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STUDY ON LAND-SOURCED LITTER (LSL) IN THE MARINE ENVIRONMENT

Review of sources and literature

In the Context of the Initiative of the Declaration of the Global Plastics Associations for Solutions on Marine Litter

Darmstadt / Freiburg 26.01.2012

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Lay out prepared to print front and back side

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Abbreviations

BKV	Beteiligungs- und Kunststoffverwertungsgesellschaft mbH
ECO-LEF	Public System for Recovery and Reuse Waste
EEA	European Economic Area
EEE	Electric and Electronic Equipment
EMCs	Eastern Mediterranean countries
EC	European Commission
EU	European Union
EuPC	European Plastics Converters
FCIO	Fachverband der Chemischen Industrie Österreichs

GIS	Geographic Information System
HELCOM	Helsinki Commission/The Baltic Marine Environment Protection Commission
ICC	International Coastal Cleanup
ICZM	Integrated Coastal Zone Management
IK	Industrievereinigung Kunststoffverpackungen e.V.
KIMO	Kommunenes Internasjonale Miljøorganisasjon
KVS	Kunststoff Verband Schweiz
LSL	Land-Sourced Litter
NGO	Non-Governmental Organization
NMDMP	National Marine Debris Monitoring Program
MAP	Mediterranean Action Plan
MARPOL	International Convention for the Prevention of Pollution by Ships
MSW	Municipal Solid Waste
MW	Municipal Waste
NABU	Naturschutzbund Deutschland e.V.
NUTS	Nomenclature of Units for Territorial Statistics
NUTS 1	Major socio-economic regions
NUTS 2	Basic regions for the application of regional policies
NUTS 3	Small regions for specific diagnoses
NMCs	Northern Mediterranean countries
OSPAR	Convention for the Protection of the Marine Environment of the Northeast Atlantic
PE	Polyethylene
PP	Polypropylene
POPs	Persistent Organic Pollutants
SMCs	Southern Mediterranean countries
SSL	Sea-Sourced Litter
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environmental Programme
WFD	Waste Framework Directive
WP	Working Programme
WWF	World Wide Fund For Nature (International);
WWTP	Waste Water Treatment Plant

Content of the document: *Study on Land-Sourced Litter (LSL), 2011*

Status of the document	Draft	Final Draft	Approved	Disseminated
	☐	☐	X	☐

		Date of revision
Draft outline by	Dr. Georg Mehlhart (GM)	2011 04 11
Section 2	Markus Blepp (MB)	2011 12 13
Section 1, 3, 4, 5, 6, 7, 8, 11, 14	GM	2011 12 12
Section 9, 10, 12, 13	MB	2011 12 13
Language Review	Nicole Neurohr	2011 12 14
Final Revision	GM / MB	2012 01 18
Language Review	Vanessa Cook	2012 01 25

Reference (“documents name”) *OEKO_Institut_LSL_Final_20120126.doc*

Introduction by the sponsors

This study on land sourced litter was commissioned by BKV, IK, KVS and FCIO in spring 2011 in the context of the "Declaration for Solutions on Marine Litter" as adopted by more than 50 plastics industry associations globally in Hawaii in May 2011.

The general objective of this declaration is to contribute to the prevention and minimisation of marine litter, acknowledged as a complex, multi-faceted and serious global problem. Therefore global and regional solutions are required, such as those coordinated and advocated by the United Nations Environmental Programme (UNEP). Most of the marine litter is supposed to be plastics waste, mainly land-sourced, the majority of which floats, while the other types of waste sink to the bottom of the seabed.

The Declaration for Solutions on Marine Litter of the global plastics industry associations outlines a six-point-strategy for industry action and advocates close cooperation with governments, NGO's, researchers and other stakeholders to prevent marine litter. The plastics industry will:

1. *Contribute to solutions by working in public-private partnerships aimed at preventing marine debris;*
2. *Work with the scientific community and researchers to better understand and evaluate the scope, origins and impact of and solutions to marine litter;*
3. *Promote comprehensive science-based policies and enforcement of existing laws to prevent marine litter;*
4. *Help spread knowledge regarding eco-efficient waste management systems and practices, particularly in communities and countries that border our oceans and watersheds;*
5. *Enhance opportunities to recover plastic products for recycling and energy recovery; and*
6. *Steward the transport and distribution of plastic resin pellets and products from supplier to customer to prevent product loss and encourage our customers to do the same.*

Against this background this study represents a contribution for action point 2 of the Global Declaration comprising "Work with the scientific community and researchers to better understand and evaluate the scope, origins and impact of and solutions to marine litter".

The objectives of this study were to:

- *Gather high-quality data from a detailed literature review regarding the present situation of land sourced litter in the Mediterranean Sea, the North Sea and the Baltic Sea. This data analysis may serve as a long-term reference and provide a basis for subsequent discussions and strategies;*
- *Display possible research and implementation activities of different stakeholders and behaviour aspects in the field of LSL;*
- *Pave the ground for sound impact assessment of measures to reduce land sourced litter most effective and efficient.*

This work package on land sourced litter is addressing only one aspect of marine litter and we are fully aware of other aspects which are not covered by this report on land sourced litter as for instance:

- *Law enforcement (as far as adequate law is established);*
- *Ecological impact assessment of marine litter;*
- *Monitoring, including biological monitoring;*
- *Education & awareness rising;*

We know that this study provides a starting point only and more work focussing on measures is required to meet the general objective - to prevent marine littering through plastics waste.

