UNEP

Institute for European Environmental Policy

SHEAVLY Consultants

Guidelines on the Use of Market-based Instruments to Address the Problem of Marine Litter

UNITED NATIONS ENVIRONMENT PROGRAMME

Regional Seas

GPA

ISBN 978-92-807-3028-9
Job Number DEP/1175/NA

Citation and disclaimer

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the United Nations Environment Programme (UNEP) concerning the legal status of any country, territory, city or area or of its authorities, or concerning delimitation of its frontiers or boundaries. Moreover, the views expressed do not necessarily represent the decision or the stated policy of the United Nations Environment Programme, nor does citing of trade names or commercial processes constitute endorsement.

The authors and publishers of this report warrant that they have taken all reasonable care to ensure the accuracy and quality of information provided; however, this does not guarantee that the information is free from errors or omissions.

The preparation of this report was financed by the United Nations Environment Programme.

For bibliographic purposes this document may be cited as:

Ten Brink, P., Lutchman, I., Bassi, S., Speck, S., Sheavly, S., Register, K., and Woolaway, C., 2009. *Guidelines on the Use of Market-based Instruments to Address the Problem of Marine Litter*. Institute for European Environmental Policy (IEEP), Brussels, Belgium, and Sheavly Consultants, Virginia Beach, Virginia, USA. 60 pp.

Layout and design: Nikki Meith

Printed in Nairobi by the United Nations Environment Programme

Guidelines on the Use of Market-based Instruments to Address the Problem of Marine Litter

Report commissioned by the United Nations Environment Programme

April 2009

Participating institutions

UNEP Regional Seas Programme

The Regional Seas Programme, launched in 1974 in the wake of the 1972 United Nations Conference on the Human Environment held in Stockholm, is one of UNEP's most significant achievements in the past 30 years. The Regional Seas Programme aims to address the accelerating degradation of the world's oceans and coastal areas through the sustainable management and use of the marine and coastal environment, by engaging neighboring countries in comprehensive and specific actions to protect their shared marine environment. It has accomplished this by stimulating the creation of Regional Seas programmes prescriptions for sound environmental management to be coordinated and implemented by countries sharing a common body of water.
Today, more than 140 countries participate in 13 Regional Seas programmes established under the auspices of UNEP: Black Sea, Wider Caribbean, East Asian Seas, Eastern and Western Africa, South Asian Seas, ROPME Sea Area, Mediterranean, Red Sea and Gulf of Aden, North-East Pacific, North-West Pacific, and South-East Pacific. Six of these programmes, are directly administered by UNEP.

Institute for European Environmental Policy (IEEP)

The Institute for European Environmental Policy (IEEP) is an independent institute with its own research programmes. Based in London and Brussels, the Institute's major focus is the development, implementation and evaluation of EU policies of environmental significance, including agriculture, fisheries, regional development and transport. For more information, please see: www.ieep.eu.

Sheavly Consultants, Inc.

Sheavly Consultants, Inc. is a US-based environmental consulting group specializing in domestic and international community-based conservation programme development, education and outreach initiatives for pollution prevention, and research and monitoring of pollution issues related to water quality and marine debris. For more information, visit: www.sheavlyconsultants.com

Acknowledgements

Project team at the United Nations Environment Programme, Regional Seas Programme

Head of Branch: Jacqueline Alder
Project Lead: Alberto Pacheco Capella
Project Team: Peter Manyara, Manjola Malaj

Project team at the Institute for European Environmental Policy (IEEP)

Patrick Ten Brink, Indrani Lutchman and Samuela Bassi

Project team at Sheavly Consultants, Inc.

Seba Sheavly, Kathleen M. Register, and Chris Woolaway

Special thanks

We acknowledge the valuable contributions of: Ellik Adler, Ljubomir Jeftic, Stefan Speck, Nikki Meith, Peter Hulm, Ulrik Weuder, Alexander Tkalin, Angela Williamson, Ilse Kiessling

Table of contents

Acronyms

CAC	Command and control
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
COBSEA	Coordinating Body of the Seas of East Asia
DDT	Dichlorodiphenyltrichloroethane
EEA	European Environment Agency
EI(s)	Economic Instrument(s)
EPA	Environmental Protection Agency
EU	European Union
GESAMP	[United Nations Joint] Group of Experts on the Scientific Aspects of Marine Environmental Protection
GPA	Global Programme of Action [for the Protection of the Marine Environment from Land-based Activities]
HELMEPA	Hellenic Marine Environment Association
ICC	International Coastal Cleanup
ICCL	International Council for Cruise Lines
IEEP	Institute for European Environmental Policy
IOC	Intergovernmental Oceanographic Commission [UNESCO]
IWM	Integrated Waste Management
MaLiTT	[UK] Marine Litter Task Team
MARPOL	International Convention for the Prevention of Pollution from Ships (Marine Pollution)
MBI(s)	Market-based instrument(s)
MCS	Marine Conservation Society
MPMMG	Marine Pollution Monitoring Management Group
NGO	Non-governmental organization
NOAA	[US] National Oceanographic and Atmospheric Administration
NOWPAP	Northwest Pacific Action Plan
OECD	Organisation for Economic Co-operation and Development
OSPAR	Previously named Oslo (dumping at sea) and Paris (land-based sources of marine pollution) Conventions
PCBs	Polychlorinated biphenyls
PLA	Polylactide
POP	Pacific Ocean Producers
PPP	Polluter Pays Principle
SRD	Sewage-Related Debris
UFA	United Fishing Agency
UNEP	United Nations Environment Programme
WIO	West Indian Ocean

Executive summary

Policymakers who are concerned with the negative impacts of litter, solid waste and debris in their ports, bays and coastal waters have long searched for effective ways to reduce this problem. This report, commissioned by the United Nations Environment Programme, provides an overview of economic tools and strategies that encourage a change in behaviour that will lead to positive and lasting benefits on the marine and coastal environment.

This report addresses two groups:

- Policymakers and economists who are seeking to understand better the marine litter and debris problem.
- Communities, local governments and citizen organizations that have in-depth understanding of marine pollution issues, but are looking to understand how economic tools can help address marine litter problems.

This report aims to be a practical reference for decision makers and relevant organizations on how to select, apply and implement economic tools (also referred to as market-based instruments) to address problems with marine litter. The report will also assist policymakers in deciding whether the conditions are favourable and which economic tools could potentially be effective.

Sources of marine litter and debris

Litter, debris, and solid waste in the marine environment are threats to the world's oceans, seas and coastal zones as well as to the fish, crab, lobster, corals, sea turtles, marine mammals and other wildlife that occupy these areas.

The international definition of marine litter "*is any persistent, manufactured or processed solid material discarded, disposed or abandoned in the marine and coastal environment.*"[1] More specifically, marine litter includes a range of items which are largely made from synthetic materials, especially plastics, glass, metals and rubber. Some common marine litter items include:

- **Fishing-related debris** (fish/lobster traps, crab pots, fishing lines, floats, and nets)
- **Food- and beverage-related waste** (bottles, cans, lids, food wrappers, bags and disposable cups, plates, forks, and straws)
- **Smoking-related waste** (cigarette filters, cigar tips, disposable lighters)
- **Manufacturing- and transportation-related waste** (resin pellets**,** pallets, plastic sheeting and straps)

Plastic materials are dominant in the composition of marine litter, although other types of marine litter may be more prevalent in regional seas and local areas. Derelict fishing gear, including nets, lines, traps and floats lost or abandoned at sea, have become a major worldwide concern.

Marine-debris researchers traditionally classify sources into two categories: *land-based* or *ocean/waterway-based*, depending on where it enters the water. Understanding the differences in these two categories will help policymakers craft policies and regulations and also select economic tools that will aid in addressing the unique aspects of these litter sources.

Land-based debris sources

Land-based debris starts on streets, public parks, parking lots, and other surfaces. The debris then is washed, blown or discharged into nearby waterways by rain, snowmelt, and wind. Sources include inappropriate or illegal dumping of domestic and industrial rubbish; public littering; inadequately covered waste containers and waste container vehicles; poorly managed waste dumps; manufacturing sites, processors, and transporters; sewage treatment and combined sewer overflows; beachgoers; fishermen; shore-based solid waste disposal and processing facilities.

[1] UNEP, 2005a.

Ocean/waterway-based debris sources

Marine debris is also generated by people's actions and activities at sea. Ocean and waterway-based debris can come from commercial fishing vessels; merchant, military, and research vessels; recreational boats and cruise ships; and offshore petroleum platforms and associated supply vessels. Some debris enters the water from accidental loss or system failure, while other debris comes from poor waste management practices, and illegal disposal. Commercial and recreational fishers create marine debris when they discard ship-generated trash overboard or fail to retrieve nets, ropes, trawl floats and other fishing-related gear.

Impacts of marine litter and debris: ecosystems and economics

Marine debris is a global issue, affecting all the major bodies of water on the planet – above and below the water's surface. This debris can negatively impact humans, wildlife, habitats, and the economic health and stability of coastal communities.

Marine litter can lead to loss of biodiversity (e.g., accidental catch by 'ghost' nets), loss of ecosystem functions, the provision of services from these ecosystems, loss of revenue (e.g., from reduced catch and reduced tourism revenue), loss of livelihoods of community groups, and increased costs (e.g., beach clean-ups). Examples of the nature and scale of the problems and their impacts include:

Human health and safety

Visitors to a beach can be harmed by broken glass, medical waste, fishing line, and discarded syringes; swimmers, divers and snorkelers can become entangled in submerged or floating debris. Medical and personal hygiene debris that enters waterways through inadequate sewage treatment systems also presents serious water-quality concerns.

Economic and aesthetic impacts

Litter, debris and solid wastes in coastal and inland waterways can result in serious economic impacts including the loss of tourism revenue for coastal communities and for fishing and maritime industries. The abundance of economically important species can be reduced through entanglement and ingestion of marine litter, and through habitat destruction.

Litter makes shorelines unattractive and potentially hazardous, and forces communities and governments to spend funds for beach maintenance. Studies from around the world confirm that marine litter harms wildlife, commercially important species, and critical habitats. Economic costs include lost fishing time due to propellers entangled in nets and other debris, depressed tourism, and labour intensive beach clean-ups.

Wildlife entanglement and ingestion

Entanglement in nets, fishing lines, ropes and other debris poses another significant threat to seabirds, sea turtles, dolphins and other marine animals, especially those that live near or on the water. Monofilament line, fishing nets and ropes, ribbons on balloons, six-pack rings, and packing strapping-bands are some of the more harmful culprits responsible for entanglements. According to the US Marine Mammal Commission, 136 marine species have been reported in entanglement incidents, including six species of sea turtles, 51 species of seabirds, and 32 species of marine mammals.

Habitat destruction & alien species introduction

Debris can physically damage shorelines, living coral reefs, and other important habitats. Ropes, nets and tarps are moved by currents and tides, and can abrade, scour, break, smother, and destroy fragile aquatic habitats. Ensnared debris may also smother sea grass or corals, and can cause increased siltation and turbidity, blocking essential sunlight. Another concern is that drifting debris can host entire communities of encrusting and attached organisms and transport them great distances – often to areas where they can harm or compete with native species as invasives.

Vessel damage

Nets, ropes and other derelict fishing gear can cause serious damage to vessels by entangling propellers and rudders. Plastic bags are a common cause of clogged and blocked water intakes, resulting in burned-out water pumps in recreational boats. Such incidents cause costly repairs, loss of time, and danger to boaters and crews. The true scope and frequency of damaging encounters between debris and vessels is difficult to calculate, as most incidents go unreported.[2]

[2] Sheavly, 2005.

It is important to note that the costs associated with marine litter are largely borne by parties different from those causing the problem, with the result that there is insufficient liability to the entities responsible for the source of the problem. In short, the polluter does not pay. The high economic costs and negative impacts associated with marine debris justify the time, research, and resources it will take to reduce this form of ocean pollution by all governments.

Solutions to marine litter: prevention, reduction and control

Like other environmental problems, marine debris can be prevented and controlled through an effective collaboration of education and outreach programmes, strong laws and policies, governmental and private enforcement, and adequate support infrastructure. Developing effective policies that will reduce this problem requires a comprehensive understanding of the sources and impacts of marine debris as well as an understanding of human behaviour and how it is affected by economic policies. While acknowledging the need for a comprehensive approach, this report mainly focuses on the potential for using economic tools – referred to as "market-based instruments" (MBIs) to address marine litter issues. MBIs have a potentially important role to play in addressing marine litter, when used as part of an integrated strategy. For example, one programme that offers attractive "bounties" for fishers to bring abandoned nets to shore also requires that these nets and gear be recycled, incinerated and/or otherwise properly disposed of in port.

What are market-based instruments?

Market-based instruments (MBIs) include taxes, charges, fees, fines, penalties, liability and compensation schemes, subsidies and incentives and tradable permit schemes.[3] There are several basic principles behind MBIs: the polluter pays principle (PPP), the user/beneficiary pays principle and the principle of full-cost recovery.

There are many definitions for market-based instruments for different contexts. The Organisation for Economic Co-operation and Development defines economic instruments as tools that '*affect estimates of the costs and benefits of alternative actions open to economic agents*'.[4] Or to put it more simply, if a tool affects the cost or price in the market then it is a market-based economic instrument.

This definition focuses on the economic signals and incentives. If it changes the cost or price of a good (e.g., plastic bags), service (e.g., waste collection), activity (e.g., waste dumping), input (e.g., materials), or output (e.g., pollution) then it is a market-based instrument.

MBIs can have an incentive effect (to encourage a change of behaviour), or a revenue-raising effect. In practice, it is a mixture of the two, with the relative importance depending on the ability of the market to respond to the "price signal." The goals for using an MBI can be a mixture of ambitions: to provide an incentive to change people's behaviour, as well as to raise revenue. Ambitions can also be to "get the prices right" and ensure that the economic cost (the price) reflects the resource cost or cost of pollution impacts. "Getting the price right" reflects the principle of "full-cost recovery" or the "user pays principle." Making sure that the price reflects the true cost of pollution reflects the "polluter pays principle" (see Box 3.2). Getting the prices right can be part of an effort at addressing market failures (underpricing resources) and making the markets work more effectively.

MBIs can be part of the solution and generate revenue, which can be large (e.g., fuel taxes) or small (e.g., selective product taxes), and which can be relatively stable (e.g., fuel taxes) or volatile (e.g., fines and fees, liability, and in certain cases taxes where consumer can move away from the taxed good). The revenues can go to the government, or channelled to specific constructive uses (e.g., earmarked to pay for port waste facilities). Revenues can also be used to strengthen monitoring and enforcement activities. Several case studies in this report have used MBIs to generate revenue to combat marine debris.

Direct regulatory or administrative measures – also called command and control (CAC) – while they also affect the market, are different in that they do not have a direct impact on cost or price. Typically a CAC instrument relies on standards (like emissions standards, product standards or ambient environmental quality standards such as bathing-water quality). The level of pollution therefore is not chosen by individuals or firms according to their economic preferences, but is mandatory fixed by a centralized policy initiative.

---

[3] Note that 'market-based instruments' (MBIs) are also referred to as "market-based economic instruments" or "economic instruments" (EIs). For the purposes of this report, "MBI" is the chosen term, though all can be used interchangeably.

[4] OECD, 1994.

So while CAC regulations and MBIs are different, they do have some similarities. Any system of economic instruments usually requires appropriate legislative or regulatory backing and generally there are inter-linkages between MBIs and regulatory instruments.

Opportunities for using market-based instruments to address marine litter

In recent years there has been increasing practical implementation of the principles that are behind MBIs. The aim is to use market forces – through price signals – as a key part of the solution to the marine litter problem. Policymakers need to understand the pros and cons of each MBI; lessons from other countries help build this understanding and reduce the risk inherent in policy innovation. In some cases, the pollution-reduction results from other countries or regions can serve as benchmarks.

There is increased support for the MBI tool as it has moved from the 'vanguard' to become a commonly used policy tool. Environmental charges, taxes, fines, and deposit-refund programmes have become commonplace and understood. While most of these policy tools have targeted the proper/legal disposal of solid waste on land and at sea, there are potential innovative uses of MBIs that can more precisely target some of the more damaging forms of marine litter. Banning products may also be a strategy for addressing more harmful forms of debris, which are not approachable through MBIs. It should be noted that bans may have other unintended impacts from the replacement products and should be thoroughly reviewed before implementation.

Policy cycle steps

There are several steps in the policy cycle, each of which requires a few practical elements. While each country will have its own formal legislative process, the following steps are typical, practical elements that may be applied.

For simple problems with a few obvious potential solutions, the process will be faster and easier. The process will also be simpler when there is clear institutional authority for action.

The steps that are followed in the policy process include: (1) problem recognition, (2) investigating the problem, (3) identification of possible solutions, (4) analysis of policy proposals, (5) selection of policy options, (6) implementation, (7) monitoring and (8) evaluation and potential revision.

Selecting the best market-based instrument to use

Selecting the best economic instrument (or instrument package) requires careful consideration and depends on several factors including:

- Type of marine litter:

  MBI relevant to the local problem, whether nets, fishing lines, floating debris, or other litter

- Source of the litter:

  Land-based or ocean-based; many sources contributing to the problem versus just a few contributing sources; domestic source, or international sources

- Economic and environmental impacts of the marine litter:

  For example, if endangered animals or coral reefs were being impacted negatively by the litter, your response would be different than if local tourism is the primary resource being negatively impacted

- State of the region's or national waste management infrastructure
- Experience and expertise in using different MBIs
- Political will to enact policies in face of possible opposition
- Understanding that the up-front costs associated with pollution prevention (including supporting the development of an adequate solid waste management infrastructure) are less than the long-term costs of pollution to the environmental and marine-related industries
- Existence of adequate legal and regulatory policy frameworks that will support the MBI
- Capacity to design, implement, monitor and enforce the MBI
- Commitment to the basic principles behind MBIs
- Which MBIs are cost-effective, practical, affordable, fair, consistent with other polices in place, and offer the most environmental benefits

- Which MBIs are politically and publicly acceptable, understood and avoid unacceptable social impacts and perverse incentives, such illegal dumping.

As mentioned earlier, there is not one solution that will fix every marine litter problem. Selecting an effective MBI or a combination of MBIs requires careful consideration and analysis. This report has several case studies that present various approaches to different marine litter problems. Some case studies focus on the use of fairly common MBIs (such as deposit-refund programmes for beverage bottles, fines for littering, etc.) to reduce land-based sources of litter. Another case study takes a more integrated approach such as recycling tonnes of fishing nets and converting those materials into electricity.

In general, reducing marine litter from *land-based sources* requires an overall waste management strategy that relies on an adequate solid waste infrastructure and effective communications and policy enforcement. While developing countries may lack this infrastructure, MBIs could be a source of revenue to support their development of an integrated waste management programme.

Marine litter from *ocean-based sources* is a rather complex issue to address. Monitoring and enforcing mechanisms are generally more difficult. Nonetheless, MBIs can be employed to help deal with solid waste management, the handling of ship wastes and retrieval of discarded and lost fishing gear. Many ocean-based pollution sources require a foundation of international cooperation – which can be bilateral, regional, or global. The problem of identifying (legal) responsibility and allocating liability limits the cases where MBIs could potentially be the best approach.

Creating new policy – practical considerations

Policymakers looking to explore what role MBIs could usefully play to address marine litter will find it helpful to distinguish the steps in the policy cycle – the process that starts with problem identification, continues to problem analysis, solution identification, evaluation and selection, its implementation, including monitoring, reporting and evaluation, and its revision. Some countries might be ready to apply a range of MBIs quickly, while others could focus on one or two. Many nations that lack the necessary waste management infrastructure may need to spend time preparing the foundations for future policies that can address marine litter.

As these strategies are being developed, keep these points in mind:

- **Obtain political commitment** – Identify the champions who can make it work; understand who can support the proposed policy changes, and under what circumstances. Also identify those who could block progress.
- **Link instruments** – Link MBIs to other tools for overall effectiveness. Sometimes the effectiveness of a policy lies in its links to other instruments (e.g., fines depend on the ability to collect fines).
- **Be realistic about timescales** – It takes considerable time to develop political commitment, get legislation passed and create the foundations and enabling conditions that are required for success.
- **Distinguish between national and international sources and responsibility –** Different types of litter have different sources – some domestic and some international. You may need to clarify limits of authority and jurisdiction over the problem. Some litter problems will require international cooperation.

