

COMPONENT 1

POLICIES AND MARKET INCENTIVES  
IN SUPPORT OF NATURAL CAPITAL



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## POLICIES AND MARKET INCENTIVES IN SUPPORT OF NATURAL CAPITAL

### OUTPUT 1.2.11

EVALUATE ALTERNATIVE MARKET-BASED INSTRUMENTS (MBI), AND SELECT ONE VIABLE INSTRUMENT FOR FURTHER DEVELOPMENT

### OUTPUT 1.2.12

BUILD POLITICAL SUPPORT, INSTITUTIONAL CAPACITY AND PRIVATE SECTOR FOR INTRODUCING THE SELECTED MARKET-BASED INSTRUMENT INTO THE NATIONAL POLICY MIX

#### Author

**Udomsak Seenprachawong**

National Institute of Development Administration

**Adis Israngkura**

Thailand Development Research Institute (TDRI)

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# 1. Overview of Market Based Instruments

The set of market-based instruments (MBIs) available for implementing an economic incentives approach to natural resource and environmental management covers a wide range of options and possibilities, and the potential mixes are virtually limitless. Governments can use a range of MBIs to implement their environmental policies. MBIs include taxes, charges, levies, tradable permit schemes, deposit refund systems, subsidies etc. These instruments can be applied to provide firms and households with incentives to change their behavior towards more efficient use of natural resources by reducing consumption, and to look for more effective ways of making environmental improvement while giving them flexibility in how they do so. In theory, if suitably designed and employed, MBIs will permit any anticipated level of pollution clean up to be realized at the minimum overall cost to society, by providing incentives for the maximum reductions in pollution by those firms that can reach these reductions most economically (Stavins, 1997)

Whether by influencing prices (through taxation or incentives), or setting absolute quantities (emissions trading), or quantities per unit of output (emission charges), MBIs indirectly recognize that firms differ from each other and hence offer flexibility that can significantly decrease the costs of environmental improvements (EC, 2000).

## 1.1 Main Principles in Using MBIs

### 1) Environmental effectiveness

The most important issue to highlight is that any environmentally related MBI should cause change in consumption or production pattern which will lead to lessen environmental degradation. If an instrument fails to do that, it should be considered whether to change or even abandon the instrument.

### 2) Economic efficiency

One of the advantages of MBIs is their effectiveness on every unit of pollution. Taxes encourage both static (abatement at the lowest-cost source) and dynamic efficiency gains (continuous reduction of pollution abatement costs and pollution levels).

### 3) Equity/income distribution

Policy makers need to study the impact of such taxes also on sensitive groups such as poor households or pollution-intensive. Lower tax rates or exemptions are sometimes put into place to limit impacts on such groups. Usually, it is recommended not to make exemptions into tax system itself, but rather use other policy instrument to overcome the distributional problems.

### 4) Competitiveness

The objective of economic instruments (particularly taxes) is to make activities with higher environmental impact less profitable in an economic sense. It means that, at the firm level, there are always firms that are better off than others – those who pollute less or are more efficient in their resource use. The competitiveness issue

increases more abruptly at a sector or national level, where taxes or tradable permit schemes imposed may have a adverse impact on international competitiveness (if the instrument is applied only at local/national level).

#### 5) Acceptance, stakeholder involvement

The acceptance of environmental taxes is associated with awareness about environmental problems in society. Opposition to environmental taxes may be caused by not enough information about the purpose of the tax, little trust of assurances in how the revenue is used, fear of loss of competitiveness or other reasons. Well-designed taxes are highly transparent in terms of their coverage and costs. It should be clear what is taxed, which polluters are exempt, and what the cost to polluters will be per unit of pollution generated.

An assessment should take place to evaluate which groups are most influential, and what their main goal is. Allocation of rights in the baseline is also quite important: groups with existing rights, whether actual or implied, will often have more power/interest in fighting changes to existing policies. The partial analysis should also assess what options exist for safeguarding any social impacts that may arise from the policy reform, especially those that affect the poor (UNEP, 2004; OECD, 2011).

### 1.2 Main Concerns About Using MBIs

Even though there are many successful examples of using MBIs, there are studies showing that MBIs are not always the best instruments for attaining change in behavior (UNEP, 2004; Fullerton et al., 2010).

There are various reasons or situations where MBIs may not succeed and regulatory and other instruments might be more successful in achieving the objectives:

**Emergency conditions.** When problems have severe implications, emergency conditions arise, and behavior needs to stop immediately, direct regulations may be more appropriate.

**Excessive monitoring costs.** When there are many small transactions (e.g., emissions trades) monitoring costs may be very high so regulations may be appropriate.

**Fragmented authorities.** Where authority to formulate and enforce regulations is highly fragmented across institutions, oversight of market-based instruments can become difficult.

**Equity/distributional issues.** Increasing prices to cover their full resource cost will impact on consumer groups where they cannot switch to alternative goods and services, and this may be of concern where they are sensitive groups such as low-income households.

**Illegal activities.** MBIs can encourage cost-avoiding damaging activities, such as illegal waste dumping.

**Strong opposition.** Where political power and interest group factions remain strong, policy makers need to judge the most prudent course.

**High level of dislocation.** Where large numbers of people will be displaced or unemployed as a result of MBIs, caution is required.

**No ability to make transitional payments to affected sectors.** From an economic perspective, it is more efficient to remove broad-based subsidies and replace them with direct payments to the poor. Examples include transitional subsidies to water, energy, and foodstuffs for the poor segment of society. However, in corrupt societies, the transfer payments to the poor are unlikely to occur. Thus, monitoring and enforcement are essential to avoid widespread hardship or social unrest.

**International competitiveness.** Taxes on industrial inputs increase the costs of production. If the domestic production competes with the foreign producers (without the tax) then it may harm the competitiveness of domestic firms.

### 1.3 Main Types of MBIs

The European Environmental Agency (EEA) has classified MBIs into four main types based on their objective and functioning (EEA, 2005):

- 1) Fiscal instruments such as taxes and subsidies could be used to bridge the gap between private and social costs/benefits. Environmental taxes can then be used to effect full-cost pricing (i.e., to bridge the gap between private and social costs). Fiscal instruments include not only taxes but also subsidies.
- 2) Environmental charges that have been designed to cover (in part or in full) the costs of environmental services and abatement measures such as waste water treatment and waste disposal.
- 3) Tradable permits that have been designed to achieve reductions in pollution (such as emissions of SO<sub>2</sub>) or use of resources (such as fish quotas) in the most effective way through the provision of market incentives to trade.
- 4) Deposit refund systems are a type of MBI that seek to address negative externalities that arise as a result of the inappropriate disposal of consumer products. The DRS is an example of a price-based MBI that combines a charge and a subsidy which together acts to encourage individuals to engage in recycling.

### 1.4 Fiscal instruments

Fiscal instruments such as taxes and subsidies could be used to bridge the gap between private and social costs/benefits. For example, the prices of polluting products such as gasoline or pesticides do not incorporate the social costs of damage to peoples' health and other activities which arise from their use because these costs are external to the decision maker (producer or consumer). Hence polluting inputs and final products are generally underpriced, both absolutely (in terms of social costs) and in relation to non-polluting or less polluting products. This results in overproduction and overconsumption which in turn result in environmental damage at a higher than socially optimal level.

Taxes are generally considered to be unrequited payments to (usually) national or regional governments with no individual counterpart service received in exchange for the payment. They are typically used as revenue raising instruments. Charges, on the other hand, are typically payments made in exchange for a service, with the charges usually levied in proportion to the quantum of service received, and so the terms 'user charges' or 'cost recovery charges' are often used in this context (Panayotou, 1994).

### 1.4.1 Environmental taxes

Environmental taxes can be levied on (a) the pollutant itself (i.e., on effluents, emissions, or solid waste), or (b) on final products associated with environmental externalities (Eftec, 2004).

Taxes on pollutants are applied directly to the offending substances thereby providing the maximum incentive and flexibility for the polluter to reduce pollution; therefore, pollution taxes are more efficient than indirect taxes on inputs or final products. Economic theory suggests that direct taxes on polluting emissions will reduce environmental harm in the least costly manner, because they give polluters an incentive to reduce their pollution up to the point where further reduction would cost more than paying the tax, and to do so in the least costly way (TPC, 2007). It can provide incentives for innovation.

Taxes on products or inputs do not provide incentives for the development and installation of pollution abatement technologies.

Emission and effluent taxes can be structured in such a way as to provide a progressive incentive for pollution control. For example, in Germany, polluters who more than meet the set effluent standards are charged a lower rate while those who violate the standards pay a higher rate than the charge set for those who meet the standard (Hogg et al., 2014).

Taxes on inputs and final products whose production or consumption are associated with pollution externalities, though indirect and hence less efficient, have the advantage of relying on the administrative procedure of the existing tax systems. No monitoring of the sources and levels of emissions or effluents is needed and product taxes can be easily collected from producers at the time of exchange (sale, export, import). Examples include taxes on fuels, on industrial chemicals, and on pesticides. The tax induces reduction in the use of these products and proportional reduction in the production of pollutants but provides no incentive for pollution abatement; its ability to act as an incentive for pollution reduction depends on its level being high enough and the demand for the product elastic enough to discourage the consumption and thus production of the product. Environmental taxes on final products are particularly suited to the control of consumption-related pollution, because consumers are made aware, through higher prices, of the environmental consequences of their choices.