BKV Beteiligungs- und Kunststoffverwertungsgesellschaft mbH

BKV Beteiligungs- und Kunststoffverwertungsgesellschaft mbH (Plastics Recovery Holding of the German Plastics Industry) operating as Platform for Plastics and Recovery is a joint undertaking of German plastics manufacturers, plastics converters, and plastics machinery builders; respective associations are amongst their shareholders, too. Via BKV the German plastics industry administers their product responsibility with regard to consumers and environment. In doing so BKV addresses all issues of plastics sustainability focusing on resource efficiency and plastics recovery issues, especially.

In particular BKV

- *monitors and informs about market development of plastics and plastics recovery and the respective parts of the industry;*
- *calls attention to upcoming important issues;*
- *commissions studies on such issues;*
- *encourages an unbiased communication between industry, politics, and society in cooperation with the relevant associations.*

IK Industrievereinigung Kunststoffverpackungen (IK)

The German Plastics Packaging Industry Association is the voice of the manufacturers of plastics packaging and films acting on the German market and represents

- *more than 300 member companies*
- *over 80 per cent of the market*
- *a branch with 4 Mio t annual production of plastics packaging and films*
- *an industry with more than 14 billion Euros annual sales and*
- *over 90.000 employees*

IK plays a key role as a successful trade organization on national, European and international level.

Kunststoff Verband Schweiz (KVS) / Swiss Plastics Association (KVS)

- *acts as spokesman of the Swiss plastics industry with 854 companies which offer about 35‘000 jobs and generate a turnover of 15.8 bn CHF.*
- *represents the plastics industry sector over the whole value chain, particularly its sections and its members towards the authorities, the media and other industry associations, nationally and internationally.*

- *operates a head office which professionally manages the key aspects of vocational and continuing training, communication, environmental issues and technology.*
- *has access to a large wealth of knowledge generated in various working groups.*
- *is available to its members and to the public for all type of information about plastics.*

FCIO- Fachverband der Chemischen Industrie Österreichs

The Association of the Austrian Chemical Industry - FCIO represents the interests of all Austrian companies which manufacture chemical or plastics products on an industrial basis.

Main tasks and activities:

- *Representation of membership at all level of government.*
- *Information and advisory service to members. Typical issues include chemical legislation, environmental protection, transportation of dangerous goods, public relations.*
- *Collective bargaining with trade unions.*

Executive Summary

This study on land sourced litter (LSL) was commissioned by four associations of the plastics industry in Germany, Austria and Switzerland. The objectives were to:

- Gather high-quality data from a detailed literature review regarding the present situation of land sourced litter in the Mediterranean Sea, the North Sea and the Baltic Sea. This data analysis may serve as a long-term reference and provide a basis for subsequent discussions and strategies;
- Display possible research and implementation activities of different stakeholders and behaviour aspects in the field of LSL;
- Pave the way for sound impact assessment of measures to reduce land sourced litter most effective and efficient.

Data on Marine Litter

The data collection considers the Mediterranean Sea, the North Sea and the Baltic Sea. LSL is distinguished from sea sourced litter (SSL) as displayed in the **Table A** below.

Table A: Overview of the SSL and LSL sources of marine litter

Sea (ocean)-based sources of marine litter (SSL)	Land-based sources of marine litter (LSL)
Waste from vessels	**Individual actions**
• Merchant shipping (cargo, equipment, etc.) • Naval and research vessels • Private vessels (pleasure) • Public vessels (cruise liners, ferries)	• Littering in general (inland and coastal) • Littering caused by tourism (recreational visitors to the coast) • Events (e.g. charity, fly balloons)
Fishing activities	**Facilities and construction**
• Fishing vessels • Abandoned, lost or otherwise discarded fishing gear (fishing nets, ropes and light sticks) • Aquaculture installations	• Industrial or manufacturing outfalls (e.g. by-products, plastic resin pellets) • Construction and demolition sites • Harbours (Seaport, commercial port, fishing port, ferry port etc.) • Ship-breaking yard • Agriculture activities
Other structures	**Municipalities**
• Legal and illegal dumping at sea; • Offshore oil and gas platforms, and drilling rigs	• Litter and waste generated in coastal and inland zones from improper waste management • Wastes from dumpsites located on the coast or riverbanks • Untreated municipal sewerage
Transport of litter and waste	**Transport of litter and waste (on land or on waterways)**
• Natural events.(tsunamis, storm, strong sea)	• Rivers and floodwaters; • Discharge from storm water drains / sewer; • Natural storm related events (e.g. mistral, tornadoes, hurricanes)

Relevant literature and studies address the marine waste either as “items” or as “volume in kg” and distinguish between beach litter, floating litter in the water column and litter at the sea floor. Much more data is available for “items” than for “volume” and most of the data refers to beach litter; data for floating litter and sea floor is rarely available. Biological monitoring (e.g. fulmar stomachs monitoring) is not considered in this report. As the results of monitoring depend on local conditions, data aggregation or even comparison is difficult. Therefore we demonstrated the range of results in a comprehensive Annex. **Table B** below shows an example of beach litter found on the shore of the Baltic Sea.

