FEASIBILITY STUDY OF INTRODUCING INSTRUMENTS TO PREVENT LITTERING

Contract No. 070307/2011/608703/D3

Final Report

prepared for
DG Environment

RPA

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by

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EXECUTIVE SUMMARY

The aim of this study is to undertake a feasibility analysis on the introduction of measures to prevent and/or clean up litter, including plastic litter, and to reduce the quantity of litter that could potentially reach the seas. It aims to build on the initiatives of the EC concerning plastic bags and biodegradable plastics and will complement the findings of two other studies being carried out for the Commission:

- *Pilot project - plastic recycling cycle and marine environmental impact - Case studies on the plastic cycle and its loopholes in the four European regional seas areas (ENV.D.2/ETU/2011/0041); and*
- *Study of the largest loopholes within the flow of packaging material (ENVD.2/ETU/2011/0043).*

Types, Sources and Trends of Marine Litter

Waste contamination and plastic litter in the marine environment has direct social, economic and environmental impacts. Plastic is the largest single type of marine litter. Other common litter types include packaging material, fishing-related material and smoking-related material.

Sources of Marine Litter	
Sea-based Sources	***Land-based Sources***
Waste from vessels: • *merchant shipping (cargo, equipment, etc.)* • *Naval and research vessels* • *private vessels (pleasure)* • *public vessels (cruise liners, ferries)*	*Individual actions:* • *littering in general (inland and coastal)* • *littering caused by tourism (recreational visitors to the coast)* • *events (e.g. charity balloon releases)*
Fishing activities: • *fishing vessels* • *abandoned, lost or otherwise discarded fishing gear (fishing nets, ropes etc.)* • *aquaculture installations*	*Facilities and construction:* • *industrial or manufacturing releases (e.g. by-products, plastic resin pellets)* • *construction and demolition sites* • *harbours (seaports, commercial ports, fishing ports, ferry ports etc.)* • *ship-breaking yards* • *agricultural activities*
Other structures: • *legal and illegal dumping at sea* • *offshore oil and gas platforms and drilling rigs*	*Municipalities* • *litter and waste generated in coastal and inland zones from improper waste management* • *wastes from dump sites located on the coast or riverbanks* • *untreated municipal sewage*
Transport of litter and waste: • *natural events (storms, strong tides, tsunamis)*	*Transport of litter and waste (on land or waterways)* • *rivers and floodwaters* • *discharge from stormwater drains/sewers* • *natural storm-related events (e.g. mistral, tornados, hurricanes)*
Source: Öko-Institut (2012): Study on Land-Sourced Litter in the Marine Environment	

Although there is considerable literature on waste management offshore, very limited information is available specifically about the amounts or types of litter arising from sea-based sources, or the factors that give rise to it. Land-based sources arise largely from individuals, pedestrians or motorists who directly deposit litter. This litter can enter the marine environment through a series of pathways such as riverine transportation, discharges of (untreated) industrial or municipal wastewater, storm sewers and poorly managed waste facilities, including transport of waste to the facility.

Factors Influencing Littering by Individuals on Land

A better understanding of the behaviour of individuals and organisations responsible for litter can assist with the formulation of effective policy measures to address the problem of marine litter. The context (such as the level of cleanliness of the area), available facilities for the disposal of litter and people's attitudes and perceptions also impact littering behaviour.

Main Influencing Factors for Littering Behaviour	
Influencing factors	***Littering behaviour***
Unnecessary packaging, single-use shopping bags, advertising flyers, etc.; *Lack of anti-litter law enforcement;* *Insufficient quantity, insufficiently maintained or ineffectively designed receptacles;* *The prevalence of existing litter; and* *Items/material not perceived as litter.*	*Pedestrians dropping waste directly on the street or into rivers;* *Motorists discarding waste out of vehicle windows;* *Litter is thrown at a bin and misses it; and* *Litter is buried, often under sand at the beach.*

Who Litters and Why?

The motivations behind littering include social norms as well as a lack of awareness about the consequences and the general impact of littering. Some studies have identified trends in littering behaviour and attitudes, with variations along gender lines, age groups, etc. Older people are less likely to view littering as acceptable and there is some indication that men feel littering is more acceptable than women. Reasons for littering also appear to differ between different groups of litterers.

Existing Measures to Address the Problems of Littering

Types of Measures

Measures to address the problem of littering can be divided into three types. Each type is linked to the different factors driving littering behaviour:

- *measures which aim at reducing littering by **influencing the behaviour** of selected target groups (behavioural measures, aimed at changing the attitudes and perceptions that drive littering);*
- *measures which public authorities could implement to **prevent littering** (preventive measures, aimed at improving the quality of infrastructure and product and packaging design); and*

- *measures which aim at **cleaning up** litter in the environment (clean-up measures, addressing the context that drives littering).*

However, there is considerable overlap between these types of measures. In addition, some measures target particular types of litter, groups of litterers or particular locations.

Cost and Effectiveness of Existing Measures

One key finding from our research is that few of the measures addressing litter have been subject to systematic evaluation. In order to assess the available evidence on existing measures we adopted two different approaches:

- *evaluation of a short-list of existing measures against assessment criteria; and*
- *detailed case studies to examine how (combinations of) existing measures have functioned in practice and the key factors affecting their success or failure.*

A short-list of measures was evaluated to help determine how effective and efficient these are at achieving the objectives of preventing, cleaning up and reducing the quantity of plastic litter that could potentially reach the seas. To ensure consistency between the three projects, a common set of assessment criteria was agreed upon and used. The five overarching criteria for evaluation of the measures are feasibility, costs, effectiveness, distributional analysis and wider issues.

Although general information is available on many of the measures, they tend to lack both qualitative and quantitative data on specific practical issues such as that specified in the feasibility criteria. Where possible, contact was made with the persons or organisation responsible for the measure to try to gain further information, but again detailed data were lacking in most cases.

Case Studies

In addition to the feasibility assessments, case studies were also used to determine the success factors of particular measures. The case studies also aimed to identify the likelihood that these measures could be replicated in other Member States. The following case studies were completed:

- *a case study comparing similar instruments implemented in different Member States: plastic bag taxes and charges across Europe;*
- *a case study on the effectiveness of measures and packages of measures targeted at particular types of litter: cigarette and chewing gum litter;*
- *a case study comparing the effectiveness of different measures aimed at particular target groups; measures aimed at school children; and*
- *a case study comparing different instruments targeted at a particular location: measures targeted at tourist beaches.*

Recommended Programme of Measures

On the basis of the evidence collected from literature, together with the (rather limited) data on costs and effectiveness of individual measures and the findings of the

case studies, the key finding of the assessment is that measures need to be tailored to particular circumstances. This makes it rather difficult to recommend a single programme of measures that are equally cost-effective and applicable across the EU.

Instead, our recommendations set out an approach for responsible authorities to identify and select measures for particular circumstances. The recommendations cover actions at different levels, by different actors (local/regional authorities, Member State governments and the Commission as well as other partners) and focus on coordination and partnerships to maximise the effectiveness of measures.

Programme of Actions for Local/Regional Authorities

Local (and/or regional) authorities in most Member States have direct responsibility for dealing with litter on land. They are generally responsible for street (and beach) cleaning and waste management, spatial planning, enforcement of regulations on littering and often play a key role in education and training. They are also likely to have strong links with local stakeholder groups. This gives them a key role in litter prevention.

The following steps are suggested for local authorities seeking to implement measures aimed at reducing marine litter, or litter in general:

- *identify the problem;*
- *identify the drivers for managing litter;*
- *identify target groups;*
- *map existing measures and analyse gaps;*
- *select measures to fill the gaps;*
- *agree and implement the programme; and*
- *monitor the impacts.*

Programme for Member State Authorities

The recommended programme of actions for Member State authorities includes:

- *sharing information and guidance with local authorities, NGOs and stakeholders in the private sector on amounts and sources of marine litter;*
- *encouraging NGOs and stakeholders in the private sector to launch measures relevant to their field of activity by increasing funding and facilitating bottom-up approaches to take place;*
- *assisting local authorities to identify target groups responsible for littering;*
- *ensuring that neighbouring authorities (including authorities in neighbouring Member States) are aware of each others' actions, so that they can be effectively coordinated;*
- *providing a platform for information sharing and collaboration;*
- *providing guidance and resources to help local authorities select and implement measures to address marine litter; and*
- *finally, assisting local authorities as well as NGOs to monitor the effectiveness of measures, for example by developing methodologies for assessment and by gathering and sharing the results of assessments of different measures.*

Programme for the European Commission

The primary delivery mechanism to manage marine litter for the European Commission will be through the Marine Strategy Framework Directive (MSFD). Through the MSFD the Commission requires each Member State to establish characteristics of Good Environmental Status (GES) (as required under Article 9) including targets and indicators by end 2012. Member States then have to develop programmes of measures by 2015 and to implement these programmes by 2016.

Monitoring and reporting mechanisms used by Member States will ensure compliance with the MSFD and can also aid in the general reduction of marine litter. It will be important for the Commission to liaise directly with Member States to identify areas of good practice and determine where measures can be replicated in other Member States.

To improve information exchange, the data received from MSFD monitoring and compliance could be disseminated through a Commission website which could also be a hub for marine litter information. The Commission also has a wider research and educational function and can facilitate exchange of experience through research and pilot projects to test specific measures across Member States. Example actions could include developing tools to enhance networking between authorities responsible for marine litter and to improve their competencies.

The Commission could further utilise social media to facilitate information exchange and engage stakeholders and the public. Its role would also consist of making additional funding available, facilitating further exchange of experience, coordinating efforts at regional sea levels and enforcing the existing European guidelines.

The Commission could support networking between responsible authorities and stakeholders in many ways such as through facilitating 'twinning' of authorities and NGOs in countries with well-developed programmes and in those without; funding and hosting training courses and workshops; providing links to local websites to encourage working in partnership, as well as to ensure consistency between neighbouring authorities. The Commission website could also host an expanded version of the marine litter toolbox to help those responsible identify which measures may be appropriate. The approach could draw from existing Commission models as well as specifically developed flowcharts.

Programme for the Regional Seas Convention

One of the key roles for Regional Seas Conventions is to ensure effective co-operation between States bordering regional seas in addressing marine litter. This allows for wider co-ordination and includes non-Member States within the plans. One way this could be achieved is by supporting the development of Strategic Regional Action Plans on Marine Litter and including them within the relevant Regional Seas Conventions.

The role of the Regional Seas Commissions (OSPAR, Mediterranean, Baltic Seas etc.) in terms of evidence on the cost effectiveness of measures, access to support, materials etc. should not be overlooked. This could be particularly important with

respect to data gathering, where OSPAR in particular has significant experience at a trans-Member State level.

Programme for NGOs

The NGO and charity sectors need to be fully engaged, both through the MSFD Programmes of Measures and through their inclusion in national and regional strategies for litter management. Their engagement and support in the implementation of the Member State and Local Authority actions is fundamental to the successful management of marine litter. Both Member State and local authorities should work with these sectors and make available government funding. In addition, where good practice by NGOs is identified, supporting replication across Member States can improve the efficiency of measures to address marine litter.

Cooperation between NGOs and national and local authorities is likely to make actions addressing marine litter more cost-effective and consistent. A key role for NGOs is to facilitate bottom-up approaches and enhance the behavioural impacts. Member State and local authorities can provide practical help to NGOs in the form of guidance, training, funding, etc.

Programme for the Private Sector

The private sector can work with local, regional and national authorities, as well as with the European Commission, to further enhance measures. The key industry sectors which can provide input include:

- *the plastics and packaging industries;*
- *retailers;*
- *the tourism and recreational sector; and*
- *other business sectors.*

The plastics and packaging industry can support the reduction of plastics and packaging materials ending up as litter by:

- *promoting re-use and recycling, and use less material for products and their packaging;*
- *taking account of eco-labelling criteria in product design; and*
- *continuing to promote and finance anti-litter initiatives.*

The industry can also continue to work with regulatory authorities and NGOs to develop behavioural campaigns to encourage recycling and responsible disposal of waste packaging.

Retailers are closest to the consumers and thus are in a good position to alter their purchasing choices. Potential actions that retailers could take include:

- *providing information to customers on the impacts of litter;*
- *participating in separate collection and deposit refund systems for bottles and bags and promoting alternatives to plastic bag use;*
- *providing facilities for disposal of litter; and*
- *participating in local clean-up activities.*

The tourism and recreation sector in coastal areas is directly affected by marine and coastal litter, as it can make destinations less attractive to tourists. A programme for the tourism and recreation sector could include:

- *inform tourists about the impacts of litter on the marine environment;*
- *provide funding for and encourage the use of litter disposal facilities; and*
- *participate in and promote stewardship concepts.*

All business sectors can contribute to the reduction of marine litter by developing effective environmental management plans, incorporating problem identification, development of best practices and staff training.

Integration of Results from the Three Marine Litter Studies

This chapter brings together in a comprehensive way the results of three studies on marine litter financed by the European Commission. It also provides a 'reading guide' to certain elements of these three studies (see Table 1 (next page) for the overview of the three projects).

Background

Marine litter poses a serious threat to the marine environment around the globe and raises growing environmental, economic and health concerns. It contains a range of persistent, manufactured or processed solid materials (such as plastic, glass, wood, metals, etc.) which are discarded, disposed of or lost into the sea and on beaches, including materials which are transported into the marine environment from land by rivers, drainage or wind.

Plastics are the most abundant debris found in the marine environment and comprise more than half of marine litter in European Regional Seas. More than half of the plastic fraction is composed of plastic packaging waste with plastic bottles and bags being predominant types of plastic packaging. However, the lack of a systematic approach to monitoring marine litter means that determining trends in the amount and type of litter is difficult. Recent information indicates that significant differences exist in the types of marine litter found between the seas bordering the EU. Additional beach surveys performed as part of one of the studies, confirmed these findings. Predominant types of litter other than packaging materials include sanitary waste, smoking-related material and fishing-related material.

Considerable efforts have been made to combat the problem of marine litter. However, the problem is growing in scale, in particular due to non-degradability or slow degradation of litter in the marine environment. At local, regional, national and international scale numerous measures and initiatives have been taken, either targeting marine litter specifically or comprising general litter management or environmental stewardship and sustainable practices. Coordination of these actions within a coherent strategy, with exchange of experiences by learning from good practice examples or drawbacks and taking account of the origin, activities and actors to which marine litter is linked, should enable the implementation of measures that successfully mitigate/prevent the (increasing) pressure of (plastic) litter in the coastal and marine environment.

Three new projects on marine litter – an overview

The European Commission is a very active player in addressing the issue of marine litter. Commission policies, strategies, legislation and environmental projects, research and other initiatives aim to increase the knowledge base and to foster cooperation and dialogue.

Three studies have been contracted by the European Commission, DG Environment (see table below) to aggregate data on marine litter in European Marine Environments, to contribute to achieving good environmental status with respect to descriptor 10 on marine litter of the Marine Strategy Framework Directive and to

help to further develop (European) policy for marine litter. The results of the three studies will also contribute to the Rio +20 commitment to take action to achieve significant reductions in marine debris and the achievement of the goals and strategy objectives of the Honolulu strategy[1].

Honolulu strategy - Main goals

Goal A: *Reduced amount and impact of land-based sources of marine debris introduced into the sea;*

Goal B: *Reduced amount and impact of sea-based sources of marine debris including solid waste, lost cargo, Abandoned, lost or otherwise discarded fishing gear (ALDFG), and abandoned vessels introduced into the sea; and*

Goal C: *Reduced amount and impact of accumulated marine debris on shorelines, in benthic habitats, and in pelagic waters*

All three projects propose a mixture of feasible and affordable measures in order to improve the situation concerning marine litter whilst adopting a slightly different focus, as shown in the following project overview:

Table 1: Project Overview of the Three Marine Litter Studies

Project	***PROJECT 41*** *Pilot project '4 Seas':* *Case studies on the plastic cycle and its loopholes in the 4 EU regional seas* *(ENV.D.2/ETU/2011/0041)*	***PROJECT 42*** *Anti-Littering Instruments:* *Feasibility study of introducing instruments to prevent littering* *(ENV.D.2/ETU/2011/0042)*	***PROJECT 43*** *Plastic Packaging Loopholes:* *Loopholes in the flow of plastic packaging material* *(ENVD.2/ETU/2011/0043)*
Contractor	*ARCADIS (MILIEU, EUCC)* *www.arcadisbelgium.be*	*RPA (ARCADIS, ABPmer)* *www.rpaltd.co.uk*	*BiPRO GmbH www.bipro.de*
Objectives	• *Identify main sources and loopholes of marine litter in the 4 regional seas* • *Focus on four case studies: Oostende (North Sea), Barcelona (Mediterranean Sea), Riga (Baltic Sea) and Constanta (Black Sea)* • *Building on local knowledge through regional workshops and stakeholder interviews* • *Proposal of possible measures and feasibility assessment*	•*Identify best practices in plastic and other littering prevention and cleaning up* • *No geographic restriction* • *Build on initiatives concerning plastic bags and biodegradable plastic as well as initiatives outside the field of litter* • *Assessment of the feasibility of different options to prevent littering (including plastic) and increase public awareness*	• *Identify loopholes in the plastic packaging cycle* • *Focus on Member States (MS) lagging behind and 3 non-EU Mediterranean Countries* • *Build on initiatives concerning plastic bags and biodegradable plastic* • *Proposal of possible measures and feasibility assessment*

[1] The Honolulu Strategy, published by UNEP and the NOAA Marine Debris Program [UNEP 2012], is a framework for comprehensive and global effort to reduce the ecological, human health, and economic impacts of marine debris. It is intended to help improve collaboration and coordination among the multitude of groups and governments across the globe in a position to address marine debris. It is intended to serve as a common frame of reference for action among these communities, as well as a tool for groups to develop and monitor marine debris programs and projects. (http://ec.europa.eu)

Table 1: Project Overview of the Three Marine Litter Studies			
Different-iation	• *Marine litter including PPW* • *Geographical area: 4 selected case studies* • *Bottom-up approach*	• *All litter sources including PPW* • *Policy support* • *No geographical limitation but case studies cover specific areas*	• *Plastic packaging waste (PPW)* • *Geographical area: selected EU MS (BG, CY, EE, ES, FR, GR, IE, IT, PL, RO, UK) + Egypt, Lebanon, Morocco* • *Top-down approach*
Synergies	• *Identification and proposal of measures* • *Feasibility assessment* • *Include bags, bottles* • *Policy support*	• *Identification and proposal of measures* • *Feasibility assessment* • *Include bags, biodegradable plastics and all types of litter* • *Policy support*	• *Identification and proposal of measures* • *Feasibility assessment* • *Consideration bags and biodegradable plastics* • *Policy support*

Common methodology

In order to recommend a programme of measures, the three studies looked at existing measures which address the problem of littering, each with their specific focus (Table 1). These long-lists of measures were structured according to the goals and strategies of the Honolulu strategy for project 41. Project 42 divided the measures into three major types linked to the different factors driving littering behaviour. The three major types of measures are to reduce littering by influencing behaviour, to prevent littering and to clean up litter. In project 43 the measures were allocated to the steps of the plastic packaging life cycle and most relevant actors who are in the position to close existing plastic packaging loopholes.

These long-lists of measures were further screened to produce short-lists of measures which were then analysed in greater detail (feasibility assessment). This aimed to determine how effective and efficient these measures were at achieving the objectives of preventing, cleaning up and reducing the quantity of litter that could potentially reach the marine environment.

As a result of the synergies taking place between the three EU marine litter studies, all short-listed measures have been described according to a common template. The template for the Marine Litter Fact Sheets has been based on the template developed for the Marine Litter Toolbox[2], and extended with criteria to feed the feasibility assessment. A long list of common feasibility criteria has been developed between the three studies. The full list of criteria can be found in the main report. The main criteria categories are listed in Table 2. It should be noted that even though the project gained substantial information from stakeholder interviews (project 41 and 43) and literature reviews, it appeared that the level of detail was insufficient to score all criteria. Detailed results of the feasibility assessment can be found in Chapter 6 of report 41, Chapter 4 of report 42 and in Chapter 9 and Annex 6 of report 43.

[2] Toolbox developed for the marine litter high-level preparatory meetings of which the third preparatory meeting took place in Brussels on 27 February 2012.

Table 2: Main Groups of Evaluation Criteria used for the Feasibility Assessment	
Category	***Evaluation issue***
1. Feasibility	*1.1 Administrability*
2. Costs	*2.1 Financial*
3. Effectiveness	*3.1 Relevance* *3.2 Effectiveness* *3.3 Coherence* *3.4 Community added value* *3.5 Sustainability* *3.6 Monitorability*
4. Distributional analysis/ stakeholder analysis	*4.1 Who causes the problem?* *4.2 Who pays (incurs costs)* *4.3 Who benefits (positively impacted)* *4.4 Who loses out (negatively impacted)*
5. Wider issues	*5.1Transferability (applicability)*

In addition, case studies were used in project 42 to identify the success factors and barriers to particular measures. The case studies incorporated the analysis of similar instruments in different Member States, the analysis of different measures targeted at particular types of litter, the analysis of different measures aimed at particular target groups, and the analysis of different measures targeted at a particular location.

This common approach allowed an exchange of relevant measures between the three studies to compose an adequate mixture of policy measures and strategies targeting all relevant key actors and pathways.