Sample MBIs

The following sample MBIs have various merits, and are suitable for use to combat different marine litter problems. Note that some of these MBIs may also generate revenues:

- **Deposit-refund programmes** on plastic and glass bottles. These programmes increase the incentive to reuse the bottles and reduce the temptation to litter. These have been proven to reduce roadside litter and are applicable in most countries.
- **Plastic bag tax.** Taxes such as these increase the incentive to reduce the use of plastic bags. More and more countries and regional governments are applying MBIs of this type, while other communities are pursuing outright bans on some packaging types. It should be noted that bans may have other unintended impacts from the replacement products and should be thoroughly reviewed before implementation.
- **Other product charges**. Extra charges can also be applied to the sale, distribution or use of other products such as fishing line, fishing floats and foamed plastic food containers in order to reduce the incentive to litter and to raise funds that can be made available for clean-up activities or to improve coastal waste management infrastructures.

- **Liability for pollution/marine litter**. The liability is linked to the cost of the clean-up and linked to a compensation scheme for those whose livelihood is compromised by the impacts of marine litter. This is a non-trivial scheme to set up and requires a certain legal system and capacity to make it work. It is likely to be impossible for certain international sources of marine pollution and operationally difficult, especially in developing countries.
- **Fines for litter and illegal disposal of waste items.** Many communities impose fines aimed at discouraging anti-social behaviours including the improper discarding of waste and trash. Revenues can be used to fund awareness campaigns or provide additional waste receptacles and other infrastructure.
- **Charging for waste services including landfills.** Taxes and fees can be charged to cover the costs of collection and environmentally-sound disposal of waste. These revenues can help pay for landfills, their operation and maintenance. More and more countries are looking for methods to cover the full cost of waste management (full-cost recovery). Such fees and taxes also offer an incentive to consumers to reduce the amount of waste they are creating. This has to be done carefully to avoid perverse incentives to dump waste elsewhere, and hence actually lead to more litter that could end in the marine environment.
- **Port reception, ship berthing, and commercial and recreational fishing fees.** Portions of these fees can be designated to improve waste management infrastructure and start innovative programmes that remove marine litter from the ocean.
- **Tourist taxes, car park fees** (e.g., near waterfronts)**, and waterfront business charges**. Taxes and fees paid by coastal tourists could be earmarked[5] for beach cleaning, waste infrastructure and awareness-raising programmes. In this "user pays" plan, tourists (the beneficiaries of clean beaches) contribute to the maintenance of the beaches. This is a *de facto* payment for an environmental service.
- **Award-based incentives for coastal villages with Integrated Waste Management (IWM) systems.** These programmes incorporate all the policies, programmes, and technologies that are necessary to manage the entire waste stream. The mix and emphasis of approaches that are taken generally varies from region-to-region.
- **Incentives to fishermen for reporting on and the removal of debris.**
- **Financial and technical support** for the installation of waste management systems on board fishing vessels, leisure crafts and larger ships which have inadequate facilities.

There are numerous examples of MBIs that have been implemented to deal with specific forms of marine litter, including retail packaging (bags) and containers (beverage) through taxes and fees, for example. Landfill taxes and fees have been used to support recycling and composting efforts, as well as providing funding to support land remediation efforts in some areas. Vessel berthing and registration fees and port waste and reception fees have also been implemented in a variety of forms – mandatory fees or "fee-for-service" fees.

The incentive approach of a deposit for a beverage container has also been used with mixed success. Some programmes have evolved to include some modifications where only selected containers require a deposit fee, thus promoting a more controlled recovery process.

Incentives and technical or financial support such as programmes for fishermen to retrieve litter or report on problems (including fishing gear) while at sea can be very helpful related to safety and navigation.

Other MBIs include fines, penalties, penalty charges and non-compliance fees based on the costs of the damage or an affordability basis. Litter laws exist with penalties assigned to non-compliance; however, these laws usually lack enforcement. Waste management practices such as dumpster handling also may have regulations to help prevent waste from leaving the containers, with fines for non-compliance that can be very high.

Green procurement involves the integration of decisions on what products to purchase, favouring the selection of reusable materials over disposable items for use in food concession stands, for example.

Integrated approaches to address marine litter including monitoring, research and education and providing adequate facilities and human resources that would help to ensure effective and productive prevention

5 Some economists oppose the principle of 'earmarking' on the grounds that it is more economically efficient if revenues raised go to the government budget without earmarking. Others argue that earmarking helps with public acceptability of the instrument and also helps ensure that funds actually do go to needed areas.

measures. While not considered MBIs in the formal sense, they could be the foundation for future MBIs. One example involves the recycling of discarded fishing nets to produce electricity.

Regional management of marine litter also affords opportunities to implement MBIs through collaborations related to marine litter prevention and control as demonstrated in the NOWPAP region with South Korea's national marine litter programme.

Foundations for future applications of MBIs

There is great potential to reduce and prevent marine litter through additional research on economic instruments, technological advancements, collaborations and voluntary efforts. Current efforts by governments and the private sector to increase awareness, establish debris abatement programmes and change behaviours need to expand with the primary goal of sharing information and lessons learned bilaterally.

The issue of marine litter is a rather complex issue due in no small part to the myriad of sources producing it, compounded by the challenges of monitoring and enforcement of existing controls for its abatement. Nonetheless, MBIs can be employed to help reduce these sources of litter. Many ocean-based pollution prevention efforts require a foundation of international cooperation, which can be bilateral, regional, or global. The problem of identifying legal responsibility and allocating liability limits the cases where MBIs could potentially be the best approach in this situation. Reducing and controlling marine litter in the world's oceans is a significant but achievable challenge. The economic aspects of the global marine litter problem need to be fully explored if we are to be successful in effectively addressing this issue.

Chapter 1. Introduction

1.1 The problem of marine litter and why it is time to employ the use of market-based instruments

Marine litter is far more than just an unsightly inconvenience for beach-bound vacationers or weekend boaters. It is one of the world's most pervasive pollution problems impacting our oceans and waterways. Marine litter (or debris) and trash that enters our oceans and waterways, affects the economies and the inhabitants of coastal communities worldwide, threatens wildlife and sensitive aquatic habitats, and impacts the quality of life for local inhabitants and visitors. Marine litter continues to be a growing threat to the world's oceans, seas, and coastlines despite the efforts at a global, regional and national level over the last three decades.

The ubiquitous presence of marine litter, coupled with its physical, ecological, cultural, and socio-economic complexities, poses a real threat to the sustainability of sensitive coastal and aquatic habitats, as well as wildlife and people worldwide. Much of the debris that is found around the globe is attributable to what we consume – food, beverages, tobacco products and other consumer goods. Other significant categories of marine debris emanate from activities associated with marine transportation and shipping, fishing and manufacturing.

During the past 45-50 years, a shift has occurred in the composition of our wastes from primarily being organic and degradable materials to more synthetic materials (Sheavly and Register, 2007). Durable and slow to degrade, plastic materials that are used in the manufacture of electronic equipment, automobiles and boats, packaging and bags for beverages and food products, cargo packing straps and tarps and nylon materials used in fishing line and gear, have the potential to become long-lasting marine litter (Sheavly, 2005). In addition, these products are characteristically buoyant, allowing them to be transported by the wind and ocean currents across the globe, endangering an array of marine ecosystems and wildlife along the way. Glass, aluminium and other metals in household and industrial items, combined with their resistance to natural degradation when disposed of or discarded, have contributed to the predominance of these materials/items in marine litter globally. Other types of marine litter are also prevalent in regional seas and local areas. Nets, lines, traps and floats lost or abandoned at sea are also increasing in quantity and have become a major concern worldwide (Raaymakers, 2007a).

Both legal and illegal waste handling practices also can contribute to the presence of marine litter. These include the accidental release of trash from coastal landfills and rubbish illegally dumped from water transports; recreational beach and roadside litter; and the illegal dumping of domestic and industrial trash into coastal and marine waters. Our mishandling of waste materials, such as the packaging from convenience items, food wrappings, beverage containers, and a host of other products, has created the foundation for the marine debris problem as we know it today.

Key concerns are the impacts of marine litter on wildlife (e.g., ghost nets on marine mammals,[6] plastic bags on sea turtles), on humans and the marine environment. There are impacts on ecosystems, in places compromising their functions and provision of ecosystem services and often with impacts on livelihoods of communities dependent on the marine environment (e.g., via reduced catch) and with costs impacts (e.g., clean-up or costs to equipment).

There is a need for further action and an examination of relevant economic instruments to determine if these could help meet the challenge.

Instruments used to address marine litter

A wide range of instruments are available to address the problem of marine litter. Some are regulatory instruments such as bans on waste dumping at sea, others are direct investments in waste management infrastructures, awareness-based instruments (e.g., information campaigns) and market-based instruments such as plastic bag taxes. Some instruments target marine litter directly and others affect marine litter as part of a wider ambition – e.g., as part of waste management, litter control or resource efficiency.

6 Brown et al, 2005.

What are market-based instruments?

Market-based instruments (MBIs) include taxes, charges, fees, fines, penalties, liability and compensation schemes, subsidies and incentives and tradable permit schemes.[7] There are several basic principles behind MBIs: the polluter pays principle (PPP), the user/ beneficiary pays principle and the principle of full-cost recovery.

There are many definitions for market-based instruments for different contexts. The Organisation for Economic Co-operation and Development defines economic instruments as tools that 'affect estimates of the costs and benefits of alternative actions open to economic agents'.[8] Or to put it more simply, if a tool affects the cost or price in the market then it is a market-based economic instrument.

In recent years there has been increasing rhetorical uptake of the principles behind market-based instruments (MBIs) – e.g., support for the "polluter pays" principle, "user/beneficiary pays" principles and principle of full-cost recovery (see Chapter 3 for details). There has also been an increased uptake of MBIs and new lessons available on how they can be designed, launched, and made to work. There exists a new opportunity to explore the role of MBIs for marine litter. MBIs include:

- Deposit refund schemes on plastic and glass bottles – increasing the incentive to reuse the bottles and reduce the temptation to litter;
- Plastic bag tax – increasing the incentive to not use or reuse plastic bags – and other product charges – again reducing the risk of litter;
- Fines for litter and illegal disposal of unwanted fishing gear, bait boxes and hooks / fly tipping – making anti-social behaviour costly; and
- Liability for pollution/marine littering, linked to cost of a clean-up, and linked to a compensation scheme for those whose livelihoods were compromised by marine litter.

There are also revenue-raising MBIs that could prove valuable as a means to fund needed waste infrastructures such as:

- Charging schemes for waste service covering the costs of collection and environmentally sound disposal of waste;
- Port reception or ship-berthing fees – a general fee could have a portion of the revenues allocated for waste management infrastructure; and
- Tourist taxes, car parking fees, waterfront business charges and other sources of revenue earmarked for beach cleaning and awareness-raising programmes.

Finally, there are also subsidy schemes or incentives, for example:

- Award-based incentives for coastal villages with Integrated Waste Management (IWM) systems and
- Incentives to fishermen for reporting and retrieval/removal of debris especially abandoned or lost fishing gear.

Each of these can address parts of the marine litter problem. They are generally targeted more widely than marine litter, though the latter does have the potential for specific application on coastal areas and beaches.

1.2 Purpose and structure of this report

There is a new opportunity for using market-based instruments to address marine litter. There is a general increase of support for these tools as these strategies have moved from being a "vanguard" instrument to a traditional instrument. There is also a growing wealth of experience in the design, launch, and operation of MBIs that help to offer lessons in where and how they can work. This report, initiated by UNEP and initially drafted by the Institute for European Environmental Policy (IEEP) and further developed by Sheavly Consultants, responds to the opportunity for a fresh look at using market-based instruments for address marine litter.

---

[7] Note that 'market-based instruments' (MBIs) are sometimes referred to as "market-based economic instruments" or "economic instruments" (EIs). For the purposes of this report, MBIs is the chosen term, though they all can be used interchangeably.

[8] OECD, 1994.

This report was prepared to function as a practical “reference” guide for decision makers and relevant organizations on how to select, apply and implement various market-based instruments (MBIs) as part of a multifaceted strategy to address problems associated with marine litter. It provides an overview of the types of marine litter problems that exist and sources (Chapter 2); and useful for the policymakers who are more familiar with economic policies than marine environmental issues (Chapter 3). It also provides an overview of what MBIs are and where they have been used (Chapter 4). An Overview and recommendations are also presented (Chapter 5).

There are numerous opportunities for using MBIs and this report should help in providing some insight in deciding whether the conditions are right and which instruments could potentially be useful to a municipality.

This report is also intended as an “operational” guide, and hence provides clear, practical and operational guidelines (Chapter 3) to assist policymakers and the Regional Seas programmes in selecting and promoting, as appropriate, the various types of market-based instruments for use in addressing marine litter problems.

The decision as to which instrument or instrument package is best will ultimately be dependent on the type of marine litter, source of the litter and national context – its legal and regulatory status, the state of its waste infrastructure and experience and expertise in using different economic instruments.

This report has been prepared in consideration of the wide range of countries with varying economic, environmental, political and social conditions. Addressing marine litter issues on all fronts is critical if this environmental problem is to be brought under control. The long-term health and survivability of our many ocean resources may well depend upon it.

Chapter 2. Marine litter – what is it and what are the current initiatives to address the problem?

This chapter is intended to provide policymakers, economists, local governments and members of civil society with a brief overview of the marine litter problem, highlighting the impacts including costs and losses, as well as some international, regional and national initiatives that are currently working to address this global problem. The information in this chapter is, in part, based on the UNEP report (2005), other regional reports undertaken by UNEP Regional Seas Programmes and organizations in Europe and the Caribbean and Pacific regions and marine debris programmes in the United States. Additional information on marine litter and related issues can be found in the referenced materials.

2.1 What is marine litter?

The international definition of marine litter:

> "*…is any persistent, manufactured or processed solid material discarded, disposed or abandoned in the marine and coastal environment.*"[9]

More specifically, marine litter includes a range of items such as remnant packaging and containers from convenience foods and disposable products, gloves, clothing, fishing gear and nets. Marine litter is largely composed of synthetic materials including plastic, foamed plastic, metal, glass and rubber. Common and abundant marine litter examples include:

- Beverage and food packaging-related wastes (e.g., bottles, cans, lids, food wrappers and containers and disposable cups, plates, straws and utensils);
- Fishing-related debris (e.g., fish/lobster traps, crab pots, bait boxes, fishing lines, lures, nets and floats);
- Household items (e.g., clothing, furniture, appliances, light bulbs and computers);
- Manufacturing and transportation-related wastes (e.g., resin pellets, barrels, drums, shipping pallets, plastic sheeting and strapping bands);
- Sewage and sanitary-related debris (e.g., tampons, condoms); and
- Smoking-related wastes (e.g., cigarette filters, packaging, cigar tips and disposable lighters).

The type of material associated with the types of marine litter helps to focus attention on sources and usage. Products are made with specific materials based on the function and durability of the material for that product. The choices in materials and applied usage are an inherent part of this issue (See Table 2.1).

Table 2.1 Materials and items found as marine litter

Material	Litter types
Plastics	Beverage bottles, trash bags, food wrappers, bottle caps, toys, light sticks for fishing, cigar tips, cigarette filters
Rubber	gloves, boots, tyres
Wood	construction timber, pallets, fragments of both
Sanitary or sewage related debris (SRD)	tampons, condoms, human waste (faeces), cleansing materials/products
Paper and cardboard	boxes, containers, general items closer to shore
Cloth	clothing, furnishings, shoes
Glass	bottles, light bulbs
Pottery	fragments of plates, cups, etc.
Resin	agricultural fertilizer pellets, pre-production resin pellets
Metal	beverage cans, oil drums, aerosol cans, automobile parts, scrap including household items (e.g., bikes, furniture)
Various combined materials	lost and abandoned fishing nets (plastics, wood & metal) and computer equipment, monitors (plastics, glass & metal)

Source: UNEP, 2005b

[9] UNEP, 2005a.

Currently, there is no up-to-date estimation of the amount of marine litter worldwide. There has been a study by the US National Academy of Sciences that gave an estimate of approximately 6.4 x 10^6 tons of trash per year entering the ocean.[10]

This study was published in 1975, before MARPOL Annex V, and thus is quite dated. This study only took into account debris from vessels. Data were collected from vessels' Garbage Record Books. Today, with the implementation of MARPOL Annex V, Garbage Record Books are only required by vessels over 400 tonnes. MARPOL Annex V entered into force in December 31, 1988. It is obvious that a method for assessment needs to be developed to answer this question. At present, information on the amount of marine litter can only be determined in localized activities (e.g. monitoring and beach clean-ups) where this information is being recorded.

Data from beach and underwater clean-up campaigns organized by international non-governmental organizations (NGOs) and national governments provide some insights into the scale of the problem at the global and national levels. An international marine debris campaign known as the International Coastal Clean-up (ICC), coordinated by the Ocean Conservancy, a US-based, ocean conservation NGO has engaged 127 countries during this programme's 22-year history, establishing a global database of marine debris information.

During the 2007 ICC activities, debris was removed along 53,795 kilometres of coastline, inland waterways and underwater sites and more than 7.2 million pieces of marine litter were collected and tabulated, weighing in at more than 2,758 metric tonnes. A majority of the sources of the documented marine litter collected during the ICC included shoreline and recreational activities (57.4 per cent) and smoking-related activities (33.6 per cent). The remaining sources were associated with ocean and waterway activities (6.3 per cent), dumping (2 per cent) and 0.8 per cent related to medical and personal hygiene (Ocean Conservancy, 2008).

Examining the data collected during the 2007 International Coastal Clean-up, which was conducted in 76 countries, revealed that 84.1 per cent of the total debris collected occupied the "top ten" debris items tabulated, which consisted of smoking materials, food and beverage containers, various types of packaging and utensils – see Table 2.2 (Ocean Conservancy, 2008).

Table 2.2 2007 ICC – "Top ten" debris listing

Debris items	Counts	Percentage
Cigarettes/cigarette filters	1,971,551	27.2
Food wrappers/containers	693,612	9.6
Caps/lids	656,088	9.1
Bags (paper & plastic)	587,827	8.1
Beverage bottles (plastic)	494,647	6.8
Cups/plates/forks/knives/spoons	376,294	5.2
Beverage bottles (glass)	349,143	4.8
Cigar tips	325,893	4.5
Straws/stirrers	324,680	45
Beverage cans	308,294	4.3
Total "top ten" debris items (global)	6,088,027	84.1
Total debris (global)	7,238,201	

Source: Ocean Conservancy, 2008

[10] National Academy of Science, 1975.

Furthermore, a number of regional clean-up surveys and campaigns in Africa, the Caribbean and Mediterranean, as well as national surveys in the UK, Japan and Korea provide various estimates of the quantity of marine litter, which highlight that plastic materials are a key problem which requires urgent action (Allsopp et al, 2006). In 1998, a survey found that 89 per cent of the litter observed floating in the North Pacific was composed of plastic materials (UNEP, 2005a); in the North Atlantic almost 60 per cent of marine litter is plastic (OSPAR, 2007) and in Mozambique and South Africa, the most common litter material collected on those beaches was approximately 80 per cent plastic (Lane, 2007).

2.2 Sources of marine litter

All marine litter can be linked to human activities on land or at sea. Researchers traditionally classify debris sources into two categories: ocean/waterway-based or land-based, depending on where the debris enters the water. Understanding the differences in these two categories will help policymakers to develop appropriate policies and regulations, as well as select appropriate economic tools that will aid in addressing the unique aspects of these litter sources.

2.2.1 Ocean/waterway-based litter sources

Ocean and waterway-based marine litter can come from commercial fishing vessels; merchant, military, and research vessels; recreational boats, ferries and cruise ships; and offshore oil and gas platforms and associated supply vessels (UNEP, 2005b) and Sheavly and Register, 2007). Some litter enters the water from accidental loss or system failure, while other debris is the result of poor waste management practices and illegal disposal. Commercial and recreational fishermen create marine debris when they discard ship-generated trash overboard or fail to retrieve nets, ropes, trawl floats and other fishing gear.