Table B: Example of beach litter found on the shore of the Baltic Sea

BEACH LITTER		BALTIC SEA											
		Baltic Sea					*Country specific*						
							Estland		Finnland	Latvia	Poland	Russia	
Total [kg litter/area]	min	0.4					25.2		1				
	average	33				1.5	35.0		11			1128m²*	
	max	65.6					44.8		45				
Total [item litter/area]	min	6		4	6		9.3		21				
	average	603		92.5	603		14.1		260				
	max	1200		181	1200		18.8		691				
Plastic [kg litter/area]	min								0.3				
	average								3.6				
	max								14.9				
Plastic [item litter/area]	min	3.0			1.8		1.0		11.3				
	average	340.7			271.4		1.5	1.6	140.4	2.2			1.1
	max	756.0			720.0		2.0		373.1				
Percentage of plastics [% kg]	min												
	average								33%		48%		
	max												
Percentage of plastics [% item]	min	50%	50%		30%								
	average	57%	60%		45%		52%	57%	54%	42%			48%
	max	63%	70%		60%								
Type of plastics		Plastics	Plastic bags + Bottles		Plastics		Plastics	Plastic bags + Bottles	Plastics	Plastic Bottles	Plastics		Plastic bags + Bottles
References		UNEP (2009b), pp. 29-31	WWF, 1998-2005. Naturewatch Baltic Report. http://www.naturewatchbaltic.org/. 13.2.2008.	Tuomisto (1994)	SAO (2010)	UNEP 2009b, 191	UNEP 2009b, 29-31	WWF (2006)	Tuomisto (1994)	WWF (2006)	UNEP 2009b, 31	UNEP 2009b, 30	WWF (2006)
Comments		Total highest amount 700-1200 pieces/100m; lowest amount 6-16 pieces/100m. 58% litter attributed to shoreline activities. Values items from UNEP 2009b Figure 1 p.29	Plastic bottles: 31-43%; Plastic bags: 19-27%			ICC Data			Surveys in 15 beaches. 40% of the litter comoes from Russia, Estonia, Latvia and Lithuania and 21% from Poland		Fisheries Protection Board of Poland	Over an area of 540m² in St. Petersburg collected in 2006	
Raw data	Calculated												

Based on the literature review and the kind of data compilation displayed above the following assumptions are supported:

- Numerous international data demonstrates that LSL has a share of 75% to 90% the total marine litter items (see **Figure 2**[1] and **Figure 3**[1]) at beaches. These observations are mainly based on the collection of beach litter. No valid data is available for volume in kg or for the water column or the sea floor.
- The patterns for the three European seas in question differs from the global picture. as less plastic bags are detected (in per cent of all detected items).
- For the Mediterranean Sea and the Baltic Sea LSL is predominant; all “top ten” items are LSL (see **Table 2**[1]).

[1] See main report.

- For the North Sea (and the north-east Atlantic) LSL is also predominant but in contrast to the above-mentioned seas more than 20% of the detected items found on reference beaches of the North Sea are SSL, more specifically they are waste from fishing activities.
- In terms of marine litter, plastics is the predominant material. Regardless of whether reported as items or volume or for beach or water column or sea floor, no report refers to plastics having less than a 30% share; some refer to shares of up to 90%.
- Data refers to the situation in a defined area at the time of the investigation or monitoring programme as a spot check. Due to the prevailing local conditions it is very difficult to detect trends. However the German government reported that the plastic content in the total marine waste observed at beach of the German North Sea has increased from 68% in 2001 to 78% in 2006.
- Considerably more literature and details which might serve as a reference for future discussions are provided in the main report and the annex.
- Harmonisation of monitoring programs is most advanced for the North Sea covered by the OSPAR convention. In order to ensure a better combination of different data sources it is strongly recommended that joint guidelines are developed, at least for a regional sea such as the Baltic Sea or the Mediterranean Sea.

Data on plastic production and reuse

PlasticsEurope reports that a demand of the European Plastic Converters (EU-27 +Norway + Switzerland) amounts to 46.4 million tonnes for different segments. The dominant segment is packaging material (mainly PE-LD, PE-HD, PP, PET) and building and construction material (mainly PVC PE-HD, EPS). The exact whereabouts of the 46.4 million tonnes is difficult to detect as the import / export of products and post-consumer material and the effects of stocks is not reported. However the total post-consumer plastic waste is estimated by PlasticsEurope to be 24.7 million tonnes for 2010 with a recovery rate of 57.9 per cent.

Eurostat reports an amount of 14.5 million tonnes for EU-27 in 2008 for the segment plastic packaging post-consumer waste. Six million tonnes thereof have been disposed of (mainly on landfills). Even though the recycling rate has increased in recent years, the total disposed volume of plastic packaging has remained more or less stable as improved recycling activity was compensated by rising amounts of plastic packaging put on the market.

Data on "pressure indicators"

Comprehensive analyses have been carried out to identify potential reasons for LSL (=pressure) and indicators demonstrating the level of this pressure as displayed in **Table C**. The reasoning and availability of indicators is discussed in detail in the main report.