The proposed mixture of affordable and feasible measures in the three studies target the most important materials and sources contributing to marine litter: sanitary waste, cigarette butts, ropes & nets and plastics (project no 41), specifically plastic packaging (project no 43) as well as other relevant waste materials (project no 42).

Main findings

1. *The three projects showed that plastic is the dominant fraction and that plastic packaging waste (PPW) in marine litter comes primarily from land based activities, although with some important regional differences (see below). The most relevant plastic packaging items present in marine litter are plastic bags and bottles, and consumer packaging (e.g. crisps/ sweets). Therefore, measures within a strategy to close the largest loopholes in the plastic packaging cycle should target plastic bottles and plastic bags, and specifically address the responsible actors in the production, consumption and waste management stage of plastic packaging which could bring about improvements by changing their behaviour and implementing practical actions to do so. More specific information on selected feasible and affordable measures to close the largest loopholes contributing to marine litter in plastic packaging flows is available in Chapter 9 and Annex 6 of report 43, Chapter 5 of report 41. Information on measures targeting packaging, which could be*

adapted for use in different Member States, can be found in Chapter 4 and Annex 3 of report 42.

2. *The three studies identified individual behaviour and people's attitudes and perceptions as a major influential factor with regards littering. Other important factors include context (e.g. cleanliness of the area, administrative capacity and competences, etc.) and available waste infrastructure (e.g. sewerage systems) and facilities (e.g. port reception facilities, suitable receptacles).*

   Consumer's purchasing, consumption and disposal behaviour is also considered a key aspect which needs to be changed in order to close the largest loopholes by which marine litter, including plastic packaging, enters the marine environment. Therefore, the measures should in particular influence these specific behaviours and involve all relevant actors which could influence consumer behaviour.

   There is a key role here for retailers, as they are in direct contact with millions of consumers daily, the tourism industry to address coastal tourists and residents, waste management companies to improve consumer's disposal behaviour and local competent authorities to provide for relevant informative, economic, administrative and infrastructural measures. Consumers could also have a direct impact by modifying their behaviour. The combination of individual actions will lead to significant and measureable results in terms of the reduction of plastic waste in the environment. Simply starting to reject single use bags in stores, use alternative cotton bags, drink tap water (where possible) instead of buying bottled water, discard your waste properly, etc. can make an impact on litter levels. Other ways of improving management of waste in our society and preventing it from becoming marine litter is outlined in each report (Chapter 5 of report 41, Chapter 4 and 5 of report 42 and Chapter 10 of report 43).

   Due to the important impact that individual behaviour has on marine litter, increased knowledge of the behaviour of individuals and organisations responsible for litter can assist with the formulation of effective policy measures to address the problem of marine litter.

3. *Project 41 and 43 show that appropriate waste management is another crucial issue to close the largest loopholes for household waste including plastic packaging waste. Therefore, relevant actors in waste management (waste collectors, operators of waste treatment facilities) must improve the performance of the waste management system. This could be managed by, for example, increasing the waste collection frequency, increasing capacity of municipal waste services during busiest tourist days (summer season), better maintenance of and improvements to the sewerage system, provision of information to consumers on proper disposal behaviour, organisation of training for personnel involved in waste collection and disposal, etc. (see Chapter 5 of report 41, Chapter 10 of report 43 for further specific recommendations).*

4. *Finally, producers should be involved and fulfil the extended responsibility over the whole product life cycle and should implement measures to optimise the performance of the PPP (plastic packaging products) production (e.g. through design for re-use, recycling, prevention, low material demand, etc.). The plastic industry can prove its commitment to contribute to the GES indicator 10 by supporting and financing various types of measures which aim at improving the situation concerning plastic packaging litter in the marine environment (see Chapter 10 of report 43 for further specific recommendations) or by providing more environmentally friendly alternatives to, amongst others, sanitary products use (Chapter 5 report 41).*

In addition to these common findings, the studies - particularly project 41 and 42, identified variability with regards to marine litter across Europe and its regional seas. This variability spans types, sources and trends in litter. While land-based activities, for example, generate most of the marine litter in the Mediterranean, Baltic and Black Sea (also confirmed by the findings of the project 43, Chapter 4 and Annex 2), sea-based activities are almost equally important in the North Sea region (including ropes and nets). Project 41 highlights the importance of sanitary waste in the Mediterranean and Baltic region, while this is not observed in the surveys from the North Sea and Black Sea cases. Equally, the factors influencing littering behaviour can be very context specific (project 41, 42 and 43).

On the basis of the evidence collected from literature, together with the (rather limited) data on costs and effectiveness of individual measures the key finding of the assessment showed that the measures need to be tailored to particular circumstances in order to successfully prevent (marine) littering. This makes it rather difficult to recommend a single programme of measures that are equally cost-effective and applicable across Europe. However, by tailoring measures to particular contexts it ensures that the measures which are implemented are those which are most suitable to the circumstances in which they are applied.

The three studies therefore, set out an approach for responsible authorities to identify and select measures for particular circumstances. Policy mixes have been proposed per regional sea as part of project 41 and are available in Chapter 7 and Annex 17 to 20. The recommendations cover actions at different levels, by different actors (local/regional authorities, Member State governments and the Commission as well as other partners) and focus on coordination and partnerships to maximise the effectiveness:

- *Local (and/or regional) authorities have a key role in litter prevention. An overall reduction in the amount of litter entering the environment, both at inland and coastal locations, is likely to result in a reduction in marine litter. The three projects set out an approach which local authorities could take to help solve the marine litter problem. This includes a wide range of measures such as identifying the problem, educational/informative initiatives and actions to raise environmental awareness among different target groups according to their needs, promotion and reward for good practice examples, promotion of measures to prevent PPW becoming marine litter, provision of adequate waste collection and treatment infrastructure, monitoring the measure post-implementation, etc.*

- *Regarding Member States, it is recommended that they assist and work with local and regional authorities to enhance their programmes of action on marine litter. Member State authorities can support the local authorities' programmes through facilitating funding, adjusting and enforcing regulative provisions and drafting new legislative requirements which can be placed on relevant market players, exchanging experiences, working through partnerships, and coordinating efforts at regional sea levels.*

- *The role of the policy makers at EU level would be to provide a platform for national and local authorities thus supporting their actions. Moreover, policy makers could further utilise social media applications to engage stakeholders and the public in the prevention and clean-up of marine litter. Their role would also consist of making additional funding available, facilitating further exchange of experience, coordinating efforts across regional seas and enforcing the existing European guidelines.*

Policy should establish specific targets to be achieved at these different levels (local, regional, national or EU wide) for the long term reduction of plastic packaging in marine litter. This can be accomplished by adopting targets aiming to reduce litter inputs to the marine environment by improving the resource efficiency, waste management, consumer behaviour or specific pollution sources (for example by increasing targets for re-use, recycling and recovery of PPW and setting targets to divert plastic packaging from being landfilled) or by establishing environmental targets regarding the presence of marine litter in European Regional Seas (e.g. to decrease beach litter 50% per decade). Further recommendations on actions and measures to reduce marine litter applicable on a local/regional or EU wide level can be found in Chapter 4 and 5 of report 42 and Chapter 10 of report 43.

Recommendations and Follow-up

The three projects shall provide important input for the development of a "Marine Litter Strategy" as a systematic approach addressing mitigation and prevention actions, identifying responsible actors and policy instruments in order to reduce/prevent future inputs of litter into the European Seas.

In practice each stakeholder can take specific action against marine litter. The measures proposed within the three projects seek to provide information on possible ways to support actions by stakeholders to prevent and mitigate the impact of littering. The following messages can be addressed to specific stakeholders.

What can consumers do?

- *Reject single use plastic bags and bottles and use re-usable alternatives*
- *Drink tap water (where possible)*
- *Think before you buy! Consider environmental impacts whilst purchasing*
- *Buy regional/local products (reduction of primary, secondary, tertiary packaging)*
- *Separate waste at home and participate in systems for separate collection and deposit refund systems*
- *Do not litter! Take your waste with you during consumption "on the go", "away from home" and "on the beach"*

- *Don't flush domestic sanitary waste down the toilet! Change to the solid waste route for the disposal of this waste*
- *Participate in organised clean-ups*

What can the plastic industry do?

- *Promote and support closed loop business models and eco-design (promote re-use and recycling, and use less (plastic) material for products and their packaging)*
- *Extend and improve producer responsibility over the entire product life cycle*
- *Exchange information, knowledge and best practices on innovative technologies, production processes and sustainable plastic packaging products*
- *Promote and finance marine litter initiatives*
- *Incorporate eco-labelling criteria in product design*

What can retailers do?

- *Motivate and inform your customers on sustainable consumption*
- *Participate in separate collection and deposit refund systems for bottles and bags and promote and establish individual small scale deposit systems at local level*
- *Provide your customers with alternatives to plastic bottles and bags*
- *Procure re-usable and recyclable packaging*
- *Commit to targets for reduction of plastic packaging*
- *Exchange ideas and best practices with other retailers*

What can the tourism and recreational sector do?

- *... do generally the same as retailers, and*
- *Sensitise tourists to the impacts of litter on the marine environment*
- *Provide eco-alternatives for plastic beach ashtrays*
- *Establish water dispensers in the hotel lobbies and other communal areas*
- *Participate in eco-tourism certification schemes*
- *Create and promote stewardship concepts such as adopt-a-beach*
- *Clean-up plan for events*

What can waste management professionals do?

- *Inform, motivate and encourage inhabitants to improve source separation*
- *Organise training for professionals in waste operations (collection, disposal, etc.) to introduce simple measures to improve waste management and minimum requirements for landfills*
- *Exchange ideas and best practices with other waste professionals, municipalities, etc.*

What can policy makers at local/regional level do?

- *Invest in research and monitoring activities for:*
  - *Identifying the problem: what are the main types of litter and who are the main litterers;*
  - *Determining what the main targets for a litter prevention/clean-up programme should be;*
  - *Mapping existing relevant measures that are already being implemented in the area and analyse gaps that need to be filled;*
  - *Selecting measures to fill the gaps;*

  - *Working with the local community, voluntary organisations, businesses etc. to agree the programme and to help to deliver it; and*
  - *Monitoring the impacts of the programme*
- *Motivate and inform citizens on sustainable consumption (e.g. initiate public awareness, establish public water dispensers, promote consumption of tap water, seasonal bans on plastic bags in coastal cities, ban plastic bottles during beach events and concerts, avoid plastic packaging in public procurement, etc.)*
- *Inform, motivate and encourage inhabitants to improve source separation*
- *Inform, motivate and implement beach and street cleanliness*
- *Check and improve local waste management services (availability of collection infrastructure, bin design, bin marking, regulatory compliance of landfills, eradication of illegal dumpsites, consideration of littering in local waste management plans and river management, etc.)*
- *Cooperate with retailers/tourism and waste management professional and exchange best practices with other municipalities*
- *Increase waste management services during top days (bathing season)*

What can policy makers at Member State level do?

- *Establish and adopt environmental targets aiming to reduce litter inputs to the marine environment*
- *Share information with local authorities, NGOs and stakeholders in the private sector on amounts and sources of marine litter, particularly from monitoring to meet the requirements of the MSFD;*
- *Encourage NGOs and stakeholders in the private sector to launch relevant behavioural, preventive and clean-up initiatives by increasing funding and facilitating bottom-up approaches to take place*
- *Assist local authorities to identify target groups responsible for littering*
- *Ensure that neighbouring authorities i.e. within the context of regional seas are aware of each other's actions, to facilitate coordination*
- *Provide a platform for local authorities, NGOs and stakeholders in the private sector to share information and collaborate, allowing for the expansion of programmes and projects*
- *Provide guidance and resources to help local authorities select and implement measures to address marine litter*
- *Assist local authorities and NGOs to monitor the effectiveness of measure*

What can policy makers at EU level do?

- *Support the actions of local and Member State authorities by funding research*
- *Facilitate experience and information exchange; e.g. through hosting a database of published marine litter survey information, guidance on marine litter monitoring, common recording templates, etc.*
- *Coordinate efforts across regional seas and enhance networking between authorities and other stakeholders*
- *Host an expanded version of the marine litter toolbox (ideally including broad costs of measures) Provide information or links to locally implemented measures to encourage working in partnership and consistency between neighbouring authorities*
- *Foster effective enforcement of existing waste legislation*
- *Foster effective enforcement of extended producer responsibility scheme*

- *Increase existing recycling targets for plastic packaging waste and establish reduction targets for plastic (packaging) waste being sent for disposal in landfills*
- *Establish (ambitious) environmental targets for marine litter reduction*
- *Strengthen the relationship between water and waste management policies*
- *Support development of Strategic Regional Action Plans on marine litter and their inclusion in relevant Regional Seas Conventions*
- *Support international activities to combat marine litter such as the Honolulu Strategy and the Rio +20 commitment to take action to achieve significant reductions in marine debris*
- *Establish a harmonized EU monitoring strategy for beach litter, floating litter and litter on the seabed, as well as for micro litter.*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF BOXES

LIST OF ABBREVIATIONS

AECO	Association of Arctic Expedition Cruise Operators
AUD	Australian Dollars
AUSMEPA	Australian Marine Environment Protection Association
BAT Australia	British American Tobacco Australia
BGN	Bulgarian Lev
CBSM	Community-Based Social Marketing
CGAG	Chewing Gum Action Group
CIWEM	Chartered Institution of Water and Environmental Management
COOU	Consorzio Obbligatorio degli Oli Usati (Mandatory Consortium of Used Oils)
CSR	Corporate Social Responsibility
CYMEPA	Cyprus Marine Environment Protection Association
DEFRA	Department for the Environment, Food and Rural Affairs
ECOMB	Environmental Coalition of Miami & the Beaches
ENCAMS	Environmental Campaigns (former name for Keep Britain Tidy)
EPA	Environmental Protection Agency (USA)
EPA	Environmental Protection Act (1990, UK)
EPA Victoria	Environment Protection Authority Victoria
ERIC	Environmental Regulation and Information Centre
EU	European Union
EVS	European Values Study
FAO	Food and Agriculture Organisation
FEE	Foundation for Environmental Education
FIFA	Fédération Internationale de Football Association
FKF Zrt	Fővárosi Közterület-fenntartó Zrt. (Municipal Public Maintenance Ltd.)
GES	Good Environmental Status
HELMEPA	Hellenic Marine Environment Protection Association
IBAL	Irish Business Against Litter
ICPDR	International Commission for the Protection of the Danube Region
IEEP	Institute for European Environmental Policy
INTERREG IVC	Innovation and Environment regions of Europe Sharing Solutions
KAB	Keep America Beautiful
KESAB	Keep South Australia Beautiful Inc.
KIMO	Kommunenes Internasjonale Miljøorganisasjon (Local Authorities International Environmental Organisation)
MARLIN	The Baltic Marine Litter project
MARPOL	International Convention for the Prevention of Pollution from Ships
MBI	Market-Based Instruments
MCS	Marine Conservation Society
MED/POL	Mediterranean Pollution Monitoring and Research Programme
MIO-ECSDE	The Mediterranean Information Office for Environment, Culture and Sustainable Development
MSFD	Marine Strategy Framework Directive
M&S	Marks & Spencer

LIST OF ABBREVIATIONS (cont)

NABU	Naturschutzbund Deutschland eV (Nature and Biodiversity Conservation Union)
NEA	National Environment Agency (Singapore)
NGO	Non-Governmental Organization
NOAA	National Oceanic and Atmospheric Administration
OECD	Organisation for Economic Co-operation and Development
OSPAR	Oslo/Paris Convention (for the Protection of the Marine Environment of the North-East Atlantic)
OVAM	Openbare Vlaamse Afvalstoffenmaatschappij (Flanders Public Waste Agency)
RAPs	Regional Action Plans
RON	Romanian Lei
SAS	Surfers Against Sewage
TU Delft	Delft University of Technology
UNEP	United Nations Environment Programme
UNEP/MAP	United Nations Environment Programme - Mediterranean Action Plan
WET	Water Education for Teachers
WFD	Water Framework Directive
WVS	World Values Survey
WWF	World Wildlife Fund

1. INTRODUCTION

1.1 Background

Marine litter can be defined as:

> *"any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine or coastal environment[3]"*

Marine litter consists of items that have been made or used by people and deliberately discarded or unintentionally lost in the sea or on beaches, including materials transported into the marine environment from land by rivers, draining, sewage systems or winds.

Marine litter can consist of plastic, wood, metal, glass, rubber, clothing, paper etc. Litter (especially plastic) reaching the marine environment is a growing problem which imposes an increasingly serious threat to the environment.

1.2 Objectives of the Study

The aim of this study, as set out in the Technical Specification, is to undertake a feasibility analysis on the introduction of instruments to prevent and/or clean up litter, including plastic litter, and to reduce the quantity of litter that could potentially reach the seas. The study also aims to build on the initiatives of the European Commission concerning plastic bags and biodegradable plastics.

This study complements the findings of two other studies carried out for the Commission:

- Pilot project - plastic recycling cycle and marine environmental impact - Case studies on the plastic cycle and its loopholes in the four European regional seas areas (ENV.D.2/ETU/2011/0041). This study (project 41) was led by Arcadis; and

- Study of the largest loopholes within the flow of packaging material (ENVD.2/ETU/2011/0043). This study (project 43) was led by BiPro.

[3] Galgani *et al* (2010): **Marine Strategy Framework Directive. Task Group 10 Report. Marine Litter**. Joint Report .

1.3 Approach

Our approach to the study involves carrying out the following Tasks:

- Task 1: Project inception;
- Task 2: Literature review and desk based research;
- Task 3: Establishing criteria;
- Task 4: Reporting: Interim Report;
- Task 5: Analysing the feasibility of proposed measures;
- Task 6: Policy recommendations; and
- Task 7: Reporting: Draft Final Report and Final Report .

1.4 Structure of this Report

The remainder of this Draft Final Report has been organised as follows:

- **Section 2** describes the problem of marine litter, including sources and types of litter and the target groups that contribute to littering;

- **Section 3** describes current measures to prevent and mitigate the impacts of litter;

- **Section 4** provides an overview of the costs and effectiveness of existing measures, including the results of the case studies of different packages of measures; and

- **Section 5** describes a proposed package of measures to prevent and/or clean up litter, including plastic litter, and to reduce the quantity of litter that could potentially reach the seas.

The report is supplemented by a series of annexes setting out the detailed findings of the study. These are:

- **Annex 1** describes the current state of knowledge of sources and types of marine litter;

- **Annex 2** analyses the factors influencing the behaviour of target groups and the implications of this for the selection of measures to address marine litter;

- **Annex 3** sets out an inventory of measures available to address the problems of marine litter and also provides the common template for the feasibility assessment; and

- **Annexes 4 to 7** include the detailed case studies of packages of measures.

2. THE PROBLEM OF MARINE LITTER

2.1 Types and Sources of Marine Litter

2.1.1 Introduction

Waste contamination and plastic litter on the open waters has direct social, economic and environmental impacts:

- social impacts: reduction in aesthetic value and public safety;
- economic impacts: e.g. cost to tourism, damage to vessels, fishing gear and facilities, losses to fishery operations, clean-up costs; and
- environmental impacts: mortality or sub-lethal effects on plants and animals through entanglement and capture in ghost nets[4], physical damage and ingestion including uptake of (mainly plastic) microparticles and release of associated chemicals, facilitating the invasion of alien species and altering benthic structures[5].

Some of the most problematic litter is composed of plastic, which has a very slow rate of decomposition, leading to a gradual build up in the marine environment. Annex 1 provides detailed information on our current understanding of the types and sources of marine litter.

The main goal of the EU Marine Strategy Framework Directive (MSFD) is to achieve "Good Environmental Status" (GES) of all marine waters of the European Union by 2020. Annex I of the MSFD lists ten qualitative descriptors for determining good environmental status. Descriptor 10 relates to marine litter; it is that: "*Properties and quantities of marine litter do not cause harm to the coastal and marine environment*".

Various provisions of the MSFD require Member States to take action relating to marine litter by 2012:

- Article 8 of the MSFD requires Member States to carry out an initial assessment of marine waters. This includes a description of pressures and impacts on the marine environment, including marine litter;
- Article 9 requires Member States to determine a set of characteristics for GES on the basis of qualitative descriptors, including Descriptor 10 on marine litter;
- Article 10 requires Member States to establish environmental targets and indicators to guide progress to achieving GES. Some Member States are proposing to adopt targets requiring a reduction in visible litter items at the coast and reductions in the rate of increase of visible litter items on the sea floor (HM Government, 2012)[6].

Although a number of sources provide data on marine litter, there are significant drawbacks with the nature and quality of the data. As yet, there are no standard

4 Ghost nets is the name given to fishing gear which has been lost or abandoned at sea.

5 Galgani *et al* (2010)*, op cit*

6 HM Government (2012): **Marine Strategy Framework Directive consultation: UK Initial Assessment and Proposals for Good Environmental Status**. March, 2012.

monitoring programmes across Europe, or even voluntary agreements between all regional seas on a consistent measurement methodology (although there are common methodologies at regional sea level, such as the OSPAR beach litter monitoring programme, which covers the North East Atlantic regional sea[7]). Similar issues apply to data on litter dropped on land.

The importance of monitoring is recognised by the MSFD. It requires Member States to complete an initial assessment of marine litter status by 2012 and monitoring programmes are due to begin in 2014. These are likely to result in better and more comparable data becoming available in the future. Types and sources of marine litter are also being examined in the parallel study on the plastic recycling cycle and marine environmental impact (project 41).

