economic instruments	Fiscal and financial instruments to set up the incentives
Operation	Unity among relevant government agencies
Responsible agencies	Relevant agencies responsible in areas around mangroves and mangrove areas.
Relevant measures	Effective measures on mangrove conservation Coordination among relevant agencies Effective monitoring and enforcement
Beach and coastal waters	
Target	Reducing the pollution.
Economic instrument	Charge system Local revenue earning for expenses on treatment to reduce pollution
Operation	Charge on waste disposal and treatment Adjust tax structure in corresponding to local authority in environmental management Develop local environmental management trust fund Develop third-party monitoring system
Responsible agencies	Ministry of Finance Provincial and local administration offices Tambon (Village) Organization Administration
Relevant measure	Develop capacity of local administration in environmental management.
Coral	
Target	Increase public awareness, training and regulation
Economic instruments	Liability system and granting right Quota on exploitation
Operation	Training for local beneficiaries Increasing public awareness Set up buoyancies in coral areas Training for relevant agencies Management on coral in marine tourism area using the revenue from quota fee
Responsible agencies	Royal Forest Department Department of Fisheries Tourism Authority of Thailand
Relevant measure	Quota on visitors in marine tourism area
Sea grass and seaweed	
Target	Reducing incentive in area utilization while increasing incentive for other area utilization
Economic instruments	Fiscal and financial instruments to set up the incentives
Operation	Determine guideline for relevant agencies in utilizing the areas Unity among relevant agencies in conservation areas
Responsible agencies	Relevant agencies in the areas
Relevant measures	Effective measures on area conservation Coordination among relevant agencies Effective monitoring and enforcement

Resources	Activities
Marine tourism areas	
Target	Utilization according to carrying capacity
Economic instrument	Charge system Quota on number of visitors in accordance to area carrying capacity
Operation	Quota revenue for environmental management in the area Establish quota ticket offices Monitoring and enforcement on access to the area Adequate punishment on violation
Responsible agencies	Royal Forest Department Tourism Authority of Thailand Provincial Office Tambon Administration Organization
Relevant measure	Allocation on quota revenue on environmental management
Coastal fisheries	
Target	Renewal resource abundance for sustainable utilization among coastal communities
Economic instrument	Community based fishery management
Operation	Granting fishing right to appropriate coastal fishing communities according to justified physical, legal, and social conditions
Responsible agencies	Department of Fisheries Local Administration Authority
Relevant measures	Strengthening local fishery management capacity Government support on enforcement
Commercial fisheries	
Target	Renewal fishery resource abundance by reducing fishing effort to the optimum level
Economic instrument	Granting fishing right through tradable permit on fishing quota
Operation	Determine individual fishing quota Quota allocation on basis of fishing vessels Improve landing facilities to support quota control
Responsible agencies	Department of Fisheries Fish Market Organization Harbour Department Local Authority Thai Fisheries Association
Relevant measure	Liability system and charge system, at rational fee

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