The acceptance of environmental taxes is in good correlation with awareness about environmental problems in society. Opposition to environmental taxes may be caused by not enough information about the purpose of the tax, little trust in assurances of how the revenue is used, fear of loss of competitiveness or other reasons. Well-designed taxes should be highly transparent in terms of their coverage and costs. It should be clear what is taxed, which polluters are exempt, and what the cost to polluters will be per unit of pollution generated.

Finding the proper level of taxation is critical to the effectiveness of the instrument because it is difficult to estimate exactly how much pollution reduction will result from any given tax (Hatch, 2005).

Policy makers can be expected to fully explore the factors that are likely to determine the effectiveness of the tax, and consider the potential need to be flexible and ready to make changes in the design of the tax, should

the circumstances change. For example, increasing commodity prices could result in reducing the case for taxes to raise the price.

Taxes, such as carbon pricing, are a clear illustration of the risk for MBIs to bring competitive disadvantage (there are many other factors influencing competitiveness, such as skills, infrastructure, proper functioning of institutions, etc.) and losing market shares against competitors that do not face a carbon tax (Greene ,2013).

Industries that are subject to a climate policy have the potential to move their production to countries without such taxation, reducing the employment opportunities and the economic output within the implementing country. Opposition to increased environmental taxes often focuses on concerns that firms might relocate and/or people might lose their jobs.

The introduction of some taxes (e.g., carbon tax) can have a regressive impact, as low-income households tend to spend a higher share of their income on energy bills and energy intensive goods. However, the final distributional impact of carbon pricing depends on the government's allocation of the revenues raised or expenditures saved through the carbon pricing mechanisms (Greene, 2013).

Introducing a tax creates a conflict between objectives: less pollution means less revenue. This means that evaluation of the tax needs to be undertaken against its direct objectives but also in the context of the wider tax and spend policy, as part of environmental tax reform.

#### **1.4.2 Environmental subsidies**

Fiscal instruments include not only taxes but also subsidies. Instead of taxing the polluters to reduce pollution to the optimal level, polluters can be subsidized to do exactly that.

The OECD broadly defines a subsidy as “any measure that keeps prices for consumers below market levels, or for producers above market levels, or that reduces costs for consumers and producers” (OECD, 1998). Subsidies can come in the form of:

- direct grants, transfers of funds that are clearly visible in some countries' budgets (i.e., on-budget subsidies);
- tax exemptions (which are generally less visible on government accounts, but can be calculated, so called off-budget);
- other types that are less evident as subsidies: for example, accelerated depreciation of environmentally preferable capital assets (IEEP, 2007); OECD, 2014); and less than full-cost recovery pricing with resources costs/the costs of externalities not borne by the producer and not covered by the price of their goods or services.

Beyond this there are other subsidies that are not always recognized as such: for instance, where prices for goods and services, such as water supply, do not reflect the full costs of provision (i.e., not full cost recovery pricing), or do not reflect the resource costs. A further important category is where there is no internalization of externalities such as environmental damage (i.e., not following the polluter pays principle).

Subsidies have traditionally been used for economic or social reasons, for example to support ailing industries, to help develop vital infrastructure or to protect domestic producers from foreign competition. They can be seen as a way of protecting jobs, either generally or in specific regions, for example support for fishermen to protect coastal fishing communities. The use of subsidies for environmental purposes, however, is more recent, but they are nowadays widely used by government to achieve environmental objectives to encourage more environmentally beneficial behavior (e.g., introduction of cleaner technologies).

Some subsidies are environmentally harmful. These are the subsidies/tax exemptions etc. which confer an advantage on certain consumers, users, or producers, in order to supplement their income or lower their costs, but in doing so, discriminate against sound environmental practice (OECD, 2005). Subsidies are present in all sectors of the economy. The most common areas where subsidies exist include energy and transport (EEA, 2005).

Some subsidies are inefficient use of government resources – notably where the original rationale for the subsidy is no longer applicable.

Some subsidies create environmental burdens – e.g., pollution and climate effect; excessive resource use; or other impacts such as on fisheries stock viability, biodiversity, etc.

Environmentally harmful subsidies (EHS) lead to inefficient working of the internal market, and overall impacts on competitiveness.

EHS can hinder innovation by locking in old technologies and locking out new ones and hence undermining the needed innovation developments for a competitive and environmentally-sustainable economy.

Important targets will not be met or be difficult to meet without reforming subsidies – notably meeting CO<sub>2</sub> reduction targets (IEEP, 2007).

The scale of subsidies with potential negative impact on the environment, notably in the areas of fossil fuels, transport, and water, are estimated to be worth a global total of USD 1 trillion. These subsidies lead to higher levels of waste, emissions, resource extraction, or negative impact on biodiversity (EC, 2011).

## **1.5 Environmental charges**

Environment charges are rarely distinguished from environmental taxes and are often used interchangeably, creating an unnecessary source of confusion and often a source of friction between Ministries of Finance and Environmental Agencies. In this study we distinguish between charge systems and fiscal instruments. Charges are defined as payments for use of resources, infrastructure, and services and are akin to market prices for private goods. One way of thinking of charges is as “prices” for public goods or publicly provided private goods. They differ from market prices for private goods because they are not market determined but are administratively set by a government agency, a public utility, or other types of regulated natural monopoly. This contrasts them with taxes which are not payments for “services” but a means for raising fiscal revenue. Pigouvian taxes, however, may be thought of as a charge for the use of the environment's assimilative capacity (a natural resource or public good) and hence, analogous to a user charge.

A second difference is that taxes are connected to the budget, forming part of the general government revenues while charges are extra-budgetary, aiming to recover cost for a specific public investment or more appropriately, to finance the long-term marginal cost of supply. More importantly, charges are used as instruments of demand management and when set optimally (equal to the long-term marginal supply cost), they may or may not recover supply cost. When the long-term marginal supply cost is falling, “optimal” user charges result in a deficit; when it is rising, they result in a surplus. The deficit is usually met by a subsidy from the general budget, while the surplus either goes to the budget or more often is prevented through regulation of the tariffs charged by a public utility.

We may divide charge systems into three groups. The first group may be called pollution charges, this includes emission charges, effluent charges, solid waste charges, noise pollution charges, and product charges. When set at optimal levels (equal to the marginal damage cost), pollution charges are identical to Pigouvian taxes.

The second group of charges may be called direct or “active” user charges which include utility charges (e.g., for water, electricity, etc.), road tolls, and access fees to parks, beaches, etc. These charges are analogous but not identical to prices for private goods. Road tolls, for example, may be thought of as congestion prices not as prices for gaining access to roads. If there is no congestion, restricting access to roads through road pricing reduces social welfare because there is an unused opportunity to make someone better off without making anyone worse off (known as “Pareto improvement”).

The third group of charges may be called indirect or “passive” user charges and they include betterment charges and impact fees. Betterment charges are usually imposed on private property which benefits from public investments. For example, private property values may increase manifold as a result of new roads, parks, environmental clean ups, etc. While property taxes capture some of the windfall appreciation, betterment charges may also be imposed to collect revenues for financing the relevant public investment or for partial cost recovery. This is an application of the beneficiary pays principle and could be a major source of financing, but its incentive effect is rather limited and indirect: betterment charges, if sufficiently high, may reduce the incentive for private land owners to lobby government officials to influence the location, type, and level of public infrastructure and services in order to benefit their property. Impact fees are charges that aim to internalize the external cost of private investments (construction, tourism, or industrial development) on the landscape or the ambient environment. For example, a charge may be imposed per cubic meter of built-up place. The incentive effect here is stronger than with betterment charges, especially as it applies to new construction. As such impact fees may be classified as “visual pollution charges” and included in the first group, impact fees generally refer to a much larger set of environmental impact, and may, in a sense, be thought of as the reverse of betterment charges.

## **Main Concerns Related to Environmental charges**

Some of the potential risks and challenges that may be encountered in applying this instrument are as follows:

- 1) Lack of, or insufficient, data available on the damage caused by pollution which can vary from one location to another depending on factors such as the location of the population at risk, prevailing wind, sunshine, temperature.
- 2) Challenging to set the pollution charge at the appropriate level to encourage desired behavioral change.
- 3) Political opposition to large revenue transfers from pollution sources (the firms) to the authority imposing the tax (government).
- 4) Pollution can be difficult to measure and it can be costly to implement monitoring schemes, for example in the case of a solid waste collection charge.

## **1.6 Payment for Ecosystem Services (PES)**

Natural ecosystems, including forests, wetlands, rivers, mangroves, and agricultural landscapes, provide a wide range of essential ecosystem services that support human well-being and economic development. These services include the provision of clean water, carbon sequestration, biodiversity conservation, flood regulation, and climate regulation. Despite their significant value, ecosystem services are often overlooked because their benefits are not reflected in market prices. As a result, ecosystems are frequently degraded or converted to other land uses, leading to the loss of biodiversity and natural capital.