As displayed in **Table C** below, most of the indicators need to be considered in combination with the level of the municipal waste management. In this context it is important to understand the characteristic of an indicator. It is not sufficient to change the drivers of the indicator alone: rather the pressure (respectively the effects of the pressure) needs to be taken into account under realistic conditions. This applies, for instance, to the waste water treatment being an important source for LSL but no valid data is available to establish an

appropriate indicator. Thus data on municipal waste management is considered as an approximation. But changes in municipal waste management will not be sufficient to change the effects of poor waste water treatment.

Table C: Overview of impacts and related indicators for land-sourced litter (numbers (e.g. 4.1) refer to the chapter in the main report)

Pressure	Indicator
Population density (4.1)	Population density (4.1) *- in combination with-* groups for municipal waste management (4.4.1)
Tourism / recreation (4.2)	
Level of littering (inland / seashore)	-/-
Littering caused by tourism / recreational visitors / events to the coast	Nights spent by residential and non-residential in tourist accommodation establishments (4.2) *- in combination with-* groups for municipal waste management (4.4.1)
Activities at ports (4.3)	
Level of littering at ports	-/-
Littering caused by commercial activities at ports	Marine transport of freight; loaded and unloaded (4.3) *- in combination with-* groups for municipal waste management (4.4.1)
Solid waste management (4.4)	
Collection and treatment of municipal waste (4.4.1)	Groups for municipal waste management (4.4.1)
Dumpsites located on the coast or riverbanks (4.4.2)	Groups for municipal waste management (4.4.1)
Plastic packaging waste management (4.4.3)	Plastic packaging waste disposed off (4.4.3) *- in combination with-* groups for municipal waste management (4.4.1)
Waste management of commercial and industrial waste (4.4.4)	Groups for municipal waste management (4.4.1)
Waste management of agricultural plastic waste (4.4.5)	Groups for municipal waste management (4.4.1)
Waste water treatment (4.5)	
Coverage of collection (sewer) and treatment (4.5.1)	Groups for municipal waste management (4.4.1)
Sewer overflow, combined sewer overflow (4.5.2)	Groups for municipal waste management (4.4.1)

Comparing the three seas, differences in structure and pressure for different regions became visible, as demonstrated in the Table below. For instance, the following observations apply:

- The indicators population density, tourism activity and activities at ports are, in relation to the length of the shore, at the lowest level for the Baltic Sea.
- The North Sea has the highest level (in relation to the shore) of the economic activities at ports.
- The Mediterranean Sea has the highest pressure from inhabitants and tourism compared to the other two seas.

Table D: Regional differences for the three seas

	Baltic Sea	North Sea	Mediterranean Sea
Coastline (km)	37 043	13 144	55 629
Volume (km^3)	21 547	94 000	3 700 000
Average depth (m)	53	125	ca. 1500
Surface (km^2)	374 000	750 000	2 500 000
Inhabitants in catchment area	85 million	184 million	460 million
People in the administrative area* bordering directly to the shore	27 million	26 million	77 million
Nights spent by residents and non-residents in tourist accommodations in the administrative area** bordering the shore	128 million	136 million	>650 million
Load and unloaded freight (Million tonnes) at ports	636	987	>1100

* NUTS 3

** NUTS 2

In addition to the geographical differences shown in **Table D** above it is important that the waste management (and waste water treatment) around the Mediterranean Sea is less developed than for the other seas (**see Map 14.4**) and the same applies for plastic waste disposal (**Map 14.5**).

Countries where a high population density (**Map 14.1**) and a high level of tourism (**Map 14.2**) (or a high level of port activities, **Map 14.3**) is combined with less developed waste management (**Map 14.4**) and a relevant level of plastic packaging waste disposal (**Map 14.5**) must be deemed the regions with the highest risk for LSL.

The Maps 14.1. to 14.5 demonstrate that there is still much progress to be made within the EU-27 and EEA countries to improve waste management and to avoid LSL. This includes activities addressing behaviour, particularly in terms of the use of shores for tourism and recreation. With regard to the Mediterranean Sea much more attention needs to be given to

the Mashreq and Maghreb regions and also to some western Balkan countries in which a high population density is combined with low waste management standards.

Behaviour aspects

Behavioural aspects and general trends could be very relevant to understanding reasons for LSL. Different attitudes can cause different volumes and characters of material flows. Attitudes might also differ according to activity, for instance individuals spend much less attention to littering during recreation periods than during time spent at home.

The effects of behaviour on volume and characteristics of LSL are difficult to detect.

Behavioural aspects need to be explored in each specific country and the findings analysed in order to improve understanding of the reasons for LSL. The overall purpose of these efforts is to make people familiar (e.g. special activities for children at school) with the concept and reality of marine litter and to make them care about it. Educational programmes (e.g. focusing on waste management in general and/or marine litter specifically), public awareness and information activities are an important pillar of future measures to be taken in order to reduce marine litter in the oceans.

Stakeholders

With regard to the stakeholders the national and even the sub-national level is crucial, as it is here that decisions are taken on the appropriate enforcement of strategies, measures and objectives. Further, this includes a better understanding of the above-mentioned behaviour aspects in the specific countries as well as the consideration of the future trends and aspects concerning the impact of pressures on European seas.