2.1.2 Types of Litter

Plastic is the largest single type of marine litter[8]. No report finds plastics as having less than a 30% share of total marine litter; some refer to shares of up to 90%. Microplastics are widely dispersed in the water column, on beaches and on the seabed and in some locations can represent the largest component of marine litter by number[9].

A report by the Öko Institut[10] shows the significant differences that exist in the types of marine litter found between the three seas bordering the EU. Packaging materials (plastic and other) accounted for over 30% (Mediterranean) to over 40% (North Sea and Baltic Sea) of total marine litter, with smoking-related material accounting for 16% (North Sea) to 42% (Baltic Sea). Fishing-related material was only part of the top ten types of litter in the North Sea, where it accounted for 20% of the total. Plastics accounted for 30% to 70% of beach litter in the Baltic, 44% to 95% in the North Sea and 37% to 80% in the Mediterranean.

Smoking-related litter and food and drink packaging also represent the largest share of litter dropped on land, while plastic bags represent only a minor share[11]. However, as cigarette butts are harder to clean up and might accumulate, it is possible that the share of smoking related litter is overestimated.

2.1.3 Sources of Marine Litter

The sources of litter reaching the marine environment can be categorised in a number of ways, for example according to whether they are sea or land based. Globally, land-based sources are estimated to account for some 80% of marine litter, with the remaining 20% stemming from sea-based sources (see Table 2.1).

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7 Joint Research Centre (2011): **Marine Litter Technical Recommendations for the Implementation of MSFD Requirements**, European Commission, available at: *http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/22826/2/msfd_ges_tsg_marine_litter_report_eur_25009_en_online_version.pdf*

8 Öko Institut (2012): **Study on Land-Sources Litter in the Marine Environment**. Review of Sources and Literature. Freiburg, Öko Institut e.V

9 Joint Research Centre (2011): *op cit*

10 Öko Institut (2012) *op cit*

11 Joint Research Centre (2011) *op cit*

Table 2.1: Sources of Marine Litter	
Sea-based Sources	**Land-based Sources**
Waste from vessels: • merchant shipping (cargo, equipment, etc.) • Naval and research vessels • private vessels (pleasure) • public vessels (cruise liners, ferries)	Individual actions: • littering in general (inland and coastal) • littering caused by tourism (recreational visitors to the coast) • events (e.g. charity balloon releases)
Fishing activities: • fishing vessels • abandoned, lost or otherwise discarded fishing gear (fishing nets, ropes etc.) • aquaculture installations	Facilities and construction: • industrial or manufacturing releases (e.g. by-products, plastic resin pellets) • construction and demolition sites • harbours (seaports, commercial ports, fishing ports, ferry ports etc.) • ship-breaking yards • agricultural activities
Other structures: • legal and illegal dumping at sea • offshore oil and gas platforms and drilling rigs	Municipalities • litter and waste generated in coastal and inland zones from improper waste management • wastes from dump sites located on the coast or riverbanks • untreated municipal sewage
Transport of litter and waste: • natural events (storms, strong tides, tsunamis)	Transport of litter and waste (on land or waterways) • rivers and floodwaters • discharge from stormwater drains/sewers • natural storm-related events (e.g. mistral, tornados, hurricanes)
Source: Öko-Institut (2012): Study on Land-Sourced Litter in the Marine Environment	

The MSFD GES technical subgroup on marine litter found considerable variations in sources of litter between regional seas. Sea-based sources of litter include merchant shipping, ferries and cruise liners, commercial and recreational fishing vessels, military fleets and research vessels, pleasure craft, offshore installations such as oil and gas platforms, drilling rigs and aquaculture facilities[12]. The quantity, type, and location of litter resulting from different vessels can vary significantly. Although there is considerable literature on waste management offshore, very limited information is available specifically about the amounts or types of litter arising from sea-based sources, or the factors that give rise to it. Litter may be deposited directly into the marine environment by recreational visitors and beach-goers[13] or illegally dumped at sea.

On land a high proportion of litter is directly deposited by individual pedestrians or motorists. Litter caused by torn/damaged garbage bags (e.g. by animals), large sporting or cultural events, or inadequate waste management e.g. spilling during kerbside collection, can also contribute to land-based litter.

12 Joint Research Centre (2011): *op cit*

13 Trouwborst (2011): **Managing Marine Litter: Exploring the Evolving Role of International and European Law in Confronting a Persistent Environmental Problem**, Merkourious Utrech Journal of International and European Law, Volume 27/Issue 73, Article, pp. 04-18.

Litter dropped on land (known as land-based sources) can also enter the marine environment through a series of pathways. These include illegal dump sites, riverine transport of waste from inland sources, discharges of (untreated) industrial or municipal wastewater, storm sewers and poorly managed waste facilities, including transport of waste to the facility. Poor waste management at ports could also give rise to marine litter; however, no data on littering/lost material at ports are available[14].

Natural events, such as highs winds, rough seas, flooding, melting of snow and heavy rainstorms, may also transport litter into the marine environment. Countries where a high population density and a high level of tourism (or a high level of port activities) and a high level of plastic packaging waste is combined with less developed waste management systems are likely to have the highest risk for land-sourced litter entering the marine environment.

Similar pathways are responsible for the transport of litter from business and commercial activities on land into the marine environment. For example, pre-production plastics, transported in the form of pellets and powders, can be accidentally released through spillage. They may then enter the aquatic environment through storm water drains and discharges, or be spilled directly into waterways during cargo-handling operations at ports or during cargo transportation at sea.

2.1.4 Trends in the Amount of Litter

The lack of a systematic approach to monitoring marine litter means that determining trends in the amount and type of litter is difficult. However, it is widely accepted that both the levels of marine litter and the rate of input into the oceans are rising. The German government reported that the plastic content in the total marine waste observed on beaches on the German North Sea increased from 68% in 2001 to 78% in 2006[15].

In the UK, the Marine Conservation Society beach litter survey showed a 77% increase in litter between 1994 and 2009; the 2009 survey recorded the highest percentage of plastics to date at 63.5%[16]. A background study for the OSPAR Ecological Quality Objectives for the North Sea found that there was a reduction in the amount of litter at sea during the late 1990s, but this trend has since stagnated and there has been no significant reduction in recent years[17]. Some data indicate that the amount of litter dropped on land is increasing. For example, the amount of litter dropped in the UK increased by 500% from the 1960s to 2009[18].

14 Öko Institut (2012): *op cit.*

15 Öko Institut (2012): *op cit*.

16 KIMO International (2010): **Economic Impacts of Marine Litter,** KIMO.

17 KIMO International (2008): **Fishing for Litter Scotland Final Report 2005-2008,** KIMO.

18 Lewis A *et al* (2009a): **Litterbugs. How to Deal with the Problem of Littering**, Policy Exchange, London

2.2 Factors Influencing Littering by Individuals on Land

2.2.1 Introduction

Improving our understanding of the behaviour of individuals and organisations that are responsible for marine litter can assist with the formulation of effective policy measures to address the problem of litter. Annex 2 provides a detailed review of studies on target groups responsible for littering and the reasons behind littering.

Studies[19] show that individuals dropping material account for up to 87% of general litter, 3% is from domestic bins (being torn or spilling over), and 4% is commercial/business waste. Most research into littering has therefore focused on the behaviour of individuals. Table 2.2 shows some of the main influencing factors of individuals littering behaviour.

Table 2.2: Main Influencing Factors for Littering Behaviour

Influencing factors	Littering behaviour
Unnecessary packaging, shopping bags, advertising flyers, etc.; Lack of anti-litter law enforcement; Insufficient quantity, insufficiently maintained or ineffectively designed receptacles; The prevalence of existing litter; and Items/material not perceived as litter.	Pedestrians dropping waste directly on the street or into rivers; Motorists discarding waste out of vehicle windows; Litter is thrown at a bin and misses it; and Litter is buried, often under sand at the beach.

2.2.2 Context

A number of studies indicate that the condition of an area of land is likely to affect people's behaviour. An untidy environment sends out a signal that it is acceptable to litter; 'litter attracts litter'. There is also evidence of a relationship between graffiti and littering as well as evidence to suggest that there is a negative correlation between the level of litter in an area and perceived safety of the area. However, a US study[20] concluded that about 85% of littering is the result of individual attitudes; only 15% of the variance in general littering behaviour was due to contextual factors. While some types of contexts invited more litter, there was a large amount of variability in the behaviours of individuals within a site.

The design of packaging influences the chances of it being littered. It is presumed that packaging – including fast food packaging - that is discarded immediately after purchase carries little to no value to the consumers and can be a factor in influencing

[19] ENCAMS (2002): **First Annual Report of the Local Environmental Quality Survey** , downloaded from: http://www.keepbritaintidy.org/ImgLibrary/Local%20Environmental%20Quality%20Survey%20of%20England%202002_2003_597.pdf

[20] KAB (2009a) **Littering Behaviour in America; Results of a National Study,** California, Keep America Beautiful.

littering behaviour. A 2009 study[21] on the Wadden Sea ecosystem found that the various forms of packaging accounted for 28% of the litter found on the beaches.

2.2.3 Facilities

Many studies[22] emphasise the relationship between the amount of litter and the provision of litter bins. Most littering occurs at a considerable distance from a receptacle. Cigarette litter is most common at 'transition points'; areas where a smoker must extinguish a cigarette before proceeding, such as outside retail stores, hotels, office buildings; before entering beaches, parks or other recreation areas; and at roadside rest areas, parking lots, bus shelters, and train platforms.

Not only the number, but the location and the design of receptacles can also impact the incidence of litter. A UK study concluded that bins should be planned using a case-by-case approach. Looking at pedestrian flows and patterns of use in conjunction with information about local land use and adjacent building types can identify hotspots where there may need to be more permanent bins, and hot times where there may need to be more frequent collections, or larger bins installed temporarily. Clear signage on and around bins is also important so people know what to put where, as well as being aware of the bins in the first place[23]. Research has also been carried out in the Netherlands on the optimal location, size and type of bins. Guidelines have been drafted to aid public authorities[24].

2.2.4 Attitudes and Perceptions

The most recent European Values Study survey[25] which was published in 2008 (the most recent readily available) contained two questions relevant to litter:

- the first asks whether dropping litter in public places can be justified or not; and
- the second asks: 'How many of your compatriots throw away litter in a public place?'

The first question is a proxy for litter dropping and the second is a measure of social norms. Across the countries surveyed, 69% of respondents felt that dropping litter in a public place was never justified. The highest-performing countries in the 'Never Justified' category (over 80% agreement) were Malta, Croatia, Latvia, Romania and Denmark. The worst (below 50% agreement) were Belarus, Slovakia, Finland and Sweden. Overall, 15% of respondents claimed that almost all of their compatriots throw away litter in public places. The highest number by far was noted in Hungary, with a figure of 77%. Other countries with lower but significantly negative social

21 Fleet et al (2009): **Wadden Sea Ecosystem No 25**, Marine Litter, Quality Status Report 2009, downloaded from http://www.waddensea-secretariat.org/QSR-2009/03.8-Marine-Litter-%2810-08-25%29.pdf

22 For example Lewis A *et al* (2009a): **Litterbugs. How to Deal with the Problem of Littering**, Policy Exchange, London; ENCAMS (2007): **People Who Litter**. London, Environmental Campaigns Ltd (ENCAMS)

23 Lewis A et al (2009a): *op cit*

24 Nederland Schoon (2005): Litter Bins in Public Spaces - Guidance on Design, Placement, Emptying and Maintenance, 2005 (in Dutch).

25 Tilburg University (2008): **European Values Study 2008**, downloaded from http://www.europeanvaluesstudy.eu/evs/surveys/survey-2008.html

norms are Turkey, Northern Ireland, Greece, Finland and Belarus (28% to 23%). The best performing countries are Denmark, Belgium, Latvia and the Netherlands (all on 4%), France (6%), and Austria (9%).

Who Litters?

Much of the research into who litters and why has been undertaken in the USA, Canada, Australia and the UK. The literature identifies differences in attitudes towards littering by different groups in society. The European Values Survey provides some evidence for age variations in the responses, with older people less likely to view littering as acceptable. There is also some indication that men feel littering is more acceptable than women. This is in line with the findings of other studies reported in the literature. For example, data collected in a UK study[26] found that:

- men are slightly more likely to drop litter than women;
- people over the age of 44 and under the age of 15 are much less likely to drop litter than those in between; the 15-34 age group are the most persistent litterers;
- people under 25 were most likely to drop litter when in a group of their peers, while those over this age were most likely to drop litter when they were alone; and
- students and those currently unemployed had higher than average littering rates, while those with tertiary and post-graduate qualifications had lower than average littering rates.

The study also found that 42% of smokers, but only 16% of non-smokers, think it is acceptable to drop cigarette litter. This is particularly relevant given the high proportion of cigarettes and cigarette filters in marine litter. This is consistent with data from Keep America Beautiful[27] as well as other findings (Annex 2 provides further details on who litters).

Why Do People Litter?

The motivations behind littering include social norms as well as a lack of awareness about the consequences and the general impact of littering. A UK survey[28] identified a number of attitude-related reasons why people litter, including:

- it is seen as someone else's responsibility (i.e. someone else, generally the local authority, will clear up the litter);
- it is not really littering (e.g. because the litter is biodegradable); or
- laziness.

The issue of dropping biodegradable materials being seen as 'not littering' is particularly problematic with regards to marine litter as degradation in seas happens under different conditions than ambient degradation on land. The role of biodegradable materials and relevant initiatives are further detailed in the parallel

[26] Lewis A et al (2009a): **Litterbugs: How to deal with the problem of littering**. Policy Exchange, London.

[27] KAB (2009c): **Litter America, Executive Summary, 2009** National Litter Research Findings and Recommendations

[28] Lewis A et al (2009a): *op cit*.

study on the Largest Loopholes within the Flow of Packaging Material (project 43). Littering can also be influenced by the perceived likelihood of being seen or caught. For example, Keep Britain Tidy noted that motorists throw litter out of their cars, thinking that they will not be seen[29].

Reasons for littering appear to differ between different groups of litterers. For example, Keep America Beautiful[30] identified a number of reasons why **smokers** litter. Many smokers see cigarette butts as small and insignificant pieces of litter. They tend to overlook the consequences of littering. Similarly, cigarette litter research in Australia found that many smokers:

- do not believe littering their cigarette butts is inappropriate behaviour;
- consider dropping butts into gutters or storm drains as a safe way to extinguish a cigarette[31]; and
- blame their littering on a lack of well-placed bins for cigarette butts.

Major events, whether concerts, art exhibitions or sporting events cause significant increases in the amount of litter, as large crowds of people leave rubbish. For example, the Glastonbury music festival in the UK generates 2 000 to 3 000 tonnes of waste, from 150 000 staff, performers and visitors over a five day period. Litter is collected during the festival by over one thousand volunteers who generally work three eight-hour shifts picking litter. After the festival, cleaning the site takes a further ten days to two weeks[32].

2.2.5 Factors Influencing Workplace Littering on Land

We identified only limited research into factors influencing littering of commercial/business waste or factors influencing the littering behaviour of people at work (for example professional waste collectors/managers, delivery drivers and fishermen). It is likely, however, that the behaviour of people at work is similar to their behaviour outside work. Similar factors therefore, such as context, facilities and attitudes and perceptions, will influence littering of business and commercial waste.

A 1993 study by the US Environmental Protection Agency (EPA)[33], working with the Society of the Plastics industry, identified the causes of releases of plastic pellets into the aquatic environment from the plastics industry. These are similar to the factors affecting littering by individuals, including lack of awareness of the importance of avoiding loss of pellets, poor packaging and lack of containment facilities for spilt pellets. This study was carried out in the USA, but the prevention programme developed as a result has been used as a model by industry associations in the EU, indicating that its findings are considered widely applicable.

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29 ENCAMS (2007): **People Who Litter**. London, Environmental Campaigns Ltd (ENCAMS)

30 KAB (2009b): **Cigarette Littering Misconceptions,** available at: http://preventcigarettelitter.org/why_it_matters/misconceptions.html

31 McGregor Marketing (1998): **Please Bin Your Butts: A Comprehensive Study Into Cigarette Butt Litter,** Keep Australia Beautiful.

32 Peake (2010): *When the Party's Over*, Resource Magazine, No. 59

33 EPA (1993): **Plastic Pellets in the Aquatic Environment Sources and Recommendations**, available at: *http://water.epa.gov/type/oceb/marinedebris/upload/2009_11_23_oceans_debris_plasticpellets_plastic_pellets_summary.pdf*

Although not directly related to littering in the workplace, a company survey for the UK Environment Agency[34] identified a number of behavioural characteristics amongst companies that could affect littering by employees. For example, most companies (from a range of sectors) claimed to encourage staff to recycle (85% of those questioned) and to comply stringently with environmental regulations (84%). However, more specific measures to ensure that such requirements are followed are less widespread. For example, only 42% had accredited environmental systems and only 28% had corporate social responsibility (CSR) policies. The survey also highlighted divisions by size; although environmental management systems and CSR are commonplace amongst large organisations (around 72%), they are still rare amongst small companies (15%). It is likely that lack of effective training and monitoring of behaviour in the workplace is a further aggravating factor.

2.3 Factors Influencing Littering at Sea

2.3.1 Who Litters at Sea and Why?

The data shown in Table A1.1 of Annex 1 indicates that, for some regional seas, materials which can be associated with the workplace, such as fishing nets and rope, can form a significant proportion of total marine litter.

In general, the literature makes little reference to 'littering' in the marine context and very limited information is available about who litters at sea and the reasons for their littering. It is difficult to be certain that items which end up in the sea or on the seafloor are due to littering. Although they may have been transported from land or they may be due to accidental waste disposal, they may also be a result of planned waste disposal. The 1978 MARPOL Protocol was designed to abate the occurrence of waste disposal into the sea, specifically Annex V, which prohibits "*the disposal into the sea of all plastics, including but not limited to synthetic ropes, synthetic fishing nets and plastic garbage bags*".

More recently, Resolution 60/30 of the United Nations invited the International Maritime Organization to review Annex V of the MARPOL Protocol with the aim to assess its effectiveness in addressing sea-based sources of marine debris. The review was completed and amendments to Annex V were adopted in July 2011. These are expected to enter into force on 1 January 2013[35].

The new provisions under Annex V prohibit the disposal of all litter at sea unless stated otherwise. Consequently, ships will be required to send their litter to reception facilities at ports or inshore. They will not be allowed to discharge litter including plastics, synthetic ropes, fishing gear, plastic garbage bags, incinerator ashes, clinkers, cooking oil, floating dunnage, lining and packing materials, paper, rags, glass, metal, bottles, crockery and similar refuse. However, they will continue to be able to

[34] Ipsos Mori (2012): **Influencing Business Behaviour: Enabling the Wide-Scale Adoption of Electronic Duty of Care within the UK**. Report for the Environment Agency, downloaded from: http:/www.environment-agency.gov.uk/static/documents/Business/edoc_Market_Research_Report.pdf

[35] International Maritime Organization (2011): Prevention of Pollution by Garbage from Ships, Overview of Annex V, downloaded from http://www.imo.org/ourwork/environment/pollutionprevention/garbage/Pages/Default.aspx

discharge comminuted or ground food waste, both outside and within the special areas[36] identified under MARPOL. Moreover, they will be allowed to discharge other specific types of waste into the water that are not defined as harmful substances by the criteria set out in MARPOL Annex III and which do not contain any carcinogenic, mutagenic or reprotoxic components.

Ash residues from shipboard incinerators will be classified as operational waste. Ash is therefore deemed as litter and its disposal into the sea will not be permitted. Garbage processing capacities of port facilities will need to be checked prior to the ships arrival assuring that the garbage off-loaded can be segregated and processed appropriately. In addition, ships will need to maintain records showing that any cleaning agent or additive used was not harmful to the marine environment. According to the recommendations of the International Maritime Organization the suppliers of these additives or cleaning agents should provide signed and dated statements to this effect, either as part of a Material Safety Data Sheet (MSDS) or as a stand-alone document.[37]

Compared to monitoring of litter on land, monitoring the release and subsequent quantification of ship-based litter is notoriously difficult. It relies upon the availability of suitable vessels and the ability to track litter back to source and can be affected by weather conditions. However, it is theoretically possible to estimate the types and quantities of solid waste generated by ships and pleasure craft (Dixon and Dixon[38]).

Only one study specifically considered reasons for littering. A study of reports from observers on foreign vessels operating in the Australian fishing zone during the early 1990s noted that around half of the vessels carrying observers did not comply with MARPOL provisions. The reasons for non-compliance included:

- lack of knowledge of MARPOL regulations;
- the attitude of the captain and/or crew; and
- poor waste management practices either due to a lack of facilities on board or inadequate facilities at port[39].

These findings are supported by a 1995 report[40] by the UK Maritime and Coastguard Agency, which recommended that there was a need for a "mariners" waste handbook which detailed good practice.

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36 The MARPOL special areas are the Baltic Sea, North Sea, Mediterranean, Black Sea, Red Sea, the Gulfs Area, Wider Caribbean Region and the Antarctic Area. However, due to a lack of shore reception facilities in the Black Sea and Red Sea, these regions will not be classified immediately as special areas for the discharge of garbage when the new regulations enter into force.