Payment for Ecosystem Services (PES) is a market-based instrument that provides economic incentives for the conservation and sustainable management of natural ecosystems. Under a PES scheme, beneficiaries of ecosystem services voluntarily provide financial or in-kind compensation to landowners, local communities, or resource managers who undertake actions that maintain or enhance ecosystem services. By creating direct economic rewards for environmental stewardship, PES helps align conservation objectives with sustainable livelihoods and encourages long-term investment in natural capital.

The primary objective of a PES program is to conserve and restore ecosystems while generating tangible environmental, social, and economic benefits. Specifically, PES seeks to protect biodiversity, improve water security, enhance climate resilience through increased carbon sequestration, and promote sustainable land-use practices that reduce environmental degradation. At the same time, it provides sustainable income opportunities for local communities, Indigenous peoples, farmers, and other land managers whose conservation efforts generate valuable ecosystem services.

An effective PES scheme involves clearly defined service providers, beneficiaries, payment mechanisms, and monitoring systems. Service providers typically include farmers, Indigenous peoples, local communities, private landowners, and community organizations that manage natural resources. Beneficiaries may include governments, water utilities, private companies, tourism operators, carbon market participants, development agencies, and other organizations that benefit directly or indirectly from ecosystem services. Payments are

generally linked to measurable environmental outcomes, such as maintaining forest cover, improving water quality, restoring habitats, or increasing carbon storage. Transparent monitoring, reporting, and verification systems are essential to ensure accountability and that payments are conditional upon the successful delivery of agreed ecosystem services.

A well-designed PES program contributes to multiple sustainable development objectives by reducing deforestation and ecosystem degradation, conserving biodiversity, protecting watersheds, and increasing carbon sequestration to support climate change mitigation. In addition to these environmental benefits, PES can improve rural livelihoods by creating diversified and sustainable sources of income while strengthening collaboration among local communities, government agencies, the private sector, and development partners. Through these combined outcomes, PES promotes the long-term conservation of natural capital while supporting inclusive and sustainable economic development.

### **1.7 Tradable permits**

Market-based tradable (also transferable) permits or cap-and-trade schemes set a limit on access to a resource (the cap) and then allocate it among the users in the form of permits (Tietenberg, 2003).

Under a tradable permit system, an allowable overall level of pollution or use of resource is established and allocated among firms in the form of permits. Firms that keep their emission levels or resource use below their allotted level may sell their surplus permits to other firms or use them to offset excess emissions in other parts of their business (Stavins, 2001).

Tradable permits have been designed to achieve reduction in pollution or use of resources in the most effective way through the provision of market incentives to trade (EEA, 2005).

With tradable permits it is likely to achieve a maximum set level (a cap) at a lower cost than other measures, and, importantly, may reduce below that level due to technological innovation.

The most common forms of tradable permits are: emissions trading on air pollutants (e.g., EU ETS), emissions trading on water quality (nutrients discharges to water courses), resource use allowances (e.g., fishing quotas, animal allowances), etc.

In theory, different tradable permit systems are analogous. However, there may be important differences in practice between, for example, pollution permits markets and fishing quota markets. For instance, controlling and forecasting emissions from a power plant is arguably easier than predicting both the level of catch on any trip and its composition. This is especially true in multi-species fisheries where fish populations cannot be directly targeted without incidental catch of other stocks (Newell et al., 2002).

Where regulators have a good sense of the point at which emissions causing health problems or ecosystems begin to fray, tradable permits are often the best choice. Caps can be set in advance, either based on:

- absolute values (e.g., tons of salmon that can be caught or emissions emitted) or
- relative values (e.g., percent of total allowable catch or emission) (UNEP, 2004).

- Another important aspect of tradable permits is whether they are auctioned or allocated via free allocation/ grandfathering. There are three main modes of allocating allowances:
- competitive auctioning
- free allocation proportional to sources' past emission levels
- free allocation subjected to regular update based on activity levels.

Full auctioning is the most economically efficient approach as it generates budget revenues that can, for example, be used to offset other distortionary taxes and assist with transitional costs. However, some level of free allocation is common practice when trading systems have been introduced. This is generally done to lower direct financial cost and alleviate concerns about international competitiveness. Within the same system, more than one allocation mechanism can be applied, sometimes differentiated across sectors (OECD, 2013).

### **Main Concerns Related to Tradable Permits**

Emissions trading (ET) offers a dynamic incentive and can help ensure that a given target is met, if combined with appropriate allocation of emission allowances. The price of allowances is, however, uncertain and determined by the market. Therefore, the costs of pollution abatement are uncertain, and excessive costs could be occurred (Fullerton et al., 2010).

ET can lead to significant additional administrative tasks and burdens and greater needs for monitoring, verification and enforcement, the costs of which need to be considered in any consideration of whether ET schemes are the sensible solution.

An argument against permits is that formalizing emission rights is effectively giving people a license to pollute, and this can be socially unacceptable.

When using a transferable-permit system, it is very important to accurately measure the initial problem and how it changes over time. This is because it can be expensive to adjust (either in terms of compensation or through undermining the property rights of the permits) (OECD, 2008).

### **1.8 Deposit refund systems**

A deposit-refund system (DRS), or advance deposit fee, is a surcharge on a product when purchased and a rebate when it is returned. This instrument is flexible and can be applied to a wide range of consumer goods from acid lead batteries, small chemical containers, refrigerators and most frequently, beverage containers (AARES national symposium, 2003).

Deposit-refund schemes require paying a deposit on the purchase of potentially polluting products, which is refunded when the products or their residues are returned for recycling or disposal. Consumers who do not return the product pay a charge, whereas those who return the product receive a refund and are rewarded for behaving in an environmental responsible manner.

Under the scheme, consumers of packaging or container materials are given the right to a refund if the waste product is returned to the seller, i.e., to an authorized recycling or reuse point.

California and Hawaii have undertaken a slightly different approach to the design of the DRS. Retailers collect deposits from final consumers and then transfer the collected deposits to distributors. Distributors, in turn, pay the deposits to the state government. Under this approach retailers and distributors are not responsible for collecting used containers and for returning refunds to consumers. Rather, consumers return used containers to redemption locations and receive refunds that come directly from the state-managed program. Under this system, all unclaimed deposits stay with the state (Beatty, Berck & Shimshack, 2007).

Two advantages of this approach are that unclaimed deposits can be drawn upon by the state to supplement environmental programs. Secondly, having centrally located redemption locations may lessen the burden on smaller retailers for storage space and maintenance of the system. This approach may also be appropriate in urban areas where capacity to operate schemes may be low.

The deposit return system can potentially be associated with several co-benefits, including:

- Alleviating poverty through job creation associated with the establishment of recycling centers;
- Generating additional revenue (from unredeemed deposits) that may be used by government to achieve other environmental objectives:
- Reducing illegal dumping;
- Encouraging recycling and reducing the amount of waste sent to landfill;
- Raising awareness of the connection between consumer behavior and environmental degradation;
- Improving health from improved waste management.

The implementation of a DRS needs to be accompanied by various measures including:

- Supporting legislation such as a waste management bill;
- Development of recycling infrastructure and viable recycling markets;
- Enforcement of the scheme;
- Education and awareness; and
- Political will.

### **Main concerns related to deposit refund systems**

Establishing the appropriate deposit refund fee is an iterative process that may require multiple attempts to get the deposit refund high enough to stimulate uptake. This is especially the case in situations where there is limited information on the possible reactions of consumers to the scheme or the value of environmental damage caused by the product.

## 2. MBI for the tourism sector

Policy instruments for sustainable tourism management can be market-based, regulatory, and institutional instruments (Shchoka, 2016). Economic instruments include environmental taxes, user fees, financial incentives and tradable market permits, regulatory instruments include quotas and zoning, while institutional instruments refer to eco-labels and changes in property rights. Sometimes a combination of various instruments might be more effective than implementing one.

### 2.1 Tourist environmental tax

This tax is levied on tourists for environmental purposes. Whether or not a drop in tourism income will result depends mainly on the amount of tax being levied and the ability of a destination to compensate for higher prices with a higher quality of tourism products and services. Different levels of environmental tax in high and low tourist seasons can enable more equal distribution of the number of tourists during the year, and consequently reduce pressures on the environment and increase the stability of incomes.

Several countries have introduced taxes on tourism in the form of a tax paid per visitor, often raised per overnight stay as a “room tax.” This is most usually collected from tourism enterprises, and may or may not be passed on to tourists. Generally, it is not seen as a way of influencing visitor numbers but rather as a way of raising revenue. Significant sums can be raised in this way, but it can lead to industry concerns about the adverse effect on demand and on enterprise profitability. A key issue for sustainability is the extent to which the proceeds are reserved locally and used to support destination management, environmental conservation, and social causes.