In the 2007 International Coastal Clean-up, 6.3 per cent of all the debris collected was related to ocean-waterway sources resulting from activities such as recreational and commercial fishing and boating, commercial shipping and other offshore industrial activities (Ocean Conservancy, 2008). In the UK, fishing debris such as line, nets, buoys and floats is the second biggest source of beach litter at 14.1 per cent which is much higher than shipping, medical and sewage-related wastes (MPMMG, 2002).

2.2.2 Land-based litter sources

Land-based litter begins on city streets, public parks and beaches, parking lots, and other surfaces. The debris then is washed, blown or discharged into nearby waterways by rain, snowmelt, and wind. Sources of land-based litter include inappropriate or illegal dumping of domestic and industrial rubbish; public littering; inadequately covered waste containers and waste container vehicles; poorly managed waste dumps; manufacturing sites, processors, and transporters; sewage treatment and combined-sewer overflows; beachgoers; surfers and pier fishermen; shore-based solid waste disposal and processing facilities.

Land-based sources account for 60 to 80 per cent of marine litter globally, with variations occurring between regions and countries (UNEP, 2005a). In the Wider Caribbean region, a large percentage of marine litter is attributable to land-based sources. As indicated in annual beach clean-ups conducted since 1989, it was estimated that 89.1 per cent was attributable to land-based sources with 10.9 per cent attributable to ocean-based sources (UNEP, 2006b).

However, it should be noted that in large ocean areas, a large proportion of marine litter cannot be source typed, largely due to the influence of winds, tides and currents which transport and move marine litter once at sea. An additional problem is the persistence of some forms of litter which may circulate at sea for a long time, floating or sinking to the seabed.

2.3 Impacts and costs of marine litter

2.3.1 Impacts and costs

Marine litter is a global issue, affecting all the major bodies of water on the planet – above and below the water's surface. This litter can negatively impact humans, wildlife, sensitive aquatic habitats and the economic sustainability of coastal communities. Marine litter can also lead to a loss of biodiversity (e.g., accidental catch by "ghost" nets), loss of ecosystem functions, the provision of services from these ecosystems, the loss of revenue (e.g., reduced fisheries catch and tourism revenues), loss of livelihoods within the local community and an increase clean-ups and maintenance costs.

Examples of the nature and scale of marine litter problems and their impacts include:

<u>Human health and safety:</u>

Visitors to a beach can be harmed from broken glass, medical wastes, fishing line and hooks and discarded syringes. Swimmers, divers and snorkelers can become entangled in submerged or floating

debris. Medical and personal hygiene debris that enters waterways through inadequate sewage treatment systems also presents serious water quality concerns.

Economic and aesthetic impacts:

Litter, debris and solid wastes that enter coastal and inland waterways can result in serious economic impacts including the loss of tourism revenue for coastal beach communities, as well as with the fishing and maritime industries. Litter makes shorelines unattractive and potentially hazardous, and forces communities and governments to expend funds for beach cleaning and maintenance. The abundance of economically important species can be reduced through entanglement and ingestion of litter, and through habitat destruction.

Wildlife entanglement and ingestion:

Entanglement occurs when an animal becomes trapped in marine litter, mistaking it for a source of food or accidentally encountering it. Entanglement can lead to injuries due to lacerations, suffocation and strangulation, and can also hamper an animal's ability to swim or fly away to avoid predators or hunt food. Entanglement in nets, fishing line, ropes and other debris poses a significant threat to seabirds, sea turtles, dolphins and other marine animals, especially those that live near or on the water. Monofilament line, fishing nets and ropes, ribbons on balloons, six-pack rings, and packing strapping bands are some of the more harmful culprits related to entanglements of wildlife (Sheavly, 2005). According to the US Marine Mammal Commission (1998), 136 marine species have been reported in entanglement incidents, including six species of sea turtles, 51 species of seabirds and 32 species of marine mammals. Although it is difficult to quantify the scale of the entanglement problem, there are some estimates for specific species:

- It is reported that approximately 130,000 small cetaceans are caught in nets each year (USEPA, 1992) and approximately 100,000 marine mammals per year die from entanglement or ingestion of marine litter.
- In the Southern Ocean, it was reported that several thousand Antarctic fur seals were entangled in discarded fishing gears in the early 1990s although this situation has since improved with the implementation of waste dumping guidelines at the international and regional level (Allsop et al, 2002).
- The rate of entanglement of some species in marine litter, for example, seal lions in southern Australia may be slowing the recovery of these populations (Allsop et al, 2002).
- Cases of entanglement have been recorded in six of the seven existing sea turtle species mainly in monofilament lines, rope and commercial trawls and gillnets (Marine Mammal Commission, 1999).
- Derelict blue crabs (*Callinectes sapidus*) have the potential to affect the blue crab fishery and other marine oriented species (Havens et al, 2008).

The impacts of lost or abandoned fishing gear are well documented. For example, in the northeast Pacific, it was estimated that 15 per cent of the mortality of young fur seals (*Callorhinus ursinus*) could be attributed to net debris (FAO, 2003). In Australia, Australian sea lions are most frequently entangled by monofilament gillnets that originates from shark fishing operations (UNEP, 2005b).

Ingestion of marine litter is also a serious problem, when marine animals mistake marine litter for food. Birds and marine mammals are particularly susceptible to this problem where the occurrence of litter ingestion can reach 100 per cent in some seabird populations (MPMMG, 2002). Plastic items that look like possible food or prey and which have broken into smaller pieces can be ingested by seabirds and are sometimes passed on when feeding young chicks. These materials can be harmful or lethal obstructing the passage of food and causing stomach ulcers in the larger birds.

There are also records of ingestion of plastic bags by sea turtles which can mistake the floating bags for jellyfish incurring damage to the digestive tract, sometimes with deadly consequences. The breakdown of plastic items into smaller pieces and the ingestion of these pieces also threaten marine wildlife as they can result in leaching and absorption into the body ([US] EPA, 1992). In addition, hazardous pollutants such as DDT and PCBs can enter the food chain when contaminated plastic pieces are ingested. A study of the seabirds, shearwaters, cited by Derraik (2002), revealed that PCBs in the tissue of these animals was derived from ingested plastic debris.

Habitat destruction and non-native species introduction :

Debris can physically damage shoreline areas, living coral reefs, and other sensitive coastal and benthic habitats. Ropes, nets and tarps are moved by currents and tides, and can abrade, scour, break, smother, and destroy fragile aquatic habitats. Ensnared debris may also smother seagrass beds or corals, and can cause increased siltation and turbidity, blocking essential sunlight to these benthic communities.

Another key ecological impact of marine litter is the transport of invasive species through drifting debris which can host entire communities of encrusting and attached organisms and transport them great distances – often to areas where they can harm or compete with native species. The impact of the biological invasion of non-native species have been known to have detrimental impacts on ecosystems as the litter items acts as transporters or "rafts" and organisms from algae, barnacles and molluscs are frequently transported from one region to another (Allsopp et al, 2006).

According to Barnes (2002 and 2003), it has been estimated that man-made marine litter has approximately doubled the opportunities for transporting marine organisms in tropical latitudes and tripled it in high latitudes, thus increasing the risk of non-native species invasions. In a survey of the beaches of 30 remote Antarctic islands, the British Antarctic survey has found that plastic has replaced wood as the primary shoreline litter material and the non-native species "riding on the back of the litter" (worms, barnacles and various larvae) are of great concern. These species are non-native to these islands and there are concerns about the impact of these introductions on endemic species (Barnes, 2002).

Vessel damage:

Nets, ropes and other derelict fishing gear can cause serious damage to vessels by entangling propellers and rudders. Plastic bags are a common cause of clogged and blocked water intakes, resulting in burned-out water pumps in recreational boats. Such incidents cause costly repairs, loss of time, and danger to boaters and crews. The true scope and frequency of damaging encounters between debris and vessels is difficult to calculate, as most incidents go unreported.[11]

Variability of marine litter impacts

The impact of marine litter is dependent on the nature of the litter. Some materials take longer to degrade than others and persist on land and at sea longer, thereby posing threats to wildlife and humans over different time periods (see Table 2.3).

Table 2.3. Degradation rates of different materials in the marine environment

Material	Degradation rate (years)
Cotton rope	1
Untreated plywood	1-3
Plastic bag	10-20
Commercial netting	30-40
Foamed plastic buoy	80
Aluminium can	80-200
Plastic beverage bottle	450
Monofilament fishing line	600
Glass bottle	1 million

Source: Thomson et al, 2004.

Plastics by their chemical nature are durable, waterproof and can be highly persistent in the environment. A plastic bag, for example that takes 10-20 years to degrade can be a serious problem. Mandating the use of bio-degradable (polylactide-PLA) and compostable bags poses additional concerns as many of these products can only be effectively composted in professionally-managed, large-scale composting facilities with mature compost, constant temperature under normal thermalphylic conditions and specific relative humidity for good biological growth.[12] Also, the mixing of biodegradable plastic with recyclable plastic items during the recycling process would contaminate the reprocessed materials, destroying their usability.

[11] Hall, 2001.

[12] NatureWorks. http://www.natureworksllc.com/. Accessed July 2008.

Costs of marine litter impacts

It is important to note that the costs associated with marine litter are largely borne by parties different from those causing the problem, with the result that there is insufficient liability to the entities responsible for the source of the problem. In short, the polluter usually does not pay. The high economic costs and negative impacts associated with marine debris justify the time, research, and resources it will take to reduce this form of ocean pollution by all governments.

The costs of marine litter can be categorised into "aesthetic intangible costs" and "direct economic costs and losses." Aesthetic costs occur when the presence of marine litter in an area affects the public's perception about the quality of the surrounding marine environment, water quality and amenities. This negative perception impacts the value of local property, the quality of life as well as wildlife and sensitive habitats.

In relation to the economic costs and losses associated with marine litter, these include the loss of fishing and tourism opportunities, as well as the costs of clean-up campaigns and waste management systems.

Marine litter results in lost revenues for the fishing industry due to the time and effort involved in removing debris from their nets, contaminated catch due to debris and the damage and repair of nets due to debris. In the Shetland Islands, fishermen estimated that 69 per cent of their catch has been contaminated or bruised by marine litter with additional costs incurred due the snagging of nets on the seabed. The cost and time spent on clearing nets and propellers of marine litter can often be high, especially when the litter has to be removed by divers. It is estimated that between £6,000 and £30,000 (USD 9,096- 45,480[13]) per boat can be lost per year (Hall, 2000). Other estimates put the cost of marine litter for the UK fishing industry at over €33 million (USD 31 million[14]) a year (MPMMG, 2002).

The loss of economic opportunities for the tourism industry due to marine litter can also be great. In Sweden, it is estimated that the substantial accumulation of litter on the beach depresses tourism by between one and five per cent. In the worst case scenario, this equates to the annual loss to the local community of approximately £15 million (USD 30.03 million), in addition to 150 person-years of work (OSPAR, 2007). In the US, large quantities of medical wastes posing health risks to humans led to expensive beach closures in New Jersey and New York in 1987-88 with a loss of several billion dollars (MPMMG, 2002).

It is more difficult to quantify the environmental costs associated with marine litter but these should not be overlooked when accessing the true costs of marine litter. Beach clean-ups are a common practice for local and national authorities in many countries in Asia, the Caribbean, Europe, the Mediterranean and the Americas. Beach clean-ups are labour intensive and can be costly depending on the scale of the activity. According to Hall (2000), the total cost reported by local authorities in Denmark, Sweden, UK and Norway for beach clean-ups was £2,913,795 (USD 4.42 million). The clean-up of marine litter from other waterways is equally expensive. An estimated cost to effectively remove litter from South Africa's waste water streams is about R2 billion (USD 279 million) per year (Lane, 2007). In the UK, the costs to harbour authorities to remove floating debris can be as high as £15,000 (USD 30,025) per year.

The environmental impact of clean-ups can also be significant. In the UK, beach clean-ups are a common practice for district councils reliant on the tourist industry. Recent surveys suggest that 43 per cent of the UK clean-ups are done manually, while 57 per cent use manual and mechanical techniques. The mechanical techniques threaten natural habitats as the machines affect species diversity and abundance and there are also concerns about the impact of mechanical clean-ups on the stability of the beaches (MCS, 2002). For example, mechanized beach cleaning can uncover and destroy sea turtle nests, and leave ruts or ridges that disorient hatchlings as they leave the nests (Lutz and Musick, 1996).

2.4 What is currently being done to address marine litter?

There are a range of initiatives at the global, regional and national level that have been implemented to help address the problem of marine litter. There are three international conventions that address various aspects of marine litter – Annex V of the International Convention for the Prevention of Marine Pollution from Ships (MARPOL 73/78), the Convention for the Prevention of Marine Pollution by Dumping of Wastes and other Matter (the London Convention) and the Convention on the Transboundary Movements of Hazardous Wastes and Their Disposal (the Basel Convention). The following is a partial listing and review of international conventions, agreements, global plans of action, regional initiatives, global and regional networks and select activities by national governments and NGOs that are working to address marine litter:

[13] At £1=USD 1.516 (Year 2000 mean exchange rate).

[14] At €1=USD 0.945 (Year 2002 mean exchange rate).

- *London Convention*, signed in 1972, is an important tool which is concerned solely with the disposal of wastes at sea. The Convention was recently reviewed and amended and when it has been ratified and implemented should further strengthen the rules on dumping at sea, although there is still no direct reference to marine litter.
- *International Convention for the Prevention of Pollution from Ships* (MARPOL 73/78). Annex V to the MARPOL Convention prohibits the dumping of garbage, specifically all plastics and synthetic materials including ropes and fishing nets into the ocean and is the leading international instrument to control marine litter from shipping, including fishing vessels and leisure craft.
- *Basel Convention* is concerned with "the problems and challenges posed by the trans-boundary movements and environmentally sound management of hazardous waste and other wastes." Although solid plastic wastes are not included as part of the Basel Convention, waste collected from households is included under "non-hazardous land-based marine litter."
- *Global Programme of Action for the Protection of the Marine Environment from Land-based Activities* (GPA) is a UNEP programme that was adopted in 1995 in response to concerns over the impacts of land-based activities on the marine environment. Litter is one of the nine pollution sources identified by the GPA. This programme proposes a number of actions which should be taken at international, regional and national levels to address the problem.
- Ocean Conservancy launched their beach clean-up campaign in 1986 in the US and by 1989 had expanded their activities globally to create the *International Coastal Clean-up* (ICC). The mission of the ICC is to engage people in the removal of trash and debris from the world's beaches and waterways, to identify the sources of debris and to change the behaviours that cause pollution.
- For the past 22 years, on the third Saturday in September, hundreds of thousands of volunteers converge on every major body of water around the world to remove debris and record information on the types and sources of debris collected. In 2007 alone, Ocean Conservancy engaged 378,192 volunteers in 76 countries who collected and documented 7.23 million pieces of debris through the International Coastal Clean-up. Ocean Conservancy has had a significant role in determining what activities produce the debris and uses this information to help develop policies and programmes to abate and reduce the presence and impacts of marine debris around the world.
- *International Council for Cruise Lines* (which merged with the Cruise Lines International Association in 2006) adopted mandatory environmental standards for cruise ships in 2001 and its ICCL members are committed *to "implementing a policy of zero discharges of MARPOL Annex V solid waste products (garbage)…"* into the marine environment. Further, no waste, including glass, cardboard, aluminium and steel cans, can be discharged unless it has been properly processed in line with MARPOL requirements.
- *Oceans and the Law of the Sea.* The problem of marine litter was recognized by the UN General Assembly (GA), in its Resolution A/60/L.22 - Oceans and the Law of the Sea - of 29 November 2005. Articles 65-70 of this resolution call for national, regional and global actions to address the problem of marine litter. This GA resolution notes the lack of information and data on marine debris, encourages States to develop partnerships with industry and civil society, urges States to integrate the issue of marine debris within national environmental strategies, and encourages States to cooperate regionally and sub-regionally to develop and implement joint prevention and recovery programmes for marine debris.
- In response to the GA call, UNEP (GPA and the Regional Seas Programme), through its Global Marine Litter Initiative took an active lead in addressing the challenge, among others, by assisting 12 Regional Seas around the world in organizing and implementing regional activities on marine litter in the Baltic Sea, Black Sea, Caspian Sea, East Asian Seas, Eastern Africa, Mediterranean Sea, Northeast Atlantic, Northwest Pacific, Red Sea and Gulf of Aden, South Asian Seas, Southeast Pacific and Wider Caribbean. In the framework of these activities, selected Regional Seas prepared Regional Reviews on Marine Litter, with many also preparing Regional Action Plans for Management of Marine Litter.

In addition to regional initiatives, there are other actions being taken at a national level to address the problems of marine litter. These include the introduction of financial incentives and disincentives (see Chapter 3 for a more detailed review of these tools) including refunds, taxes and fines to ensure compliance with laws and rules pertaining to litter. Countries which have taken specific actions include UK, Sweden, Australia, Republic of Korea, and the Netherlands by implementing bans, fines and taxes to dissuade the use of synthetic materials.

For example, China banned the use of disposable expanded polystyrene food containers in 2000 and in 2008 also imposed a ban on the free distribution of the ultra-thin plastic shopping bags. In 2003 Taiwan banned the use of disposal tableware, and Ireland, Denmark and Switzerland imposed fees for the use of plastic bags which have resulted in a decline in their use. In addition, NGOs including the Hellenic Marine Environment Protection Association (HELMEPA) in Greece, the Marine Conservation Society in the UK and Caribbean Conservation Association have carried out regular beach and seabed clean-ups and public awareness campaigns targeted at changing behaviours related to general littering and dumping.

2.5 Limitations of current measures to address marine litter problems

Despite growing political commitment and a range of international, regional and national initiatives to address and control marine litter, it remains a global problem and challenge which requires further actions that include coordinated and multi-sectoral strategies.

At a global level, there is still a need to ratify and implement existing international conventions which can assist in addressing the marine litter problem. For example, not all coastal or flag states have ratified or adhere to international instruments such as MARPOL Annex V. In cases where countries have ratified Annex V, these countries need to have the financial and technical capacity to enforce necessary regulations. Countries are at different levels of development; ensuring implementation and compliance with international legislations could pose a particular challenge to developing countries. In the Western Indian Ocean (WIO), for example, there are a number of policies and laws to regulate and manage general waste but in the case of all WIO countries except for Seychelles, there is a need to enforce and monitor existing laws (Lane, 2007).

There is also a need to improve the knowledge base upon which to make decisions. While there are governmental and national efforts to survey, monitor and quantify marine litter from land-based sources, information about litter from ocean-based sources in most cases is non-existent or not collected on a regular basis. In some instances the collection of such information is largely dependent on funding from international organisations such as UNEP and IOC. Furthermore, there is a lack of current information on the social, economic and environmental impacts of marine litter. These are largely inferred and not adequately assessed or quantified.

Funds to monitor, reduce and manage marine litter at the international, regional, national and/or local level are a major constraint on extending efforts on marine litter. International organisations such as UNEP fund projects to develop projects for assessing marine litter regionally through the Regional Seas Programme, but more funds are required to implement activities, increase public awareness, implement regulatory controls and improve waste management systems. In developing countries the lack of funds increases the impact.

2.6 Summary – what is needed?

Marine litter remains a global problem and challenge. In 2005, UNEP concluded that:

> "*… marine litter is not a problem which can be solved only by means of legislation, law enforcement and technical solutions. It is a social problem which requires efforts to change behaviours, attitudes, management approaches and multi-sectoral involvement.*"[15]

This chapter reviewed select initiatives to address marine litter but concludes that there are limitations in their effectiveness to further address marine litter. Even if these limitations were addressed, there is still the need to look beyond traditional regulatory and technical measures and evaluate the potential of economic instruments (EIs) such as market-based instruments (MBIs) to alleviate the problem of marine litter in the long term.

Chapter 3 presents a list of economic instruments as well as guidelines for selecting MBIs that could be employed by communities and states to reduce the amount of litter and debris entering coastal waters and the ocean.

[15] UNEP, 2005b.

Chapter 3. Economic tools/market-based instruments – availability, use and potential

Communities, government agencies, members of civil society, business and industry can all take steps to reduce marine litter. This chapter introduces some of the tools and the steps to be taken in order to ensure cleaner oceans.

As an introduction to market-based instruments (MBIs), it indicates what can be learned from their use and what potential there is to use these strategies to promote the reduction of marine litter. It offers policymakers insights into numerous economic tools, how to select the appropriate tool for local litter problems and guidelines on implementing policies that will have a positive effect.