37 West of England (2012): MARPOL, amendments to Annex V, downloaded from http://www.westpandi.com/Publications/News/MARPOL---Amendments-to-Annex-V/

38 Dixon and Dixon (1983): *Marine Litter Distribution and Composition in the North Sea.* Marine Pollution Bulletin, volume 14, issue 4, pp 145 – 148.

39 Jones (1995): *Fishing Debris in the Australian Marine Environment*, Marine Pollution Bulletin volume 30, part 1, pp 25–33.

40 Maritime & Coastguard Agency (1995): Survey of UK Reception Facilities for Oil and Garbage. Project 352. Referenced in Fanshawe *et al.*(2002): **The Impacts of Marine Litter - the Marine Pollution Monitoring Management Group**, May 2002. Available at:
http://www.scotland.gov.uk/Uploads/Documents/Impacts%20of%20Marine%20Litter.pdf

The availability and suitability of facilities is an influential factor in littering at sea. For example, the lack of disposal facilities has been identified as an influencing factor in littering by fishermen[41]. In fact, many studies on sea based sources of litter focus on the adequacy of reception facilities at ports for waste[42]. Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues sets out requirements for litter provision at ports. The objective of the Directive is to maximise the protection of the marine environment from operational pollution by harmonizing relevant international provisions. However, it is not clear to what degree this may affect illegal waste disposal at sea, or littering.

A review of Directive 2000/59/EC was initiated by the European Commission in 2011 stemming from the fact that there are a variety of port reception facility systems active in Europe. Additionally, stakeholders concerned had requested further guidance and clarifications on specific provisions of the Directive.[43] Amongst the policy options for consideration are a broader legislative reform and an improved implementation of the Directive through clarification and provision of guidance in certain key areas[44].

2.3.2 Availability of Facilities

A lack of facilities has also been identified as an influencing factor in littering by fishermen. The reasons why fishermen abandon or discard fishing gear at sea have been identified by FAO/UNEP[45] as:

Abandonment of gear due to:
- illegal, unreported of unregulated fishing;
- illegal gear; and
- too much gear for time; or

Discarding gear due to:
- too much gear for space;
- chosen over onshore disposal; and
- damaged gear.

The lack of convenient harbour-side collection facilities can result in fishermen having to dispose of unwanted gear in municipal waste facilities. This can involve both time (with associated costs) and charges imposed for disposal, if indeed such disposal is permitted at all. Therefore, there may be strong incentives to deliberately

41 FAO/UNEP (2009): **Abandoned, lost or otherwise discarded fishing gear,** Rome, available at: ftp://ftp.fao.org/docrep/fao/011/i0620e/i0620e.pdf

42 For example UNEP (2005a): **Marine Litter and Abandoned Fishing Gear**. UNEP Regional Seas Programme, Report to the Division of Ocean Affairs and the Law of the Sea, Office of Legal Affairs. UNHQ. Regional Seas Coordinating Office, UNEP, Nairobi.

43 European Commission (nd): **Background note on the possible revision of Directive 2000/59/EC on Port Reception Facilities for Ship-Generated Waste and Cargo Residues**, downloaded from http://ec.europa.eu/transport/modes/maritime/consultations/doc/prf/background-note.pdf

44 European Sea Ports Organisation (2011): **ESPO Favours Better Implementation of Port Reception Facilities Directive**, downloaded from http://www.espo.be/index.php?option=com_content&view=article&id=217%3Aespo-news-1728-october-2011&catid=35&Itemid=93

45 FAO/UNEP (2009): *op cit*

discard gear at sea, or to illegally dump it at other land-based locations. Even where convenient shore side facilities are provided for collection and disposal of unwanted gear, if costs are set too high there may still be an economic incentive for fishermen to discard unwanted gear at sea.

It appears likely that similar reasons, of cost and convenience, lie behind littering from commercial activities, both at sea and on shore. However, the lack of research on these types of littering makes this hard to confirm.

3. EXISTING MEASURES TO ADDRESS THE PROBLEMS OF LITTERING

3.1 Introduction

Measures to address the problem of littering can be divided into three types, which are linked to the different factors driving littering behaviour:

- measures which aim at reducing littering by **influencing behaviour** of selected target groups (behavioural measures, aimed at changing the attitudes and perceptions that drive littering);
- measures which public authorities could implement to **prevent littering** (preventive measures, aimed at changing the quality and quantity of infrastructure, and product and packaging design); and
- measures which aim at **cleaning up** litter in the environment (clean-up measures, addressing the context that drives littering).

In practice, there is considerable overlap between these types; for example, the provision of more litter bins by public authorities is a preventive measure as people are less likely to drop litter if more bins are present, thus it also has a behavioural aspect.

In addition, while some measures have the objective of reducing litter in general, others are targeted at particular types of litter, particular groups of litterers or particular locations.

Annex 3 provides a comprehensive listing of the measures that we have identified.

3.2 Types of Measures

3.2.1 Behavioural Measures

The majority of behavioural measures use awareness raising techniques, in the form of posters, advertising, leaflets, TV campaigns, stickers, web pages, etc., to stimulate a change in behaviour. Some adopt a more unusual method of transferring information and highlighting the litter problem. An example of this is the SOS Plastica programme run by WWF Italy on the Mediterranean Sea. The project asks recreational boat skippers and passengers to report plastic litter floating on the sea surface and provide the coordinates to locate them or to submit photos or videos.

Behavioural measures also include more formal education and training, ranging from lessons for children in the classroom to sessions for employees in their place of work. For example, Grimpola (Spain), Let's do it with Ferda (Estonia), Bottle Champions (UK), and Reef Guardian schools (Australia) are all fun measures aimed at children. They use various approaches ranging from classes and activities integrated into sailing courses, carried out in the classroom and/or in the local area, and collection and recycling. Examples of training measures for workers include the UK CIWEM waste awareness course, training for employees of plastics manufacturing companies

under the international Operation Clean Sweep and the ProSea Marine Environmental Awareness course.

While behavioural measures often focus on a particular type of waste or target group (see Section 3.3), others aim at encouraging the correct disposal/reduction or recycling of litter in general, for example the Australian "Don't be a Tosser" campaign, which is an integrated public education campaign combined with the introduction of new anti-littering laws. Behavioural measures can thus range from low-key and small-scale activities to national or global level implementation of policies.

3.2.2 Economic Incentives and Disincentives

Economic incentives and disincentives which allocate either a value or a cost to waste are a particular type of behavioural measure. They differ from regulatory measures, including fines for breaching anti-litter legislation, as individuals have a choice in whether or not to alter their behaviour.

Measures with economic instruments that put a value on waste include deposit-refund schemes (such as the German deposit system for waste packaging), reverse vending (packaging material is returned in exchange for cash or vouchers via a vending-type machine); exchanges (e.g. used cooking oil returned in exchange for a container to hold clean oil) and prizes for litter collection. Reverse vending can require complex infrastructure, logistical or organisational procedures.

Disincentives generally take the form of taxes to discourage the use of non-reusable items that may end up as litter, for example plastic bags and other types of packaging or disposable cutlery, plates and cups. Some taxes apply to all items of a particular category, whilst others distinguish between single and multi-use items and between different materials. For example, the packaging taxes in Germany and the Netherlands both differentiate between bio-based and conventional materials.

3.2.3 Preventive Measures

Preventive measures include the provision of infrastructure which is designed to aid litter prevention or encourage the correct disposal of litter. The number, location and aesthetic design of the receptacle can impact the amount of use that it receives, as well as the cleanliness of the area around it.

Many of these measures involve designated bins. For example, in the list of identified measures (Annex 3), the subsection of preventive measures gives examples of measures which make use of bins specifically for paper, plastic, chewing gum, fishing nets or mobile phones and similar devices.

Preventive measures can also include the design of products or packaging to limit the potential for littering. In the Netherlands, a checklist for preventing litter when designing a product or packaging was developed, based on scientific research by TU

Delft[46]. The list is based on five key aspects that make packaging more difficult to litter:

- prevent loose parts;
- make sure the packaging can be closed;
- ensure clean and compact storage of packaging after use;
- provide clear instructions for use and disposal; and
- adding an anti-litter text.

3.2.4 Behavioural/Preventive Measures

The combination of behavioural measures with preventive measures is common. Rather than simply raising awareness and educating about appropriate disposal of litter, these measures involve an additional negative or positive incentive, such as a ban, a tax, the provision of personal ashtrays, etc.

Many of these measures also focus on target groups or types of litter (plastic bags, cigarettes, cooking oil, lubricating oils, paper, etc.). Others aim to address the problem of littering at its root, thus contributing to the prevention of all types of littering. This group of measures includes examples of regulatory measures such as bans on plastic bags as well as economic incentives or disincentives. Economic incentives or disincentives, such as plastic bag taxes and reverse vending schemes, are also included in this group of measures. Operation Clean Sweep, which targets losses of plastic pellets from the plastics industry, also includes behavioural and preventive measures.

3.2.5 Clean-up Measures

Clean-up measures remove litter and waste from the environment. They can target specific locations such as towns or villages, coastal areas or off-shore. They may also have a behavioural impact as they demonstrate the litter problem first-hand. Many clean-up initiatives set a particular date where participants take part in one big clean up, rather than smaller on-going clean-up activities, as this has a bigger impact in demonstrating the problem.

Clean-ups target all litter types and often catalogue and monitor the litter which has been found in each location. Some measures target groups of people who may be particularly impacted by the litter problem – e.g. fishermen, scuba divers, surfers, beach-goers or local communities cleaning up their locality.

Some clean-ups include an additional behavioural measure when, for example, they use items retrieved to create art work which will attract attention and thus raise awareness of the problem of litter.

[46] TU Delft (nd): Checklist packaging, available at: http://www.nederlandschoon.nl/media/138018/checklist%20verpakkingen.pdf

3.2.6 Clean-up/Behavioural Measures

Some clean-up measures include activities which have a behavioural aspect to them. There are examples of using innovative ways to attract the attention of the public and thus raise awareness about the problem of marine litter. These initiatives use items, or litter, retrieved from the sea to create something which will attract attention. Examples include the creation of a 'litter hotel' (Corona Save the Beach) or a 'marine litter vacuum cleaner' (Electrolux, Vac from the Sea); others have also used collected marine litter to create art works.

Many clean-up projects also provide educational programmes, outreach, or research. Often projects aim to attract support by highlighting the harm caused to marine life. This type of initiative generally publicises the harm and distress caused to marine mammals, birds and turtles as they tend to be more popular than fish and crabs etc. Fishing for Litter initiatives also have a behavioural element encouraging fishermen to collect litter means they will be less likely to dump their own litter.

3.3 Targeted Measures

3.3.1 Introduction

Although a number of measures are general to all groups of litterers and all types of litter, others focus on particular targets. In most cases, the targets are particular types of litter rather than particular social groups (although there is some overlap; for example, measures targeting smoking waste are clearly aimed at smokers). There is also some indirect targeting of social groups (e.g. measures using social media or mobile phone apps are likely to be more targeted at young people).

Some clean-up measures target specific groups of people who may be particularly impacted by the litter problem, such as fishermen, scuba divers, beach-goers and local communities. Others may be specifically designed for people working in the waste management sector or on commercial vessels (e.g. training measures or guidelines). Measures may also be differentiated by the location in which they take place.

3.3.2 Measures Targeted at Specific Types of Litter

The specific types of litter targeted by measures include:

- smoking-related litter;
- chewing gum;
- packaging: mainly plastic bags, but also other types of packaging *(e.g. fast food, cigarette packaging etc.);*
- other single-use items *(e.g. water bottles, plastic cups and cutlery)*;
- other types of litter: balloons, bathroom waste *(including sanitary towels/tampons, plastic cotton buds*), used cooking oil, lubricating oil, mobile phones; and
- fishing gear.

A number of campaigns target ***smoking-related litter***; some work in partnership with cigarette bin and portable ashtray manufacturers to offer smokers better opportunities for responsible disposal of smoking material. The distribution of personal ashtrays is used by different organisations and local authorities, particularly for beaches. Variety in design or personalisation of these ashtrays could increase their popularity. They can also be combined with the installation of permanent ashtrays, fines, education, etc. As with personal ashtrays, anti-***chewing gum*** campaigns have used the provision of facilities for disposal as a way of reducing this type of litter. However, their use is not yet widespread.

Plastic bags are the target of a large number of measures, primarily bans and taxes. These initiatives generally target the thinner, conventional plastic carrier-bag intended for single use. However, some measures cover all categories of carrier bag. Some initiatives exclude biodegradable and compostable bags. Bags with a hygiene role, such as those which are used to cover meat or fish, also tend to be exempt from these types of initiatives.

A number of measures target other types of packaging and single-use items which may end up as litter. These include reverse vending schemes which use a positive economic incentive to encourage people to recycle used ***packaging***. These measures require the provision of a complex infrastructure of recycling machines, which need to be emptied of containers and filled with cash regularly, in order to function smoothly. Other measures, such as taxes on ***single use items*** do not require such complex infrastructure.

Other measures targeting particular types of litter include those targeted at ***balloons, bathroom waste*** and ***mobile phones***. They raise awareness though internet sites, posters, leaflets, etc. They include suggesting alternative activities and providing advice about safe disposal. Tragamovil in Spain is an example of a measure targeting mobile phones but which also offers collection points where the public can bring their old mobiles and dispose of them correctly.

One scheme in Hungary uses a positive incentive to encourage people to return used ***cooking oil***, which can be exchanged for a small gift. This is similar to reverse vending, using gifts (related to the type of litter) rather than cash. Another scheme in Singapore adopts a similar method as part of its overall anti-litter scheme. This comprises a prize draw (at big events) in exchange for deposits.

Several programmes provide an easy means by which fishermen can recycle ***fishing gear***; including one which converts the gear into energy for local communities. Fishing for Litter is a European initiative which, although it does not specifically target fishing gear, contributes significantly to its retrieval from the marine environment.

One particularly interesting measure targeted at ***fishing nets*** is the ECONYL project in Slovenia lead by Aquafil Group[47]. This project recycles used nylon from waste fishing nets (amongst other sources) which might otherwise end up in the waste stream or get dumped at sea. What is particularly important for Aquafil is the

[47] Aquafil (2011): **Econyl. A journey, a new idea of the future,** available at: http://www.aquafil.com/images/pdf/inglese/libro_interno_22x22_en_230511ok.pdf

establishment of an international network to recover fishing nets abandoned in the sea. Currently the project uses 70% reprocessed industrial waste and 30% post-consumer waste (including fishing nets) from the US, Egypt, Pakistan, Thailand, Hong Kong, Norway and Turkey.

3.3.3 Measures Targeting Different Groups

We have identified a number of current or recently finished measures aimed at specific *target groups*, including those who are responsible for dealing with waste or litter as well as those who are likely to be responsible for litter:

- people working in waste management;
- smokers;
- young people;
- motorists;
- workers responsible for waste management; and
- people without a sense of community.

Measures targeting those in the work place generally take the form of training specifically aimed at people who are, or will be, directly concerned with waste, litter or the marine environment. Training better equips this group of people with the knowledge they need to carry out their duties with diligence and care. Training measures range from practical on-the-job training and apprenticeships for those with specific waste management functions to one-day awareness courses for other staff including shop floor workers, managers, office staff, cleaners and contractors. Although these courses are not specific to litter prevention, effective waste management is likely to minimise litter generation from the workplace.

In the UK, Keep Britain Tidy also provides a range of training courses which focus on different aspects of waste management, and have a specific focus on litter prevention in the workplace. These are primarily aimed at those who work within the waste industry or the environmental sector.

Guidelines targeted at people at work include Operation Clean Sweep, which provides the plastics industry with advice on reducing loss of pellets, especially during transfers. This was initially developed in the US but is now being adopted by the plastics industry in the EU. The Western Australia guidance manuals also provide guidance on Truck-to-Truck Transfers as well as information on environmental protection when working with waste.

There is considerable overlap between measures targeted at particular types of waste and those targeted at particular groups of litterers. For example, measures targeted at smoking waste are obviously targeted at ***smokers***. The experiences of anti-smoking campaigns are relevant for littering. They suggest that as well as the provision of ashtrays and litter bins, cones etc., campaigns targeting the littering behaviour of smokers need to convey the message in different ways, while surveys analyse which are the most successful in targeting key audiences (young men in particular, as they have been found to be more likely to litter than young women - see Section 2.2.4).

Measures targeted at ***young people*** include a campaign to tackle the growing problem of "takeaway trash" from fast food chains and takeaway restaurants, targeting the highly image conscious 18 – 24 year old age group. The campaign shared many similarities with a drugs-related litter campaign: campaign posters were the medium of choice and were displayed in places such as bus stops, washrooms and restaurants. Other campaigns have aimed at encouraging ***motorists*** and their passengers to take their litter home with them. One campaign in particular targeted young male motorists and passengers through posters in motorway service station toilets and other sites showing how others find throwing litter out of cars disgusting. A radio advert was also produced, to ensure the campaign message targeted people at a time when they might consider littering from their car. In the Netherlands, a McDonald's restaurant started a campaign to dissuade people from throwing packaging paper out of the window by writing the car registration numbers of customers on the packaging. Employees of McDonalds and of the cleaning department of the municipality provided the numbers to the police.

In the UK, local authorities have used competitions such as 'Britain in Bloom' to help engage those ***lacking a sense of community***. Some anti-litter educational campaigns have targeted influential individuals within a community, such as religious leaders, social housing landlords and charities, as well as liaising with the landlords of business premises, especially of pubs, restaurants and fast food chains[48]. In the Netherlands, one organisation pays homeless people, former drug addicts, etc. to clean up litter to give them work experience, self-esteem, extra money, etc.

In addition, measures targeted at different locations, e.g. beaches, by definition target beachgoers, including tourists. However, most measures targeted at particular groups do not distinguish between, for example, young people who are tourists or recreational visitors to a beach and young people who live within an area.

3.3.4 Measures Targeted at Particular Locations

A number of the measures that we have identified are targeted at specific locations (or types of location). These include coastal locations, offshore and major events.

There are a large number of measures targeted at ***coastal locations***, including clean-up, preventive and behavioural measures. Most coastal clean-up measures tend to be very similar in nature, with an organised group taking part in a beach clean, or a clean-up along rivers, lakes, motor ways / streets within the vicinity of the coast, etc. Preventive measures tend to be localised. Private companies, as well as municipalities and other public bodies, are involved in the provision of infrastructure (bins, ashtrays, etc.). Behavioural measures include those which are focused on raising awareness through posters, web pages, logos, stickers, etc. and those which have a wider set of activities such as training, research and exhibitions.

Other measures which focus on litter on the beach combine behavioural and clean-up activities. They can cover a wide array of different activities. Combining education and awareness-raising with a clean-up may increase the impact of the scheme (the more knowledgeable people are about the environmental impact of litter the more

[48] Lewis, A et al (2009): *op cit*

likely they are to take part in the clean-up). The combination of these activities may also mean that the area cleaned remains clean for longer.

Measures targeted ***offshore*** include dive, canoe and fishing boat clean-ups. They often take a similar form to coastal clean-ups; in fact, some beach clean-ups have developed to include marine clean-up activities lead by, for example, scuba dive groups. However, the parties involved and the infrastructure required for each of these measures may differ considerably. There are also preventive measures targeted offshore, such as Carnival Cruises' provision of recycling receptacles throughout its cruise ships, for the use of passengers and crew, to encourage correct disposal.

A number of guidelines also focus on activities carried out offshore, both commercial and recreational. The examples identified include the UNEP sectoral guidelines for marine litter management on passenger ships, guidelines developed by The Association of Arctic Expedition Cruise Operators with the aim of ensuring that expedition cruises and Arctic tourism is carried out with consideration for the environment as well as other aspects. The Recreational Angling Code of Conduct has been developed by the Welsh Federation of Sea Anglers and is directed at anglers. It aims at raising awareness about the aquatic environment and encourages the prevention of waste from entering the aquatic environment.

Major events, such as music festivals and sports tournaments, pose particular problems in terms of litter. Measures relevant to major events include the event policy in Flanders and the waste management programme during and after the Glastonbury music festival, which combines collection of litter 24 hours a day during the festival, provision of recycling bins, banning of certain materials from the site (including polystyrene, glass and bio-plastics) and requirements on suppliers (for example, all food disposable packaging must be biodegradable)[49]. The Festival also runs educational campaigns for visitors, including a video of litter left after the festival calling on visitors to 'take it home' and emails and guides sent to all those purchasing tickets.

A range of measures to reduce waste, and discourage litter, at major events have been taken in Germany. These include the compulsory use of reusable dishes and the provision of mobile automatic dishwashers at the Munich Oktoberfest, and Green Goal, which dealt with waste prevention at the football world cup in 2006. This included reusable cups for beverages, reusable transport packaging for food and regulations specifying low-waste packaging and merchandising. In Austria, reusable dishes and mobile dishwashing machines have been used at 1700 festivals, with 1.9 million visitors, resulting in 1.3 million kg of avoided waste (0.7 kg per visitor).

[49] Peake L (2010): *When the Party's Over*, Resource Magazine, No. 59

4. THE COSTS AND EFFECTIVENESS OF EXISTING MEASURES

4.1 Introduction

One key finding from our research into measures to address littering is that few of the measures have been subject to systematic evaluation of their effectiveness. As the summary tables on existing measures in Annex 3 show, for many measures there is only limited information available on their costs and effectiveness.