Taxes of this kind can be introduced specifically for the purpose of benefiting the destination and sustainability. However, even if they are presented in this way, they can prove to be debatable, as was well demonstrated by the Balearics ecotax (UNEP and WTO, 2005, Box 5.10, p.91). There was a fierce debate about the merits of the tax. Some felt that the long-term competitiveness of the islands would have gained from the improvements funded by the tax, despite negative short-term reactions. Whatever the merits of it, however, the experience pointed to the need to make sure that the industry is fully supportive of such a process, especially if it is engaged in its implementation, that it is seen to be fair, and that it is positively promoted as a measure seeking to bring benefits to all.

The successful introduction of such taxes may be more difficult if it is seen by business as adding to their existing tax burden. A more successful approach may be to direct such a charge at visitors, as is the case in Belize (UNEP and WTO, 2005, Box 5.11, p.93), which is essentially a hypothecated exit tax. Any tax of this kind needs to be fairly and evenly applied, easy to collect, and fully discussed and supported by all those involved, including the travel trade. The utilization of the tax needs to be completely transparent and made widely known to those who are paying it.

## 2.2 Access fees

When access to a specific environmental resource can be controlled, access fees charged to tourists can serve as a simple mechanism for capturing part of the benefits derived from the resource. The most common used are entrance fees to protection areas. Access fees also are a conventional tool to manage carrying capacity limits.

Charging for the use of public facilities can provide a valuable tool in the field of tourism. As visitors perceive that they are getting a direct benefit, there is often little negative reaction to this. A particular example is the setting of an entrance fee for entry into a national park or heritage site. Charges may be used for management purposes, to control visitor numbers and environmental impact—this may be related to carrying capacity and targeted levels of demand. They may be varied at different times of the year. Social equity considerations would suggest that differential charges should be used that reflect ability to pay, preventing economic discrimination.

Generating revenue for use in conservation and management, or to support local communities, can be an important objective in the setting of charges of this kind. In some situations, charges may be specifically augmented in order to raise revenue available for local causes. Where possible a structured and transparent approach should be used for the distribution of financial resources raised, involving local communities, and informing those paying the charge about how their expenditure is being used, as in the Madagascar (UNEP and WTO, 2005, Box 5.11, p.93). The government national park service has a policy of distributing 50 per cent of the admission revenue from all parks to local conservation and community development projects. The latter, proposed by special committees made up of elders from individual villages, tend to be very practical (such as fruit growing schemes, bee keeping, construction of grain stores) supporting sustainable livelihoods as an alternative to slash and burn agriculture. The funding link with the local park enhances community awareness and support for conservation.

Charges may also be raised for the use of infrastructure. A common example is the use of car parking charges as they help to limit vehicle use and consequent pollution. They can sometimes provide the only direct source of revenue for the management of sites where no other form of admission charge is possible. This is the case for certain countryside sites.

## 2.3 Financial incentives

These can be designed to change behavior either by increasing or reducing the prices of goods or services (UNEP and WTO, 2005, Box 5.12, p.95). Governments can encourage the use of environment friendly equipment for water and energy-saving at hotels by lowering taxes, providing subsidies, or reducing import tariffs. In a similar way, taxes or tariffs on non-environmental goods or services could be raised. In United Kingdom, the government offers interest-free energy loans and 100 per cent capital tax allowances on energy efficient equipment through the 'Carbon Trust' (which receives funding through environmental taxes such as the Climate Change Levy). This assistance is packaged for hotels, together with a comprehensive advice program, within the government backed 'Hospitable Climates' initiative.

In most countries incentives of this kind are applied generally in order to influence the activities of all businesses. It is unlikely that the tourism industry will be singled out for special treatment. However, changes in behavior on account of these measures will affect the impact of the industry, particularly in places where tourism has traditionally contributed to environmental or social impacts.

## **2.4 Eco-labels**

These can be applied to almost any product or service offered to tourists that satisfy certain environmental criteria (accommodation facilities, tour operators, beaches, restaurants, marinas, or tourist destinations). To be meaningful, an eco-label must be internationally recognized and administered by a reputable organization. The 'Blue Flag' is probably the best known international eco-label in tourism, which has been awarded to beaches and marinas in 36 countries worldwide. Green Globe 21 is also a certification for sustainable travel and tourism products and services, used principally in Asia, the Caribbean and Australia. Green Globe 21 is a global environmental & Social Sustainability Certification program for the Travel and Tourism industry. It works with consumers, companies, and communities to create a sustainable industry through the implementation of Agenda 21.

## **2.5 Quotas**

Setting a limit on the number of visitors admitted to a destination during a fixed period may include closure of certain places, like environmentally fragile areas at certain times; establishing a maximum number of accommodation units; determining a maximum number of persons allowed at certain tourist attraction, particular area, or a whole country. These instruments prevent overcrowding and subsequently the degradation of the natural resources. Bhutan is the only country that has introduced a tourist quota at the national level. Its quota allows 6,000 foreign tourists and 3,000 tourists from neighboring countries per year, with established fixed minimum daily expenditures per tourist.

## **2.6 Zoning**

This instrument for limiting construction activities allows for planned tourism development and is relatively inexpensive and easy to implement. The physical plan that can restrict construction in environmentally sensitive areas (e.g., 100 meters from the coast) or minimize areas allocated for new construction. In the Maldives, for example, regulations state that the built environment should utilize no more than 20 percent of the total land area in order to maintain the natural beauty of an island environment. Moreover, two-story buildings are allowed only if there is enough vegetation to screen them from view. Ecological economic zoning has also been proposed in climate change policy to protect Brazilian rainforests under Reduced Emissions from Deforestation and Forest Degradation initiative.

# **3. MBI for the water resource sector**

## **3.1 Water Withdrawal Taxes**

A water withdrawal tax is a certain amount of money charged for the direct abstraction of water from ground or surface water (Roth, 2001). In some cases, only ground water abstractions are charged to reduce the price

differential between surface and groundwater abstraction, while in others, both ground and surface water abstractions are taxed, however often at different rates.

In addition to their revenue-generating function, water withdrawal taxes can act as incentive measures. Effective water withdrawal taxes can induce a change in user behavior resulting in lower water consumption. If the tax is set to reflect marginal costs of water abstraction, it enhances the cost effectiveness of the service provided. In general, water abstraction policies should consider both surface and groundwater in order to limit negative effects that more efficient pricing for one source of water will have on the other (European Commission, 2000a).

In many countries, revenues generated by abstraction charges are set aside for explicit water management purposes, so that the proceeds from the tax are indirectly returned to those liable to pay. Water withdrawal taxes may be set to reflect the relative scarcity of water and may vary by regions.

### **3.2 Water Pricing**

The instrument of water pricing has the main goal of financing water supply infrastructure. According to the European Commission (2000b), water prices should be set at a level that ensures the recovery of costs for each sector i.e. agriculture, households, and industry. Water prices should in principle relate to three types of cost: direct economic costs, social costs, and environmental costs. The estimation of each type of costs involves a different set of problems (Kraemer and Buck, 1997):

- 1) Direct economic costs: Full recovery of the economic costs of water services will require that water prices include (1) the costs of operation and maintenance of water infrastructure, (2) the capital costs for the construction of this water infrastructure, and (3) the reserves for future investment in water infrastructure.
- 2) Social costs: With respect to water services, the direct or indirect social benefits (for instance in the field of public health) vary largely with respect to the specific contextual settings. Estimating these costs and comparing them across cases is, then, not a feasible task, which prohibits their incorporation into a comparative study.
- 3) Environmental costs: The environmental costs of a certain economic activity are generally not reflected in the prices established in the market, but appear as externalities. Conceptually, the exclusion of negative environmental costs in price mechanisms can be discussed under the heading of subsidies. In practice, there are great difficulties linked to the establishment of benchmarks for costs caused by environmental degradation, and to the inclusion of these costs into market-based mechanisms. Still, the principle of full cost recovery requires taking these costs into account. Given the methodological problems involved in estimating environmental externalities, the inclusion of an environmental component into water prices will be supported by political rather than economic arguments.

In addition to their financing function, water pricing policies often fulfil an incentive objective as well. Water prices which represent full costs provide price signals to consumers resulting in a more efficient water use and generate the means for ensuring a sustainable water infrastructure (van Hijum, Y. J. (n.d.).

### 3.3 Sewerage and Effluent Charges

Sewerage charges are tariffs paid for the discharge of waste water. A sewerage charge is the amount of money paid for indirect discharges, that is domestic sewage or effluents discharged into the sewer system. Foremost, sewerage charges have the objective of providing environmental agencies with financial resources for water management activities. Moreover, these charges may achieve an incentive function and are in accord to the polluter-pays principle by internalizing treatment costs into the decision process of users through adequate price signals (Kraemer and Piotrowski, 1995).

### 3.4 Water Pollution Charge

A water pollution charge takes the form of a direct payment based on the measurements or estimates of the quantity and quality of a pollutant discharged to a natural water body. Pollution charges are an important step towards the realization of the polluter-pays principle even if their calculation is not based on estimates of damage costs. By levying a charge on pollution, a clear signal is given that society is no longer willing to bear the costs of pollution and that at least part of the costs of the damage caused must be recovered directly from polluters (Roth, 2001). Pollution charges may set incentives in terms of pollution abatement promotion. In cases where the revenue generated by the charge is earmarked for measures to improve water quality, a pollution charge additionally fulfils a financial function for the improvement of water quality.