1 Introduction

As mentioned above the objectives of this study for BKV, IK, KVS and FCIO were to:

- Gather high-quality data from a detailed literature review regarding the present situation of land sourced litter in the Mediterranean Sea, the North Sea and the Baltic Sea. This data analysis may serve as a long-term reference and provide a basis for subsequent discussions and strategies;
- Display possible research and implementation activities of different stakeholders and behaviour aspects in the field of LSL;
- Pave the ground for sound impact assessment of measures to reduce land sourced litter most effective and efficient.

It is important to understand that the study has a narrow focus and will not address all issues related to marine litter.

1.1 Regional coverage

The regional scope of this study covers three seas: the Mediterranean Sea, the North Sea and the Baltic Sea. Thus, from a European point of view, the Atlantic Ocean and the Black Sea are excluded.

1.2 Structure of the study

The report is structured as a top-down report, beginning with a general overview of the situation and focus of marine litter in chapter 2, which introduces definitions and general issues as well as a section showing the quantities of (plastic) marine litter by region according to the identified sources.

Chapter 3 addresses the generation and whereabouts of plastics across Europe. However, this section is kept short as most of the information relies on information published by PlasticsEurope and is thus well known by the client.

Several potential sources for land-sourced litter are identified in Chapter 4, and a series of pressure indicators is proposed.

Chapters 5 to 7 provide detailed information for the three seas in question including the detailed analysis of the pressure indicators and chapter 8 provides a first overview of different patterns for the structure and the pressure the three seas are exposed to.

Chapter 9 addresses behaviour aspects and chapter 10 provides an overview of the stakeholders involved while the conclusions are given in chapter 11.

2 The current situation of marine litter

2.1 Marine litter

Marine litter is any persistent, manufactured or processed solid material discarded, disposed or abandoned in the marine coastal environment (UNEP 2005).

Marine litter is a complex issue and found in all the oceans of the world, not only in densely populated regions, but also in remote places far from obvious sources and human activities. It does not respect national boundaries or territorial claims, and often the garbage produced or consumed in one country can end up somewhere completely different.

Marine litter is an environmental, economic, health and aesthetic problem, and furthermore it causes serious ecological damage to marine wildlife. From an economic perspective, marine litter results in immense costs each year for tourist regions or local communities (e.g. beach cleaning).

The problems it causes are both cultural and multi-sectorial, rooted in poor solid waste management practices, extensive use of marine resources, lack of infrastructure, indiscriminate human activities and behaviours, and an inadequate understanding on the part of the public of the potential consequences of their actions (UNEP 2009b).

Marine litter is, not least because of the impacts mentioned above, also an area of increased concern for European seas. The management of its impacts has been included in the Marine Strategy Framework Directive (2008/56/EC)[2] and in regional sea conventions. The aim of the Directive 2008/56/EC is to achieve good environmental status in Europe's seas by 2020. This good environmental status is defined by 11 qualitative descriptors of the marine ecosystem (2008/56/EC, Annex 1). Descriptor 10 defines the input of waste in the ocean: *"Properties and quantities of marine litter do not cause harm to the coastal and marine environment"*. However, a commonly used and applicable definition relying on indicators demonstrating harm or not is still lacking.

Marine litter, also known as **marine debris,** occurring in different sizes washed up on beaches, floating on the water surface or drifting in the water column and sinking to the sea floor.

1. Litter washed on the coastline **(beach litter)** is one of the most obvious signs of marine litter pollution and can appear from land- or sea-based sources.
2. **Floating debris** (on the water surface and in the water column <40 cm depth) in the sea can be estimated either by direct observation of large debris items, by net trawls for smaller items or by aerial surveys.
3. **Sea floor debris**: debris on the sea bed is much less widely investigated than the water surface.

One problematic litter is the plastic garbage, as it has a very slow rate of decomposition[3] and a large amount of plastics is visibly accumulating in widespread areas (called very

[2] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0056:EN:HTML

[3] For instance, a plastic bottle can remain intact for up to 450 years or a disposal nappy up to 500 years (MGU 2011).

often as 'great garbage patches') of the sea. The accumulation is more like a soup of small plastic particles (similar to ocean plankton), spread throughout the upper water column. Due to their visibility and low degradability the plastic debris are often seen as the primary problem, while other types of marine litter are sinking straight down to the bottom of the sea due to their higher weight .

Already in the 1970s, MARPOL[4] signed the first international agreement on the prevention of pollution of the marine environment from ships by operational or accidental causes. Several other programs and laws have been implemented on the European and global level. Up to now these initiatives have not been able to stop the waste flow into the seas.

Marine littering is seen as a problem of a lack of coordinated national and international strategies and of deficiencies in the implementation and enforcement of existing programmes, regulations and standards. Global solutions are needed such as those coordinated and advocated by the United Nations Environmental Programme (UNEP). Several institutions around the world have supported the UNEP Regional Seas Programme[5] as a platform, and have developed strategies such as monitoring programmes (although with certain limitations in the standardisation of methods), education and public awareness campaigns, mitigation activities (including the creation of integrated solid waste management, economic incentives and controls to reduce amounts). However, the funding has become a sensitive issue as marine litter crosses institutional and administrative departments inside the governments (UNEP 2009a). Furthermore, more than 50 plastics industry organisations from around the world have signed up to a *"Joint Declaration for Solutions on Marine Litter"*[6], which outlines a six-point strategy for the plastics industry on reducing marine litter. The declaration shall also provide for a close cooperation with a broad range of stakeholders. The sponsors of this study assess this project as a contribution for point two of the Global Declaration of the plastics industry (see *Introduction by the sponsors*). Moreover the European Plastics Converters (EuPC) has launched the Waste Free Oceans[7] project as a foundation that is willing to investigate the problem of floating marine debris together with fishermen.