This is a general problem across policy areas, which is now beginning to be addressed by initiatives such as the EU requirement for policies and programmes to be subject to regular evaluation. It is a particular issue for behavioural measures; this was raised by the UK House of Lords[50] in its report on behavioural change, which concluded:

> *"a lot more could, and should, be done to improve the evaluation of interventions. This is not only good practice but would help to build a body of research that could inform effective policies targeting population-level behaviour change".*

The aim of this section is to assess the available evidence on the effectiveness and costs of existing measures to address littering. This has been done through two different approaches:

- evaluation of a shortlist of existing measures against agreed assessment criteria; and
- detailed case studies to examine how (combinations of) existing measures have functioned in practice and the key factors affecting their success or failure.

We discuss the results of each of these steps below.

4.2 Assessing Costs and Effectiveness

4.2.1 Criteria for Assessment

The aim of developing feasibility criteria is to help to determine how effective and efficient different measures are at achieving the objectives of preventing, cleaning up and reducing the quantity of plastic litter that could potentially reach the seas. This information can then be used to propose a package of feasible and affordable measures to address problems associated with marine litter.

All three of the projects outlined in Section 1.2 were required to develop assessment criteria and assess the feasibility of measures (explicitly in the case of this project and Project 41 and implicitly in the case of Project 43). To ensure consistency between the three projects, the teams therefore agreed a common set of assessment criteria to be used across the three projects. These criteria also reflect discussions during the kick-off meeting for this project, which identified cost and effectiveness, as well as sustainability, coherence and applicability to different situations, as important criteria.

[50] House of Lords (2011): **Behaviour Change**. Report of the Science and Technology Select Committee. London, HMSO, 19 July 2011

The full set of criteria is described in detail in Annex 3.

In summary, the five main categories for evaluation of the measures are:

- ***feasibility***: this includes the institutional, political and legal issues, including time needed for implementation, likely opposition or support from stakeholders and legal constraints and opportunities;
- ***costs***: this includes the cost of implementation, the time over which costs would be incurred and any social costs (such as impacts on employment);
- ***effectiveness***: this includes relevance of the measure to the objectives, effectiveness in reducing the amount of litter or changing perceptions and/or behaviour, overlap and complementarity with other measures, ability to measure effectiveness quantitatively and any added value that was provided;
- ***distributional*** analysis: includes the distribution of costs and benefits among different groups in the population and if those who are causing the problem pay for the measures; and
- ***wider issues***: includes the potential to implement the measure in other countries, areas or sectors and how adaptable the measure may be (***transferability***).

4.2.2 Selection of Measures for Detailed Analysis

To ensure that attention and effort was focused on the most promising measures, we screened the 'long list' of existing measures against the feasibility criteria using a simple matrix. We identified a list of measures to include those which:

- were innovative or provided a different approach from other measures to give a good range of types of actions taken to reduce litter; and/or

- had sufficient information available to apply the feasibility criteria, or were recent enough to enable the collection of more information from contacts who were involved with the measure.

Some measures initially selected were withdrawn from the list, because of lack of data or because, on further investigation, they proved to be rather limited in scope or applicability.

Because of the data gaps highlighted in Section 4.1, a further iteration of data collection and evaluation of the selected measures was carried out to try to provide an evidence base that was as comprehensive as possible. However, this further iteration indicated that data on which to assess the measures against the criteria is limited. Only a few measures have any data available on costs and effectiveness.

For example, Keep Britain Tidy in the UK launched a major educational campaign, sending out 14,000 posters after a 2004 survey found 150,000 discarded syringes on school grounds, an increase of 7% on 2001. However, the only reported information available on the results of the campaign was on the uptake of posters, rather than the impacts on dropping of drug-related litter. This was because most of the littering occurred on land not covered by regular litter surveys and because the available data does not provide sufficient detail.

4.2.3 Key Findings

The list of measures which have been subject to detailed analysis is given in Table 4.1 (at the end of this section), which also provides the key findings of the detailed analysis. The evaluation questions are answered by a simple scoring system using Y (Yes), N (No) answers representing data availability and the following keys for feasibility:

- (--) indicates infeasibility;
- (-) indicates low feasibility ;
- (0) indicates neutrality;
- (+) indicates feasibility; and
- (++) indicates high feasibility.

In order to assure comparability the measures presented in the table are organised according to type (Behavioural, Preventive, etc.).

Many of the measures tend to have information describing their aims and goals as well as the basic method by which the measure will be carried out. However, they tend to lack both qualitative and quantitative data on specific practical issues such as costs, involvement of stakeholders or time needed to carry out the measure as well as on results and monitoring aspects of the measures. Therefore, where possible, contact has been made with the persons or organisation responsible for the measure to try to gain further information.

Within the group '**Behavioural Measures**' both *Love Clean London* in the UK and *Grimpola* in Spain stood out as innovative measures which may be adaptable to other regions of Europe. Although *Love Clean London* targets all litter rather than specifically marine litter, it may be affective in encouraging citizens to take more responsibility for their surroundings and in turn make them more aware of the negative impact of litter. Grimpola on the other hand targets marine litter. It takes an innovative approach to capturing its target audience and uses existing infrastructure (see Annex 6 for a detailed analysis of Grimpola).

In terms of the '**Economic Incentives and Disincentives**' it was apparent that measures which had been in place for longer periods of time had more data available. The *Irish Plastic Bag Levy* for example has been subject to much analysis and there is much literature on the topic. The *Norsk Resirk* programme in Norway similarly had much data associated with the measure but also on practical aspects of implementation. The more recently implemented measures such as the *Bulgarian Plastic Bag Tax* had little available data. Economic instruments are becoming a widely used method aimed at altering behaviour and lessons can be learnt from different types of incentives and disincentives which are already in place.

The *Ashtray Cones* measure is an innovative '**Preventive Measure'** which is becoming a popular means of reducing cigarette, (and other) litter on the beach. The information available on the measure indicates that it would be feasible to implement in various other regions but also in other situations, such as at festivals, sporting events, etc. Other measures such as *Fishing for Energy* and *Reel In and Recycle,* both in the USA, which target fishing gear and are therefore directly related to the marine

environment, may also have the potential to be developed to become more feasible and effective in other fishing communities and regions around Europe.

The group of '**Behavioural/Preventive Measures'** features a variety of different measures. These include measures which target a variety of litter types such as plastic bags, drinking containers, waste oil, waste paper, etc. Each of these measures aim at raising awareness about the problems and impacts of littering as well featuring a function to prevent litter. For example, the Hungarian Paper Collection Campaign in School aims to educate children on the value of used paper while raising awareness about selective collection of litter. Similar measures may be feasible for implementation in other regions and even adaptable to suit a wide scope of products, such as batteries, packaging, etc. Similarly, based upon the information available on other return campaigns such as Hungarian measures *We cooked it up: Now bring it in!* or the Italian initiative *Circoliamo* both of which encourage consumers to return waste cooking oil, these can presumably be extended and adapted to other regions and to other waste types as well. The Hungarian measure has in fact been introduced in parts of Romania as well.

'**Clean-up Measures'** chosen for detailed analysis include the international measure *Dive Against Debris* which targets litter in the water column and sea bed through scuba-dive clean-ups; the European measure *Fishing For Litter* which targets litter off-shore through clean-ups on boats and *MyBeach* in the Netherlands which targets litter on the beach. Each one offers limited quantitative data with regard the amount and type of litter collected. There is also limited data on cost of carrying out such clean-ups. It can be presumed that clean-ups on the beach would be less costly as there is no need for specialised equipment and training (i.e. scuba gear, boat, boat/scuba licence).

The group of measures listed under the **'Clean-up / Behavioural Measures'** for detailed analysis includes a variety measures which feature very innovative ways to attract publicity and raise awareness about the issue of marine litter, whilst also encouraging action and clean-ups. For example, *Corona- Save the Beach* has attracted wide spread media attention for its trash hotel which is entirely made of marine litter collected from European beaches. It also organises music events and beach parties which are popular for young adults. Each event promotes the significance of caring for our coasts, which is particularly important for raising awareness amongst local communities that are often initiators of projects linked to the preservation of their marine environment. The *Vac from the Sea* is another unusual measure implemented by Electrolux which has created artistic vacuums made from plastic collected from the marine environment around the world. As with Corona's trash hotel, the vacuums have also toured around various cities to raise awareness of the issue of marine litter. Although there may be limited data available on the practical side of these measures, they seem to be an entertaining way to attract attention and raise awareness. It is likely that similar measures could be designed to fit different regions and circumstances. Other measures in this group could also be applicable to other regions of Europe. For example, it would be feasible to develop and adapt measures such as *Zwervend Langs Zee (Drifting along the Seashore)* in the Netherlands and *Canoe Patrol of St. Francis* in Poland, to other coastal regions of Europe or locations with rivers and lakes, while *Clean-up by Homeless People* and *Stop Frustration, Adopt a Waste Location, both measures form the Netherlands* could be adapted to an even wider scope of locations.

Table 4.1: Key Findings of the Detailed Analysis of Selected Measures

Measure	Data available and score assigned	Category													
		Feasibility					Costs		Effectiveness				Distributional Analysis	Wider Issues	
		Government action needed?	Change to infrastructure needed?	Opposition?	Support?	Risk of non-compliance?	€ Costs of scheme	Time	Change in amount of litter found	Change in amount of litter produced	Other benefits	Sustainability (continued implementation)	Who is the target audience	Limited wider applicability?	
Behavioural Measures															
Kick the trash	Data (Score)	n/a (+)	Y (+)	N (+)	N (0)	N (0)	N (+)	N (+)	N (+)	N (+)	N (+)	N (+)	Y (0)	N (++)	
Love Clean London Campaign	Data (Score)	N (++)	Y (+)	N (++)	Y (++)	N (+)	N (+)	Y (++)	N (+)	N (+)	Y (0)	N (+)	Y (+)	Y (++)	
End of Plastic Bags in the Czech Republic	Data (Score)	N (--)	N (--)	N (--)	N (--)	N (--)	N (--)	N (--)	N (--)	N (--)	N (--)	N (--)	N (--)	N (--)	
GRIMPOLA	Data (Score)	N (++)	Y (+)	N (+)	Y (++)	N (0)	N (0)	Y (+)	N (-)	N (0)	N (0)	Y (+)	N (0)	Y (+)	
Litter Less (CZ)	Data (Score)	N (--)	N (--)	N (--)	N (--)	N (--)	Y (+)	N (--)	N (--)	N (--)	N (--)	Y (+)	N (--)	Y (+)	
The WI Packaging Campaign	Data (Score)	n/a (0)	N (+)	N (0)	N (+)	N (0)	N (0)	N (++)	N (0)	N (0)	Y (0)	N (+)	Y (+)	N (+)	
Mimando Nuestro Mar (Pampering our Seas)	Data (Score)	N (+)	N (+)	N (0)	Y (+)	N (0)	N (0)	N (0)	N (+)	N (+)	N (+)	Y (++)	N (0)	N (++)	
Chewing Gum Action Group (CGAG)	Data (Score)	N (0)	N (0)	N (0)	Y (++)	N (-)	N (+)	Y (+)	N (0)	Y (+)	Y (0)	N (0)	Y (0)	Y (0)	

Table 4.1: Key Findings of the Detailed Analysis of Selected Measures

Measure	Data available and score assigned	Category												
		Feasibility					Costs		Effectiveness				Distributional Analysis	Wider Issues
		Government action needed?	Change to infrastructure needed?	Opposition?	Support?	Risk of non-compliance?	€ Costs of scheme	Time	Change in amount of litter found	Change in amount of litter produced	Other benefits	Sustainability (continued implementation)	Who is the target audience	Limited wider applicability?
Economic Incentives and Disincentives														
Irish Plastic Bag Levy	Data (Score)	Y (-)	Y (0)	Y (-)	Y (++)	N (+)	N (+)	Y (0)	Y (+)	Y (++)	Y (+)	N (+)	Y (0)	N (+)
We have cooked it: Give it back!	Data (Score)	N (0)	Y (+)	N (0)	Y (+)	N (0)	N (0)	N (0)	N (0)	Y (+)	Y (+)	Y (+)	Y (+)	Y (+)
Norsk Resirk	Data (Score)	Y (-)	Y (+)	Y (-)	Y (++)	N (0)	Y (0)	Y (-)	N (0)	Y (++)	Y (0)	Y (+)	Y (0)	N (++)
Dansk Retursystem	Data (Score)	Y (0)	Y (+)	Y (0)	Y (++)	N (0)	Y (0)	N (+)	Y (++)	Y (++)	Y (0)	Y (++)	N (0)	N (0)
Bulgarian Plastic Bag Tax	Data (Score)	Y (0)	N (0)	N (0)	Y (+)	N (0)	N (0)	Y (++)	N (0)	N (0)	N (0)	N (0)	Y (+)	N (0)
Belgian Pic-Nic Tax	Data (Score)	Y (0)	Y (0)	N (-)	N (0)	Y (-)	N (-)	Y (++)	N (+)	Y (++)	Y (++)	N (+)	Y (0)	Y (++)
Preventive Measures														
Ashtray Cones	Data (Score)	Y (+)	N (+)	N (+)	N (0)	N (0)	N (+)	N (+)	Y (++)	N (++)	N (+)	N (++)	Y (0)	Y (+)
Fishing for Energy	Data (Score)	N (0)	N (-)	N (-)	Y (++)	N (0)	Y (0)	Y (+)	N (0)	Y (+)	Y (+)	N (0)	Y (0)	N (+)

Table 4.1: Key Findings of the Detailed Analysis of Selected Measures

Measure	Data available and score assigned	Category													
		Feasibility					Costs		Effectiveness				Distributional Analysis	Wider Issues	
		Government action needed?	Change to infrastructure needed?	Opposition?	Support?	Risk of non-compliance?	€ Costs of scheme	Time	Change in amount of litter found	Change in amount of litter produced	Other benefits	Sustainability (continued implementation)	Who is the target audience	Limited wider applicability?	
Gum Target	Data (Score)	N (0)	N (+)	N (0)	N (0)	N (-)	Y (0)	Y (0)	N (0)	Y (+)	Y (+)	N (0)	Y (0)	N (0)	
Hulladékgyűjtési Kampány a Gyimesekben (Litter Campaign in Gyimes)	Data (Score)	N (0)	N (--)	Y (+)	N (0)	N (0)	Y;N (+)	N (0)	N (--)	N (--)	N (--)	N (--)	N (--)	N (--)	
No Butts on the Beach	Data (Score)	N (0)	Y (0)	N (0)	N (0)	N (+)	N (+)	Y (+)	N (0)	N (0)	Y (+)	N (0)	Y (0)	Y (+)	
Reel In and Recycle	Data (Score)	N (0)	Y (-)	N (-)	N (+)	Y (-)	N (0)	Y (+)	Y (+)	N (0)	Y (+)	N (0)	Y (0)	N (+)	
The City of Leiden gives Seagulls a Yellow Bag	Data (Score)	Y (0)	Y (+)	Y (+)	Y (0)	N (0)	Y (0)	Y (0)	N (0)	N (0)	N (0)	Y (0)	N (0)	N (+)	
Ban on Non-reusable Cups and Tableware	Data (Score)	N (0)	Y (+)	Y (-)	Y (+)	N (0)	N; Y; (;++)	N (+)	N (+)	Y (++)	N (0)	Y (-)	N (0)	Y (++)	
Behavioural/ Preventive Measures															
Belgian Pic-Nic Tax	Data (Score)	Y (0)	Y (0)	N (-)	N (0)	Y (-)	N (-)	Y (++)	N (+)	Y (++)	Y (++)	N (+)	Y (0)	Y (++)	
Australian Plastic Bag Ban	Data (Score)	Y (++)	Y (+)	N (0)	Y (++)	N (+)	N (0)	Y (+)	n/a (n/a)	Y (++)	Y (0)	N (0)	Y (0)	Y (++)	

Table 4.1: Key Findings of the Detailed Analysis of Selected Measures

Measure	Data available and score assigned	Category												
		Feasibility					Costs		Effectiveness				Distributional Analysis	Wider Issues
		Government action needed?	Change to infrastructure needed?	Opposition?	Support?	Risk of non-compliance?	€ Costs of scheme	Time	Change in amount of litter found	Change in amount of litter produced	Other benefits	Sustainability (continued implementation)	Who is the target audience	Limited wider applicability?
Irish Plastic Bag Levy	Data (Score)	Y (-)	Y (0)	Y (-)	Y (++)	N (+)	N (+)	Y (0)	Y (+)	Y (++)	Y (+)	N (+)	Y (0)	N (+)
We have cooked it: Give it back!	Data (Score)	N (0)	Y (+)	N (0)	Y (+)	N (0)	N (0)	N (0)	N (0)	Y (+)	Y (+)	Y (+)	Y (+)	Y (+)
Norsk Resirk	Data (Score)	Y (-)	Y (+)	Y (-)	Y (++)	N (0)	Y (0)	Y (-)	N (0)	Y (++)	Y (0)	Y (+)	Y (0)	N (++)
Dansk Retursystem	Data (Score)	Y (0)	Y (+)	Y (0)	Y (++)	N (0)	Y (0)	N (+)	Y (++)	Y (++)	Y (0)	Y (++)	N (0)	N (0)
Butt FREE City	Data (Score)	N (0)	Y (0)	N (+)	N (0)	N (+)	N (+)	Y (+)	N (0)	Y (+)	Y (+)	N (0)	Y (0)	N (0)
Iskolai papírgyűjtési Akcio/ Paper Collection for Schools	Data (Score)	N (--)	Y (+)	N (--)	N (--)	N (--)	N (--)	N (0)	N (--)	N (--)	Y (+)	Y (+)	Y (+)	Y (+)
Dedicated to Those Who Love the Sea	Data (Score)	N (--)	N (--)	N (--)	N (--)	N (--)	N (--)	N (--)	Y (+)	N (--)	Y (+)	Y (+)	Y (+)	Y (+)
Clean-up Measures														
Dive Against Debris	Data (Score)	N (+)	N (0)	N (0)	N (+)	N (0)	N (+)	Y (+)	Y (+)	N (0)	Y (+)	N (0)	Y (0)	N (-)
Fishing For Litter Scotland	Data (Score)	N (-)	N (-)	N (-)	N (+)	N (-)	Y (0)	Y (+)	Y (+)	N (0)	Y (+)	N (0)	Y (0)	N (+)

Table 4.1: Key Findings of the Detailed Analysis of Selected Measures

Measure	Data available and score assigned	Category												
		Feasibility					Costs		Effectiveness				Distributional Analysis	Wider Issues
		Government action needed?	Change to infrastructure needed?	Opposition?	Support?	Risk of non-compliance?	€ Costs of scheme	Time	Change in amount of litter found	Change in amount of litter produced	Other benefits	Sustainability (continued implementation)	Who is the target audience	Limited wider applicability?
MyBeach	Data (Score)	N (no info)	Y (+)	N (++)	Y (0)	N (+)	Y; N (;)	Y (+)	N (0)	Y (0)	N (0)	Y (+)	N (0)	Y (++)
Clean-up / Behavioural Measures														
Canoe Patrol of St. Francis	Data (Score)	N (0)	Y (++)	N (0)	N (0)	N (0)	N (0)	N (++)	N (+)	N (+)	Y (++)	N (0)	Y (0)	N (++)
Corona- Save the Beach	Data (Score)	N (0)	N (+)	N (+)	N (++)	N (0)	N (0)	N (++)	Y (++)	Y (++)	Y (0)	N (0)	Y (0)	N (+)
European Waste Free Oceans	Data (Score)	N (0)	Y (++)	N (0)	N (+)	N (-)	N (0)	N (0)	N (+)	N (+)	Y (0)	Y (+)	Y (0)	Y (++)
Electrolux - Vac from the Sea	Data (Score)	N (0)	N (+)	N (0)	N (0)	N (0)	N (0)	N (0)	N (0)	N (0)	Y (0)	N (0)	Y (0)	N (++)
Clean-up by Homeless People	Data (Score)	Y (+)	Y (+)	Y (++)	Y (++)	N (0)	Y (0)	N (depends)	N (0)	N (0)	N (0)	N (-)	N (0)	N (++)
Zwervend Langs Zee (Drifting along the Seashore)	Data (Score)	Y (+)	Y (+)	Y (++)	Y (++)	Y (0)	Y; Y (;++)	N (+)	N (0)	N (0)	N (0)	Y (+)	Y (0)	N (++)
Stop Frustration, Adopt a Waste Location	Data (Score)	Y (+)	Y (+)	N (++)	N (++)	n/a (n/a)	N; Y (0;0)	Y (+)	N (+)	N (0)	N (+)	Y (0)	N (0)	N (0)

Note: Many of the identified measures which have been chosen for detailed analysis fit into multiple categories. Therefore they may be listed more than once in this table.

4.3 Case Studies

4.3.1 Introduction

The aim of the case studies is to obtain further information on a list of selected measures (or combinations of measures). This detailed analysis is undertaken in order to assess the wider context in which the initiatives have been adopted as well as the factors that have made them successful. Moreover, the case studies aim to identify the likelihood that these measures could be replicated in other countries. The following case studies have been completed:

- a case study comparing similar instruments implemented in different Member States: plastic bag taxes and charges in Ireland, Bulgaria, Belgium, Wales and the UK;
- a case study on the effectiveness of measures and packages of measures targeted at particular types of litter: cigarette and chewing gum litter;
- a case study comparing the effectiveness of different measures aimed at particular target groups: measures aimed at school children; and
- a case study comparing different instruments targeted at a particular location: measures targeted at tourist beaches.