Designing optimal pollution taxes that minimize the total cost of pollution (damage costs plus control costs) is a difficult task, as it requires the existence of a reasonable data-base and information on pollution damages. The exact calculation of taxes requires information about the exact quantity and quality of the discharged wastewater (Kraemer, 1995).

### 3.5 Subsidies

The OECD (1996) defines subsidies as “government interventions through direct and indirect payments, price regulations and protective measures to support actions that favor environmentally-unfriendly options over environmentally-friendly ones”. This definition includes direct subsidies in the form of direct payments by the government to certain users, and indirect subsidies. Even in the absence of “explicit monetary transfers” one can speak of (indirect) water subsidies if the system of water prices in place does not adequately reflect full costs involved in providing that service. Therefore, the effective implementation of the principle of “full cost recovery” in the formation of water prices in turn would eliminate water subsidies (Kraemer and Buck, 1997). This conceptual perspective highlights the close relationship between water subsidies and water pricing practices. Further indirect subsidy schemes include tax concessions or allowances, guaranteed minimum prices, preferential procurement policies and cross-subsidization.

Generally, subsidies can have two main objectives: either they are instituted to compensate users for a cost they incur in response to a required action or a prohibition, or subsidies are constructed to set the necessary incentives for achieving a certain desired, but not required, action.

Subsidies can be of a fiscal nature and paid out of public funds or can take the form of parafiscal cross-subsidies through redistribution between urban areas. From an environmental perspective, a subsidy consists of the value of uncompensated environmental damage arising from any flow of goods or services (Barg, 1996). As environmental damage is usually not included in water prices, subsidies de facto often exist.

Subsidies are a type of economic instrument that may lead to inefficient situations. However, they can create the necessary incentives to change user behavior towards environmentally friendly conduct or induce investment in environmentally friendly production processes, thereby mitigating or eliminating negative effects. In some cases, like flood alleviation for example, subsidies may provide a relatively cheap alternative for governments, especially considering the reduction in losses that may be achieved through adequate flood proofing (Otter and Veen, 1999). There is, however, a danger that over the longer term, resources may be channeled to problems that are no longer high priority.

When the government grants payments in return for an environmental benefit, subsidies are a form of internalization of external benefits.

### **3.6 Tradable Permits**

If disagreement exists over the allocation of water from shared resources among segments of the population, a potential instrument is the creation of transferable rights to use/pollute water and the creation of efficient markets on which the rights can be traded. The rationale behind water allocation through tradable rights is that in a perfectly competitive market, permits will flow towards their highest value use (Tietenberg, 2000). Permit holders that gain a lower benefit from using their permits (for example due to higher costs) would have an incentive to trade them to someone who would value them more. A sale will result in a situation of mutual benefit: the benefit the permit holder reaps from selling his permit will exceed the benefit he derives from using it, while the buyer gets more value out of the permit than he must pay for it.

When discussing tradable permits systems relating to water, three fundamentally different fields of application can be discussed (Kraemer and Banholzer, 1999): tradable water abstraction rights for quantitative water resource management; tradable discharge permits, or tradable water pollution rights, for the protection and management of (surface) water quality; tradable permits to use or consume water-borne resources, such as fish or the potential energy of water at height or the kinetic energy of water flowing.

Further distinctions can then be made within each of these fields of application. In relation to tradable water rights, distinctions can be made regarding the “intensity” of trading, which can be permanent or temporary (seasonal) or even one-off. Concerning water pollution rights, further differentiations can be made in relation to the polluting substance (or class of substances) in question (Kraemer and Banholzer, 1999).

Several prerequisites must be fulfilled for the successful implementation of a tradable permit system. First, property rights must be well-defined and specified in the unit of measurement (Kraemer, Interwies, Kampa, 2002). As a second point, water rights must be enforceable to secure the net benefits flowing from the use of the water rights for the rights holder. In the ideal case, transferable water rights should be separate from land

use in order to create exposure to the opportunity to realize higher valued alternatives (Pigram, 1993). Finally, an efficient administrative system must be in place to ensure market working (Armitage, 1999).

Situations in which the conditions may not be adequately met include the possibility for market power, the presence of high transaction costs and insufficient monitoring and enforcement (Tietenberg, 2000). However, even in the presence of these imperfections, tradable permit programs can be designed to mitigate their adverse consequences.

### **3.7 Liability for Damage to Waters**

Environmental liability systems intend to internalize and recover the costs of environmental damage through legal action and to make polluters pay for the damage their pollution causes. To that extent environmental liability laws are in line with the polluter-pays principle. The aim of environmental liability laws is twofold: first, they induce polluters to make more careful decisions about the release of pollution according to the precautionary principle and second, they ensure the compensation of victims of pollution. While liability systems assess and recover damages ex post, they can nonetheless provide incentives to prevent pollution, if the expected damage payments exceed the benefits from non-compliance.

For liability to be effective, there needs to be one or more polluters; the damage needs to be concrete and quantifiable; and a causal link needs to be established between the damage and the identified polluter (European Commission, 2000c). Thus, liability is not a suitable instrument for dealing with pollution of a widespread, diffuse character where it is impossible to link the negative environmental effects with the activities of certain individual actors.

The instrument of environmental liability, therefore, conveys several advantages (EEB, 2022):

- 1) Liability rules control pollution through the decentralized decisions of polluters to act in their own interest. Polluters will control pollution up to the point where the marginal pollution damage equals the marginal cost of control, thereby minimizing their total costs for compensating victims and controlling pollution.
- 2) The provision that polluters must pay for the damage they cause provides great incentives to avoid environmental damage. The higher the anticipated payment in case of a damage, the higher the incentive for taking preventive measures (precautionary principle).
- 3) Environmental liability laws constitute a significant step towards the application of the polluter-pays-principle.
- 4) Environmental liability will also be reflected in prices and is thus an important contribution towards realizing the principle of “ecologically honest prices.”

## 4. Build political support, institutional capacity and private sector for MBI in the pilot site

This chapter analyzes the appropriateness of the various economic incentive instruments identified in chapter 2 and chapter 3 against the various level of institutions. Table 1 shows economic incentive instruments for the tourism sector. Table 2 shows economic incentive instruments for the water resource sector.

**Table 1 Economic instruments for the tourism sector**

Economic instruments	Explanation	Level of Application	Level of institution
1. Tourist environmental tax	Raising revenue from consumers and enterprises that can be used to mitigate impacts and support actions such as conservation or community projects.	Tourists and businesses	Provincial government
2. Access fees	Access fees charged to tourists can serve as a simple mechanism for capturing part of the benefits derived from the public resources. Charges may be used for management purposes, to control visitor numbers and environmental impact.	Tourists	Local governments
3. Financial incentives	These can be designed to change behavior either by increasing or reducing the prices of goods or services.	Tourist and businesses	Local governments
4. Eco-label	These can be applied to almost any product or service offered to tourists that satisfy certain environmental criteria.	Businesses	Provincial government
5. Quotas	These instruments prevent overcrowding and subsequently the degradation of the natural resources.	Tourists	Local governments
6. Zoning	This instrument for limiting construction activities allows for planned tourism development and is relatively inexpensive and easy to implement.	Businesses	Provincial government

**Table 2 Economic instruments for the water resource sector**

<b>Economic instruments</b>	<b>Explanation</b>	<b>Level of Application</b>	<b>Level of institution</b>
1. Water abstraction charges	Water abstraction levies - a natural resource tax rather than a charge to recoup infrastructure costs.	Industry	Provincial government
2. Water prices	The instrument of water pricing has the main goal of financing water supply infrastructure.	Households, businesses	Local government
3. Sewerage charges	Sewerage charges are tariffs paid for the discharge of waste water. A sewerage charge is the amount of money paid for indirect discharges, that is domestic sewage or effluents discharged into the sewer system.	Households, businesses	Local government
4. Water pollution charge	A water pollution charge takes the form of a direct payment based on the measurements or estimates of the quantity and quality of a pollutant discharged to a natural water body.	Industry	Provincial government
5. Subsidies for environmental R&D, tax differentiation	Government interventions through direct and indirect payments, price regulations and protective measures to support actions that favor environmentally-unfriendly options over environmentally-friendly ones	Businesses	National government
6. Tradable permits	Transferable rights to use/pollute water and the creation of efficient markets on which the rights can be traded.	Industry	National government
7. Liability legislation	Environmental liability systems intend to internalize and recover the costs of environmental damage through legal action and to make polluters pay for the damage their pollution causes.	Industry	National government

**Case 1 – Tourist Environmental Tax / Hotel Tax Enhancement in Krabi Province**

In Krabi Province, the Provincial Administrative Organization (PAO) has implemented a strategic approach to strengthen hotel-tax collection and channel the revenue toward supporting public services for the tourism

sector. While not explicitly labeled as a “tourist environmental tax,” the hotel tax effectively functions in a similar manner by generating funds from tourism enterprises to finance infrastructure and services that mitigate the impacts of tourism. This aligns with Instrument #1 (“Tourist environmental tax”) in the table, applied at the business level and managed by the provincial government. Chaicharoen (2023) highlighted that the PAO consolidated multiple databases into a “big data” system to enhance hotel tax administration and plan tourist services, overcoming limitations of existing official data and increasing potential revenue capture. Similarly, Krueathep (2021) examined provincial hotel tax revenue potential, noting substantial variation in estimation and collection processes.