There clearly is potential for the increased use MBIs to address the problem of marine litter. How and where MBIs should be used, what their design should be and how they link to the broader portfolio of instruments depend not only on the type and source of marine litter but also the national context. This chapter presents some guidelines for helping to clarify whether the instrument is the right one, at the right time, given the particular conditions that would affect that potential success of the instrument.

This chapter also reviews the policy cycle, along with the steps in the process – problem identification, solution identification, implementation, monitoring and revision. The chapter further explores practicability and political reality issues that should help policymakers in their evaluation as to whether the instrument would be the politically acceptable, implementable and the most practical strategy.

3.1 What are market-based instruments?

Market-based instruments (MBIs) include taxes, charges, fees, fines, penalties, liability and compensation schemes, subsidies and incentives and tradable permit schemes. MBIs are sometimes referred to as "market-based economic instruments" or "economic instruments" (EIs). For the purposes of this document, MBIs is the chosen term, though they can often be used interchangeably.

There are numerous definitions for market-based instruments based on different approaches and applications. The Organisation for Economic Co-operation and Development (OECD) defines economic instruments as tools that "*affect estimates of the costs and benefits of alternative actions open to economic agents"* (OECD, 1994). Or to put it more simply, if a tool affects the cost or price in the market, then it is a market-based economic instrument. This definition focuses on the economic signals and incentives. If it changes the cost or price of a good (e.g., plastic bag), service (e.g., waste collection), activity (e.g., waste dumping), input (e.g., materials), or output (e.g., pollution) then it is a market-based instrument.

MBIs can have an incentive effect that results in a change of behaviour, or a revenue-raising effect. In practice, it is a combination of the two, with the relative importance depending on the ability of the current market to respond to the price signal. The goals for using an MBI can be a mixture of ambitions – to provide an incentive to change people's behaviour, as well as to raise revenues. Goals can also be to "get the prices right" and ensure that the economic cost (the price) reflects the resource cost or cost of the pollution impacts. "Getting the price right" reflects the principle of "full-cost recovery" or "user pays principle." Making sure that the price reflects the true cost of pollution reflects the "polluter pays principle" (see Box 3.1). Getting the prices right can be part of an effort at addressing market failures (under pricing resources) and making the markets work more effectively.

For an incentive effect, MBIs rely on individuals and/or firms having the ability to respond to the price signal – hence choosing a less-polluting good, service or activity or simply less of it if there is no appropriate alternative. Note that market-based instruments can be applied to different components – e.g., on the inputs and hence change the production costs, or on the outputs and hence change the price. In some situations a change in cost will result in a change of the price (if the cost increases can be passed on to the consumer) and in other cases there will be less pass through. This is important as it will affect the likely influence of the instrument.

Note that even when the price goes up, there may not be an immediate change of behaviour, as there might not be adequate alternatives or substitutes or the ability to reduce consumption. Economists call this short-term "inelasticity." In the longer term, there might be a response, which economists call "elasticity" of demand. Again, this is an important issue to integrate into the consideration of which instruments to use.

MBIs can be part of the solution as they can generate additional revenues, which can be large as in fuel taxes or small with selective product taxes. These can be relatively stable (e.g., fuel taxes) or volatile (e.g., fines and fees, liability and in certain cases taxes where the consumer can move away from the taxed good). The revenues can go to the government or be channelled for specific, constructive uses (e.g., earmarked to pay for port waste facilities). Revenues can also be used to strengthen monitoring

programmes and enforcement activities. Several case studies in this report have used MBIs to generate revenues to combat marine litter (see Chapter 4).

Direct regulatory or administrative measures (also called "command and control"), while they also affect the market, are different in that they do not have a direct impact on costs or pricing. Typically a regulatory instrument relies on set standards like emissions standards, product standards or ambient environmental quality standards such as swimming-water quality. In other words, a law enforces a mandated level of performance. The level of pollution, therefore, is not chosen by individuals or industry according to their economic preferences, but is mandatorily fixed by a centralized policy initiative. Command and control instruments mandate socially desirable behaviours through legislation, using enforcement strategies such as the courts, police, fines and other penalties to make the mandate obeyed (Field and Field, 2002).

So while command and control regulations and MBIs are different, they do have some similarities. Any system of economic strategies usually requires appropriate legislative or regulatory backing and generally there are inter-linkages between MBIs and regulatory or administrative measures.

Environmental market-based instruments types – broad definitions and examples

The following list describes various MBIs with examples of each. Remember that these MBIs have various merits, and are suitable for use to combat different marine litter problems. Some of these MBIs also generate revenue.

Environmental taxes:

Environmental taxes are normally designed to change prices and therefore alter the behaviour of producers and consumers. They also raise revenues. They are "environmental" where the taxed item has a specific link (e.g., negative effect) on the environment. The revenues raised are usually applied to the government budget, or are earmarked for specific uses. Examples include energy taxes, fuel taxes, car tax, road tax, product taxes and pollution taxes:

- **Tourist taxes.** Taxes paid by coastal tourists could be earmarked for beach cleaning, waste infrastructure and awareness-raising programmes. In this "the user pays" plan, tourists (the beneficiaries of clean beaches) contribute to the maintenance of the beaches. However, some economists oppose the principle of earmarking funds on the grounds that it is more economically efficient if revenues raised go to the government budget without earmarking. Others argue that earmarking helps with public acceptability of the instrument and also helps ensure that funds actually do go to needed areas. This is a *de facto* payment for an environmental service.

- **Plastic-bag tax.** Taxes such as these increase the incentive to reduce the use of plastic bags. More and more countries and regional governments are applying MBIs of this type, while other communities are pursuing outright bans on some packaging types. It should be noted that bans may have other unintended impacts from the replacement products and should be thoroughly reviewed before implementation.

- **Taxes on other products**. Taxes can also be applied to the sale, distribution or use of other products such as fishing lines, fishing floats and foamed-plastic food containers, for example, in order to reduce the incentive to litter and to raise funds that can be made available for beach clean-up activities or to improve the coastal waste management infrastructure.

- **Landfill taxes**. Many European states have established landfill taxes. Landfill taxes vary from country to country in their level, their structure and how the revenues are used. A landfill tax strives to recover all or part of the expenses related to running a landfill, plus it may also be an attempt to reduce the quantity of waste going to landfill, therefore encouraging recycling and reuse. Landfill taxes usually have different effects on different actors. The effect on households depends on the way the taxes are collected (e.g., a flat yearly tax versus a per-bag tax) and the incentives they convey. For commerce and industry, the impact is felt more directly.
  Revenues generated from these taxes can be used to maintain the landfill, plan for future landfills, and to invest in additional environmental infrastructure. The impact on marine litter depends on the risk that waste will be blown off the landfills and find their way into marine areas, which is dependent of course on location and transport corridors for the waste (streams, rivers, sewers and culverts). It should be noted though that high landfill taxes might also lead to an increase of illegal dumping as an attempt by the users to avoid the payment of the fee. The setting of a landfill tax therefore should be accompanied by an adequate system of monitoring and control and the tax level should be set at an affordable level.

The marine environment benefits indirectly from these taxes, as long as they are effective in reducing the amount of waste typically found on along waterways and at sea.

A series of case studies are presented in Chapter 4, including examples of the use of environmental taxes.

Environmental charges and fees:

Environmental charges and fees are normally designed to pay for a good (e.g., electricity) or service (water supply, wastewater treatment), and cover, in part or in full, the cost of environmental services and abatement measures. Some examples of product taxes and charges are provided below. These types of tools are not specific to addressing marine litter in particular, but address better waste management practices in general. Market-based instruments can target activities that are only indirectly related to the production and/or abandonment of wastes at sea (for example, tourism, and boat ownership). Although these instruments are not specifically designed to decrease the production of waste *per se*, their revenues can be earmarked for local environmental initiatives, including those addressing marine litter.

Product fees and charges:

Product fees and charges consist of a surcharge on the price of products with potential negative environmental impacts. This type of economic instrument can be levied on many different products, including different types of packaging, tyres, batteries and various types of containers. A higher price is meant to disincentive their use. In the case of marine litter, this tool is particularly appropriate for reducing the quantity of plastic bags (plastic bag tax) and plastic bottles (packaging waste taxes) that can end up at the seashore. The revenue produced through taxes and charges can be applied to further environmental measures. Some countries prefer to have the money go to the public purse and others prefer earmarking the revenues for a specific purpose (EEA, 2005 and 2006).

Port reception, ship berthing, and commercial and recreational fishing fees:

These fees are paid by boats/vessels upon arrival to a port. According to the MARPOL Convention and its Annex V on garbage, ships should deliver all their wastes ashore, and

> …*"the Government of each Party to the Convention undertakes to ensure the provision of facilities at ports and terminals for the reception of garbage, without causing undue delay to ships, and according to the needs of the ships using them."*

The MARPOL 73/78 Convention, and especially through its Annex V on garbage, is the primary international instrument to control marine litter pollution from ships, including fishing vessels and leisure craft.

Port reception fees are usually not meant to reduce ships' waste directly, but portions of these fees can be used to improve waste management infrastructures in ports and support the development of innovative programmes to reduce the introduction of marine litter into the ocean. Furthermore, ports can impose waste requirements on boats using their facilities, like requirements to discharge of all waste prior to departure (therefore discouraging dumping at sea), monitoring and collecting data related to waste and encouraging recycling efforts.

Fees households pay for wastewater water treatment and waste disposal. When the charge or fee pays the full cost of the service, then the principle of "full-cost recovery" is upheld (see Box 3.1 for more on "full-cost recovery").

Charging for waste services, including landfills:

Fees also referred to as "taxes," can be charged to cover the costs of collection and environmentally-sound disposal of wastes. These revenues can help pay for landfills, their operation and maintenance. More and more countries are looking for methods to cover the full cost of waste management (full-cost recovery). Such fees and taxes also offer an incentive to consumers to reduce the amount of waste they are creating. This has to be done carefully to avoid perverse incentives to dump waste elsewhere, and hence actually lead to more litter that could end in contaminating marine environments.

Car parking fees (e.g., near waterfronts), beach entrance fees and waterfront business charges:

Fees paid by coastal tourists could be earmarked for beach cleaning, waste infrastructure and awareness-raising programmes. However, some economists oppose the principle of earmarking on the grounds that it is more economically efficient if revenues raised go to the government budget without earmarking. Others argue that earmarking helps with public acceptability of the instrument and also helps ensure that funds actually do go to needed areas. In this "the user pays" plan, tourists (the beneficiaries of clean beaches) contribute to the maintenance of the beaches. This is a *de facto* payment for an environmental service. Examples and case studies from Malta, the UK and East Asia are provided in Chapter 4.

Deposit refund systems:

These systems require paying a deposit upon the purchase of potentially polluting products (e.g., bottles and cans). This deposit is refunded if the product or its residues are returned for disposal and recycling, thereby avoiding a loss of materials and resulting in environmental pollution if the containers are not handled properly. Deposit refund systems aim to reduce the amount of waste going to landfills, encourage recycling, and prevent the incorrect handling of waste. They reward good behaviour and often cover the costs of environmentally-sound waste disposal. This is an incentive scheme and not intended to raise revenues. However, an efficient recycling programme must be in place for this strategy to work effectively.

These instruments have proved to be very effective when used for refillable bottles, with return rates above 95 per cent (EEA, 2005). Their use on bottles and cans has also proved very effective in reducing the amount of such material disposed of into the general waste stream, in particular when they are combined with some taxes (e.g., in some Nordic countries). Deposit-refund systems can also be extended to include batteries, lubricating oils, electronic equipment, white goods (refrigerators, stoves, washing machines) and automobiles (e.g., scrapping deposits in Denmark, Norway and Sweden).

As with other economic tools, deposit refund systems do not attempt to tackle marine littering in particular, but the overall reduction of bottles and cans from the waste stream can help reduce the amount of this type of litter at sea and the seashore. Some implementation problems occur with this system. See Chapter 4 for case studies on how these problems have been handled.

Fines, penalties, non-compliance fees:

Other MBIs are fines, penalties, penalty charges and non-compliance fees. The levels are set using different criteria – in some cases on the costs of damage, or on an "affordability basis" or on other factors such as legal limits or precedents set elsewhere. Sometimes non-compliance fees are a great deal higher than the costs associated with compliance if done correctly. Collection and enforcement are essential in making these instruments work effectively.

Fines and penalties can focus specifically on beaches (e.g., for littering specific items, including cigarette butts), fishing-related gear (e.g., illegal disposal of unwanted fishing gear, bait boxes and hooks) or illegal dumping (also called "fly tipping"). Penalties range very widely depending on the country and scope of the problems. The fines can be linked to clean-up costs[16] or simply set at a high level to deter littering. Revenues can be used to help with awareness campaigns or to provide additional waste receptacles and other infrastructure support.

Liability and compensation schemes:

Liability and compensation laws and policies focus on ensuring adequate compensation for damage resulting from environmentally harmful activities. This can include liability for marine litter and compensation payments to pay for beach clean-ups or habitat restoration. Compensation could also be provided for those whose livelihood is compromised by marine litter. It is no trivial process to set up such schemes and requires collaboration with the legal system, and is likely to not be possible for certain international sources of marine pollution. It may also be operationally difficult, especially in developing countries. Countries and governments have different laws and expectations when it comes to imposing liability on those who pollute or otherwise damage the marine environment. Some countries enforce "polluter pays" concepts, where the party that pollutes, not the government or the public, pays to mitigate the damage. Some nations have established funds financed by various industries to ensure adequate compensation if damage occurs. Nations vary on the limits on the liability of the responsible party and the scope of recoverable damages.

Environmental subsidies:

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*."

Some subsidies are "pro-environmental subsidies," where they focus on, relatively speaking, environmentally benign products or activities. Other subsides are "environmental harmful subsidies" where there are negative impacts on the environment.[17]

16 See http://www.ecy.wa.gov/programs/swfa/litter/fines.html for general litter fees.

17 See also, IEEP (2007), OECD (2005) and OECD (2006)

Tradable permits:

Tradable permits are:

"….An economic policy instrument under which rights to discharge pollution or exploit resources can be exchanged through either a free or a controlled permit-market."[18]

Examples include individual transferable quotas in fisheries, tradable depletion rights to mineral concessions, marketable discharge permits for water-borne effluents and carbon dioxide emissions trading. Tradable permits are less appropriate for marine litter issues, and therefore fall outside the scope of this study.

Incentives and technical or financial support:

Economic incentives can encourage fishers to bring back any debris found at sea, particularly debris likely to cause a hazard to navigation and safety. This type of incentive is meant to directly tackle the problem of marine litter by encouraging fishers to monitor or collect waste found at sea. Some examples from Hawaii and northern Europe are summarised in Chapter 4. Governments and non-profit organisations can also offer financial and technical support for the installation of waste management systems on board fishing vessels, leisure crafts and larger ships that have inadequate facilities. Award-based incentives can be offered to coastal communities that actively work to manage wastes, and to reduce the amount of litter entering waterways, ports and the ocean. Technical and financial support can also be offered to communities to develop Integrated Waste Management (IWM) systems. This system uses a combination of techniques and programmes to manage the municipal waste streams. It is based on the fact that the waste stream is made up of distinct components that can be managed separately.

Box 3.1 Principles supporting market-based instruments

There are several basic principles behind MBIs: (1) the "polluter pays" principle, (2) "user/beneficiary pays" principle and (3) principle of "full-cost recovery." These principles, adopted by many governments, support the use of market-based instruments and in some cases are strong drivers for the application of MBIs or reform of MBIs.

The "polluter pays principle" (PPP), which has been increasingly applied over the last 20-30 years and has become widely accepted as the general framework for internalising environmental externalities that assigns responsibility for addressing pollution to the polluter. This principle requires the polluter to take measures to reduce pollution, measure the pollution they are creating and releasing into the environment and in some cases pay taxes or charges for pollution and compensate for pollution impacts. The PPP requires that environmental costs are "internalised" and reflected in the price and output of goods and services. It also has the result of encouraging companies to find alternative manufacturing processes that create less pollution. For marine litter, this creates a basis for saying that the polluting entity should pay directly for the clean-up or pay a fine that allows for the payment of clean-up and also contribute to monitoring of marine litter.

A further interpretation of these principles may lead to the concept of the "user/beneficiary pays principle" which suggests that, where an action provides a benefit, those who receive the benefit should pay for the cost of providing that benefit. This can be used to argue that the user of a clean beach should pay a contribution to beach cleaning.

According to the "full-cost recovery principle" the costs of environmental services should be fully recovered from the entity benefiting from the service. This supports the idea that consumers should pay the full cost of electricity, water supply, wastewater treatment and waste services. There has been an increasing move internationally for the full-cost recovery principle to be applied directly and explicitly to electricity and to water pricing. Pricing for waste is moving in this direction, but it is still often seen as part of regional authorities' role financed via general taxes.

There is also a concern that charging each household based on the amount of solid waste (trash) they produce could create a perverse incentive – some people might illegally dump their waste (sometimes called "fly-tipping") in order to avoid paying waste fees.

Each of these principles has a potential role in dealing with marine litter. It is critical that these principles be understood and adopted as countries create relevant policies and regulations. Note that the design of an instrument will allow room for social considerations (e.g., affordability) to be taken into account.

[18] Scialabba, Nadia (ed.), 1998

Green procurement:

Another MBI is green procurement, where environmental considerations are integrated into procurement decisions. For example, a waterside community can require restaurants to purchase and use only reusable plates, cups and silverware, thereby eliminating the use of disposable items that often end up as marine litter.

Integrated approaches:

As mentioned above, in order to be more effective, MBIs should be considered part of more inclusive marine litter strategies, addressing issues such as monitoring, research and education, and providing sufficient facilities and human resources to ensure an efficient and coherent implementation of marine litter prevention measures.

3.2 What other tools are in the toolkit?

In addition to the market-based instruments (summarized above), there are other approaches that can help lead to a reduction in the amount of litter and debris entering our oceans and coastal waters. These other approaches do have an affect on consumer behaviour but are not considered economic instruments. Implementing a variety of these policies along with market-based instruments is recommended to ensure an effective and measurable decrease in the amount of solid wastes entering the marine environment.

These other approaches include:

- **Regulations** – Direct regulatory or administrative measures are also called command and control (CAC). As discussed earlier in this report, regulations typically rely on mandated standards (like emissions standards, product standards or ambient environmental quality standards such as swimming water quality). Examples include waste discharge prohibition and the labelling on products. The level of pollution is not chosen by individuals or firms according to their economic preferences, but is mandatory and fixed by a centralized policy initiative, and then enforced by the government.
- **Voluntary approaches** – awareness-raising, codes of conduct, self-managed pollution prevention programmes
- **Legislation** – extend powers of beach wardens and designation of special areas as under existing international pollution-prevention agreements such as MARPOL; ban the mass release of balloons into the outdoors, mandatory recycling programmes, etc.
- **Infrastructure improvements** – provide adequate facilities - such as bins, recycling collection facilities, fishing net and fishing line recycling facilities and collection boxes, etc.
- **Technological improvements** – promote the research and development of new or updated products and packaging that have increased degradability rates or design of commonly littered items in order to lessen their negative impacts, redesign stormwater conveyance systems to prevent litter from reaching streams, rivers, bays and ultimately the ocean.

While this report focuses on market-based instruments, other approaches and policy measures should be seen as complements. Below in Table 3.1, these approaches are highlighted where the approach is relevant to different types of marine litter. The table distinguishes between instruments for land-based sources of marine litter and from sea-based sources, as these often require different instruments to address them.

Nations vary also in their stages of economic, social and political development, all of which affect their ability to respond to environmental problems such as marine litter. Measures can be launched and be effective only if the regulatory framework and institutional infrastructures are in place. Nations also differ in their ability to afford the expenses associated with the various programmes. The relevance and effectiveness of any instrument will need to be assessed on a case-by-case basis to determine its potential for success.

It is also useful to remember that a large percentage of the litter found in the ocean originated from sources many kilometres inland. So a reduction of waste generated at inland sources, and a reduction in the improper handling of waste on land will be beneficial downstream. Furthermore, all countries should have implemented a proper waste management strategy and a properly functioning waste collection and disposal procedure. For example, municipal solid waste (one of the main categories of marine litter) has to be collected and disposed in an environmentally sound manner. This is clearly a necessary condition for the introduction of some of the MBIs, including landfill taxes.