The key findings of the case studies are set out below while the individual case studies in their entirety are presented in Annexes 4-7.

4.3.2 Case Study on Market-Based Measures in Different Member States

Market-based measures aim to influence behaviour by increasing the costs of actions which are considered undesirable and/or reducing the costs of actions which are considered to be desirable. This case study analysed the use of market-base measures, in the form of taxes and charges, which have been employed to decrease the use of plastic bags. The measures which have been analysed for this case study are listed in Table 4.2 (next page).

These types of measures are generally considered to have the potential to effectively reduce consumption of plastic bags as well as have a positive impact on the reduction of litter[51]. The structure of such measures may differ depending on the relevant policy aims and the capacity and infrastructure available.

[51] Ten Brink, et al (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.

Table 4.2: Examples of Market-Based Measures in Different Member States – Plastic Bags					
Type of initiative	**Measure**	**Organisation**	**Coverage**	**Type of litter**	**Main Method/ Activity**
Behavioural/ Preventive	Irish Plastic Bag Levy	Irish Government	Ireland	Plastic bags	Market-Based measures: Product tax
	Bulgarian Plastic Bag Tax	Bulgarian Government	Bulgaria	Plastic bags	Market-Based measures: Product tax
	Belgian Pic-Nic Tax	Belgian Government	Belgium	Plastic bags	Market-Based measures: Product tax
	Welsh Single-use Carrier Bag Regulations	Welsh Government	Wales	Single-use bags	Market-Based measures: Tax per bag
	M&S Grocery Carrier Bag Charge	M&S (Marine Conservation Society)	M&S stores	Plastic bags	Market-Based measures: Charge per Bag
	Lidl Carrier Bag Charge	Lidl	Lidl stores	Plastic bags	Market-Based measures: Charge per Bag

The Irish plastic bag tax was the first within Europe and is probably one of the most well documented. It has been considered a success, not only in reducing consumption of plastic bags but also in reducing the amount of litter in the Irish countryside and coastal areas. Although the Bulgarian tax has faced industry opposition, it has gained public support. In terms of reducing consumption of plastic bags, both the Welsh and Belgian tax have also been deemed successful.

With regards the voluntary charges imposed by large retail outlets, there is more information available on the M&S charge than the Lidl charge. Plastic bag charges can reduce costs for large retail outlets but may also encourage customers to bring their own reusable bags, which has an environmental benefit. In the case of M&S, the charge is accompanied by awareness raising campaigns such as educational activities and beach cleans. The profits are donated to environmental charities. Although the Irish and Welsh tax also fund environmental projects, few details are available. M&S provides in depth details and links to different aspects of their campaigns and activities on its webpage as well as providing some information in store.

The detailed design of measures differs, depending on the main policy aims. If the main policy aim is to reduce litter, it is likely that effectiveness may be increased by applying the tax or by levying all single-use bags, as in the Welsh case. Biodegradable bags are as likely to become litter as traditional plastic bags and can continue to form a visible nuisance when discarded. Therefore, by targeting all single-use bags the message is clearly conveyed that that the practice of using a bag once and then throwing it away is inappropriate.

Setting the tax or charge level right is also a major factor in the potential effectiveness of a measure. Setting the level too low may result in an inadequate disincentive for customers as well as giving the impression that the policy aims are of little

importance, whereas setting the level too high may result in industry or public opposition.

Retailers have recommended that a thorough assessment of the potential environmental impact should be carried out prior to implementation of a market-based measure which tackles litter issues. [52]. Indeed, such an assessment is a requirement of policy development at EU and Member State level. Tackling marine litter requires efforts to change behaviour, attitudes and management approaches as well as multi-sectoral involvement[53]. Evidence suggests, though, that market-based instruments can play an important role in addressing marine litter when used in conjunction with other measures within a comprehensive approach which may include education and outreach programmes, strong laws and policies, governmental and private enforcement, and adequate support infrastructure.

4.3.3 Case Study on Measures Targeting Cigarette and Chewing Gum Litter

The objective of this case study was to examine the effectiveness of different measures and combinations of measures targeted at a particular type of litter, namely smoking and chewing gum related litter. Factors resulting in cigarette and chewing gum littering are relatively similar. Different types of measures have been implemented in different Member States: these include educational campaigns, provision of personal ashtrays, enforcement, etc. The measures analysed in this case study are listed in Table 4.3.

Table 4.3: Examples of Measures Targeting Cigarette and Chewing Gum Litter

Type of initiative	Measure	Organisation	Coverage	Type of litter	Main Method/ Activity
Behavioural/ Preventive	Ashtray Cones	Local authorities/ Coastal authorities	popular in ES, PT, IT, NL	Cigarette litter	Provision of ashtray cones
	No Butts on the Beach	Surfers Against Sewage, British Naturists and MCS	UK	Cigarette litter	Provision of butt bins
	Gum Target	Meteora Limited	UK	Chewing gum	Gum bins
	Butt FREE City	Butt Free Australia	Australia	Cigarette litter	Personal ashtrays, leaflets, fines, etc
Behavioural	Chewing Gum Action Group.	Chewing Gum Action Group (CGAG)	UK	Chewing gum	Advertising campaign, awareness raising

[52] Europen (2007): **Europen Comments on The European Commission Green Paper on Market-Based Instruments for environment and related policy purposes**. Europen, Brussels.

[53] UNEP (2006): **Ecosystems and Biodiversity in Deep Waters and High Seas**. UNEP Regional Seas Reports and Studies. No. 178. UNEP/IUCN, Switzerland 2006.

This case study provides a clearer view of the relevance of different instruments and how instruments can be combined to increase their effectiveness. However, there is no magic bullet to reduce cigarette butt or chewing gum litter. It requires effort, a combination of instruments and cooperation between different actors.

Perhaps the best approach for reducing littering is a combination of measures: people should know the harmful environmental effects of litter or specific types of litter (e.g. cigarette litter), but they should also have the 'tools' to change their behaviour (e.g. availability of ashtrays). Sometimes the threat of enforcement strengthens the approach and further influences litterers to change their behaviour[54].

Campaigns targeting specific litter types in Australia and the UK have been shown to be effective and significant litter reduction has been achieved. According to the Victorian Litter Action Alliance's evaluation of the 'Don't be a Tosser – Bin Your Butts' campaign, four critical change enablers were identified[55]:

- Partnerships – strong strategic alliances between the hospitality industry, local governments and state government to facilitate an integrated collective approach;
- Place – venues acting on the campaign's messages and providing facilities for smokers to bin their butts (providing bins, having staff regularly patrol and clean up butt litter, having signage asking smokers to bin their butts);
- Promotion – supporting promotion, mainstream advertising and media publicity can raise awareness of butt litter; and
- Personal action – ensures that smokers making the effort to bin their butts do not feel ostracised or 'blamed' through the campaign.

It is clear that the key to a successful strategy is the promotion of a collective responsibility and capacity building in local governments and relevant businesses (traders, business owners, building managers, etc.) to address the issue specifically, as well as to raise awareness of litter in the general community, and develop strategic cross-sectoral partnerships[56].

4.3.4 Case Study on Measures Aimed at School Children

Littering is a mind-set developed at a very early age, which children often learn from their parents. According to Lewis *et al*[57], children are low level litterers. However, at around the age of 15 people become more persistent litterers. Measures which target children may help to reverse this trend. Various initiatives are in place in Member States that aim at improving the littering behaviour of children as they grow up, thereby supporting their education.

The measures selected for the case study analysis (see Table 4.4 below) include individual initiatives as well as international projects. The projects identified focus on a variety of litter types covering general litter, paper and plastic.

54 Defra (2007): **Preventing Cigarette Litter in England** – Guidelines for Local Authorities http://archive.defra.gov.uk/environment/quality/local/legislation/cnea/documents/cigarette-litter.pdf

55 Sustainable Victoria (2007) **Tackling butt litter** – The don't be a Tosser, Bin your Butts Campaign – Evaluation Report

56 ibid

57 Lewis et al (2009a): **Litterbugs: How to deal with the problem of littering**. Policy Exchange, London.

Table 4.4: Examples of Measures Aimed at School Children					
Type of initiative	**Measure**	**Organisation**	**Coverage**	**Type of litter**	**Main Method/ Activity**
Behavioural	GRIMPOLA	Ecomar	Spain	Marine litter	Education and communication
	Litter Less (CZ)	Tereza	Czech Republic	All	Clean-up, awareness raising, education
	Mimando Nuestro Mar (Pampering our Seas)	Fundación Global Nature	Tenerife	Marine litter	Education; briefings, exhibitions, leaflets and stickers
Preventive	Hulladékgyűjtési kampány a Gyimesekben (Litter Collection Campaign in Gyimes)	Pogány-Havas Micro Regional Association	Pogány – Havas micro regions, Romania	Paper and plastic bottles	Collection; education, communication and outreach. Provision of designated bins in schools
Behavioural/ Preventive	Iskolai Papírgyűjtési Akcio/ Paper Collection for Schools	INEST and Green Bridge Region Waste Management Ltd.	Hungary	Paper	Collection and education. Provision of designated waste containers

Campaigns aimed at children are often delivered through a range of fun and entertaining activities. This is likely to raise effectiveness as it promotes interest and eagerness to participate while keeping the children's attention. However, it is also crucial that the message behind the measure, of reducing litter, is not lost. Campaigns should include an effective educational element which clearly explains to children why they are partaking in such activities and what the importance is.

Grimpola, in Spain, has been successful on this level. It cleverly used an established network of sailing and boating clubs, as well as the associated network of stakeholders, in order to ensure participation. However, this structure means that it focuses on coastal locations and this may limit possibilities to reach inland residents who may holiday on or visit the coast.

The competitive nature of the Hungarian measure provides children with motivation to take an active role in the measure. Both the Romanian and Hungarian measure take a fun, light hearted approach but lack comprehensive long-term and wide-spread coordination throughout the country. Their ad-hoc nature is likely to reduce their capacity for consistent long-term results. Moreover, increased efficiency of these measures could possibly be achieved if they were accompanied by specific education on the use of waste and the importance of recycling.

The Czech Republic example demonstrates how a measure can be locally specific whilst simultaneously taking advantage of a large network of groups working towards

a mutual goal. The Eco-Schools carry out multiple activities to reduce litter and encourage environmentally friendly behaviour among young people. The students take an active role in how their school can be run for the benefit of the environment in their local community. The individual schools are, however, encouraged to bring along issues that are of local importance as well as to collaborate and exchange ideas and knowledge with other schools, both nationally and internationally.

Many campaigns targeting children aim at changing behaviour in the long-run. Therefore, it may take longer to see the extent of the results. Because of this, long-term projects are likely to be more appropriate than short-term, one-off projects. This has implications in terms of funding, as well as the organisational structure of projects. However, one-off, short-term sub-projects may make it easier to maintain the interest of individual children as part of a longer-term approach. These sub-projects could include exhibitions, documentaries, site visits that could serve to give students additional information regarding the impacts that individual actions of littering can have on the environment, as in the Ecofellows initiative in Finland[58]. In the case of expanding coastal initiatives such as Grimpola in Spain, to an inland area, classroom activities could be useful in explaining to children the impact that littering can have on the marine environment.

Coordination and collaboration with similar campaigns and other projects may also increase achievements. One of the areas that could be further improved is collaboration between schools that participate in the individual measures and activities. Such collaborations could also be useful for providing more comprehensive information on the results achieved in terms of changes in behaviour.

4.3.5 Case Study on Different Measures Targeted at Tourist Beaches

A wide variety of measures are currently being implemented at a range of different scales along the European coastline. From reviewing the measures it is apparent that the focus of some of the measures, especially those dealing with beach clean-up, is on relatively populated areas. This is partly due to population demographics, distribution and ease of access. Management of marine litter is a priority for many municipalities with coastal resorts. Ensuring beaches are clean, visually appealing and safe for visitors is vital for local tourism economies and can have indirect regional implications.

Therefore, legislation and statutory requirements aside, local factors act as a powerful incentive to maintain a clean coast. However, managing beach litter remains a considerable environmental challenge. This case study analyses selected measures targeting tourist beaches, these are listed in Table 4.5.

[58] Pre-Waste (2012): **Ecofellows: Awareness Raising Lessons for the School Children**, downloaded from:
http://www.prewaste.eu/waste-prevention-good-practices/detailed-factsheets/item/377-ecofellows-awareness-raising-lessons-for-the-school-children-pre-waste-factsheet-76.html

Table 4.5: Examples of Measures Targeted at Tourist Beaches

Type of initiative	Measure	Organisation	Coverage	Type of litter	Main Method/ Activity
Clean-up	International Coastal Cleanup	Coastal Conservancy	International	Marine litter	The largest one-day clean-up of marine litter
	Mediterranean Initiative	Clean-up the world	European (the Mediterranean)	All	Beach and coastal clean-up
	Beachwatch	MCS	UK	Beach litter	Local communities and volunteers clean-up and survey beaches
	Barefoot Beach Rescue	SAS (Surfers Against Sewage)	UK	Beach litter	Community based beach clean
	Big Spring Beach Clean	SAS	UK	Beach litter	Community beach clean
	Motivocean Beach Clean	SAS	UK	Beach litter	Community events and clean-up
	North Devon Beach Clean Series	SAS	Devon, UK	Beach litter	Community based beach clean
	Da Vor Redd Up	Shetland Amenity Trust	Shetland, Scotland	All	Annual spring clean of beaches and roadsides
	My Beach ("Cleanup? Do It Yourself!")	North Sea Foundation (Stichting De Noordzee)	Local (The Netherlands)	Beach litter	Locals agree to clean the beach instead of relying on the municipality
Behavioural, Clean-up	Coastwatch	North Sea Foundation (Stichting de Noordzee)	Netherlands	Beach litter	Environmental educational project for high schools.
	Corona Save the Beach	Corona beer company	European	Beach litter	Activities promoting respect for the beach
	I Want Clean Seas and Beaches	HELMEPA-Junior, and Wind	Greece	Marine litter	Information leaflet and computer game for children
	Forth Coastal Litter Campaign	The Forth Estuary Forum	Regional (UK)	Marine litter	Community involvement and awareness raising

Table 4.5: Examples of Measures Targeted at Tourist Beaches					
Type of initiative	**Measure**	**Organisation**	**Coverage**	**Type of litter**	**Main Method/ Activity**
	Blue Flag Award	Keep Britain Tidy	UK, EU wide	Marine litter	Award scheme, collection, litter monitoring
Behavioural	Mermaids Tears	SAS	UK	Plastic	Urges the plastic industry to reduce its impact
	Baltic Marine Litter (MARLIN)	Keep Sweden Tidy Foundation	Sweden	Marine litter	Capacity building and awareness raising actions
	Become Part of the Solution	HELMEPA and North Aegean Sea Canneries SA	Greece	Marine litter	Raises awareness about marine litter for fishing vessels and pleasure craft users.
	Return to Offender	SAS	National (UK)	Litter	Challenges companies whose litter is found on beaches
	'Bag It and Bin It – Don't Flush!'	Industry-led national campaign	National (UK)	Bathroom litter	Encourage people not to flush 'personal products'

This case study aims to provide a clearer view of the factors which influence the success of particular measures. It also identifies the challenges faced in order to determine what measures (if any) could be used in the management of beaches across Europe.

Rural resorts or isolated stretches of coast which have fewer visitors (and where economic incentives are smaller) tend to have fewer measures which deal with beach litter in comparison with populated tourist areas. Reduced visitor numbers is likely to reduce the amounts of litter dropped (i.e. a direct source of beach litter), although dealing with indirect sources of beach litter (such as from nearby rivers, drains or from shipping) can be considerably more difficult and expensive for practical reasons, such as accessibility.

Beach cleans mitigate the short-term impacts of marine litter, but are only perceived as being economically beneficial on amenity beaches where tourist revenue is important. However, there is a lack of quantitative evidence of the economic impacts on regional tourism of littering upon rural beaches. Behavioural and preventive measures often increase in effectiveness when coupled with remediation in the form of clean-ups.

The existing clean-up measures are vital, but the underlying sources of beach litter remains as the 'culture' of littering is still often considered socially acceptable by some members of the public. Therefore it is vital that behavioural measures are also prioritised. Aside from public awareness campaigns (e.g. conducted by some NGOs) and other small initiatives there is still a general lack of behavioural measures implemented by governments at a national level. Such campaigns could be beneficial in terms of addressing a national littering culture. In terms of behavioural measures targeting the coast, quality awards and eco-labels such as the international Blue Flag award appear to be powerful drivers for municipalities. Although no assessments have been made, the economic value of these awards could potentially be in the millions of pounds (sterling).

In the majority of cases, local authorities and voluntary groups (rather than the litterers) cover the cost of marine litter removal. Fixed penalties for dropping litter on beaches is one solution to deal with public sources of litter (i.e. individuals). However, this does not address the issue of litter from offshore sources or from industry. The enforcement and monitoring of obligations under the Marpol Convention remain a challenge. Campaigns such as the SAS 'Mermaids Tears' and 'Return to Offender', both in the UK, are trying to put pressure on industry to prevent items becoming litter on beaches. Other measures such as the My Beach ("Cleanup? Do It Yourself!") scheme in the Netherlands encourages beach users to take greater ownership for keeping beaches clean, rather than relying only upon the municipalities.

It is apparent that there is currently a lack of geographical coordination between the large number of measures being undertaken at International, EU and National levels. Better coordination at an EU or regional seas level is required. A broader suite of economic and practical incentives implemented by governments may also help prevent litter caused by industry.

Collecting data, for example during beach cleans, is also an important means of quantifying the sources and levels of beach litter in any given area. However, the quality and potential usefulness of the data collected tends to be highly variable. An example of a measure which provides relatively consistent monitoring and trend data for marine litter on national and regional level in the UK is the MCS 'Beachwatch' scheme. This scheme also has links with the International Coastal Clean-up and data is fed into the OSPAR Marine Litter Monitoring Project.

A comprehensive and standardised monitoring programme implemented at EU level would allow for spatially comparable analysis and would support subsequent actions to reduce marine littering. Although some developments have been made in this regard in the form of the MCS 'Beachwatch', to meet the requirements of MFSD litter monitoring, surveys will be required to use standardised methodologies agreed at an EU level (as recommended by the MSFD GES Technical Subgroup on Marine Litter). This will aid in clarifying the extent of the issue, as well as provide trend data which will help with the evaluation of the effectiveness of measures to prevent litter.

5. PROPOSALS FOR A PROGRAMME OF MEASURES

5.1 Lessons from Previous Research

5.1.1 The Need for Tailored Measures

A key finding of the literature research, the case studies, as well as the detailed analysis of measures, is that measures need to be tailored to specific circumstances in order to be effective. For example, in relation to market-based instruments for addressing the problem of marine litter, Ten Brink *et al* concluded that selecting the best economic instruments (or instrument packages) depends on several factors. These are summarised in Box 5.1.

Box 5.1: Factors to Consider in Selecting Market- Based Instruments

- The type of marine litter;
- Which instruments are relevant to the type of litter, 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 or international;
- Economic and environmental impacts of the marine litter: for example, if endangered animals or coral reefs were being impacted negatively by the litter, the 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 instruments;
- 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 instrument;
- Capacity to design, implement, monitor and enforce the instrument;
- Commitment to the basic principles behind instruments;
- Which instruments are cost-effective, practical, affordable, fair, consistent with other polices in place, and offer the most environmental benefits; and
- Which instruments are politically and publicly acceptable.

Source: Ten Brink *et al* (2009): **Guidelines on the Use of Market-Based Instruments to Address the Problem of Marine Litter**. Report Commissioned by the United Nations Environment Programme. Brussels, Belgium, Institute for European Environmental Policy, April 2009

These conclusions are also relevant to other types of measures. The Ten Brink *et al* report notes that:

> *"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… Marine litter from ocean-based sources is a rather complex issue to address… 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 [market-based instruments] could potentially be the best approach"*

5.1.2 Lessons in Targeting Individuals

The research into the nature of littering behaviour and particularly the target groups responsible for littering, described in Section 2 and Annex 2, has a number of implications for the selection of measures which help to prevent littering. Although this research has been carried out mainly in relation to littering on land, the lessons should apply equally to littering at sea. By examining recommendations highlighted in the literature[59] some strategic points can be identified. These include:

- designing measures to target particular types of litterers;
- using an integrated approach that combines different types of measures; and
- adopting measures that can influence social norms

Several studies have emphasised that **different target groups require different approaches**. For example, actively involving younger people in clean-up and remediation activities can help to raise their awareness about litter as an issue, and increase their commitment to prevent litter[60]. Other studies emphasise that deeply entrenched negative attitudes towards putting litter in bins may be more successfully addressed by making it unattractive to drop litter.

Campaigns against other aspects of anti-social behaviour provide examples of targeting young males. For example, UK campaigns against drink-driving target male drivers, delivering messages about the risk of loss of livelihood and reputation as a result of drink-driving. For younger drivers, famous faces have been used. For example, Michael Schumacher and Rafael Nadal have contributed to drink-drive campaigns.

Often, public awareness efforts are directed towards children, since they are responsive and easily accessible, and it is believed that they can influence adult attitudes[61]. UNEP's Regional Seas programme has targeted children by printing leaflets designed with pictures and quizzes. Other initiatives targeted at young people include paper and plastic collection campaigns in primary and high schools as well as used cooking oil collection.