The instrument is designed to target the hotel sector, assessing tax liability based on factors such as occupancy, room count, location, and tourist flows. The PAO is responsible for tax assessment, data management, and service allocation, while hotels and guesthouses serve as the application level. Implementation involves integrating datasets including hotel registrations, tax records, tourist arrival and occupancy data, and visitation to attractions. Analytics are applied to estimate unreported tax bases and identify noncompliant establishments, while revenue collection is aligned with planning for tourist service infrastructure, such as sanitation, safety, and beach facilities. Monitoring trends over time allows adjustments to tax policy and administration, enhancing transparency and compliance (Chaicharoen, 2023).

The introduction of the big data system has been shown to highlight opportunities for revenue enhancement in Krabi PAO (Chaicharoen, 2023). At a national level, Krueathep (2021) estimates that hotel-tax revenues across provincial organizations ranged from 964 to 11,739 million THB in 2017–2018, averaging about 6,352 million THB, offering context for potential scale. Although specific figures for Krabi PAO’s revenue increase post-data system are not publicly detailed, the evidence indicates improved accuracy and revenue potential.

Several practice lessons emerge from this case. Data integration is critical: without capturing tourism flows, occupancy, and informal accommodations, tax base estimation is undermined. Linking tax revenue to visible services, such as beach toilets, waste collection, and safety measures, enhances legitimacy and stakeholder support. Business-level instruments, like taxing hotels rather than individual tourists, can be administratively simpler but may miss day-trip visitors or informal lodgings. Transparency and monitoring are essential, as perceived unfair application or poor revenue use can reduce compliance. Equity and enforcement remain challenges, with smaller guesthouses potentially struggling and informal accommodations evading taxation.

Recommended indicators for monitoring and evaluation include annual hotel tax revenue collected and its growth rate, the percentage of registered accommodation compliant with tax filing, a tax yield index comparing revenue to estimated tourism expenditure or occupancy, the number and percentage of tourist-related public service projects funded by the tax, guest satisfaction with linked services, the estimated informal lodging tax gap, and the administrative cost of collection including cost-to-revenue ratio.

Overall, Krabi’s hotel tax enhancement demonstrates how a business-level tax instrument can operate effectively as a “tourist environmental tax” when revenue is directed toward mitigating tourism impacts and

improving services. Its success depends on robust data systems, transparent revenue allocation, and effective enforcement, offering a model for other provinces aiming to capture tourism benefits sustainably.

### **Case 2 – Access Fees for Koh Phi Phi and Marine Tourism Areas**

In Krabi Province, access fees have been applied to manage visitor flows and generate revenue for environmental management, particularly in high-traffic destinations such as Koh Phi Phi and surrounding marine national parks. Access fees function as a mechanism to capture some of the economic benefits tourists derive from public natural resources, while also regulating visitor numbers to prevent ecological degradation. Tourists pay the fees upon arrival, either at ferry piers, entry points to islands, or designated park entrances. Local government authorities are responsible for fee collection and enforcement, ensuring that visitor access aligns with the carrying capacity of fragile ecosystems.

At Hat Noppharat Thara–Mu Ko Phi Phi National Park in Krabi Province, entrance fee rates reflect a clear tiering by nationality and age: Thai adults are charged 40 THB and Thai children 20 THB, whereas foreign adults pay 200 THB and foreign children 100 THB. For designated special islands within the park—such as Ko Phi Phi Don, Ko Phi Phi Le and Ko Mai Phai—an additional service/entry fee applies to foreign visitors, typically around 400 THB for adults and 200 THB for children (Bangkok Post, 2023). Over a recent four-month window (October 2023 to February 2024), the park collected approximately 267.5 million THB in entrance fees from around 126,398 tourists, underscoring the strong revenue potential of such dual-rate structures (Bangkok Post, 2024)

Implementation involves clearly communicating fee requirements to tourists through signage, booking platforms, and ferry operators. Collected fees are earmarked for environmental management, including beach cleaning, marine conservation programs, waste management, and park administration. Authorities also monitor compliance, enforce visitor limits, and adjust fees or restrictions as necessary to maintain ecological balance. Seasonal closures, combined with visitor quotas, have been applied to sensitive areas to allow ecosystems time to recover.

The outcomes of access fee implementation include more controlled visitor flows, reduced overcrowding at popular tourist sites, and a stable revenue source for environmental management. These funds support tangible conservation measures and community projects, helping to offset tourism impacts. For example, fee revenue contributes to coral reef rehabilitation, waste management infrastructure, and monitoring programs for wildlife protection. Although detailed revenue figures for Krabi-specific sites are not always publicly reported, similar fee structures in Thailand have generated millions of THB annually for park and environmental management purposes.

Lessons from Krabi's access fee experience highlight the importance of integrating ecological and economic considerations. Effective communication ensures tourists understand the purpose of fees, which improves compliance and acceptance. Monitoring visitor numbers and environmental conditions allows adaptive management of fees and access restrictions. Access fees demonstrate a practical approach to balancing tourism

benefits with environmental sustainability, providing incentives for both tourists and authorities to maintain natural assets responsibly.

Recommended indicators for monitoring include total revenue collected from access fees, compliance rates with entry regulations, visitor satisfaction levels, ecological indicators such as coral cover or water quality, and the number of conservation projects funded by access fee revenue. These indicators allow authorities to assess the effectiveness of the instrument in both financial and environmental terms.

### **Case Study – Instrument #1: Water Abstraction Charges**

Nationally in Thailand, the legal framework for water abstraction charges exists under the Water Resources Act 2018, with the intention to levy industry (and other users) for water withdrawals. The OECD notes that “a water abstraction charge is applied to surface-water and groundwater” though in practice rates are often low and do not reflect seasonal scarcity (OECD, 2022). Based on the available information, there is no publicly released official data on the water charge per cubic metre (THB/m<sup>3</sup>) set by the Royal Irrigation Department (RID) across Thailand for agricultural or industrial water use. According to some research documents, the RID may set a maximum rate of approximately 0.50 THB/m<sup>3</sup> for agricultural water use in certain cases, but this is considered a ceiling rather than a standard rate applied nationwide (Thailand Development Research Institute [TDRI], 2013).

In Krabi Province no publicly accessible case was found that documents a local industry-level abstraction levy with full details (volume withdrawal + charge) implemented specifically for tourism or other sectors. However, the presence of water-scarcity in tourist regions, private suppliers charging high rates, and references to abstraction regulation suggests potential for this instrument to be applied in the future. For research or policy development, Krabi could adopt an abstraction-charge model for large water users (hotels, resorts, bottling plants) based on volume withdrawn above a baseline. Recommended indicators: volume of water abstracted (m<sup>3</sup>) by major users, number of abstraction licences/charges applied, revenue collected via abstraction levy, and change in total abstraction volumes over time.

### **Case Study – Instrument #2: Water Prices (Water Supply Tariffs)**

In Krabi Province, the issue of water pricing has come into focus through the lens of tourism and seasonal supply shortages. Reports show that during high-tourism periods, especially on islands and coastal zones of Krabi, private or supplementary water suppliers charge significantly higher rates (e.g., raw water or trucked water at ~150–300 THB/m<sup>3</sup>) due to scarcity of piped supply (Livingcost.org, 2025) and local news/social media posts about water shortage in Ao Nang/Krabi (Thailand Newsroom, 2024).

While these rates are largely market-driven rather than formal regulated tariffs from local government, they illustrate the principle of instrument #2 (water pricing) where water consumers (businesses or households) pay higher charges which reflect scarcity or supply infrastructure cost. For instance, national tariff schedules from the Provincial Waterworks Authority show standard water rates ( $\approx$  21.20 THB/m<sup>3</sup> for many regions) which contrast with the high rates seen under market scarcity conditions (PWA, n.d.). Although a dedicated Krabi municipal tariff reform specific to tourism is not documented, the disparity suggests that differential pricing exists in practice.

Key lessons include that price signals can reflect supply constraints and encourage conservation, but also raise concerns about affordability and equity when tourists and business users face high costs. Monitoring indicators would include average tariff per m<sup>3</sup> in tourism-zones, percentage of users paying non-regulated rates, and volume of water supplied relative to seasonal demand.

### **Case Study: Instrument #3: Sewerage Charges – Krabi Town, Krabi Province**

In Krabi Province, the Wastewater Management Authority (WMA) branch serving Krabi Town has introduced a formal sewerage-service charge to manage municipal wastewater effectively. This initiative imposes a fee for the treatment of wastewater discharged into sewer systems or treatment facilities, corresponding to Instrument #3 – Sewerage Charges in water resource management, applied to households and businesses at the local government level (Wastewater Management Authority [WMA], 2021a). The municipal by-law formally authorizes the collection of these fees, defining multiple pollution-source categories for billing purposes. Type 1 sources began paying the sewerage-treatment fees in January 2022, with Types 2 and 3 scheduled for subsequent implementation (WMA, 2021a).