3.3 Guidelines for choosing market-based strategies to prevent marine litter

Opportunities for using market-based instruments to address marine litter

In recent years there has been an increase in the practical implementation of the principles that are behind MBIs. The focus is to use market forces, through price signals, as a key part of the solution to the marine litter problem. Policymakers need to understand the pros and cons of each MBI, lessons from other countries and reduce the risk inherent in new policy innovation. In some cases, the pollution-reduction results from other countries or regions can serve as benchmarks.

There is increased support for the MBI tool as it has moved from being the "vanguard" to becoming a commonly used policy tool. Environmental charges, taxes, fines and deposit-refund programmes have become commonplace and are understood by a majority of the private sector. While most of these policy tools have targeted the correct disposal of solid waste on land and on the sea, there are potential innovative uses of MBIs that can more precisely target some of the more damaging forms of marine litter.

Selecting the best market-based instrument to use

Selecting the best instrument (or instrument package) requires careful consideration and depends on several factors including:

- The type of marine litter:

  The MBI should be relevant to the local problem whether it is nets, fishing lines, floating debris, etc.

- The source of the litter:

  Land-based or ocean-based;

  Many sources contributing to the problem versus just a few contributing sources;

  Domestic source or international sources.

- The economic and environmental impacts of the marine litter:

  For example, if the litter were impacting endangered animals or coral reefs negatively, your response would be different than if local tourism is the primary recipient of the negative impacts.

- The state of the region's or national's waste management infrastructure:

  Reducing marine litter from land-based sources requires an overall waste management strategy that relies on an adequate solid waste infrastructure, effective communication and policy enforcement. Many developing countries need to increase this infrastructure.

- The experience and expertise of using different MBIs.
- The political will to enact policies in face of possible opposition.
- The understanding that the up-front costs associated with pollution prevention, including supporting the development of an adequate solid waste management infrastructure, are less than the long-term costs of pollution to the environment and marine-related industries.
- The existence of adequate legal and regulatory policy frameworks that will support the MBI.
- The capacity to implement, enforce and monitor the impact of the MBI.
- A commitment to the basic principles behind MBI (polluter pays, etc.).
- The determinations of which MBIs are cost-effective, fair and consistent with other policies in place and offer the most environmental benefits.
- Which MBIs are politically and publicly acceptable?

Later in this chapter, the steps in the policy cycle are described, and the criteria that are essential to the process of selecting MBIs are discussed in detail.

As mentioned earlier, there is not one solution that will fix every problem; selecting an effective MBI requires careful consideration and analysis. Chapter 4 of this report has several case studies that show various approaches to different marine litter problems. Some case studies focus on the use of fairly common MBIs such as deposit-refund programmes for beverage bottles, fines for littering to reduce land-based sources of litter, while other case studies use more unique approaches.

Marine litter from ocean-based sources is a rather complex issue to address as monitoring and enforcing mechanisms are generally more difficult to develop and implement. Nonetheless, MBIs can be employed to help reduce these sources of litter. Many ocean-based pollution prevention efforts require a foundation of international cooperation, which can be bilateral, regional, or global. The problem of identifying legal responsibility and allocating liability limits the cases where MBIs could potentially be the best approach in this situation.

Table 3.1 Marine litter categories and market-based instruments

	MARINE LITTER CATEGORIES (Waste category affected by a tool highlighted in blue)								
TOOLS	**Land-based sources**				**Ocean-based sources**				
MARKET-BASED INSTRUMENTS	**Plastic**	**(Other) solid waste**	**Medical / sanitary**	**Sewage related debris**	**Plastic**	**(Other) solid waste**	**Sewage related debris**	**Nets & Boxes**	**Fishing debris**
Plastic bag tax									
Charging schemes for waste services									
Landfill tax									
Deposit for drink containers (plastic, glass and aluminium)									
Port reception fee (general fee approach)									
Incentives to fishermen for reporting and retrieval/removal of debris									
Award-based incentives for coastal communities with Integrated Waste Management (IWM) systems									
Damaged/abandoned fishing gear buy-back									
Tourist taxes, car parking fees, waterfront business charges and other sources of revenue to earmark for beach cleaning									
Fine for illegal disposal of litter/fly tipping/pet waste fouling									
REGULATION: "Command and Control" (CAC)									
Ships to provide prior notification of the amount and type of waste for disposal before entering the port									
Smoking prohibition on beaches									
Prohibit discharge of sewage (e.g., within 4 nautical miles) and sewage must be comminuted (reduced to fine particles) and disinfected (e.g., between 4 and 12 miles)									

TOOLS	MARINE LITTER CATEGORIES (Waste category affected by a tool highlighted in blue)								
	Land-based sources				Ocean-based sources				
MARKET-BASED INSTRUMENTS	Plastic	(Other) solid waste	Medical / sanitary	Sewage related debris	Plastic	(Other) solid waste	Sewage related debris	Nets & Boxes	Fishing debris
Ship garbage record books									
Fines register									
VOLUNTARY									
Awareness raising									
Codes of conduct									
Information on correct disposal of sanitary waste									
Volunteer beach cleaning									
LEGISLATION									
Extend powers of beach wardens, etc.									
Extend powers and duties for litter clearance to include beaches, rivers and canals									
Monitoring									
Designation of Special Areas (under MARPOL)									
OTHERS									
Provide adequate facilities (bins, recycling collection facilities, etc.)									
Biodegradable plastic									
Plastic recycling schemes (targets, standards)									
Litter surveys									
Improve sewer overflows									
Improve sewer infrastructures									
Secondary treatment as minimum requirement									
Simplify procedures for discharging waste to port reception facilities									
Mark drift nets									

3.4 Lessons from the application of MBIs on marine litter

General instruments that also address marine litter:

Many market-based instruments currently in use target the reduction of waste production and dispersal in general, though many have an indirect effect on marine litter. Marine litter in fact is often of the same nature of landfill waste – e.g., plastic bags, bottles, tyres, etc. – therefore encouraging the proper disposal and recycling of these waste categories can also limit their dispersal into the ocean, the seabed and the seashore. In general, an effective waste management will benefit the overall country environment, including the marine environment.

Specific instruments for marine litter:

Other market-based instruments are especially designed to reduce the quantity of marine litter directly – e.g., incentives to fishermen to collect or monitor wastes at sea. These tools do more than just improve the marine environment – they can also create momentum for a broader change in waste management and collective behaviours. For instance, promoting virtuous behaviour with regard to marine litter can raise environmental awareness among citizens, and encourage general good behaviours – like increased recycling and reuse or reduced illegal dumping.

Revenue raising instruments that can be useful for marine litter:

Some tools are not targeted to reduce waste, but are rather a way to raise revenues that can then be earmarked for waste management, infrastructures and monitoring. This includes port and tourist fees.

Care is needed when considering whether experience abroad is useful at home:

It must be kept in mind that MBIs can be successful in one country, but less suited in others, given that their effectiveness is related to the country's economic, political and social conditions. In particular, the issue of affordability is very relevant when setting the level of fees and incentives. For instance, too high landfill taxes may lead to increased illegal dumping rather that a reduction in waste production, therefore potentially increasing the problem of marine litter.

The context is critical for the potential success of an instrument:

The institutional context is also crucial when developing market-based instruments. Market tools can turn out to be ineffective, if there is not sufficient institutional capacity to support their proper implementation and enforcement and to guarantee sufficient monitoring. Furthermore, an effective waste management strategy needs to be in place in order to treat the collected marine and other litter appropriately.

It is important to underscore that there is increasing experience with market instruments and increasing support for the broader concepts of the polluter and beneficiary pays principles and the principle of full-cost recovery.

Other lessons from the development and use of instruments

There are other lessons from the development of market-based instruments that are valuable to note (EEA, 2005 and EEA, 2006). The choice and success of an instrument is much more than simply a question of which instrument is the most cost-effective. Other key insights as to what makes instruments work include:

- It is vital to have a "champion" who is willing to provide leadership in implementing a new MBI, take the risk and make it work.
- Focus on the issues for which there is agreement and pressure to have them addressed.
- Keep it simple, understandable and realistic – for example, do not set fees or rates higher than what is affordable.
- Connect a new MBI with other policies – a MBI never acts alone and it is vital that the interconnections with other strategies/policies are understood. It is the mix that matters.
- Let people know in advance of new policies, so that they can respond and offer input. Collaborative processes are more likely to have higher "buy-in" amongst the affected groups (also known as stakeholders), and less opposition to the instrument will arise. Work hard at getting and keeping stakeholders on board.

- Understand the potential trade-offs and work out which trade-offs are unacceptable. Know that different groups of stakeholders will, at times, have opposing opinions on how to best reach a common goal.
- Early consultation and public participation is critical.
- Enforcement and monitoring tools should be part of the planning process. These are important to make sure that the MBIs are effectively implemented and achieve the expected results.
- Finally, as innovative as national initiatives can be, it is worth watching for eventual compatibility issues with other countries or schemes. Avoiding compatibility problems can increase effectiveness of the programme, and also offer financial rewards through economies of scale.

Furthermore, it can be valuable to get the support for the "polluter pays principle" and "full-cost recovery" in both broad policy documents and in the public. This can be done through awareness work, underlining messages such as "pollute more, pay more", "use less, pay less", and "pay for what you use, pay for what you do wrong." The policy support can create a platform or series of "hooks" for future initiatives to be linked to. Public awareness can help reduce potential opposition to the instrument and can also help make the instrument work when it is implemented.

In summary, there are different instruments available and the choice of instrument or instrument mix is a non-trivial exercise that requires careful consideration of a range of factors.

3.5 Steps in the process – from problem identification to evaluating the options, choosing the instrument (package) and implementation

Policymakers seeking information on what role MBIs could effectively play in addressing marine litter will find it helpful to distinguish the steps in the policy cycle. This is the process that starts with problem identification, continues to problem analysis, solution identification, evaluation and selection, its implementation, including monitoring, reporting and evaluation and its revision. Some countries might be ready to apply a range of MBIs quickly, while others could focus on one or two. Many nations that lack the necessary waste management infrastructure and may need to spend time preparing the foundations for future policies that can address marine litter.

This section presents step-by-step guidelines for evaluating which instrument (instrument mix) is most appropriate. As the strategy is developed, keep these points in mind:

- **Obtain the political commitment and develop the political will**: Identify the champions who can make this work; understand who can support the proposed policy changes, and under what circumstances. Also identify those who could block progress. Having the political will to address the many facets of working with marine litter issues is one of the biggest obstacles most countries face in tackling this problem.
- **Link instruments**: Link MBIs to other tools for effectiveness. Sometimes the effectiveness of a policy lies in its links to other instruments (e.g., fines depend on the ability to collect fines).
- **Be realistic about timescales**: It takes time to develop political commitment, get legislation passed and create the foundations and enabling conditions that are required for success.
- **Distinguish between national and international sources and responsibility:** Different types of litter have different sources – some domestic and some international. You may need to clarify limits of authority and jurisdiction over the problem. Some litter problems will require international cooperation.

The policy cycle and practical steps

Broadly speaking, there are eight steps in the policy cycle, each of which requires a few practical elements. While each country will have its own formal legislative process, the following steps are typical, practical elements that may occur.

For simple problems with a few obvious potential solutions, the process will be faster and easier. The process will also be simpler when there is clear institutional authority for action.

The steps that are followed in the policy process include:

Step 1. Problem recognition

This first step is to acknowledge that there is a problem – i.e., that there is marine litter (on beaches or marine environments), that this causes problems (to the ecosystem, to human health and safety, to people's livelihoods) and that the negative impacts of marine litter are of sufficient importance to merit further analysis. Problem recognition may come from complaints from fisherman, coastal communities, boaters, business owners, and tourists.

There are also many existing formal, marine litter-monitoring programmes that have identified the extent of the marine litter problem. Ideally there should be a formal recognition of the problem (e.g., in ministry memos or documentation) as this creates a basis for action.

It is also important that different institutions/organisations and other stakeholders understand the extent of the problem. This will help to create the "political will" and support for potential action.

Step 2. Investigating the problem

Developing a programme to manage, control and mitigate marine debris requires an understanding of:

a. The scale or importance of the problem (e.g., amount of litter/pollution, types of materials items and location)

b. The impacts and costs imposed by the problem, both in the ecological sense (e.g., loss of market and non-market species, loss of ecosystem function), and in the economic sense (e.g., loss of revenue from fishing, loss of tourist revenue, increased costs to equipment repair). The people, industries and stakeholders who are affected by the problem also need to be identified. Who are the people who are being directly or indirectly impacted by the problem?

c. What and who are the sources of the problem?

d. Where does responsibility (actual/moral and legal) reside?

A marine litter survey could be a valuable component for this process. A well-designed study will help clarify the problem and create a basis for subsequent action. During this stage, it is also important to identify any national obligations or international objectives that need to be met. For example, countries that are signatories to international agreements often are obligated to enact laws or regulations in order to adhere to the agreement.

Step 3. Identification of possible solutions

This step requires that communities or governments look at the full range of possible solutions, look at precedence and practices in other nations, and then develop a long list of options. This will include not just individual policies or instruments, but also packages of complementary instruments – remember that often a market-based instrument is most effective if applied in combination with another instruments. Before the possible solutions are listed, it is helpful to develop a clear set of objectives that the instrument needs to address, and the particular issues it needs to take into account. Initiatives for new actions will need to build on both an understanding of the problem as well as the benefits of addressing the problem. Also, list the framework and infrastructure elements that will be needed to make the new policies work.

It is important not just to look at the "usual solutions" but to also examine potentially useful and new strategies. A thorough examination will also decrease criticism of the eventually chosen solution on the grounds that too few options were reviewed. As acceptance of an instrument will in due course require the explicit or tacit acceptance by a range of parties and often an active role in its implementation, it is useful to consider developing a steering group to develop the mandate for a study on or a proposal for the instruments. Where this is possible and appropriate, participation by the stakeholders should help with the buy-in for the instrument as well as offer ideas for what would work, or identify barriers to success. The involvement of many groups and people will help ensure that the solution to marine litter is practical and enforceable, and builds the political will needed to take action.

As this list of possible solutions is made, it is important to understand what is already legally possible. Understand what the legal rights are of the proposed initiative within the various governing bodies in the country. Review their jurisdictions and responsibilities.

It is worthwhile to solicit and understand the various positions of the different political groups on the problem and their positions as to possible solutions. Know which groups (for example, various levels of governments) could, in principle, launch litter-prevention strategies within the region or country. Note who would be the people or organisations implementing and enforcing the new initiatives. Also, identify those who have the interest and rights to oppose the new policies and MBIs. Conduct a background

study to clarify the rights and roles of the different institutions and their interconnections as well as to identify potential gaps. This can be done in-house (e.g., by ministry) and / or by using external experts.

Remember that the legal possibilities will differ between marine litter from land-based sources, marine litter from boats registered to the country in question and litter from ships flying under other flags.

Step 4. Analysis of policy proposals

The various solutions and options need to be assessed against a range of criteria. The importance of selecting these criteria is fundamental to the final success of an instrument, and care should be taken to get this right. Focusing on the wrong set, or too tight a set of criteria, may lead to problems, whether of political acceptability (i.e., it might not actually get launched), practicability (it might not be practical to implement for certain parties), effectiveness (might not reach its target), or justice (might unfairly disadvantage certain groups).

The criteria can be simple and few or more complex – depending on the problem and also on the national context and national experience. Criteria can include feasibility, effectiveness, fairness, and simplicity. This can usefully be done in two steps. First, apply a small set of key criteria to the long list of options. This should result in a shorter list of options. Then develop a more comprehensive and nuanced evaluation for this shorter list. At this stage, issues of acceptability, practicability and enforceability become important. With the involvement of stakeholders, clarify which options and policies will work together, recognizing that the usefulness of a policy on national culture and practice.

Analysis of the various policy proposals should include an impact assessment statement, which can be a useful and transparent way of presenting the pros and cons of the choice and make clear why it is the best. This is a requirement in some countries, though even where it is not a requirement, it can be useful to do.

Below are ten criteria that are essential to the process of analyzing and reviewing potential market-based instruments. It is important to take into account the national conditions/circumstances when assessing these ten criteria. These criteria offer a practical set of questions that can help evaluate options. Note the value of the process comes not only from a clear and transparent evaluation, but also from the discussion and insights around each point – the qualitative insights behind the numbers. Sometimes these can offer important insights into potential design solutions. Box 3.2, (following the list of ten criteria) contains an example of how the criteria can be applied to various policy options using a colour-code chart.

Ten criteria essential to the process of analyzing potential market-based instruments:

(1) Will this policy address important specific objectives that need to be achieved:

   a. National environmental problems and priorities

   b. National obligations

   c. International objectives

   In other words, will it work? Does it address a problem that needs to be addressed and is it likely to achieve the desired objective?

(2) Does the economic instrument have the potential to offer significant environmental benefits? Will the policy be effective?

(3) Will it raise useful revenues?

(4) Has it the potential to be a fair and equitable instrument (putting burdens in their proper place)? For example, does the polluter pay for the pollution? Does it offer the right signals as to who is responsible, and also who needs to take action?

(5) Will it avoid unacceptable social impacts?

   a. Will it avoid any negative effect on the more vulnerable members of society? What are the distributional impacts – impacts across different income/social groups?

   b. Is it affordable? Will the target audience be able to afford the expenses related to the policy, or will they be able to respond to the new policy through the use of substitutes?

(6) Is it consistent with other important economic objectives? (e.g., budget deficit, competitiveness, inflation, and balance of payments.)

(7) Is the instrument likely to be cost-effective? Will it be more effective than other instruments (such as regulatory, educational or other economic instruments)? What will it cost – including administrative costs, costs of implementing, monitoring the response, etc. Is there enough money available to invest (e.g., for new waste capacities)?

(8) Does the instrument lead to efficient pricing? (i.e., improve pricing such that the market price is closer to resource / social pricing.)

(9) Are the instrument and the rationale behind it understandable and deemed credible by the public, politicians, targeted groups and other stakeholders? Can people understand how it will work, and how they should respond?

(10) Is it feasible to implement and enforce? What are the enabling factors and barriers?

a. Is there capacity to design, implement and enforce such an instrument by the authorities? Is there capacity to collect fees and fines and enforce the instrument and address cases of non-compliance with the instrument?

b. Is the available administrative / infrastructural capacity (skills, staff) sufficient?

c. Are there barriers that could be difficult to overcome? For example, is there potential for evasive behaviour and perverse incentives?

d. Are there sufficient resources to cover additional administrative costs?

e. Are sufficient data available?

f. Is the political commitment (political will) in place to make it happen?

g. Will there be political opposition from interest groups, and if so, can the instrument be designed in a way to address these concerns?

Box 3.2 Using the 'ten criteria' to evaluate a proposed policy: an example

Applying the criteria discussed above to potential policies is an important part of selecting a successful MBI. One way to use the criteria is to create a chart that lists the criteria and the various policies. In the example shown in the following chart, points are awarded for each criterion, and the chart is filled in using colours that indicate various levels of appropriateness.

For example, evaluators may decide that one specific potential MBI would be excellent in several of the criteria. This MBI would earn five points for each of the criteria in this example, and the boxes on the chart would be coloured bright green, representing excellence; criteria that are deemed "good", would earn four points and be coloured light green in the chart. Likewise, criteria of neutral value would be assigned three points, and be coloured yellow; two points would be for criteria that have some problems, and they would be coloured orange on the chart. Finally, policy options that have major problems would earn just one point, and would be coloured red on the chart. The colour-coded approach will create easy-to-understand visuals (such as charts), while the numbering system will allow the decision-makers to have specific values that can be used to compare the various instruments.

In addition, evaluators should record specific insights for each potential instrument (e.g., why there is a problem and its source).

A template to show how this work with some colour coding, is presented in Table 3.2 below.

Note that the actual result will be sensitive to the choice of the design of the instrument. For example, a plastic bag tax could be introduced at the retailer level or at the producer/importer level. Retailer level requires more administrative work and should therefore only be implemented if the country has the capacity to implement and enforce it.

It may also be valuable to highlight what are the most promising instruments in the short term and which in the longer term, as existing conditions may make it premature for certain instruments to work. It will then be valuable to highlight which ones should prove valuable in the future (and with it, what foundations or enabling factors might need to be put in place in advance) so as to facilitate the progress towards better set of solutions in the future. The practical and political contexts are often such that only the second best options can be made to work in the present.