The diverse and diffuse pathways of marine debris are varied and come from sea-based or land-based activities. The following sub-chapter summarises the two main sources of marine litter.

2.1.1 Main source of marine litter

Marine debris is often the result of actions by individuals on land or at sea. Incorrectly covered waste bins, littering in streets, parks or on beaches, and items thrown overboard can all become marine debris. Items can be transported over long distance with ocean currents and winds before landing on coastlines or entering the ocean.

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4 International Convention for the Prevention of Pollution from Ships (MARPOL); http://www.imo.org/about/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx

5 UNEP's Regional Seas Programme aims to address the increasing degradation of the world's oceans, coastal and marine areas, through the sustainable management and use of these environments, by engaging member countries to cooperate in comprehensive and specific actions for the protection of their shared marine environment (UNEP 2009b).http://www.unep.org/regionalseas/

6 http://www.marinelittersolutions.com/default.aspx

7 http://www.wastefreeoceans.eu/

To understand the reasons for marine debris we outlined based on numerous references, the sources that generate or transport marine debris in **Table 1**. In marine pollution **Land-Sourced Litter (LSL)** is mainly derived from coastal pressures as urban populations, agriculture as well as industrial and manufacturing activities, while sources of **Sea-Sourced Litter (SSL)** include waste from vessels, other structures and natural events. The following table gives an overview of the main sources of marine litter.

The inland or coastal pressures such as tourism, industrial and manufacturing facilities and different activities in a municipality lead to litter and waste pollution. During any natural event this litter or waste could be washed up in storm drains (floods), rivers and other waterways. Once in these pathways, the waste can be carried to the oceans. Similar to marine litter originating from land-based sources, debris from sea-based sources is a result of accidental or deliberate human actions.

The following **Figure 1** gives a first overview of possible pressures on the coastal zone.

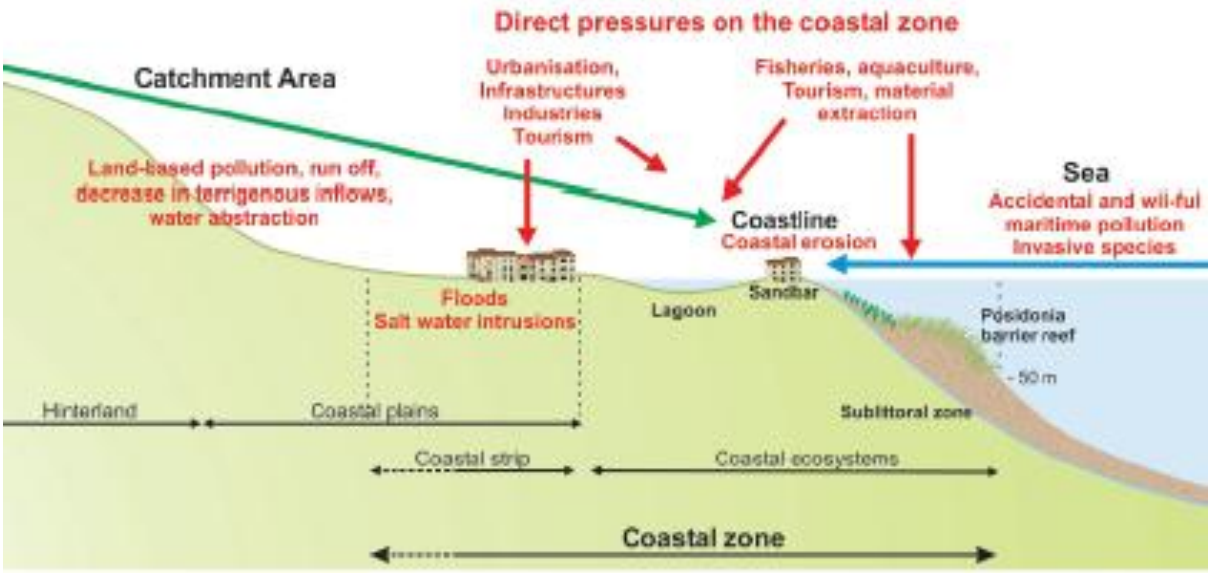

Figure 1: Situation liable to lead to pollution on coastal zones. Source: (IKZM 2008)

These sources of marine litter cause several problems to marine environments, including social, economic and environmental issues. According to Moore (2008) these can be summarised as:

- tourism and health hazard – clean beaches are desired; high costs for the municipalities
- ghost net entanglement;
- ingestion of debris;
- low biodegradability;
- accumulation of POPs and other chemical substances in debris;
- gas impermeabilisation of the seabed – plastics are preventing that marine “snow” reaches the seafloor generating an impact on the gas cycles and
- economic losses and damage of vessels.