The design of the sewerage fee relies on categorizing users based on the volume or risk of wastewater discharge. Households and businesses are billed according to their pollution-source classification, while the WMA Krabi branch is responsible for operational oversight. Implementation steps include promulgating the municipal by-law, executing field campaigns to raise public awareness, and engaging directly with users who had outstanding payments (WMA, 2025). Additionally, the WMA branch has issued contracts for personnel dedicated to fee collection, indicating the institutional capacity required to operate and enforce the system effectively (WMA, 2024).

Although full outcome data are not publicly disclosed, the initiative demonstrates measurable institutional and operational activity. The awareness campaigns and personnel deployment indicate active enforcement and efforts to ensure compliance (WMA, 2025). The municipal by-law establishes the legal foundation for the fee, which is essential for legitimacy and user acceptance (WMA, 2021a). Lessons from this case highlight the importance of outreach to promote compliance, adequate staffing for fee collection, and transparent communication regarding fee structure and responsibilities. At the same time, gaps in publicly available data on revenue collection, compliance rates, and environmental impact reveal the need for enhanced monitoring and reporting.

To evaluate the effectiveness of this instrument, suggested indicators include the number of households and businesses billed, the percentage of timely payments, annual revenue collected, volume of wastewater treated, cost-to-revenue ratio, coverage of total municipal wastewater treatment costs, environmental outcomes such as reduced illicit sewage discharges, and user satisfaction with service quality and fairness. These indicators can help policymakers understand the operational, financial, and environmental performance of the sewerage-service charge system.

Overall, Krabi Town's sewerage-service charge illustrates a functioning example of a municipal-level economic instrument for water resource management. By establishing a user-pay model, the WMA demonstrates how

local governments can fund wastewater treatment infrastructure while encouraging responsible wastewater disposal. Key success factors include legal authority, institutional capacity, public engagement, and transparent communication, while gaps remain in monitoring, reporting, and ensuring equitable burden-sharing across different user categories (WMA, 2021a; WMA, 2024; WMA, 2025).

#### **Case Study – Instrument #4: Water Pollution Charges**

On the island of Koh Lanta Yai (in Krabi Province), a scientific study examined wastewater discharge from tourism sites (hotels, resorts) into canals and coastal waters, and found elevated biological indicators (total coliform bacteria) at beach/estuarine sampling stations during peak tourism periods (Obpat, 2022). While the study does not document a formal charge regime (e.g., fee by pollutant load) being applied to those discharges, it highlights the environmental risk underlying instrument #4 (water pollution charge) — i.e., payments or penalties based on pollutant quantity/quality.

The study recommends stricter monitoring and regulatory mechanisms to internalise pollution costs, noting that if discharge increases without regulation the risk to water quality will rise (Obpat, 2022). Thus the Koh Lanta case serves as an emerging context for water-pollution charging rather than a full implementation. Key insights: monitoring of discharge quality is prerequisite; without measured pollutant loads, charging is difficult; and tourism-driven discharge needs targeted regulation. Suggested indicators: number of pollution source inspections, number of penalties or fees applied, change in biological indicator values (e.g., coliform count) over time.

Table 3 shows a SWOT analysis of the tables above to highlight four economic incentive instruments that are most appropriate for addressing sustainable water resource management (two instruments), and tourism management (two instruments).

### **4.1 Implementation Plan**

To improve revenue streams for the improved management and conservation of the natural capital delivering ecosystem services, the recommendations are proposed on the development of a Conservation Trust Fund in Krabi Province. The Fund refers primarily to new financing mechanisms and to extra-budgetary funding, not to the administration of routine state budget allocations.

The primarily mechanism that is recommended to deal with new sources of funding and with extra-budgetary financing sources, as well as to foster greater site-level financial retention and stakeholder benefit, is a Krabi Conservation Trust Fund (KCTF). The KCTF would have two core functions:

- To provide a mechanism for receiving, retaining, and allocating financial resources for the effective management of tourism and water resource sectors; and
- To administer grants and shared revenues to non-governmental organizations and community members to fund activities to promote marine and coastal conservation in the vicinity of marine national parks.

**Table 3 SWOT analysis of economic incentive instruments**

Economic Instruments	Advantages	Disadvantages
1. Water prices; sewerage charges	Are in accordance with the user-pays principle; May convey an incentive function in addition to financing or cost-recovery by reflecting the true costs of a product or service;	-
2. Liability legislation	Assess and recover damages ex-post but can also act as prevention incentives; provide strong incentives	Require an advanced legal system; high control costs; burden of proof
3. Tourist environmental tax	Different levels of environmental tax in high and low tourist seasons can enable more equal distribution of the number of tourists during the year, and consequently reduce pressures on the environment and increase the stability of incomes.	There was a fierce debate about losing competitiveness of the tourist sites.
4. Access fees	As visitors perceive that they are getting a direct benefit, there is often little negative reaction to this.	Social equity considerations would suggest that differential charges should be used that reflect ability to pay, preventing economic discrimination.

## 4.2 Funding sources and financial administration

As mentioned above, it is proposed that the KCTF is funded via the new financing mechanisms as well as from any additional funding mechanisms which are developed in the future e.g., tourist environmental tax, user fee.

In essence, the KCTF will function as a clearing-house for funds, serving to retain and allocate financial inflows in a transparent, accountable, inclusive, and conservation-oriented manner. In principle it could absorb funding from any source, including fiscal transfers from the Ministry of Finance, other line agencies or local authorities, subventions from central government, marine national park revenues, private donations, external grants, and projects.

As it will function as an autonomous entity, there are in principle no limits on the potential recipients of funds disbursed through the KCTF. The results and priority activities laid out in marine national park management plans should form the primary criteria for allocating funding, and for developing and approving annual workplans and funding schedules for the KCTF. Funds would then be disbursed on a grant basis, according to a competitive bidding process and in response to proposals submitted by potential beneficiaries.

It is proposed that the fund would operate two main programs as follows.

- Biodiversity and ecosystems conservation and restoration. With a particular focus on flagship species and key habitats, this program would focus on the conservation actions laid out in the marine national park management plans and laid out in the World Heritage Site proposal. Examples include activities related to procurement of equipment and small infrastructure, enforcement, restoration of degraded habitats, zoning, mapping, tourism planning and management, information and awareness, research, and monitoring. Although the primary beneficiaries of this program are anticipated to be the marine national park authorities, funding could in principle be made available to any individual, organization, group or company that is engaged in carrying out these activities in the marine national parks.;
- Community capacity and conservation actions. This program would provide grant-based funding to non-governmental organizations and local community initiatives. As well as providing direct support to sustainable livelihoods, biodiversity-friendly enterprises and community-level conservation activities in the MNP-adjacent area, funds are anticipated to be used for training, capacity-building, education, and awareness; and

In addition, funds would obviously have to be set aside to cover the costs of managing and administering the KCTF. As elaborated further below, this would include the costs of staffing and running a management unit, the professional fees of a fund manager, banking and other transactions charges, monitoring, evaluation, audit, and reporting.

### **4.3 Organizational structure and legal basis**

The KCTF would be established as a financially autonomous, non-profit organization, operating under the laws of Thailand. It would have status as a legal entity, its own management board, charter capital, common seal, and bank account. Although primarily concerned with funding the operations of marine national parks, the KCTF would operate as an independent fund, outside of government.

The policy and operations of the KCTF would be overseen by a Board of Directors. It is recommended that the Board is permanently chaired by the Department of National Park and Wildlife, and should have a multi-stakeholder composition, including representatives of marine national park users, donors, adjacent businesses, and communities. Membership of the Board would be on an honorary basis, with a renewable fixed term. Operating under the authority of, and answerable to, the Board of Directors, a Management Unit would be recruited which would be responsible for the day-to-day running of the KCTF, and would provide direct interface with beneficiaries. Certain key management services that are essential to the operation of the KCTF would be outsourced on the decision of the Board of Directors, especially those which depend on independent advice or require specialist expertise. A technical advisory group would provide paid advice and support to the Board of Directors and Management Unit on technical issues and studies.

#### **4.4 A Payments for Ecosystem Services (PES) Framework for Migratory Shorebird Conservation in Klong Prasong, Krabi Province, Thailand**

Klong Prasong, situated within the estuarine complex of Krabi Estuary in southern Thailand, constitutes a biologically significant intertidal ecosystem along the East Asian–Australasian Flyway. The area encompasses extensive mudflats, tidal channels, and mangrove forests that provide critical feeding and roosting habitats for migratory shorebirds of global conservation concern, including the Nordmann's Greenshank, Asian Dowitcher, Great Knot, and Chinese Egret. Coastal wetlands such as these are widely recognized for their high ecological productivity and multifunctional ecosystem services (Barbier et al., 2011).