In general, the literature reviewed calls for a **coordinated, long-term approach** to tackle the litter problem effectively. As a result of research into the effectiveness of anti-litter campaigns, Keep Britain Tidy has recommended that a range of coordinated measures is necessary to tackle litter. These include recommendations such as:

- streets should be cleaned to a consistently high standard at all times of day and night;
- there should be bins in the right places, and information about alternative disposal options and what to do with litter in the event of a bin not being available;

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59 For example Lewis *et al* (2009a); McKenzie-Mohr, D (2011); Umweltbundesamt (2010)

60 Schultz and Stein (2010): **Litter in America**, 2009 national litter research finding and recommendations. Executive Summary

61 UNEP (nd): **Public Education, East-Asia and the Pacific**, downloaded from http://www.unep.or.jp/ietc/estdir/pub/msw/ro/Asia/Topic_j.asp, last accessed 17 May 2012

- education and awareness raising campaigns should challenge attitudes towards litter and must be backed up by effective enforcement; and
- for some litter droppers, enforcement is the only thing that will change their behaviour.

Examples from campaigns against other aspects of anti-social behaviour also indicate the value of an integrated approach. For example, the UK's 'Graffiti Hurts' group[62] indicates that a range of measures can be combined to address the problem of graffiti. These include proper and rapid removal of graffiti, installing lighting, keeping neighbourhoods tidy, educating about and enforcing anti-graffiti laws, controlling access to various areas (rooftops, etc.), stepping up security, avoiding showing graffiti in the media and adopting a mural wall.

One of the few detailed evaluations of a behavioural campaign was carried out in Denmark; it evaluated the achievement of an anti-waste campaign against the specific goals set for the campaign[63]. A summary of these findings are found in Annex 2, under Section A2.5.3. Based on the analysis, the evaluation team made the following recommendations for future campaigns:

- PR effort is extremely important to spread information widely about a 'low interest' topic such as waste prevention;
- social networks work well to draw attention to a campaign among those who already have some kind of interest in the subject;
- there is great potential to use interested groups as 'ambassadors' to promote the campaign further, acting as leading figures in the campaign, and help to ensure that more people become engaged;
- there is also a potential for linking campaign messages to channels which have a close connection to the subject and are where people would look for information (e.g. messages on garbage trucks or events). You should not expect target groups to seek out information themselves; and
- cooperation between the authorities and other partners must increasingly be exploited so that the group as a whole is able to communicate more broadly to the target audience and ensure greater impact than each can achieve alone.

Social norms which encourage environmentally friendly behaviour result in a very cost effective way of keeping litter levels low. There is some evidence that social norms in relation to litter can be triggered through relatively simple means. For example, a study in the Netherlands found that placing a sign that states: "Help us keep it clean: almost all residents don't deposit garbage next to the waste container" is one of the most effective methods to encourage citizens to keep the area clean. Additionally, people don't like their behaviour to be different from what is considered acceptable. Therefore if they receive a message that everybody keeps the rubbish

62 Graffiti Hurts (2003): **Graffiti prevention**, Creating a Community Mural downloaded from http://www.graffitihurts.org/pdf/mural.pdf

63 Miljostyrelsen (2011): **Effektevaluering af kampagnen 'Brug mere – spild mindre'**. Copenhagen, Miljostyrelsen, 13 July 2011. Downloaded from: http://www.mst.dk/NR/rdonlyres/69D1FFA4-91B9-4CBB-ADED-AB167D46A8A4/0/Evalueringaf_Brugmerespildmindre_13juli2011.pdf

container area clean, they are likely to do the same[64]. A similar experimental study in the UK found that messages, coupled with accessible bins, reduced litter by nearly a third in a cinema.

Results from campaigns against other aspects of anti-social behaviour indicate that social norms can be altered, but only through a long-term approach. For example, in 2008 the number of people who were either killed or seriously injured in drink-drive incidents on British roads in 2008 was a quarter of what it was in 1980[65]. It is suggested that this decline is a result of dramatic advertising campaigns, together with increased use of breathalysers and penalties. Similarly, a study on encouraging people to stop smoking suggested that online social networking, forums or blogs could influence behaviour. A combination of shared goals and peer pressure within closely connected groups could aid in achieving goals[66].

5.1.3 Lessons in Targeting Businesses

A study for the UK Department for the Environment, Food and Rural Affairs into how companies could be influenced in relation to the use of e-documentation for waste management regulation provides some useful lessons on influencing company behaviour. The results provide a clear picture of the pressures bearing on organisations, and their needs in terms of information and support:

- **Financial considerations** are paramount. Any perceived financial burdens of new measures (whether voluntary or mandatory) cause concern – especially in the current economic climate;

- **Reputation and risk management** are also key. Organisations are conscious of the potential pitfalls around environmental practice, and this is among the key drivers of both compliance and (in some cases) innovation;

- **Information that is impactful and credible in order to encourage take-up**. Environmental information is not always pushing against an open door: it is competing against many other issues – and the benefits may be viewed as indirect at best; and

- To have most impact, information and advice must be couched in **relevant, meaningful language** – specifically, it must relate to financial outcomes, address risk, relate as far as possible to the organisation's own sector and circumstances, and be actionable largely with existing resources (whether financial or staff-related).

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64 Van Baaren et al (2010) **Voorbij Bijplaatsingen - Gedragsinterventies voor het effectief terugdringen van bijplaatsingen bij afvalcontainers**, study in commission of Stichting Nederland Schoon en Agentschap NL, downloaded from http://www.samenwerkenaaneenschonernederland.nl/images1/acm35/bestanden/Rapportage%20Voorbij%20Bijplaatsingen_0.pdf

65 Taylor (2008): **Lessons from the Drink Driving Campaign**, Guardian online article, downloaded from: http://www.guardian.co.uk/responsibledrinking/road.safety

66 Social Media Trader (2008): **Quit Smoking with Social Networks**, downloaded from http://socialmediatrader.com/smoking-and-social-networks/

5.2 Recommended Programme of Measures

5.2.1 Introduction

It seems clear on the basis of the evidence from the literature, together with the (rather limited) evidence on costs and effectiveness of individual measures we have examined, that measures to prevent litter need to be tailored to particular circumstances. These circumstances range from the types of litter to the target groups responsible for littering to social norms about littering. This makes it difficult to recommend a single programme of measures that are equally cost-effective and applicable across the EU.

Instead, our recommendations set out an approach for responsible authorities to identify and select measures for particular circumstances. The recommendations cover actions at different levels, by different actors (local/regional authorities, Member State governments and the Commission as well as Regional Seas Conventions) and focus on coordination and partnerships to maximise the effectiveness of measures. They are also designed to fit in with the work currently in place to develop monitoring programmes, set targets and develop programmes of measures to meet Good Environmental Status for litter under the MSFD.

We also make recommendations for supporting measures to be taken by other partners, particularly NGOs (section 5.2.6) and the private sector (Section 5.2.7).

5.2.2 Programme of Actions for Local/Regional Authorities

Local (and/or regional) authorities at sub-Member State level in most Member States have direct responsibility for dealing with litter on land. They are generally responsible for street cleaning and waste management, spatial planning, enforcement of regulations on littering and often play a key role in education and training. They are also likely to have strong links with local stakeholder groups. This gives them a key role in litter prevention.

Coastal local authorities are generally responsible for beach cleaning and may also have responsibilities for littering at sea, for example through ownership of ports, provision of port facilities etc. However, they may not be directly responsible for enforcement of marine waste legislation and do not have a direct role under the MSFD as most MFSD measures that deal with littering at sea are implemented nationally e.g. through government statutory bodies. The implementation process can vary between Member States.

Although inland local authorities do not have direct responsibility for marine litter, they can contribute to the minimisation of litter which may eventually reach the marine environment. For example, the regulatory structure of the MSFD is closely linked to, and builds upon the obligations of the Water Framework Directive (WFD) which deals with both terrestrial and coastal bodies of water. An overall reduction in the amount of litter entering the aquatic environment, at both inland and coastal locations, is likely to result in a reduction in marine litter.

Available Guidance

The concept for guidance to local authorities on combating littering in general is not new and a range of guides exist in countries with a more advanced approach to litter. Examples of guidance available in the UK are identified in Annex 3. Box 5.2 gives an example of guidance available to Dutch municipalities on dealing with street litter.

Box 5.2: Basic Guide to Street Litter

The key steps are:

- Set up a project plan (organised with goals, budget and task distribution, communication plan, etc.);
- Map the current situation (overview of current policy, measures, costs and organisation, identification of litter problem (type of waste, degree of littering etc.));
- Identify the targets (a 'quick scan' is available to support municipalities);
- Set the new policy and strategy (level of ambition);
- Work out the approach (measures, budget, etc.);
- Implementation phase; and
- Evaluate the project & make adjustments if necessary.

Different guides are available to make these steps more practical, covering:

- monitoring of littering;
- cleaning;
- involving citizens;
- communication;
- enforcement; and
- combating cigarette litter, etc.

Source: *SenterNovem (2007):* ***Impulsprogramma Zwerfvuil – Basishandreiking aanpak zwerfafval, Den Haag, Netherlands.***

A similar approach is recommended in California, with guidance on Best Management Practices for controlling litter and debris in stormwater and urban runoff, summarised in Box 5.3.

Box 5.3: California Best Management Practices for Controlling Trash and Debris in Stormwater and Urban Runoff

Management practices are divided into structural measures (equipment such as covers and inserts which prevent litter entering stormwater drains) and institutional controls (enforcement of legislation and behavioural measures). The guidance sets out the following general principles for implementing best management practices:

1) identify the trash "hot spots" and spatial distribution of trash throughout the targeted watershed;
2) determine the land-uses associated with the hot spots and other areas where trash enters the storm drain system;
3) determine the socio-economic demographics of the population surrounding the areas where trash enters the storm drain system; and
4) tailor the Best Management Practices implemented to the surrounding land-uses and demographics in high trash generating areas.

The guidance then provides descriptions (with pictures) of best practice measures, followed by examples of their use in California including information on performance, maintenance, and cost (although only limited information is provided on the performance and cost of behavioural measures).

Box 5.3: California Best Management Practices for Controlling Trash and Debris in Stormwater and Urban Runoff

Appendices provide information on:

- the relative costs and benefits of different structural measures;
- a list of companies supplying products; and
- a directory of devices, including information about where some have been installed

The guidance concludes that:

"There is no one method for completely controlling trash and debris in stormwater and urban runoff. Institutional controls may provide the best long-term solutions, especially those focused on prevention. However, depending on the magnitude of the problem, institutional controls may be inadequate. Focusing on enforcement of litter laws is considered by many to provide the most "bang for the buck." However, most urban municipalities will have to do more to physically capture and control trash in urban waterways or to prevent it from reaching the waterway".

*Source: Gordon and Zamist (nd): **Municipal Best Management Practices for Controlling Trash and Debris in Stormwater and Urban Runoff**. California Coastal Commission and Algalita Research Foundation. Downloaded from: http://www.plasticdebris.org/Trash_BMPs_for_Munis.pdf*

Recommended Main Steps

Box 5.4 lists the main steps which we recommend local authorities responsible for marine litter to take when deciding on a programme of measures to address the problem.

Box 5.4: Main Steps in Deciding a Programme of Measures to Address Marine Litter

1. Start by **identifying the problem**: what are the main types of litter and who are the main litterers. This could be past research in the particular area, a beach clean-up exercise with monitoring of the waste collected (which would also help raise awareness), asking local people or simply based on evidence from research at regional sea level, such as the monitoring required under the MSFD (the Commission web site could host a database of survey information, as well as MSFD results).
2. **Identify the drivers** for managing beach litter (statutory/non-statutory, environmental, economic, social and other): These can be economic drivers such as protecting/enhancing tourism revenue or societal/community benefits such as a reduction in anti-social behaviour and crime, or improved sense of social well-being/cohesion.
3. Based on this information, determine what the **main targets** for a litter prevention/clean-up programme should be – who and what to target (and when).

[Some authorities may already have gone through these stages; if so, they could move straight on to Step 4. However, we have found little evidence that this has been done in a systematic way by many authorities].

4. **Map existing measures** that are already being implemented in the area to address the problem, including the authority's own actions, actions by voluntary groups (locally, nationally and internationally) and informal action by local people. Assess their effectiveness (where possible given the lack of data). **Analyse gaps** that need to be filled.
5. **Select measures to fill the gaps** that are appropriate to the main targets and which are likely to be the most cost-effective for the particular location.
6. **Work with the local community, voluntary organisations, businesses etc.** to agree the programme and to help to deliver it. This will be easier in locations with well-developed social norms and harder where these do not exist. Here, there may be more need to introduce legislation and fines.
7. **Monitor the impacts** of the programme on a regular basis, to help shape the development of the programme and publicise the results to further enhance awareness of the issue and measures to address it.

Approaches similar to that described in Box 5.4, above are undertaken within the Environmental Protection Act from the UK which refers to the removal of litter from beaches. With regards to the problem of marine littering on the shores, the legislation allocates the responsibility for the removal of litter to municipalities. The legislation also places duties on, and gives powers to, local authorities to keep beaches clear of litter according to a Code of Practice. The requirements apply to all beaches; the Code suggests that between May and September beaches should be subject to frequent monitoring and cleansed to as high a standard as is practically possible. Authorities are advised that they may find it helpful to encourage voluntary groups to assist in cleaning up beaches. Measures that adopt similar steps are described in more detail in the case study annexes of this report (Annex 4-7).

Identifying the Problem

A number of sources are available which give general information on the main sources and types of marine litter in different regional seas. These are summarised, in Annex 1 of this report and include, for example, the report of the MSFD Technical Sub-Group on Marine Litter[67]. Additional information has been gathered for the other two projects on marine litter (see Section 1 of this report). In the absence of other information, these sources provide a low-cost way of making an initial assessment of the scale of the problem and the likely target groups. More data, on a Member State/regional sea basis, will become available from 2014 as Member States begin monitoring marine litter as part of their obligations under the MSFD.

In addition to these general sources, certain local authorities will also have more specific local information on marine litter available from past research in their area, for example information on beach litter from municipal beach-cleaning activities or from voluntary beach clean-up exercise with monitoring of the waste collected, or information on litter at sea from local 'fishing for litter' or other voluntary litter gathering exercises (see Annex 3 for a list of some current initiatives).

Although many beach-cleans fail to record data consistently, the, MCS 'Beachwatch' scheme in the UK is an example of a well-developed measure which has deployed standardised annual monitoring since 1993. It therefore acts as a relatively long-term dataset, providing monitoring and trend data for marine litter at a national and regional level. In addition, it has links with the International Coastal Clean-up and data is fed into the OSPAR Marine Litter Monitoring Project[68].

Using readily available information will entail little in the way of costs for municipal authorities. However, to gain more specific information on the types and sources of waste within their area to provide a robust basis for policy analysis, authorities may wish to conduct their own surveys, in line with the agreed methodology under the MSFD. The report of the MSFD Technical Sub-Group on Marine Litter[69] sets out

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67 Joint Research Centre (2011): **Marine Litter Technical Recommendations for the Implementation of MSFD Requirements**, European Commission, downloaded from: http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/22826/2/msfd_ges_tsg_marine_litter_report_eur_25009_en_online_version.pdf

68 MCS (2012): **Beachwatch website,** available at: http://www.mcsuk.org/beachwatch/

69 Joint Research Centre (2011): *op cit*

recommendations on beach litter monitoring, which is likely to be the most cost-effective type of monitoring for authorities to undertake.

Box 5.5: Recommendations on Beach Litter Monitoring
• Monitoring should be based on counting individual items; • Detailed assessment of micro litter should be carried out separately; • Litter items should be registered on a standard survey sheet; • Litter should be counted and removed from the beach during each survey; • The minimum frequency of surveys should be four per year, to assess seasonal differences; • It is better to survey beaches which have not been previously cleaned; • In selecting beaches for survey, an attempt should be made to cover all aspects of the problem (e.g. close to point sources such as towns or rivers, and those reflecting diffuse sources such as shipping and fisheries); and • A 100m stretch of beach should be surveyed, with a minimum of two surveyors.
Source: Joint Research Centre (2011): ***Marine Litter Technical Recommendations for the Implementation of MSFD Requirements****,*

Carrying out such monitoring will incur costs; unfortunately, little information is available on the scale of costs, although they could include the provision of equipment (such as gloves and bags for collectors, which is likely to be relatively low-cost), guidance (e.g. photo guides to distinguish between types of litter; examples are already available, as explained in the report of the MSFD Technical Sub-Group on Marine Litter[70]) and staff time.

The costs of staff time could be reduced by using volunteers, for example with the assistance of NGOs (see 5.2.6). Section 3 of this report indicates that it has been possible to recruit volunteers for beach clean-ups in many Member States. However, volunteers need training and guidance from experts to make the results of monitoring robust. In the case of volunteers, initial costs might be higher as trainers providing guidance and training for the volunteers might have significantly higher average hourly fee rates. The participation of a high number of volunteers could mean that more equipment is required but also that a larger area is encompassed within the project. Additional costs might arise from the transportation of litter collected from the beach; this could vary depending on the quantity of litter, the distance travelled and the form of disposal used. The total cost of surveys could amount to 1-10 thousand Euro per survey.

Assuming that the MSFD Technical Sub-Group recommendations are followed, this would require two people for the duration of each survey on each beach. Costs of such clean-up and monitoring activities therefore can depend on the fees and salaries of the employees or the trainers who assist the volunteers as well as on the time taken to complete the projects.

Identifying the Drivers

In order to understand the principal drivers for managing marine litter, local authorities need to understand the statutory and non-statutory drivers for its management. From this, costs and benefits can be attributed and funding sources

[70] Joint Research Centre (2011): *op cit*

identified. Examples of the non-statutory drivers are economic, social (crime and disorder) and environmental. For example, the case study on beach litter identified the Blue Flag eco-label as the primary driver for managing litter on amenity beaches. The initiative is now implemented across 46 European countries and 3 850 beaches[71]. This is an economic driver, an NGO run initiative with proven benefits to municipalities whose beaches have the award in terms of visitor perceptions of beach cleanliness, and subsequent visitor numbers and tourist revenue.

Statutory drivers include the MSFD, the Environmental Liability Directive (principally for polluters rather than litters but may be applicable in some instances) and also national legislation. For example, the Environmental Protection Act in the UK refers to the removal of litter from beaches. With regards to the problem of marine littering on the shores, the legislation allocates the responsibility for the removal of litter to local authorities. The legislation also places duties on, and gives powers to, local authorities to keep beaches clear of litter according to a Code of Practice. The requirements apply to all beaches; the Code suggests that between May and September beaches should be subject to frequent monitoring and cleansed to as high a standard as is practically possible. Authorities are advised that they may find it helpful to encourage voluntary groups to assist in cleaning up beaches.

Identifying Target Groups

The information on types and sources of litter can be used to identify who the main target groups for a litter prevention/clean-up programme should be – who and what to target (and when). Where possible, litter types and sources should be linked to the target groups set out in Annex 2 of this report, which includes:

- individuals (e.g. motorists or pedestrians, tourists or residents, different age groups);
- people at work (e.g. those involved in the waste industry and other local businesses); and
- people at sea (recreational boaters and fishermen, seafarers and professional fishermen).

This will not be an exact process; for example, fast-food litter on beaches can be linked to fast food outlets in the area, and target groups identified from the customer profile of the outlets. However, plastic bottles and bags may be dropped by many different groups, both onshore and offshore, as discussed in the study of the largest loopholes within the flow of packaging material (project 43).

Local authorities may have other data, for example from economic surveys of beachgoers, information on the tourist population etc. to help identify the most likely target groups. In some locations (primarily in countries such as the UK), there may also be results from local studies of litterers, as described in Annex 2 of this report. Local authorities could use their local knowledge to determine whether any of the profiles of litterers developed in these studies appear applicable to their circumstances.

[71] More information on the Blue Flag programme can be found at: www.blueflag.org

The costs of this step are likely to comprise staff time only, with the extent of time depending on level of detail with which target groups are identified. However, should local authorities decide to carry out their own research to identify target groups more accurately, the costs could be considerably higher (up to several thousand Euro).

Mapping Existing Measures and Analysing Gaps

A key step in development of the programme is to map the full range of actions that are already being undertaken to address the issue of litter, as well as other initiatives related to waste management, recycling etc. which may have an impact on litter in the area. Our research indicates that there is not always good coordination between initiatives.

This step could involve a survey of activities being undertaken by different local authority departments (e.g. those responsible for waste management, the environment in general, education, young people, etc.). It will also be important to identify action being taken by local and national (and even international) voluntary groups and by local businesses. This is again likely to require staff time rather than any other costs.

The data to be gathered on existing measures should include the type of information set out in the marine litter toolbox template. This will include information on the:

- responsible organisation(s);
- geographical coverage;
- waste type targeted;
- source targeted (i.e. the litterer);
- timing/duration;
- objective and description of main features;
- any information on cost/financing; and
- any information on impacts (achievement of objectives and any side-effects).

One important aspect of mapping existing actions related to marine litter is to ensure that neighbouring authorities are aware of each other's actions, so that they can be effectively coordinated. National governments can assist with this process, particularly in the context of MSFD programmes of measures. It might be useful for the Commission/national authorities' web sites either to hold information on the programmes, or at least a link to local websites, to encourage partnership working and consistency between neighbouring authorities.

Once existing measures have been mapped, they can be compared with information on target groups to identify any gaps. These could be gaps in terms of types of litter addressed, types of litterer, geographical coverage or timescale (for example certain measures may only be in place in the short-term). This process, again, is only likely to incur costs in terms of staff time.