Table 1: Overview of the SSL and LSL sources of marine litter

Sea (ocean)-based sources of marine litter (SSL)	Land-based sources of marine litter (LSL)
Waste from vessels[8]	**Individual actions**
• Merchant shipping (cargo, equipment, etc) • Naval and research vessels • Private vessels (pleasure) • Public vessels (cruise liners, ferries)	• Littering in general (inland and coastal) • Littering caused by tourism (recreational visitors to the coast) • Events (e.g. charity, fly balloons)
Fishing activities	**Facilities and construction**
• Fishing vessels • Abandoned, lost or otherwise discarded fishing gear (fishing nets, ropes and light sticks) • Aquaculture installations	• Industrial or manufacturing outfalls (e.g. by-products, plastic resin pellets) • Construction and demolition sites • Harbours (Seaport, commercial port, fishing port, ferry port etc.) • Ship-breaking yard • Agriculture activities
Other structures	**Municipalities**
• Legal and illegal dumping at sea; • Offshore oil and gas platforms, and drilling rigs	• Litter and waste generated in coastal and inland zones from improper waste management • Wastes from dumpsites located on the coast or riverbanks • Untreated municipal sewerage
Transport of litter and waste	**Transport of litter and waste (on land or on waterways)**
• Natural events (tsunamis, storm, strong sea)	• Rivers and floodwaters; • Discharge from storm water drains / sewer[9] • Natural storm related events (e.g. mistral, tornadoes, hurricanes).

[8] The waste can come from mismanagement of ship wastes, cargo, equipment, containers, leftover from the galley, fishing gear, accidental losses etc.

[9] Under normal weather conditions, sewage is carried to a wastewater treatment (Various proportion of population served by connections to sewerage systems and central wastewater treatment in EU-27). However, during heavy rains the handling with the capacities of the wastewater treatment systems may be exceeded and the sewage plus storm water is then not treated and is directly discharged into rivers and oceans.

2.2 Land-Sourced Litter (LSL)

2.2.1 Situation worldwide

LSL is seen as a problem of a lack of coordinated national and international strategies and of deficiencies in the implementation and enforcement of existing programmes, waste management systems, regulations and standards. It is a cross-border problem. Apart from individual actions being in many marine regions the main direct pressure on the coastal zones, the rivers, storm water drains, sewages or wind are the main channels of litter transportation to the oceans. Plastics dominate the debris, including pre-production plastics (in the form of pellets, powders or production scrap) which account for 10 percent of the total plastic amount (Moore 2008). However, not only plastics are found floating or in the bottom of the ocean; there are many other different materials too: wood, paper/cardboard, metal, glass, rubber, or clothing (JRC 2010).

An additional problem is the generation of microscopic plastic produced from the fragmentation and degradation of plastics and its consequences (e.g. estimating long-term behaviour or the scale of physical and chemical impacts on marine organisms) are still unknown.

In general most references have estimated that worldwide around **80%** of marine debris arises from **land-based sources** and the remaining **20%** come from **sea-based sources**. However, as the basis for these figures there were no calculation examples or benchmarks. More detailed data about distribution between LSL and SSL are provided by the National Marine Debris Monitoring Program (NMDMP 2007). This study analysed marine debris in nine specific US regions from three specific sources: land-based, ocean-based and general items. A description of the items used to distinguish the sources is shown in **Annex 13.5**. The study was initiated to standardise marine debris data collection and conducted over a five year period from 2001 to 2006. The results of the study indicated that land-based sources of marine debris accounted for 49% in comparison to 18% from ocean-based sources and 33% from general sources (**Figure 2**).

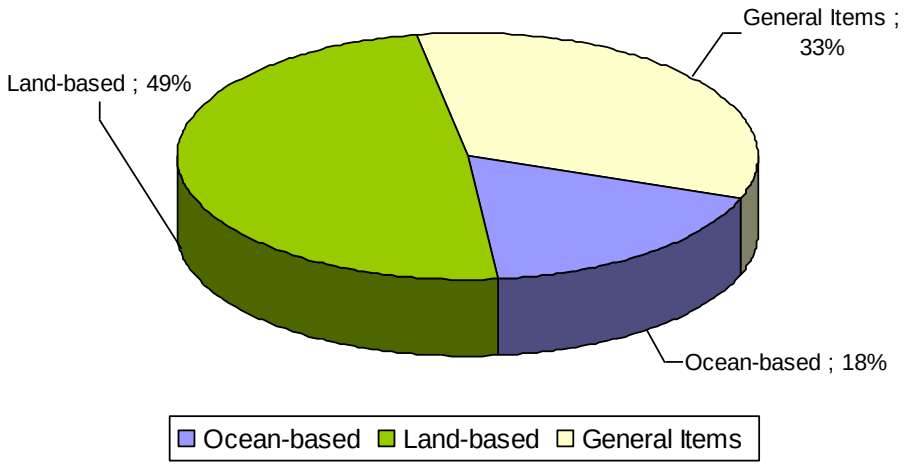

Figure 2: Distribution of indicator items for LSL and SSL , US 2001 – 2006 (MNDMP 2007)

More globally the annual International Coastal Cleanup (ICC)[10] programme provides figures for the period 1989 – 2007. The items collected, sorted by sources are displayed in **Figure 3.** Considering the "shoreline – recreational activities", "smoking related activities" and "medical personal hygiene" as clearly LSL than around 90% of the items collected are LSL. For details on the questionnaire and the oceans and countries covered, please refer to (UNEP 2009b).