Table 3.2 Example of applying the 10 criteria to various MBIs

			Criteria: 1	2	3	4	5	6	7	8	9	10	Summary	Summary
Instrument	Type of Instrument - tax, charges, subsidy, others etc.	Existing in country?	Will this policy address important specific objectives? (legal, env. problem?)	Does instrument have potential to offer significant environ. benefits?	Will it raise useful revenues ?	Has it the potential to be fair and equitable?	Will it avoid unacceptable social impacts?	Is it consistent with other important economic objectives?	Is instrument likely to be cost-effective?	Does instrument lead to efficient pricing?	Is it understandable & credible to stakeholders & public?	Is it feasible (is there capacity to design, implement & enforce)?	Short term (e.g., 3-year plan): Contender? 5=definitely; 1=definitely not.	Medium/long term: Contender? 5=definitely; 1=definitely not.
Plastic bag tax	Tax													
Landfill tax	Tax													
Deposit for drink containers	Deposit Refund													
Port reception fee (general fee approach - no special fee for waste)	Fee													
Incentives for fishermen for reporting and removal of debris	Subsidies													
Award-based incentives for coastal villages with Integrated Waste Management (IWM) systems	Awards													
Waste fishing gear buy-back	Incentive													
Tourist taxes, car park fees, waterfront business charges and other sources of revenue to earmark for beach cleaning	Tax, fee													
Other														

Colour coding	
5	**5 points = green.** 5 points means the instrument does meet criteria. For example, it offers potential benefits, contributes to the PPP, there is a capacity to design implement and enforce, and those targeted will be able to understand the instrument and respond. The burden of the instrument does not lead to unfair burdens and is affordable to those burdened. There will be no major economic pressures or economic effectives. This instrument can be cost-effective relative to others and contribute to efficiency. And stakeholders and the public can understand the instrument, what it is trying to do and how.
4	**4 points = light green**. 4 points means this instrument is good but not as good as the instruments that earned 5 points.
3	**3 points = yellow.** Neutral
2	**2 points = orange.** There are some problems with this instrument. It doesn't meet some of the criteria.
1	**1 points= red.** There are major problems with this instrument. It doesn't meet many of the criteria.

Step 5. Selection of the policy option(s)

The best instrument or instrument mix will come out of the analysis, and those selected will inevitably have to take into account a range of political and practicability issues. Other policy concerns and the relation of the instrument to these will be important, as there is a need for policy coherence. Furthermore, it is critical that the resources – money, people and commitment – are in place so the instrument can be effectively implemented and enforced. Therefore, the selection of the policy options requires an analysis of whether the conditions are right (e.g., enough wardens, existence of suitable waste infrastructure or legal ability to levy fines) and if there is adequate institutional and political support for the action. In some cases, complementary initiatives or measures are needed to help ensure that the necessary conditions are in place. As discussed above, to make an instrument work effectively, it needs to be well designed and linked to a number of other supporting instruments and policies.

For any new policy to succeed there must be political will and general support for the action. Sometimes, implementing a policy (or economic tool) is not politically feasible given election concerns, policy or political commitments, potential public resistance or capacity constraints. It will be important to not only understand these but to make clear which issues could be addressed (e.g., data availability, enforcement capacity, waste management infrastructure) so that a policy could be implemented and have a chance to succeed.

A new policy is more likely to be successful if launched in conjunction with other supporting elements. For example, if a new tax or charge is put it in place, consider also having an information campaign on the benefits of the new tax or charge. A communication and awareness campaign can help (a) test the reception of the instrument; (b) allow fine-tuning of the instruments in light of insights; and (c) help offer an early signal to those affected to what will happen and hence allow early preparation, which will reduce the cost of the instrument. In other cases, offering technical assistance (for example, access to information and research, or capacity support) will help increase the capacity of the stakeholders to fully comply with the new instrument.

Step 6. Implementation

New policies and MBIs need to be effectively launched, communicated, supported, enforced and monitored. Implementation involves activities by a range of organisations and skills. It involves much more than getting the legal texts ready. It also means ensuring that those who will face changes under the new policies (or MBIs) understand that these are coming, what they will mean, that these are serious instruments and what the implications are for not complying. This generally requires communication, which can build on consultation.

The public needs to understand why a new MBI is being implemented as well as what problems it will work to solve. The public will also need to know that various options have been explored and that the choice is fair and appropriate. All of these communication efforts will help to ensure public acceptability, awareness of the benefits, awareness of the ways of responding to the instrument, and that the authorities are serious about the instrument.

Successful implementation also requires that the regulatory and institutional frameworks be in place, including the capacity to monitor and enforce the new policy or regulations. Monitoring and enforcement, which are required for the new policy to be credible, require financial support, which also has to be in place before implementation. In addition, the physical components of a new policy (for example, waste collection facilities, recycling bins and other infrastructure) need to be in place.

If the MBI includes a new tax, it is important to work out the steps that the tax authorities will have to take to see whether there is support at each step and that there is adequate commitment to make it happen. This process can be longer than one expects – often a multi-year effort – so there needs to be a champion to get through the range of steps and hurdles.

It is useful to ensure that those who were involved in the earlier selection process are included in the implementation. Other organisations will also need to plan their part of the implementation, which will involve allocation of financial or human resources. Without this parallel commitment, the instrument might work below potential.

As seen in the table above, there are short-term priorities as well as long-term. Often the issues between the two relates to issues of political will, or lack of sufficient institutional capacity or monitoring capacity in place. Many of these can be addressed or may change over time, hence a plan for market-based instruments can usefully have some instruments in the short term, and others in the medium and long term as supporting / enabling conditions are put in place and as the benefits of the first instruments becomes evident, as this will create political capital for further action.

Step 7. Monitoring

Monitoring new policies is critical, and should be built into the process. Monitoring may include ongoing surveys that reveal the status of the problem (e.g., beach litter surveys), or monitoring the progress of the instrument (e.g., levels of payment of charges or fines, percentage of returns for deposit refund schemes). Another critical component of monitoring is to inspect whether enforcement is efficient and consistent. Data collected from monitoring efforts provide the information needed for evaluation of the instrument. Monitoring requires that funds be appropriated for this purpose. When the new policy is launched, set a date for future monitoring and evaluation to ensure it will take place.

Step 8. Evaluation and potential revision

This involves an assessment as to whether and to what extent the instrument has been effective – how much of the problem has been addressed and what more needs to be done. It also can involve an analysis of cost-effectiveness, distribution effects (whether certain groups are more affected than others), and competitiveness effects. This therefore creates both insights on the instrument and a basis for adjusting the instrument. For example, if the evaluation phase reveals a problem, recommendations can be made to improve the efficiency of the policy. As the new policies are written, they should include procedures that allow the instruments to be revised without the need to recourse to lengthy legal procedures.

Some capacity to revise the instrument can be created within the instrument itself (e.g., that the agency responsible for the instrument, or a committee set up for the purpose, can revise rates every year with broad constraints) and not require new legislation. In some cases, institutions should be given the rights to fine-tune the policy (e.g., raise or lower levels) without cumbersome legal requirements. This can be useful to reduce the risk of political blockage of a needed development of the instrument. For more fundamental changes, new legislation may be needed and the whole cycle repeated.

The policy cycle then continues, starting again with steps number two or three, depending on whether further analysis of the problem is needed.

Evolving MBIs

Generally a MBI will evolve, first within the original implementation plan – e.g., with rates increased year by year. MBIs, once tested in a pilot programme, can be expanded into new areas, activities or sectors covered. They may also evolve as new complementary measures are added separately. Ideally for the instrument to be “healthy” it should evolve to suit the needs – the developing problem and the developing capacity to address the problem.

3.6 Summary of guidelines

A range of guidelines exists for a range of options. This chapter has provided basic guidelines for the range of perspectives that might be valuable to the policymaker looking to explore whether MBIs could be part of the solution for addressing marine litter. National contexts and circumstances and the nature and source of the marine litter are very important considerations as a solution is being designed. The criteria for selecting effective marine litter prevention policies must be fine-tuned by the policymaking team to ensure that these factors are appropriately integrated. This will then help ensure that the final recommendations for reducing marine litter will be accepted, effective, and result in cleaner oceans.

Chapter 4. Putting it together – using MBIs to reduce or prevent marine litter

This chapter summarises relevant country experiences using several market-based instrument (MBI) strategies in tackling waste-related issues. Some of the case studies in this chapter address marine litter directly, while others are indirectly beneficial. The list is not meant to be exhaustive, but intends to provide some relevant examples and useful lessons to help policymakers become more aware of the range of tools available for the strategy of addressing the economics of marine litter.

4.1 Case studies: Where have MBIs been used and how do they link to marine litter?

The various economic tools and categories of MBIs are presented in Chapter 3. The primary categories are:

- Environmental taxes, charges and fees
- Deposit refund systems
- Fines, penalties, non-compliance fees
- Liability and compensation schemes
- Environmental subsidies
- Incentives and technical or financial support
- Green procurement
- Integrated approaches

Most existing examples of market-based instruments that affect marine litter are targeted at the general problem of waste and not are designed with the sole intention of addressing marine litter. Given that the United Nations Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) determined that land-based sources account for up to 80 per cent of the world's marine pollution (GESAMP, 1991), this emphasis on general waste will have positive effects on the marine environment. There are, however, also some specifically targeted cases that focus on reducing specific types of marine litter provided as well.

Environmental taxes, charges and fees

As explained in Chapter 3, environmental taxes, charges and fees are normally designed to change prices and therefore alter the behaviour of producers and consumers. Taxes can reduce the incentive to litter, and increase the incentive to recycle. They also raise revenues that are usually used by governments to cover (in part or in full) the cost of environmental services and abatement measures including beach clean-up activities, improved coastal waste management infrastructure and other environmental measures. The following case studies include taxes and charges that encourage the proper handling of waste, and the reduction of waste being produced in general:

- Tourist taxes
- Plastic bag taxes
- Taxes on food containers, fishing lines and other fishing-related products
- Landfill taxes and waste management charges
- Product fees and charges
- Port reception, ship berthing and commercial and recreational fishing fees
- Car parking fees (e.g., near waterfronts), beach entrance fees and waterfront business charges.

Case Study 4.1 - Plastic Bag Tax / Levy

In **Ireland** a fixed levy of USD 0.02 (€0.15) per plastic bag was introduced in 2002. Revenues of approximately USD 13 million (€9 million) were raised, and channelled into environmental initiatives within the country.

This tool has proved to be very effective. Retailers report a reduction of over 90 per cent in the consumption of disposable plastic bags since the levy's introduction, amounting to a reduction of one billion plastic bags being used.

The design of the levy is simple and transparent, and the costs to government are considered to be modest. Furthermore, retailers face lower costs because they have to purchase fewer bags for their operations.

A similar approach has been followed in Japan and in South Africa – although here, due to industrial pressures, the tax has been limited only to plastic bags above a certain thickness. Recently plastic bags are also charged for in Belgium and in France. There is a perception that this instrument will be applied in many countries as they realize that consumers "accept" the instrument. It is easy to understand, not difficult to apply, and not that difficult for consumers to adapt to and comply.

Case Study 4.2 – Taxes on beverage containers

The **Norwegian** charge on beverage containers is a combination of two instruments – a packaging tax and a recycling scheme. The novelty of these instruments is that it tackles in particular packaging with a potentially higher environmental impact.

Containers used for beverages that are most likely to be used at home, such as milk and juice, are exempted from the environmental tax. Containers used for other beverages pay a tax according to the material they are made of, such as glass, aluminium and cardboard. The environmental tax is reduced if the container used is included in a recycling system - in proportion to the recycled amount of containers.

Each year the expected recycling rates for the following year are settled for each container type and this determines the tax rate payable for the containers for that year. In addition to this tax, all non-refillable beverage containers are levied a tax of USD 0.13 (NOK 0.89 per unit and about €0.11).[19] This is a flat tax on non-refillable containers, independent of recycling rates.

Case Study 4.3 – Eco-contribution responsibility for producers

The eco-contribution was introduced with the aim to encourage producers to take responsibility for the environmental impact of their waste, provide incentives for the recovery of waste, and discourage the consumption of goods with a non-acceptable environmental impact. Although not targeted to marine litter in particular, such a tool can potentially reduce the quantity of waste – like packaging, plastic bags and tyres - that typically pollute the marine environment.

The eco-contribution imposed on a particular product is meant to reflect the cost of disposing of the used items. Consequently, the amount of eco-contribution varies according to different products depending on the extent to which these products are harmful to the environment. Products subject to an eco-contribution include, for instance:

- Glass, plastic or metal beverage bottles, eco-contribution range between
- USD 0.02 to 0.14 (Lm0.01 to Lm0.05 or 0.02 to €0.12) each;
- Tyres for motor and commercial vehicles approximately USD 5.52 (Lm2.00 or €4.66); and
- Plastic bags at USD 0.17 (Lm 0.06 or €0.14) each.

While somewhat controversial, the **Maltese** eco-contribution has proved to be successful, especially in reducing the number of plastic bags, and allowed to collect revenues to finance waste management operations. Retrospectively it is felt that more time could have been spent on instrument design issues (getting the rates right) and understanding perverse incentives and potential to avoid the instrument (size criteria for bags, possibility for other sources of plastic bags).

Case Study 4.4 – Landfill taxes

The landfill tax rate in **Finland** remained stable at USD 15.12 (90 FMK or €15) since its introduction in 1996. The level of waste taxation was raised to USD 24.15 (€23) in 2003 and a further increase in January 2005 to USD 40.71 (€30).

The tax revenue becomes part of the general budget. However, the Ministry of Finance is understood to have made a 'gentleman's agreement' with the Ministry of Environment when the tax was introduced, so that more money would be made available to fund contaminated land remediation.

Case Study 4.5 – Landfill tax increases

In response to a report investigating how **England** could tackle waste, the Government took several actions, including increasing the landfill tax by USD 6.02 (£3 or €4.44) per tonne in 2005/2006;

[19] Data refers to 2004. Source: Nordic Council 2006

reforming the landfill tax credit scheme and helping local authorities to meet their recycling and composting targets though funding USD 172.7 million (£90 million and about €133 million) a year for 2004-2006 and setting up local authorities task force.[20]

Case Study 4.6 – Construction disposal fees (landfills and at sea)

Inert waste is normally disposed of on-land at licensed disposal sites in **Malta** at a rate of USD 3.24 (Lm1.18 or €2.74) per tonne. Permits for dumping at sea are only granted in particular instances, and normally included large construction projects close to the coast, the debris of which is easier to dump at sea rather than on land. When MEPA grants a permit for the dumping of inert waste at sea, which must be certified as clean and non-contaminated, the charge is USD 5.52/tonne (Lm2/tonne and €4.66/tonne).[21]

Case Study 4.7 Vessel berthing fees

Currently there are two types of berthing fees which are being charged in **Malta**: those relating to the larger ships which make use of the ports, and those relating to the use of yachting centres.

Fees charged depend on size of boat, time of the year and duration of the berthing. Berthing fees earned over the last five years ranged between USD 831,344 and 1,538,115 (Lm 400,000 and Lm 500,000 or €932,000–1,165,000) per annum.

Furthermore, ships and cruise liners using the Maltese ports are subject to a sea passenger service charge[22] ranging from USD 6.15 to USD 12.30 (Lm2 to 4 or €4.66 to 9.32) per passenger.[23]

Case Study 4.8 Port waste reception facilities regulation

The UK's Port Waste Reception Facilities Regulation, implementing the EU Directive on Port Reception Units, relies on a combination of mandatory and economic tools. It takes provision for ships to provide prior notification on the amount (type and quantity) of waste for disposal before they enter the port and ships to deliver their waste to port reception facilities before leaving and administration of a mandatory fee to be collected from ships to cover the costs of these facilities.

Case Study 4.9 – Port reception fees

Most COBSEA (Coordinating Body of the Seas of East Asia – Australia, Cambodia, People's Republic of China, Indonesia, Republic of Korea, Malaysia, Philippines, Singapore, Thailand and Vietnam) members reported that, where port waste reception facilities are provided, it is on a fee-for-service (user pays) basis. Such an approach can be a barrier to the use of such facilities – since vessel operators may not wish to pay for such fees and instead may opt to dispose of their rubbish at sea at no cost (unless they are caught and fined).

In some instances a "general fee" approach has proved more effective. It requires that all vessels using a port pay a standard environmental fee, regardless of whether or not the vessel uses the waste reception facilities. The revenues from the fee are used to fund the provision and operation of the reception facilities. In this case vessels are more likely to use the facilities, as they are paying for them anyway, while dumping waste illegally at sea does not lead to any cost saving.[24]

Case Study 4.10 – Vessel registration fees

Sea transport operating under the **Maltese** flag requires registration under the Merchant Shipping Act (Cap 234). Registration fees include a one-time fee on registration and an annual registration fee. Both fees vary depending on the use, length and net tonnage of the sea vessels.

The registration of small ships is covered by the Small Ships Regulation (SL 352.15), which includes fees payable for the registration of small pleasure boats, fishing boats, jet skis etc. Registration fees vary by engine size and range from USD 68.68 to 1,379.55 (Lm25 to Lm500 and €58 – 1,165) for the one time fee and USD 41.44 to 165.78 (Lm15 to Lm60 or €35- 140) for the annual fee. Fishing boats are excluded from the one time registration.[25]

---

[20] Ernst & Young LLP, IEEP and Cordina, 2007

[21] Though some revenue is raised where bottles are not returned.

[22] In accordance with the provisions of the Port (Passenger Service Charge) Regulations S.L 352.12

[23] GHK , IEEP and Ernst & Young LLP, 2006.

[24] Raaymakers, 2007b

[25] Ernst & Young LLP, IEEP and Cordina, 2007

Case Study 4.11 – Litter prevention and recycling tax

The state of Virginia **(US**) collects USD 10 to 15 in annual litter taxes from each manufacturer, wholesaler, distributor and retailer of soft drinks, beer and wine coolers. The funds are deposited in the "Litter Control and Recycling Trust Fund." Each county and city in the state qualifies for a portion of these funds based on population and road miles.

These grants have been awarded annually since 1980 to localities for local litter prevention and recycling programme implementation, continuation, and/or expansion. Since 1981, Virginia businesses have contributed USD 40,187,797 to the Fund. This tax was developed in lieu of a "bottle bill," also known as a "deposit refund system."

Deposit refund systems

Deposit refund schemes are where a consumer, when buying a product (e.g., glass bottle) has to pay a deposit; upon return of the product container (empty bottle), the customer receives a refund of the deposit. This is an incentive scheme and not intended to raise revenue.[26]

Some examples from **Germany**, **Malta** and **Denmark** are presented below, highlighting in some cases how implementation problems have been overcome.

Case Study 4.12 – Deposit refund schemes for bottles

German retailers are required to charge a deposit on cans and so-called one-way bottles, such as plastic bottles for beer, mineral water and soft drinks. The rates are depending on the size of the relevant packages and varied between USD 0.31 and 0.63 (€0.25 and €0.50). The scheme faced a fair amount of resistance. At the end of 2004 the legislation was revised and under the new law, "ecologically unfavourable" drink containers will only be a subject to a deposit of USD 0.31 (€0.25), while all other drink containers remain deposit free.[27] The scheme faced a fair amount of resistance. At the end of 2004 the legislation was revised and under the new law, "ecologically unfavourable" drink containers will only be a subject to a deposit of USD 0.31 (€0.25), while all other drink containers remain deposit free.[28]

Case Study 4.13 – Deposit refund schemes for bottles

After revoking a ban on disposable drinks packaging, Denmark introduced a mandatory deposit-refund scheme in 2002. All beer and soft drinks are sold in returnable bottles. The deposit price was originally set at USD 0.18 (DKr 1.5, €0.20) for containers below one litre and USD 0.51 (DKr 4.25, €0.57) for those of one litre and above, which was reduced by approximately one-third in early 2004.[29]

Case Study 4.14 – Deposit refund schemes

In Malta the local beverage industry operates an efficient deposit refund scheme for glass bottles. The refund rate depends on the type and size of the containers (carton). Consumers get refunded USD 0.06 – 0.11 – 0.12 (Lm0.03, Lm0.05 or Lm0.06, €0.07 – 0.12 - 0.14) for bottles depending on the size, and USD 2.05 (Lm1.00, €2.3) for the whole container (carton). The price of the containers is automatically included in the selling price of the product.[30] An encouraging recovery rate of over 90 per cent is recorded on this scheme.[31]

Fines, penalties, non-compliance fees

Other market-based instruments include fines, penalties, penalty charges and non-compliance fees. The levels are set using different basis – in some cases on the costs of damage, or on an "affordability basis", or on other bases (legal limits, precedent elsewhere). Sometimes non-compliance fees are a great deal higher than the costs associated with compliance, if done correctly. Collection and enforcement are essential in making these instruments work.