Despite its ecological importance, Klong Prasong faces mounting anthropogenic pressures, including increasing boat disturbance during migratory seasons, mangrove degradation, small-scale land reclamation, and unregulated tourism activities. These pressures threaten biodiversity while undermining regulating and cultural ecosystem services. Globally, wetlands are among the most threatened ecosystems due to land conversion and resource extraction (Barbier et al., 2011), and conventional regulatory approaches often suffer from insufficient enforcement and funding constraints.

In response, this chapter proposes a site-specific Payments for Ecosystem Services (PES) framework designed to align conservation incentives with local livelihood development through regulated eco-tourism and habitat stewardship. By internalizing positive externalities associated with biodiversity conservation, the proposed mechanism seeks to generate sustainable financial incentives for local communities while ensuring measurable ecological outcomes.

##### **Theoretical Framework**

###### ***Definition and Economic Foundations of PES***

Payments for Ecosystem Services (PES) are commonly defined as voluntary transactions in which a well-defined ecosystem service (or land use likely to secure that service) is purchased by at least one buyer from at least one provider, conditional upon verified service delivery (Wunder, 2005). The core design elements of PES include clearly specified ecosystem services, identifiable buyers and providers, conditional payments, and monitoring and verification mechanisms (Engel et al., 2008).

From an environmental economics perspective, PES instruments are grounded in the theory of externalities and Coasean bargaining. By assigning quasi-property rights over ecosystem services and facilitating negotiated compensation, PES seeks to correct market failures associated with public goods and common-pool resources (Engel et al., 2008). However, empirical scholarship demonstrates that many real-world PES schemes function not as pure markets but as hybrid institutional arrangements incorporating state regulation, community governance, and contractual incentives (Muradian et al., 2010). This recognition is particularly relevant in coastal and estuarine systems where property rights are diffuse and ecosystem services are spatially interconnected.

A central criterion for evaluating PES effectiveness is ecological additionality—whether conservation outcomes would have occurred in the absence of payments (Pattanayak et al., 2010). Rigorous impact evaluation remains

limited in biodiversity-focused PES, highlighting the importance of designing measurable ecological indicators and credible counterfactuals (Ferraro & Pattanayak, 2006).

### **Ecosystem Services in Klong Prasong**

Klong Prasong generates multiple ecosystem services across provisioning, regulating, supporting, and cultural categories. First, the intertidal mudflats and mangrove forests provide critical habitat for migratory shorebirds, contributing to global biodiversity conservation. Biodiversity conservation is frequently categorized as a non-market public good due to its non-excludable and non-rival characteristics (Engel et al., 2008).

Second, the site generates cultural ecosystem services through bird-watching and nature-based tourism. Environmental valuation literature demonstrates that recreational and biodiversity-related services can be monetized through visitor willingness to pay (Carson & Hanemann, 2005; Richardson & Loomis, 2009). In contexts where tourism demand is sufficient, conservation levies can provide a stable financing mechanism for habitat protection (Naidoo & Adamowicz, 2005).

Third, mangrove ecosystems provide regulating services such as coastal stabilization, erosion control, and storm buffering, which yield substantial economic value to local fishing households (Barbier et al., 2011). Finally, mangroves contribute to global climate regulation through carbon sequestration, positioning the site within emerging blue carbon markets.

By integrating biodiversity, tourism, coastal protection, and carbon services, Klong Prasong presents a multifaceted ecosystem service portfolio suitable for a hybrid PES model.

### **Institutional Context**

Klong Prasong is characterized by small-scale fishing households, community-based natural resource management traditions, and informal but relatively cohesive village governance structures. Increasing eco-tourism activity in Krabi Province creates an opportunity to link conservation finance to visitor demand. However, conservation incentives are currently not formalized nor explicitly tied to stewardship behavior.

Institutional economics literature emphasizes that the success of PES depends heavily on governance arrangements, property rights clarity, and participatory decision-making (Muradian et al., 2010). Risks such as elite capture, unequal benefit distribution, and weak enforcement mechanisms can undermine program legitimacy. Therefore, a community-managed conservation fund with transparent reporting and inclusive participation is essential for long-term sustainability.

### **Proposed PES Framework**

The proposed PES scheme covers approximately 75 hectares of intertidal mudflat designated as primary feeding zones and 20 hectares of mangrove forest serving as roosting buffers, in addition to a regulated boat transit corridor within Prasong Canal. Ecosystem service providers consist primarily of Ban Klong Prasong households whose land-use and boating behaviors influence habitat conditions. Buyers include eco-tourists, tour operators, and conservation organizations. A community-managed conservation fund functions as intermediary, while verification is conducted in collaboration with provincial environmental authorities or academic partners.

Conditionality is central to program integrity. Payments are contingent upon the absence of habitat conversion within protected zones, reduction of boat disturbance during peak migratory months (October–April), participation in seasonal bird monitoring, and maintenance of mangrove restoration plots with survival rates of at least 80 percent. Such conditionality aligns with best-practice PES design principles emphasizing measurable service delivery (Wunder, 2005).

### **Payment Mechanism**

The primary funding source is a conservation levy of 400 THB per eco-tourist. Assuming 600 visitors annually by Year 3, this generates approximately 240,000 THB. Supplementary contributions from boat operators (estimated at 100,000 THB annually) increase the projected PES pool to approximately 340,000 THB per year.

Revenue allocation follows a structured formula designed to balance equity and ecological effectiveness: 50 percent is distributed as direct household incentives, 20 percent supports ranger patrols and biodiversity monitoring, 15 percent finances mangrove restoration, and 15 percent covers youth education and administrative costs. This structure reflects evidence suggesting that transparent and equitable benefit-sharing enhances compliance and program durability (Muradian et al., 2010).

### **Monitoring and Verification System**

Ecological indicators include seasonal counts of Nordmann’s Greenshank, with a target of stable or increasing populations relative to baseline; maintenance of at least 25 migratory species annually; and a 60 percent reduction in monthly disturbance events. The use of species-level indicators responds to critiques that biodiversity-focused PES often relies excessively on land-cover proxies rather than biological outcomes (Wunder, 2015).

Socioeconomic indicators include participation of at least 30 beneficiary households, representation of women at or above 40 percent in decision-making bodies, and certification of at least 10 local bird guides. Governance indicators include quarterly financial reporting, annual independent audits, and publicly accessible benefit-sharing records.

By integrating ecological, economic, and governance metrics, the proposed monitoring system seeks to enhance additionality, accountability, and adaptive management capacity in line with recommendations from the broader PES evaluation literature (Ferraro & Pattanayak, 2006; Pattanayak et al., 2010).

## **5. Conclusion**

Market-Based Instruments (MBIs) are policy tools that use economic incentives to encourage environmentally sustainable behavior by businesses, consumers, and communities. Unlike traditional command-and-control regulations, MBIs allow flexibility in how environmental objectives are achieved, often delivering better environmental outcomes at lower overall cost.

The design of effective MBIs is guided by several key principles. **Environmental effectiveness** ensures that the instrument achieves measurable improvements in environmental quality. **Economic efficiency** seeks to minimize

the cost of achieving environmental objectives by allowing market participants to choose the most cost-effective responses. **Equity** considers how costs and benefits are distributed across different groups, while **competitiveness** aims to avoid placing undue burdens on businesses or reducing economic growth. Finally, **stakeholder acceptance and participation** are essential for successful implementation and long-term compliance.

Despite their advantages, MBIs face several challenges. These include difficulties in determining appropriate pricing or incentive levels, monitoring environmental performance, addressing distributional impacts on vulnerable groups, and ensuring sufficient institutional capacity for implementation and enforcement. Public acceptance may also be limited if stakeholders perceive the instruments as additional taxes or unfair economic burdens.

MBIs encompass a wide range of policy instruments. **Fiscal instruments**, such as environmental taxes and subsidies, influence behavior by increasing the cost of environmentally harmful activities or rewarding environmentally beneficial actions. Environmental taxes encourage pollution reduction and resource efficiency, while subsidies support investments in cleaner technologies and sustainable practices.

**Environmental charges** require users or polluters to pay for the environmental costs associated with their activities, promoting the "polluter pays" principle. **Payment for Ecosystem Services (PES)** provides financial incentives to landowners or communities who conserve or restore ecosystems that deliver valuable services such as clean water, biodiversity conservation, carbon sequestration, and flood protection. PES helps align environmental conservation with local economic development by rewarding good stewardship.

Other important MBIs include **tradable permits**, which establish a market for pollution or resource-use rights under an overall environmental cap, allowing participants to trade permits and achieve environmental targets cost-effectively. **Deposit-refund systems** encourage recycling and proper waste management by charging a refundable deposit when products are purchased and returning it when used products are brought back for collection or recycling.

When carefully designed and supported by strong governance, monitoring, and stakeholder engagement, MBIs can complement regulatory approaches by promoting innovation, reducing compliance costs, mobilizing private investment, and contributing to sustainable economic development while achieving environmental objectives.

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THE INTEGRATION OF NATURAL CAPITAL ACCOUNTING IN  
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