Selecting Measures to Fill the Gaps

Once the gaps have been identified, the next step is to identify appropriate measures which could be used to fill the gaps. As noted in Section 5.1, this is likely to involve a range of context, preventive and behavioural measures. The key factor is to tailor

the measures to the specific targets identified. They also need to be tailored to the locality and the status of social norms (see Annex 2). Where social norms against littering are poorly developed, the measures may need to focus more on legislation and enforcement in the short term, together with longer-term behavioural measures to develop awareness of the problem of marine litter and its impacts. The ButtFREE measure in Australia uses fines to discourage dropping cigarette litter along with awareness raising and preventive action. Their ButtFREE website describes the fines as an "*unpopular, but ever-necessary 'stick' to follow the 'carrots' of behavioural change*"[72].

Authorities should therefore identify what measures are available to address the gaps and determine which are likely to be the most cost-effective for their particular locality. Various tools could be developed (by the Commission or Member States) to help with this process; such as, for example, one or more flowcharts to help with the decision.

Extensive information on the types of measures available to address marine litter is given in this report and in the other two reports, along with available information on their costs and effectiveness. Additional information is contained within the marine litter toolbox[73]. The gathering together of this information by national governments or the European Commission into a readily-accessible database could make it easier for local authorities to identify appropriate measures.

Agreeing and Implementing the Programme

Implementing an effective programme will require cooperation between the local authority and a range of partners, such as NGOs, schools and businesses, as well as with individuals (see sections 5.2.6 and 5.2.7). As the case study on measures targeting tourist beaches shows (see Annex 7), lack of coordination can limit the effectiveness of measures.

UNEP[74], for example, recommends that effective programmes to address marine litter should:

- be based on strengthening of public, governmental and private partnerships; and
- include development of a framework for engaging key stakeholders and partners.

The Love Where You Live Campaign in the UK prioritises working in partnership as a key to effectively achieving its goals of caring for local places and thus improving quality of life for individuals. It aims to encourage three million people and three thousand organisations to take action to reduce litter over a three year period. Box 5.6 describes the types of partnerships which it promotes.

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72 ButtFREE (2009): **ButtFREE** website**,** available at: http://www.buttfree.org.au/

73 Toolbox developed for the marine litter high-level preparatory meetings of which the third preparatory meeting took place in Brussels on 27 February 2012

74 UNEP (2009): **Marine Litter, a Global Challenge**, downloaded from: http://www.unep.org/regionalseas/marinelitter/publications/docs/Marine_Litter_A_Global_Challenge.pdf

Box 5.6: Partnerships in The Love Where You Live Campaign
Love Where You Live is based on key principles, one of which is to work in partnership. It encourages partnerships both at the local level as well as at higher levels. These partnerships may involve a variety of actors such as residents, schools, local housing authorities and associations, councils, businesses, not-for-profit organisations as well as partnerships with larger organisations such as Coca-Cola or Network Rail. The founding partners include Keep Britain Tidy, McDonalds, Imperial Tobacco, Wrigley and Defra. In addition, the initiative is supported by a wide range of groups such as Marine Conservations Society, Wrap, British Waterways, etc.
Source: ***Love Where You Live*** *webpage, available at: http://www.lovewhereyoulive.org/home.aspx*

Cooperation will be easier in locations with well-developed social norms, and harder where these do not exist. Here, there may be a need to develop cooperative networks from scratch, which will take longer.

Some additional costs may be incurred in engaging with stakeholders in this way, in terms of staff time for communication, meetings etc. However, as cooperation is likely to result in more effective and efficient implementation of the measures, it should result in lower costs in the long-term.

The costs of the measures themselves will depend on the exact measures selected, the scale and speed with which they are implemented etc. Information on the relative costs of different measures is presented in Section 4, as well as in the other two reports.

Monitoring the Impacts

A key aspect of the recommended approach is monitoring the impacts of the programme on a regular basis. This will help to shape the development of the programme and publicising the results to further enhance awareness of the issue and measures to address it.

As described in Section 4, there has been relatively little monitoring to date of the effectiveness of measures to address litter. Where monitoring has been carried out, it has focused on output measures, such as the number of posters exhibited, the number of guidance books distributed etc. There have been very few attempts to measure effectiveness in terms of actual reductions in the volume of litter or changes in behaviour of litterers.

One exception, where attempts to measure effectiveness in terms of actual reductions in the volume of litter or changes in behaviour of litterers have been made, is the review of the Danish Environment Ministry campaign 'Use More – Waste Less'. This campaign was completed in the second half of 2010 and included various elements such as a website, the use of social media (a website, Facebook profile), cooperation with network partners, events, press releases, etc. to encourage waste reduction. While not directly related to litter, the campaign aimed to change behaviour. The review is described in Box 5.7.

Box 5.7: Evaluation of the 'Use More – Waste Less' Campaign

The impact evaluation of the campaign involved three elements:

- a total of 1 578 quantitative interviews with Danes in the target group, aged 15-75 years. This was intended to measure public awareness of waste prevention, as well as measuring the effect of the campaign;
- in addition, five qualitative interviews were undertaken with network partners who participated in the campaign. This part of the study was designed to provide a picture of the effect of network partners' efforts, and to evaluate cooperation with network partners and their incentive to participate in the campaign; and
- finally, a development workshop was held. The workshop aimed to provide input for a follow-up campaign, which is expected in 2012. The workshop was attended by representatives from the Environmental Protection Agency and selected partners.

Concrete results of the campaign include:

- awareness raised (highest among men and people aged 56 years or older);
- the campaign's PR efforts, including publicity in radio, TV, newspapers and magazines, were deemed effective;
- about a quarter of respondents had gained information which they had seen on waste disposal trucks;
- after the campaign there was an increase in the amount of Danes who linked waste prevention with words such as 'good conscience';
- there was an increase in the amount of Danes who reduced their 'use-and-throw-away' habits;
- there was increased awareness among Danes about 'food waste' being a societal problem;
- one third of those who saw the campaign changed their behaviour on the basis of the campaign;
- it is stated that the campaign has reminded the public and made them aware of the importance of reducing waste in everyday life; and
- there is great interest from network partners to participate in future campaigns.

Source: Miljostyrelsen (2011): ***Effektevaluering af kampagnen 'Brug mere – spild mindre'****. Copenhagen, Miljostyrelsen, 13 July 2011. Downloaded from: http://www.mst.dk/NR/rdonlyres/69D1FFA4-91B9-4CBB-ADED-AB167D46A8A4/0/Evalueringaf_Brugmerespildmindre_13juli2011.pdf*

5.2.3 Programme for Member State Authorities

Member State authorities have responsibility for delivering the requirements of the MSFD, including those related to marine litter monitoring, target setting and implementing a programme of measures to achieve Good Environmental Status (GES). In this role, they can work with local and regional authorities, NGOs and the private sector to enhance their programmes of action on marine litter. The role of Member State authorities is also to support the local authorities' programmes through funding, facilitating exchange of experience and co-ordinating efforts at regional sea levels.

However, given the lack of good baseline data on trends and source of marine litter, the UK and many other Member States are not proposing to set targets for litter reduction in the initial MSFD management cycle, with a view to setting targets in 2018. Where additional management measures are required to support achievement of targets, it is likely that these will be incremental to existing programmes. Where such measures have historically had a terrestrial focus, some tailoring may be required to specifically address litter in the marine and coastal environment. There may also be a need to establish specific marine orientated measures, for example working with the fishing industry to reduce fishing litter. This will require co-ordination by Member States to ensure integration of MSFD measures with existing initiatives.

It is important to note that the measures do not have to be implemented by government organisations but it is the role of the Member States to ensure that those organisations which have been identified are given the tools to implement the measures (policy, funding etc.). For example, many of the measures identified in the Water Framework Directive Programmes of Measures in the UK, are to be delivered by landowners, charities and other NGOs. For marine litter it is likely that key stakeholders who have previous experience (such as the Marine Conservation Society and Keep Britain Tidy in the UK) are given the tools/funding to implement actions as well as local authorities and other where appropriate.

Another key action for both Member States and the Commission is to identify the drivers and economic benefits for managing marine litter; statutory and non-statutory. Once these are identified the Member State can then identify and map the appropriate measures and determine the benefits of implementation, and the most appropriate funding routes.

The recommended programme of actions for Member State authorities includes:

- identifying the drivers and benefits of managing marine litter;
- developing national strategies as part of the MSFD Measures. For example, in the UK the Department for the Environment, Food and Rural Affairs has supported initiatives to bring together NGOs, local authorities and businesses to develop coordinated strategies to address litter problems;
- sharing information between key stakeholders on amounts and sources of marine litter, particularly from monitoring to meet the requirements of the MSFD. Cooperation between national and local authorities as well as NGOs is likely to make monitoring of marine litter more cost-effective. Member State authorities can provide practical help to local authorities and NGOs such as guidance on monitoring protocols to ensure data from different local authorities are comparable, and training for key staff, as well as helping to ensure that appropriate finance is available;
- encourage NGOs and stakeholders in the private sector to launch behavioural, preventive and clean-up initiatives relevant to their fields of activity (such as the used cooking oil return campaigns in Hungary and Italy) by increasing funding and facilitating bottom-up approaches to take place;
- assisting local authorities to identify target groups responsible for littering by gathering together national research and information from both coastal and non-coastal areas;
- one important aspect of mapping existing actions related to marine litter is to ensure that neighbouring authorities and stakeholders (including authorities in neighbouring Member States) are aware of each others' actions, so that they can be effectively coordinated. Member State authorities can assist with this process, particularly in the context of MSFD programmes of measures;

- provide a platform for local authorities, NGOs and stakeholders in the private sector to share information and collaborate thus allowing for the expansion of programmes and projects;

- Member States can also provide guidance and resources to help local authorities to select and implement measures to address marine litter. Some Member States already provide access to resources to implement measures to address litter, such as the AUSMEPA website providing access to educational materials for teachers to use in schools and the Dutch guidance on street litter cleansing described in Box 5.2. Others, such as the UK Department for the Environment, Food and Rural Affairs, have supported initiatives to bring together NGOs, local authorities and businesses to develop coordinated strategies to address litter problems[75]; and

- finally, Member States can assist local authorities and other stakeholders to monitor the effectiveness of measures to address marine litter, for example by developing methodologies for assessment and by gathering and sharing the results of assessments of different measures.

5.2.4 Programme for the European Commission

The primary delivery mechanism to manage marine litter for the European Commission will be the MSFD. Through the MSFD the Commission requires each Member State to establish characteristics of Good Environmental Status (GES) (as required under Article 9) including targets and indicators by end 2012. Member States then have to develop programmes of measures by 2015 and implement these programmes by 2016.

Proposals for national characteristics of GES need to reflect definitions of GES as set out in the Directive and use the 11 high-level Descriptors of GES as their basis. The proposals also need to follow:

- criteria and indicators set out in commission Decision on GES; and
- proposed national targets and indicators based on GES descriptors.

Monitoring and reporting mechanisms by Member States will ensure compliance with the MSFD and as can also aid in the general reduction in marine litter. It will be important for the Commission to liaise directly with Member States to identify areas of good practice and determine where measures can be replicated in other Member States.

To improve information exchange, the data received from MSFD monitoring and compliance could be disseminated through a Commission website which could also be a hub for marine litter information. A current example is the Ourcoast website[76] for integrated coastal zone management (ICZM) which is the European Portal for ICZM and funded by the Commission. A marine litter portal could host links to published marine litter survey information, as well as the results of monitoring by

[75] An example is the "*Love where you live*" campaign, on which more information can be found at http://www.lovewhereyoulive.org/partners-supporters/founding-partners.aspx

[76] European Commission's website on Integrated Coastal Zone Management, accessible at http://ec.europa.eu/ourcoast

Member States in line with their MSFD obligations. This could also include the guidance on marine litter monitoring, once it is agreed, including common recording templates. As some of this is part of the Commissions role in relation to the MSFD, it may not require significant resources.

The Commission also has a wider research and educational function and can facilitate exchange of experience through research and pilot projects to test specific measures across Member States. The Commission could also enhance networking between authorities and other stakeholders (such as NGOs and companies in the private sector – see Section 5.2.6 and 5.2.7) responsible for marine litter and to improve their competencies. This could, for example, include facilitating 'twinning' of authorities and NGOs in countries with well-developed programmes and those without; funding and hosting training courses and workshops (including training focused on stakeholder groups, e.g. specifically on training for young children).

The Commission could further utilise social media applications to engage stakeholders and the public in the prevention and clean-up of marine litter. Its role would also consist of making additional funding available, facilitating further exchange of experience, coordinating efforts at regional sea levels and enforcing the existing European guidelines.

This approach is fitting with that of the Regional Seas Convention, which tackles regional environmental cooperation through the adoption of a 'tailored' approach to regional legal agreements. Most European Regional Seas Conventions are composed of a similar structure while differing in the specifics. This provides a flexible approach which can capture regional variation. The European Community is party to three of the four regional seas conventions that are aimed to protect the marine environment; these are the OSPAR, Helsinki and Barcelona Conventions. The MSFD requires Member States to align their marine strategies, where practical and appropriate, with the existing regional cooperation structures of the regional sea conventions.

The Commission website could also host an expanded version of the marine litter toolbox[77] (which would be expanded using the descriptions of measures developed for this and the other two projects) to identify what types of measures could be appropriate for different targets.

Flowcharts could be developed to assist with the process. Such an approach could also draw on other Commission models, such as the Pre-Waste Partnership, which brings together municipalities from ten Member States and is funded under the INTERREG IVC Programme. More information on the Pre-Waste project is given in Box 5.8.

[77] Toolbox developed for the marine litter high-level preparatory meetings of which the third preparatory meeting took place in Brussels on 27 February 2012.

Box 5.8: Objectives of Pre-Waste
The Pre-waste project has developed a consistent and comprehensive approach to help local and regional authorities to prevent waste generation. In particular, Pre-waste will deliver: • **guidelines** for planning, implementing and monitoring regional **waste prevention policies;** • 20 **best examples of waste prevention actions** implemented in the European Union by local or regional authorities, along with other **good practices; and** • a **web tool allowing the assessment** of waste prevention actions' efficiency **and monitoring**.
Source: http://www.prewaste.eu/project.html

Ideally, the marine litter toolbox should also contain information on broad costs of measures (there is a category for this in the template). Although there are currently only limited actual data on costs, some form of ranking and/or broad estimates could be developed, as has been done for this and the other two projects (e.g. in terms of amount of person-time needed to develop an educational course for primary school children).

The Commission could also provide links to actual examples of posters and communication tools, course contents, guidance on optimum location of bins etc. which could be used by authorities (there are precedents here, for example the Dutch guidance for local authorities on street cleaning described in Box 5.2, the MCS guidance on how to organise plastic bag bans described in Annex 4, etc.). Additionally, it might also be useful for the Commission website to provide links to local websites to encourage partnership working and consistency between neighbouring authorities.

In addition, the Commission could utilise social media applications such as Twitter, Tumblr or Facebook to raise awareness about marine litter related issues and projects. This approach differs somewhat to the current practice of social media communication undertaken by the Social Media Network[78] of the European Commission, which focuses on the communication of mandated staff members or agencies. Under the initiative, news and information related to a specific policy area would be communicated with the aim to increase the engagement of local stakeholders, who in turn could be linked to the Commission's account and insert local news and results. This approach could also facilitate information exchange and communication between local stakeholders.

Because we have found such a problem with lack of evidence on the cost effectiveness of measures, access to support, materials etc. could be conditional on local/Member State authorities providing feedback on results, so that a body of evidence can be gathered.

Finally, another example of Commission supported initiatives could include facilitating 'twinning' of authorities in countries with well-developed programmes and those without; funding and hosting training courses and workshops (more focused that the present stakeholder groups, e.g. specifically on training for young children).

[78] More information on the European Commission's social media communication approach can be found at http://ec.europa.eu/ipg/go_live/web2_0/index_en.htm

5.2.5 Programme for the Regional Seas Conventions

One of the key roles for Regional Seas Conventions is to ensure effective co-operation between States bordering regional seas in addressing marine litter. Some of the Conventions have already taken a range of initiatives on marine litter; for example, the OSPAR Marine Litter Monitoring Project[79]. The role of the Regional Seas Commissions (OSPAR, Mediterranean, Baltic Seas etc.) in terms of evidence on the cost effectiveness of measures, access to support, materials etc. should not be overlooked. This could be particularly important with respect to data gathering, where OSPAR in particular has significant experience at a trans-Member State level.

The Regional Seas Conventions allow for wider co-ordination than by the EU alone, as non-Member States can be included within the plans. One way this could be achieved is by supporting the development of Strategic Regional Action Plans on Marine Litter and including them within the relevant Regional Seas Conventions.

5.2.6 Programme for NGOs

A key role for NGOs is to operate behavioural, preventive and clean-up initiatives relevant to their fields of activity (such as the used cooking oil return campaigns in Hungary and Italy) by increasing funding and facilitating bottom-up approaches to take place. The NGO and charity sectors need to be fully engaged, both through the MSFD Programmes of Measures and through their inclusion in national and regional strategies for litter management. Their engagement and support in the implementation of the Member State and Local Authority actions is fundamental to the successful management of marine litter. Both Member State and local authorities should work with these sectors and make government funding available to them. In addition, where good practice by NGOs is identified, supporting its replication across Member States can improve the efficiency of measures to address marine litter.

As described in Sections 3 and 4 of this report, NGOs have played a key role in raising awareness of marine litter and developing programmes to address the issue. NGOs are well positioned, with links to local stakeholders, to enable them to design effective measures suitable for local areas. They can adopt bottom-up approaches and encourage local cooperation and partnerships. The main problem that NGOs have faced is in raising funds for their activities to ensure continuity over time, and achieving effective co-ordination between different initiatives. As the case study on measures targeting tourist beaches shows (see Annex 7), lack of coordination can limit the effectiveness of measures.

Cooperation between NGOs and national and local authorities is likely to make action to address marine litter more cost-effective and consistent, as well as enhancing the behavioural impacts. Member State and local authorities can provide practical help to NGOs such as guidance on monitoring protocols, to ensure data from different local authorities are comparable, and training for key staff, as well as helping to ensure that appropriate finance is available. Their engagement and support in the implementation of the Member States and Local Authority actions is fundamental to the successful management of marine litter.

[79] MCS (2012): **Beachwatch website,** available at: http://www.mcsuk.org/beachwatch/

5.2.7 Programme for the Private Sector

The private sector can work with local, regional and national authorities, as well as with the European Commission, to enhance the effect of the programmes outlined above. For example, the private sector already participates in Commission initiatives, such as the marine litter high-level preparatory meetings, as well as acting as partners in or initiators of many of the measures described in Sections 3 and 4 of this report. Moreover, as highlighted in Annex 3 the anti-littering measures collected include a number of private initiatives ranging from educational campaigns and paper collection in schools to plastic bag reducing campaigns by supermarkets.

The key industry sectors which can provide input to the programme include:

- the plastics and packaging industries;
- retailers;
- the tourism and recreational sector; and
- other business sectors.

The Plastics and Packaging Industry

The plastics and packaging industry can play a key role in aiming to reduce the amount of plastics and packaging materials which end up as litter. This could include, for example:

- promote re-use and recycling, and use less material for products and their packaging, to reduce the amount of waste requiring disposal which could potentially end up as litter;
- taking account of eco-labelling criteria in product design; and
- continuing to promote and finance anti-litter initiatives, such as the Love Where You Live Campaign in the UK (described in Box 5.6 above).

The industry can also continue to work with regulatory authorities and NGOs to develop behavioural campaigns to encourage recycling and responsible disposal of waste packaging,

Retailers

Retailers are closest to the consumers and thus are in a good position to impact their purchasing choices by providing information about the effects of litter. They also have a key interest in ensuring that the areas in which they are located are litter-free, given the poor perception of littered areas described in Section 2 of this report, which could adversely affect their businesses. Many retailers have already begun to take action, particularly in relation to plastic bag bans (see the Case Study on plastic bags in Annex 4 of this report).

Potential actions that retailers could take include:

- providing information to customers on the impacts of litter on the marine environment, and the environment in general;

- participating in separate collection and deposit refund systems for bottles and bags and promoting alternatives to plastic bag use;
- providing facilities for disposal of litter and participating in local clean-up activities.

Tourism and Recreation Sector

The tourism and recreation sector in coastal areas is directly affected by marine and coastal litter, as it can make destinations less attractive to tourists. The sector also provides a direct way to target the transient tourist population, which may be harder for local authorities to reach through other means. A programme for the tourism and recreation sector could include the following activities:

- inform tourists about the impacts of litter on the marine environment;
- provide funding for and encourage the use of waste and litter disposal facilities, including on-beach equipment such as ashtray cones;
- participate in and promote stewardship concepts such as adopt-a-beach and clean-up plans for events.

Other Business Sectors

As discussed in Sections 2.2 and 2.3 of this report, littering in the workplace can make an important contribution to marine litter. There is therefore a role for all business to act to minimise the potential for poor waste management practices that can lead to litter.

One of the main ways in which businesses can do this is to develop effective environmental management plans, incorporating problem identification, development of best practices and staff training. As identified in section 2.2.5 as the behaviour of people at work is often similar to their behaviour outside work factors such as context, facilities, attitudes and perceptions, will influence littering of business and commercial waste by people.

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