Case Study 4.15 – Dumpster, waste receptacles and litter fines

---

26 Though some revenue is raised where bottles are not returned.

27 EEA. 2005.

28 Ibid.

29 Ibid.

30 Ernst & Young LLP, IEEP and Cordina, 2007

31 Government of Malta, 2002.

Many communities have laws that require dumpsters and outdoor waste receptacles to be covered, emptied regularly, and maintained to prevent waste from leaving the containers. Many of these laws state that dumpsters are prohibited from being filled passed their spill line. Fines for non-compliance can exceed USD 1,000 a day.

Hundreds of states and communities have litter laws and specified fines for illegal dumping of waste, but these laws often lack enforcement. Over the last decade, beaches around the world have banned smoking as a means to reduce cigarette butt and other smoking related waste. Penalties range very widely depending on country and problems.

Incentives and technical or financial support

Economic incentives can encourage fishermen to bring back any litter found at sea, particularly debris likely to cause hazard to navigation and safety, for correct disposal. This type of incentive is meant to tackle directly the problem of marine litter by encouraging fishermen to monitor or collect waste found at sea.

Case Study 4.16 – Fishing gear reporting and cash awards

A pilot project was developed in Hawaii **(US)** to tackle fishing debris to protect the endangered Hawaiian monk seal from entanglements in lost and discarded fishing gear. The Centre for Marine Conservation (now known as the Ocean Conservancy) teamed up with commercial and recreational fishermen to identify and report derelict nets at sea. Fishermen were required only to report on the location of the debris, which were subsequently removed by trained volunteers, due to potential danger in removing fishing gear. In exchange, commercial fishermen received cash awards according to the weight of the nets gear they reported as abandoned.

In 1999, 25 tonnes of net were removed in less than a month. In the course of the two-year project, approximately 75 tonnes of debris were removed overall. This initiative created much interest, however, the project was limited by liability issues that still have not been resolved.[32]

Green procurement

Environmental considerations can be integrated into procurement decisions to reduce the usage of disposal items in lieu of reusable materials.

Case Study 4.17 – Public parks reducing vendors' waste

Many of the national public parks run by the US National Park Service require all food vendors to use biodegradable plates, cups, and other disposable food containers as opposed to items made from polystyrene. The vendors are also instructed to not to distribute straws with drinks unless specifically requested by the customer. Even then, only paper straws are allowed.[33]

Integrated approaches

As mentioned above, in order to be more effective, MBIs should be considered part of broader marine litter prevention strategies, addressing issues such as monitoring, research and education and providing sufficient facilities and human resources to ensure an efficient and coherent implementation of marine litter prevention measures. Some examples are provided below. While these are not MBIs at their current stage, they represent a potential basis for future MBIs.

Case Study 4.18 – Fishing-for-Litter

The "Save the North Sea" Fishing for Litter initiative was originally started by the North Sea Directorate of the Dutch Government in March of 2000. The Fishing for Litter campaign has been expanded from **Scotland** by KIMO to include other ports around the North Sea **(Netherlands** and **Belgium)**.

Fishing for Litter is a simple and effective way to involve the fishing industry in the reduction of marine litter. Fishermen participating in the project are asked to collect marine litter that accumulates in their nets, as part of their normal fishing activity and to do this on a voluntary basis. The wastes are then stored onboard in the large, hard-wearing bags provided by the project so that these materials can be disposed of on shore in an environmentally-friendly manner.

---

32 Marine Conservation Society, 2004.

33 K. Register, personal communication, US National Park Service, 2007.

In total it is estimated that 54 vessels have collected over 400 tonnes of litter in the first three-year period. The cost borne by the fishermen was estimated to be approximately USD 1970.80 (£1,300)[34] per tonne. These estimates were based on the average amount of time spent cleaning nets per week (two hours), the average hourly rate for a fisherman, the average time spent at sea (three weeks per month) and the average number of tonnes of litter collected by a boat in the scheme per year (four tonnes). The cost also only applies to fishermen's time, and does not include costs associated with lost catches, damage to gear or disposal costs. The total project cost is estimated at USD 5.7 M (€5.7M) with KIMO's share at USD 1.21 M (€1.2M).

As it continues today, the *Fishing-for-Litter* initiative has demonstrated on a limited scale that the objectives and aims of the scheme can gain the support of the fishing industry, port authorities and local authorities. Furthermore, it can contribute to changing practices and culture within the fishing sector, provide a mechanism to remove marine litter from the sea and seabed, and raise awareness among the fishing industry, other sectors and the general public.[35]

Case Study 4.19 – Zero solid waste discharge programme (cargo ships)

Matson Navigation transits the Pacific between Hawaii, California **(US)** and **China** and developed a "Zero Solid Waste Discharge" policy for their cargo ships in 1993. This programme was designed to also engage employees of shipyards and containerized freight companies to develop controls on discharges of solid wastes into the ocean and ports. Matson developed this programme to significantly reduce the amount of waste being thrown overboard while a vessel is at sea. Thus far the programme has been embraced enthusiastically by Matson's personnel and has resulted in improved handling of solid wastes in port.

The "Zero Solid Waste Discharge" Programme consists of signage, workshops for dock employees, increased waste receptacles on ships, and increased shoreline waste management facilities. Matson's crews store all solid wastes in special containers on the vessel, which is offloaded in port for proper disposal.

As a result of this and other waste management efforts, all of Matson's vessels now have the American Bureau of Shipping's Safety, Quality and Environmental Management (SQE) certification, which requires a documented environmental management system focused on continuous improvement.[36]

Case Study 4.20 – Derelict net recycling programme and conversion to electric power

This successful net recycling programme in Honolulu, Hawaii **(US)** began in 2005 with initial grant funding (USD 25,000) provided by the NOAA Marine Debris Program and implemented through NOAA's Restoration Program. Approximately 20 per cent of the longline fleet were surveyed regarding the frequency and volume of derelict nets encountered at sea and their willingness and ability to recover nets at sea. Of the surveyed vessels, 81 per cent agreed to retrieve nets and bring them to port.

Two organisations – United Fishing Agency (UFA) and Pacific Ocean Producers (POP) manage the programme daily on Pier 38. UFA assists longline fishermen in offloading the derelict nets and old monofilament line from the fishing vessels onto a flat next to the container. POP then loads the debris into the container. When the container is full, Schnitzer Steel-Hawaii picks up the bin and carries the debris at their facility for processing. The nets are chopped into pieces and then transported to the Covanta Energy's "Waste to Energy" facility at H-Power. UFA, POP and Schnitzer provide their services in this project at no cost. The City and County of Honolulu also waives the tipping fees for incineration at the H-Power facility. Another project partner, Matson Navigation, shipped the container from Seattle to Honolulu free of charge. In addition to the container and the physical implementation of the project, an outreach plan (in English, Korean, Vietnamese and Tagalog) was developed to communicate the benefits of the new programme to the longline fishing community.

Since January 2006, this private-public partnership has collected more than 25.61 tonnes of net and monofilament line, processed and converted it into electric power in Honolulu. Expansion to include other net recovery activities and other government agencies efforts will support the "Honolulu Derelict Net Recycling Program" in 2008.

---

34 Hall – KIMO, 2000

35 Fishing for Litter Campaign, KIMO. http://www.kimointernational.org/Default.aspx?tabid=129. Accessed July 2008.

36 Matson Navigation. http://www.matson.com/corporate/about_us/sqe.htm. Accessed July 2008.

Case Study 4.21 – Regional measures to address marine litter

The Members of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) continually monitor marine debris on the Antarctic Peninsula and around **Antarctic** and **sub-Antarctic islands**. In order to further work against marine debris, CCAMLR also produces a range of education materials to educate fishing and research vessels about the ecological and environmental impacts of marine debris and appropriate procedures for avoiding the discharge of harmful debris. In addition, CCAMLR adopted a specific Conservation Measure (CM 26-01) which prohibits the disposal of plastic bands, as well as the dumping of rubbish, offal and oil. Incidents of non-compliance with this Conservation Measure are reported to CCAMLR on an annual basis along with national actions to sanction offenders including loss of license.

Case Study 4.22 – Regional management of marine litter

In the context of the Northwest Pacific Action Plan (NOWPAP), a variety of marine litter-related researches have been carried out in **South Korea**. Since the late 1990s, special national research and development projects have been initiated to develop integrated management strategies and practical guidelines on marine litter problems, which include:

- the survey of the status of amounts, types and distribution patterns of seabed litter in ports and major fisheries areas, which aim to provide the Government with practical guidelines for clean-up operations; and
- the development of a Total Management System for Marine Debris for the prevention of the input of litter to coastal environments especially from land-based sources, through the development of equipment and facilities for survey and clean-up of marine litter, the treatment for re-use and disposal of collected material, and relevant legal and institutional re-arrangements.

These include the development of relevant national policies and educational programmes for raising public awareness on the marine litter problems.[37]

Case Study 4.23 – Regional management of marine litter

From 2004 to 2007, the Northwest Straits Initiative in Puget Sound, Washington **(US)** surveyed and removed derelict fishing gear while also estimating the costs and directly measurable benefits of the gear's removal. The programme estimated that each acre of net surveyed and removed cost USD 4,960. Surveying and removing derelict pots and traps cost USD 193 each.

The benefits of derelict pots and traps removal were determined by estimating the commercial value of the crabs and other species that were saved from mortality over a one-year period, totalling USD 248 per pot or trap. For derelict nets, the commercial value of fish and other species were estimated for a ten-year period, totalling USD 6,285 per net. The cost-benefit ratios were positive, measuring 1:1.28 for pots / traps and 1:1.27 for derelict nets. Researchers acknowledged that, given the expected long-term lifespan of these mainly synthetic-based derelict gears, negative impacts may continue for many years or decades beyond the 10-year period used in this cost-benefit analysis.

Monetary values were not assigned to the many indirect benefits that occurred due to the derelict gear removal including: human safety, impediments to vessel navigation, habitat restoration, reduction in mortality of non-commercial and protected or endangered species, and pollution removal. If the monetary value of these benefits were calibrated, the cost-benefit ratios would be more positive. Researchers point out that the cumulative costs of not removing derelict gear will likely increase in the future.[38]

---

[37] For further details, see also http://marine-litter.gpa.unep.org/documents/marine-litter-Korea-Kang.pdf. Accessed July 2008.

[38] Northwest Straits, http://www.nwstraits.org. Accessed July 2008.

Chapter 5. Conclusions and recommendations – using MBIs on marine litter

5.1 Overview

Marine litter sources

Marine litter is a threat to the world's oceans, seas and coasts despite the efforts at a global, regional and national level over the last three decades to address this problem. As with other environmental problems, marine debris can be prevented and controlled through an effective collaboration of education and outreach programmes, strong laws and policies, governmental and private enforcement, and an adequate support infrastructure. Developing effective policies that will reduce this problem requires a comprehensive understanding of the sources and impacts of marine debris as well as an understanding of human behaviour and how it is affected by economic policies.

Marine debris researchers traditionally classify debris sources into two categories: *land-based* or *ocean/waterway-based*, depending on where the debris enters the water. Understanding the differences in these two categories will help policymakers craft policies and regulations and also select economic tools that will aid in addressing the unique aspects of these litter sources.

Land-based debris sources

Land-based debris starts on streets, parks, parking lots, and other surfaces. Sources include inappropriate or illegal dumping of domestic and industrial rubbish; public littering; poorly covered dumpsters and dump trucks; manufacturing sites, processors, and transporters; sewage treatment and combined sewer overflows; beachgoers; fishers; shore-based solid waste disposal and processing facilities.

Ocean/waterway-based debris sources

Marine debris is also generated by people's actions and activities at sea. Ocean and waterway-based debris can come from commercial fishing vessels; merchant, military, and research vessels; recreational boats and cruise ships; and offshore petroleum platforms and associated supply vessels. Some debris enters the water from accidental loss or system failure, while other debris comes from poor waste-management practices, and illegal disposal. Commercial and recreational fishermen create marine debris when they discard ship-generated trash overboard or fail to retrieve nets, ropes, trawl floats and other fishing-related gear.

Impacts of marine litter and debris: ecosystems and economics

Marine debris is a global issue, affecting all the major bodies of water on the planet – above and below the water's surface. This debris can negatively impact humans, wildlife, habitats, and the economic health and stability of coastal communities.

Marine litter can lead to loss of biodiversity (e.g., accidental catch by 'ghost' nets), loss of ecosystem functions, the provision of services from these ecosystems, loss of revenue (e.g., from reduced catch and reduced tourism revenue), loss of livelihoods of community groups, and increased costs (e.g., beach clean-ups). Examples of the nature and scale of the problems and their impacts include:

Human health and safety

Visitors to a beach can be harmed from broken glass, medical waste, fishing lines, and discarded syringes; swimmers, divers and snorkelers can become entangled in submerged or floating debris. Medical and personal hygiene debris that enters waterways through inadequate sewage treatment systems also presents serious water quality concerns.

Economic and aesthetic impacts

Litter, debris and solid waste in coastal and inland waterways can result in serious economic impacts including the loss of tourism revenue for coastal beach communities and for the fishing and maritime industries. The abundance of economically important species can be reduced through entanglement and ingestion of litter, and through habitat destruction.

The presence of litter makes shorelines unattractive and potentially hazardous, and forces communities and governments to spend funds for beach maintenance. Studies from around the world confirm that marine litter harms wildlife, commercially important species and critical habitats. Economic costs include lost fishing time due to propellers entangled in nets and other debris, depressed tourism, and labour intensive beach clean-ups.

Wildlife entanglement and ingestion

Entanglement in nets, fishing lines, ropes and other debris poses another significant threat to seabirds, sea turtles, dolphins and other marine animals, especially those that live near or on the water. Monofilament line, fishing nets and ropes, ribbons on balloons, six-pack rings, and packing strapping bands are some of the more harmful culprits related to entanglements. According to the US Marine Mammal Commission, 136 marine species have been reported in entanglement incidents, including six species of sea turtles, 51 species of seabirds, and 32 species of marine mammals.

Habitat destruction & alien species introduction

Debris can physically damage shoreline, living coral reef, and other important habitats. Ropes, nets and tarps are moved by currents and tides, and can abrade, scour, break, smother, and destroy fragile aquatic habitats. Ensnared debris may also smother seagrass or corals, and can cause increased siltation and turbidity, blocking essential sunlight. Another concern is that drifting debris can host entire communities of encrusting and attached organisms and transport them great distances – often to areas where they can harm or compete with native species as invasives.

Vessel damage

Nets, ropes and other derelict fishing gear can cause serious damage to vessels by entangling propellers and rudders. Plastic bags are a common cause of clogged and blocked water intakes, resulting in burned-out water pumps in recreational boats. Such incidents cause costly repairs, loss of time, and danger to boaters and crews. The true scope and frequency of damaging encounters between debris and vessels is difficult to calculate, as most incidents go unreported.[39]

Marine litter costs

It is important to note that the costs associated with marine litter are largely borne by parties different from those causing the problem, with the result that there is insufficient liability to the entities responsible for the source of the problem. In short, the polluter does not pay. The high economic costs and negative impacts associated with marine debris justify the time, research, and resources it will take to reduce this form of ocean pollution by all governments.

The impacts of marine litter can have high economic and ecological costs. Marine litter can lead to the loss of biodiversity, loss of ecosystem functions, loss of provision of services from these ecosystems, loss of revenue, loss of livelihood of population groups, and increased maintenance costs.

There are, therefore, a wide range of important reasons to address marine litter and search for suitable policies and economic instruments to help in the process. The direct and indirect benefits to reducing and preventing marine litter merit the investment of time, effort and money. In addition, there must be the political will to address this issue across the board. Without the cooperation and support of the government, the private sector and the general population, a long-term and effective approach to handling marine debris may be too much of a challenge.

5.2 Opportunities for using market-based instruments to address marine litter

In recent years there has been increasing rhetorical uptake and practical implementation of the principles behind MBIs – e.g., support for the “polluter pays” principle, “user/beneficiary pays” principles and the principle of “full-cost recovery”. These principles offer a foundation for the application of market-based instruments. Market-based instruments (MBIs) include taxes, charges, fees, fines, penalties, liability and compensation schemes, subsidies and incentives, and tradable permit schemes.[40]

The aim is to use economic incentives and disincentives to change people’s behaviour regarding the correct handling of their waste items. Communities and governments, working with industry and nongovernment organizations, can help shape market forces by using MBIs. By changing “price signals”, MBIs can be a key part of the solution to the marine litter problem. MBIs, when used in concert with public education, adequate waste management infrastructure and other related efforts, can give people incentive to “do the right thing” with their rubbish and trash.

---

[39] Sheavly, 2005.

[40] Note that ‘market-based instruments’ (MBIs) are sometimes referred to as “market-based economic instruments” or “economic instruments” (EIs). For the purposes here, MBIs is the chosen term, though they can be used interchangeably.

The categories of MBIs related to marine litter management include environmental taxes, charges and fees; deposit refund systems, fines, penalties, non-compliance fees, liability and compensation schemes; environmental subsidies, incentives and technical or financial support; green procurement and integrated approaches.

The following examples of MBI strategies have various merits, and are potentially suitable for use in addressing marine litter problems. Some of these may also generate revenues:

- Deposit-refund programmes on plastic and glass bottles
- Plastic bag taxes
- Other product charges
- Liability for pollution/marine litter
- Fines for litter and illegal disposal of waste items
- Charging for waste services including landfills
- Port reception, ship berthing, and commercial and recreational fishing fees
- Tourist taxes, car parking fees (near waterfronts) and waterfront business charges
- Award-based incentives for coastal villages with Integrated Waste Management (IWM) systems
- Incentives to fishermen for reporting and removal of debris
- Financial and technical support for various ill-equipped vessels related to waste management

It is important to remember that nations vary in their various stages of economic, social and political development, all of which relate to their ability to respond to environmental problems such as marine litter. Measures can be launched and will be effective only if the regulatory framework and institutional infrastructures are in place. Nations also differ in their ability to afford some of the expenses associated with the proposed strategies and programmes. The relevance and effectiveness of any instrument will need to be assessed on a case-by-case basis to determine its potential for success.

It is also useful to remember that a large percentage of the litter found in the ocean originated from sources many kilometres inland. So a reduction of waste generated at inland sources, and a reduction in the improper handling of waste on land will be beneficial downstream. Furthermore, all countries should have implemented a proper waste-management strategy and a properly functioning waste collection and disposal procedure. For example, municipal solid waste (one of the main categories of marine litter) has to be collected and disposed in an environmentally sound manner. This is clearly a necessary condition for the introduction of some of the MBIs, including landfill taxes.

Addressing marine litter: case studies summary

A series of case studies have been presented that reveal significant possibilities in addressing some controls on marine litter production, impacts and management. ***Environmental taxes, charges and fees*** have been applied effectively, for example, to plastic bags and beverage containers in Ireland, Japan, South Africa, Belgium and France. A good example of effective approach to managing a significant component of the solid-waste stream related to beverage containers (plastic, glass, aluminium and cardboard) has been demonstrated in Norway where fees are assigned based on potential environmental impact coupled with a recycling scheme. Landfill taxes and fees have been used in Finland, England and Malta to support recycling and composting efforts, as well as providing funding to support land remediation efforts in some areas. Vessel berthing and registration fees and port waste and reception fees have also been implemented in a variety of forms – mandatory fees or “fee-for-service” fees. There are debates on the success of these methods based on the possible decision of the vessel operator to opt not to use the facilities and dump their wastes at sea before they come into port. The other option is to charge fees whether the services are used or not.

The ***deposit refund scheme*** is another example of an applied fee (deposit) on a beverage container that once it is returned, the deposit is refunded to the consumer. This is an incentive approach and not intended to raise revenues. The application of this approach has been met with mixed success. In Germany, their campaign met some resistance resulting with a modification to the law where only select containers had a deposit fee. In Denmark, a mandatory deposit-refund scheme was implemented after revoking a ban on disposable beverage packaging. Malta has an efficient deposit refund scheme for glass bottles that has resulted in a 90 per cent recovery rate.

Other MBIs include ***fines, penalties, penalty charges and non-compliance fees*** based on the costs of the damage or an affordability basis. In most communities, litter laws exist with penalties assigned to non-compliance, however, these laws usually lack enforcement. Waste management practices such as dumpster handling also may have regulations to help prevent waste from leaving the containers with fines for non-compliance that can be very high.

Incentives and technical or financial support such as programmes for fishermen to retrieve litter or report on problems (including fishing gear) while at sea can be very helpful related to safety and navigation. In Hawaii, fishermen were able to report on the locations of abandoned nets and gear for retrieval by trained volunteers and government agencies. This programme was hampered by liability issues of net recovery and has not been implemented fully.

Green procurement involves the integration of decisions on what products to purchase, favouring the selection of reusable materials over disposable items. In some national parks in the US, food vendors are required to use bio-degradable products instead of polystyrene containers.

Integrated approaches to address marine litter including monitoring, research and education and providing adequate facilities and human resources would help to ensure effective and productive prevention measures. While not considered MBIs in the formal sense, they could be the foundation for future MBIs. A prime example of a future MBI would be the “Fishing-for-Litter” campaign that was started by the North Sea Directorate of the Dutch government. It has now been expanded to the Netherlands, Belgium and Scotland. This programme effectively involves the fishing industry in collecting debris that is caught in their nets, which is then returned to port for proper disposal.

In Hawaii (US), recovered nets are being recycled and converted into electric power. This programme involves a public-private partnership involving fishing industry groups, non-governmental organizations, waste management companies and local and federal government agencies. Another maritime-related approach to controlling marine litter is the “Zero Solid Waste Discharge” programme developed by a regional (Hawaii, California and China) freight company – Matson Navigation that engages its employees in storing all solid wastes on board while at sea and then the wastes are off-loaded in port for proper disposal. Regional approaches to

Regional management of marine litter also affords opportunities to implement MBIs through collaborations related to marine litter prevention and control. Researchers in Antarctica (CCAMLR) monitor marine litter and works to educate fishermen on the ecological and environmental impacts of marine litter. In South Korea, integrated management strategies and practical guidelines have been developed to address marine litter problems.

Foundations for future applications of MBIs

There has been an increased implementation of MBIs and new lessons are available on how they can be designed, launched, enforced and made to work. Those who have already applied MBIs to reduce and prevent marine litter provide insights and help create the foundations for future applications of MBIs. Policymakers often need examples of practices abroad to help get the potential instrument to be taken seriously at home. Benchmarking practices can be a powerful tool. Policymakers also need to understand the pros and cons of each market-based instrument. Lessons from other countries can help build this understanding and reduce the risk inherent in policy innovation.

This, of course, does not mean that MBIs are the solution to all marine litter problems, but simply that they have a potentially important role to play in helping to deal more effectively with this global issue.

5.3 Looking beyond the current use of MBIs to reduce and prevent marine litter

There is great potential to reduce and prevent marine litter through additional research on economic instruments, technological advancements, collaboration and voluntary efforts. Current efforts by governments and the private sector to increase awareness, establish debris abatement programmes and change behaviours need to expand. Suggested recommendations include:

a. Continue and expand research on the effectiveness of MBIs as they pertain to marine litter and the costs and benefits of various marine litter abatement programmes, including direct and indirect costs and benefits (economic as well as environmental).

b. Increase efforts to develop and implement integrated waste management programmes that include technological changes that will result in more efficient management, recycling, and transportation of solid waste. All branches of government can lead by example by integrating proper solid waste management, waste reduction and recycling into all their activities.

c. Invest in the waste management infrastructure – from the smallest items (waste cans conveniently located by beaches and piers) to state-of-the-art landfills and environmental-friendly materials that will not persist in the environment and substitution of materials to increase degradability.

d. Investigate the impacts of derelict fishing gear on commercial and non-commercial species to better assess the ecological and economic impacts of marine litter on wildlife.

e. Encourage strategies that will prevent or reduce the amount of litter entering inland waterways from towns, streets, parking areas, etc. This can be done in conjunction with an educational campaign that helps people understand how all watersheds are connected, and how their piece of litter can impact natural resources, marine habitats, navigation, health and safety.

f. Review and enhance regulatory approaches. Improve the effectiveness of current laws through increased and consistent enforcement. Study the attitudes and practices of the people who use the items that are most frequently found as marine litter and determine incentives that will be effective in changing their personal habits and practices.

g. Create opportunities for all stakeholders (public and private sectors) to communicate, exchange information, share technological expertise, the latest marine litter research, guidelines, and successes.

h. Through education and community outreach, build a stronger sense of environmental stewardship among ocean users as well as people who live inland. This ethic is critical given the global nature of marine litter, its inability to be confined within territorial boundaries and the complexity of identifying sources.

i. Enhance and encourage collaboration among NGOs, industry, governments, citizens, academia, fisheries management organizations, local communities and municipalities. A variety of partners bring different skills and resources to the table, leading to a stronger foundation for success.

j. Support and promote voluntary efforts to remove litter from the marine environment (e.g., beach and river clean-up events) and to prevent litter from entering the ocean and waterways (e.g., “Clean Marina” programmes).

5.4 Summary

There is great potential to reduce and prevent marine litter through additional research on economic instruments, technological advancements, private sector collaborations and voluntary efforts. Current efforts by governments and civil society to increase awareness, establish debris abatement programmes and change behaviours need to expand with the primary goal of sharing information and lessons learned bilaterally.

The issue of marine litter is a rather complex issue due in no small part to the myriad of sources producing it, compounded by the challenges of monitoring and enforcement of existing controls for its abatement. Nonetheless, MBIs can be employed to help reduce these sources of litter. Many ocean-based pollution prevention efforts require a foundation of international cooperation, which can be bilateral, regional, or global. The problem of identifying legal responsibility and allocating liability limits the cases where MBIs could potentially be the best approach in this situation.

Controlling and reducing marine litter in the world’s oceans is a significant, but achievable challenge. The economic aspects of the global marine litter problem need to be fully explored if we are to be successful in effectively addressing this issue.

References

Allsopp, M., Walters, A., Santillo, D., and Johnston, P. 2006. *Plastic Debris in the World's Oceans.* Greenpeace. http://www.greenpeace.org/raw/content/international/press/reports/plastic_ocean_report.pdf (Accessed January 2009).

Barnes, D. 2002. Invasions by marine life on plastic debris*. Nature* 416: 808–809.

Barnes, D.A. and Fraser, P.P. 2003. *Rafting by five phyla on man-made flotsam in the Southern Ocean*. Mar. Ecol. Prog. Ser. Vol. 262, pp. 298-291.

Brown, J., MacFadyen, G., Huntington, T., Magnus, J. and Tumilty, J. 2005. *Ghost Fishing by Lost Fishing Gear*. Final Report to DG Fisheries and Maritime Affairs of the European Commission. Fish/2004/20. Institute for European Environmental Policy / Poseidon Aquatic Resource Management Ltd joint report.

Derraik, D. 2002. The pollution of the marine environment by plastic debris: a review*. Marine Pollution Bulletin* 44 (2002) pp. 842-852.

EEA. 2005. *Market-Based Instruments in Environmental Policy in Europe*. ISBN 92-9167-782-5.

EEA. 2006. *Using the market for cost-effective environmental policy*. ISBN 92-9167-810-814.

Environment Agency. 2002. *The Impacts of Marine Litter. Marine Pollution Monitoring Management Group*. [UK] Report of the Marine Litter Task Team (MaLiTT) May 2002. Environment Programme. 82 pp. http://www.marlab.ac.uk/FRS.Web/Uploads/Documents/Impacts of Marine Litter.pdf (Accessed January 2009)

Ernst & Young LLP, Institute for European Environmental Policy (IEEP) and Cordina, G. 2007. *Building capacity to introduce the polluter pays principle through economic instruments to implement the EU Environmental Acquis.* Report for the Malta Environmental Planning Authority (MEPA).

Field, B.C. and Field, M.K. 2002. *Environmental Economics: an introduction* – 3rd edition.

Food and Agriculture Organization of the United Nations (FAO). 2003. The Ecosystem approach to Fisheries. S.M. Garcia. http://www.fao.org/DOCREP/006/Y4773E/y4773e00.htm#Contents (Accessed January 2009)

Government of Malta. 2002. *Malta National Report*. Submitted by the Government of Malta to the World Summit on Sustainable Development.

GESAMP (Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). 1991. *The State of the Marine Environment*. London: Blackwell Scientific Publications. 146 pp.

Gilmore Hankey Kirke Limited (GHK), Institute for European Environmental Policy (IEEP) and Ernst & Young LLP, 2006. *Strategic Evaluation on Environment and Risk Prevention Under Structural and Cohesion Funds for the Period 2007-2013: National Evaluation Report for Malta.* Report commissioned by the European Commission Directorate General Regional Policy, 122pp.

Hall, K. 2000. *Impacts of Marine Debris and Oil: Economic and Social Costs to Coastal Communities*, KIMO International.

Institute for European Environmental Policy (IEEP). 2007. *Reforming environmentally harmful subsidies* Final report to the European Commission's DG Environment, March 2007.

James, D. 1997. *Environmental Incentives: Australian Experience with Economic Instruments for Environmental Management.* Environment of Australia.

Kang, C-G. 2005. *Marine Litter in the Republic of Korea.*

Lane, S.B., Gonzalves, C., Lukambusi, L., Ochiewo, J., Pereira, M., Rasolofojaona, H., Ryan, P., Marine Conservation Society. 2004. *Beachwatch 2003 - The 11th Annual UK Beach Litter Survey Report.* Marine Conservation Society, Ross-on-Wye, UK.

Lane, S.B., Gonzalves, C., Lukambusi, L., Ochiewo, J., Pereira, M., Rasolofojaona, H., Ryan, P., and Seewoobaduth, J. 2007. *Regional Overview and Assessment of Marine Litter Related Activities in the West Indian Ocean Region*. Report to the United Nations Environment Programme. 82 pp.

Lane, S.B., Gonzalves, C., Lukambusi, L., Ochiewo, J., Pereira, M., Rasolofojaona, H., Ryan P. 2007. *Regional Overview and Assessment of Marine Litter Related Activities in the WIO Region* – Nairobi

Convention and GEF WIO-LaB Project Countries. Prepared on behalf of UNEP (GPA and Regional Sea Programme).

Marine Conservation Society. 2002. *Beachwatch 2001 – Annual UK Beach litter survey report.* Marine Conservation Society, Ross-on-Wye, UK.

Marine Conservation Society. 2004. *Beachwatch 2003 – The 11th Annual UK Beach Litter Survey Report.* Marine Conservation Society, Ross-on-Wye, UK.

Marine Pollution Monitoring Management Group (MPMMG). 2002. *The impacts of marine litter.* Report of the Marine Litter Task Team (MaLiTT). Compiled and edited by Tim Fanshawe, Environment Agency and Dr. Mark Everard, The Natural Step.

National Academy of Science. 1975. Marine litter. In *Assessing potential ocean pollutants. A report of the study panel on assessing potential ocean pollutants to the Ocean Affairs Board, Commission on Natural Resources, National Research Council*, p. 405-438. Natl. Acad. Sci., Wash., D.C.

Nordic Council of Ministers. 2002. *The Use of Economic Instruments in Nordic Environmental Policy 1999-2001*. TemaNord 2001: 581. Copenhagen, Denmark.

Nordic Council of Ministers. 2006. The Use of Economic Instruments in Nordic and Baltic Environmental Policy 2001-2005, *TemaNord* 2006: 525. Copenhagen, Denmark

Ocean Conservancy. 2008. *2007 International Coastal Clean-up Results*. Washington, DC. 56 pp.

Organisation for Economic Co-operation and Development (OECD). 1994. *Managing the environment: the role of economic instruments.* OECD, Paris.

Organisation for Economic Co-operation and Development (OECD). 2005. *Environmentally Harmful Subsidies – Challenges for reform.* OECD, Paris.

Organisation for Economic Co-operation and Development (OECD). 2006. *Subsidy Reform and Sustainable Development: Economic, environmental and social aspects*. OECD, Paris.

Raaymakers, S. 2007a. *Regional Review of Marine Litter in the Seas of East Asia*. Report to the United Nations Environment Programme – East Asian Seas Regional Coordinating Unit. EcoStrategic Consultants, Ciarns.

Scialabba, N. (ed.). 1998. *Integrated coastal area management and agriculture, forestry and fisheries*. FAO Guidelines. Environment and Natural Resources Service, FAO, Rome. 256 p.

Sheavly, S.B. 2005. Sixth Meeting of the UN Open-ended Informal Consultative Processes on Oceans & the Law of the Sea. *Marine debris – An overview of a critical issue for our oceans*. http://www.un.org/Depts/los/consultative_process/documents/6_sheavly.pdf (Accessed August 2008).

Sheavly, S.B. and Register, K. 2007. Marine Debris & Plastics: Environmental concerns, sources, impacts and solutions. Journal of Polymers and the Environment*. Vol. 15, Number 4. pp. 229-305.*

Thomson, R.C., Olsen. Y., Mitchell, R.P., Davies, A., Rowland, S. J., John, A.W.G., McGonigle, D., and Russell, A.E. 2004. Lost at Sea. Where is all the Plastic? *Science*, 7 May 2004, vol.304. pp. 838.

United Nations Environment Programme (UNEP). 2005a. *Marine Litter: An analytical overview*. http://www.unep.org/regionalseas/marinelitter/publications/docs/anl_oview.pdf (Accessed July 2008)

United Nations Environment Programme (UNEP). 2005b. *Marine Litter and abandoned Fishing Gear*. Report to the Division of Ocean Affairs and the Law of the Sea, Office of Legal Affairs, UNHQ. A report by UNEP Regional Seas Coordinating Office, UNEP, Nairobi. http://www.unep.org/regionalseas/marinelitter/publications/docs/RS_DOALOS.pdf (Accessed July 2008)

United Nations Environment Programme (UNEP). 2006a. *Ecosystems and biodiversity in deep waters and high seas*. UNEP Regional Seas Reports and Studies. No. 178. UNEP/IUCN, Switzerland 2006. ISSN: 92-807-2734-6.

United Nations Environment Programme (UNEP). 2006b. Marine Litter in the Wider Caribbean. 18 pp. http://www.cep.unep.org/operational-components/amep-resources/marine-litter-booklet.pdf (Accessed September 2008).

United Nations Environment Programme (UNEP). 2007. *Regional overview and assessment of marine litter related activities in the WIO Region* – Nairobi Convention and GEF WIO-LaB Project Countries. Draft prepared by WIOMSA.

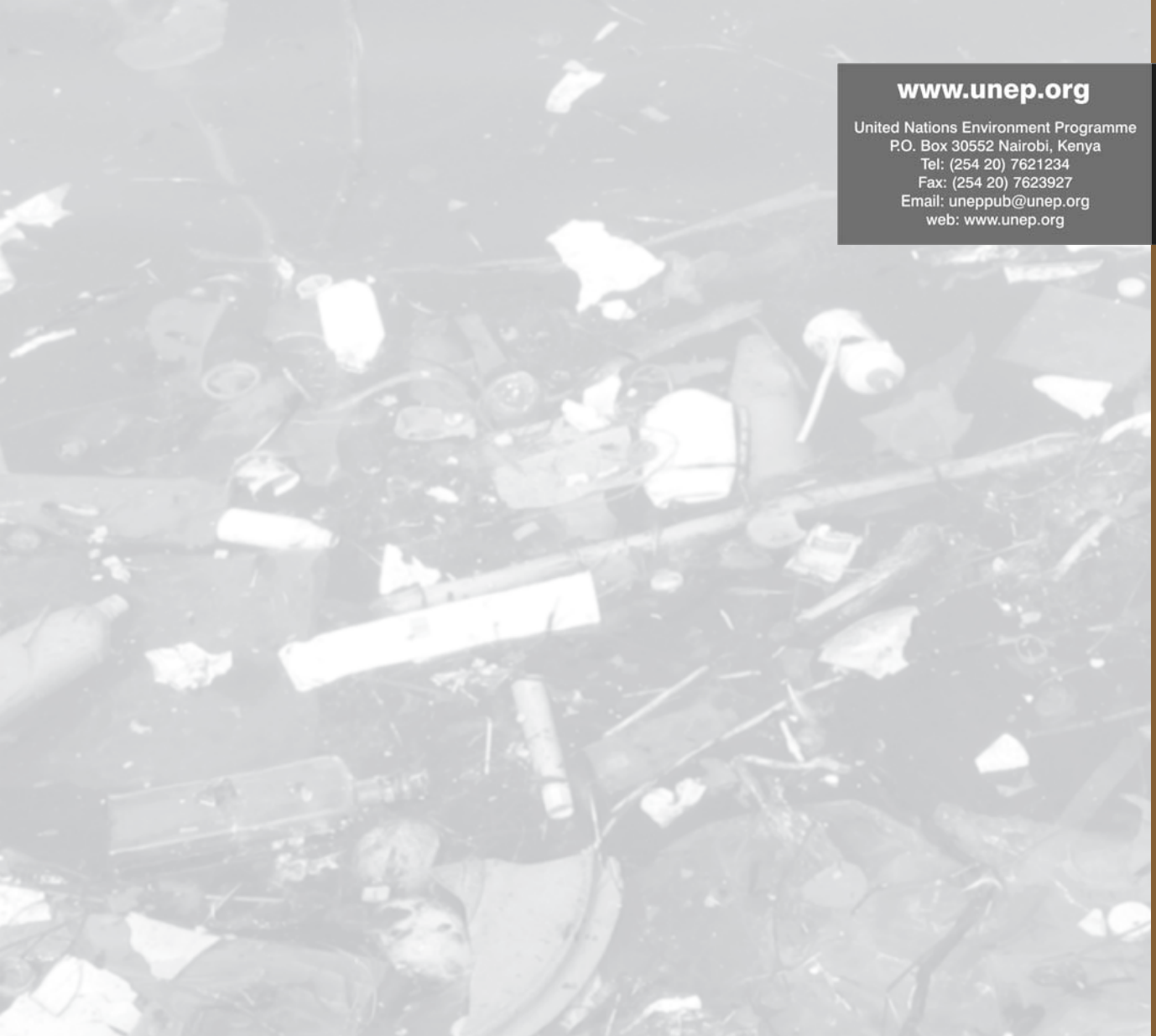
US Environmental Protection Agency (EPA). 1992. *Turning the tide on trash. A learning guide on marine debris.* EPA 842-B-92-003.

Williams, A.T., Simmons, S.L. and Fricker, A. 1993. Off-shore sinks of marine litter: a new problem. *Marine Pollution Bulletin*. 17. pp. 224-228.

Winston, J.E., Gregory, M.R., and Stevens, L.M. 1997. Encrusters, epibionts and other biota associated with pelagic plastics: a review of biogeographical, environmental and conservation issues. In J.M. Coe & D.B. Rogers (Eds.) *Marine Debris: Sources, Impacts and Solutions*. Springer.

www.unep.org

United Nations Environment Programme
P.O. Box 30552 Nairobi, Kenya
Tel: (254 20) 7621234
Fax: (254 20) 7623927
Email: uneppub@unep.org
web: www.unep.org



United Nations Environment Programme (UNEP)

Regional Seas Programme
P.O. Box 30552
Nairobi, Kenya
Tel: [+254] 20 762 4033
Fax: [+254] 20 762 4618

www.unep.org/regionalseas/

Institute for European Environmental Policy (IEEP)

London Office
15 Queen Anne's Gate
London
SW1H 9BU
United Kingdom
Tel: [+44] 20 7799 2244
Fax: [+44] 20 7799 2600

Brussels Office
Quai au Foin, 55
Hooikaai 55
1000 Brussels
Belgium
Tel: [+32] 2738 7482
Fax: [+32] 2732 4004

http://www.ieep.org/

SHEAVLY CONSULTANTS

3500 Virginia Beach Blvd., Suite 212
Virginia Beach, VA 23452-4445
USA
Tel: [+01] 757 321 2606
Fax: [+01] 757 321 2607

ISBN 978-92-807-3028-9
Job Number DEP/1175/NA