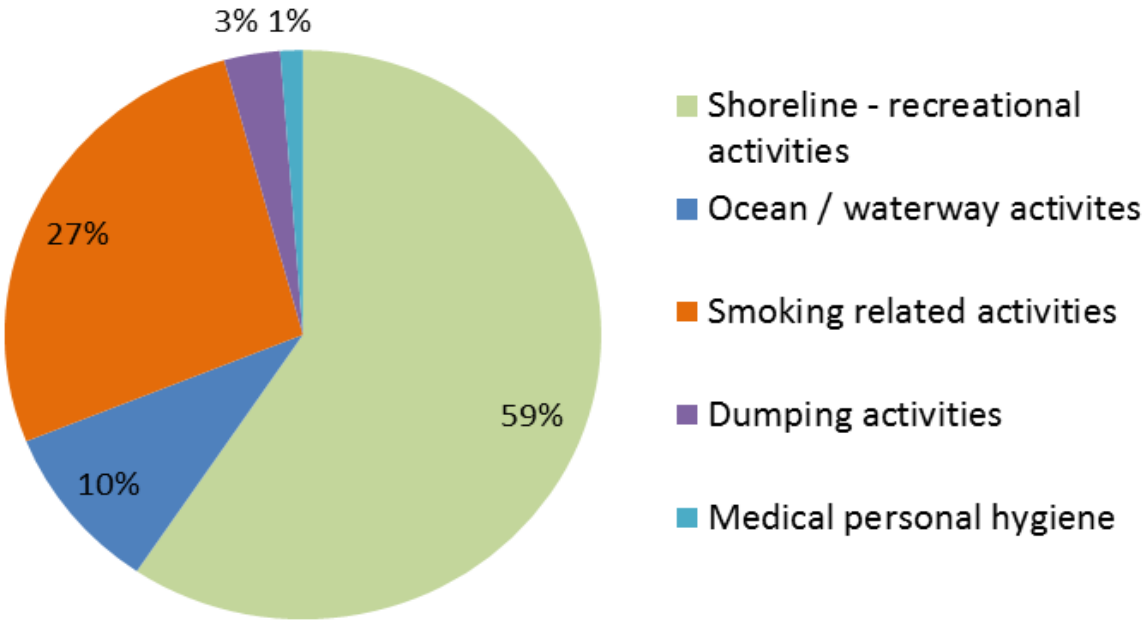

Figure 3: Distribution of indicator items for LSL and SSL , Source: Compiled from annual ICC data reports, Center for Marine Conservation/Ocean Conservancy (1989-2007) in: UNEP 2009b

Taking a more detailed look, significant differences can be detected as shown in **Table 2**. For instance, bags are globally the second most common item with 9.4%. For the three seas in question they are detected on position 8, 9 and 10 with less than 5% of the collected items. But even more interesting is the high percentage of ropes, fishing nets and fishing lines for the North Sea and the north-east Atlantic accounting for more than 20% of the collected items, compared to the Baltic Sea and the Mediterranean Sea where these items are not even ranked in the "top ten". Apparently this demonstrates the higher relevance of fishing activities and thus SSL for the North Sea and the north-east Atlantic. The mentioned source displays the "top ten" items for the regional level only and more details might be detected if the full range of data are reviewed.

[10] The International Coastal Cleanup (ICC) programme was initiated in 1986. The ICC takes place every year in September. In 2009, 498,818 volunteers from 108 countries and locations collected 3,357 tonnes of debris from over 6000 sites.

Table 2: "Top ten" marine debris items for ICC Global and for Baltic Sea, North Sea and north-east Atlantic and Mediterranean Sea

Items	Global	Baltic Sea	North Sea and the north-east Atlantic	Mediterranean Sea
		("top ten" only)		
Cigarettes / cigarette filters (cellulose acetate)	24.6%	37.4% (1)	16.0% (1)	29.1% (1)
Bags (paper & plastic)	9.4%	2.6% (9)	4.1% (10)	4.1% (8)
Caps / lids	9.1%	8.8% (2)	12.4% (3)	6.7% (2)
Food package	8.9%	7.7% (3)	12.7% (2)	4.0% (9)
Cups / plates / forks / knives / spoons	7.2%	:	4.8% (8)	:
Beverage bottles (plastic) <2 litres	5.5%	6.5% (4)	7.9% (6)	5.1% (6)
Beverage bottles (glass)	4.8%	5.9% (5)	:	5.5% (4)
Beverage cans	4.6%	4.7% (6)	5.2% (7)	6.3% (3)
Straws, stirrers	4.4%	:	:	4.7% (7)
Rope	2.1%	:	8.1% (4)	:
Cigarette lighters	0.8%	:	:	5.2% (5)
Tobacco packaging	0.7%	4.4% (7)	:	:
Pull tabs	1.1%	3,6% (8)	:	:
Clothing / shoes	1.7%	2.5% (10)	:	:
Fishing nets	0.8%	:	8.0% (5)	:
Fishing line	0.9%	:	4.2% (9)	:
Cigar tips	0.8%	:	:	3.1% (10)
Others	12.6%	15,9%	16.6%	26.2%
Total number of debris items	103 247 609	35 925	220 877	49 453

Legend:
Sources: smoking-related activities
Sources Shoreline / recreational activities
Sources: Ocean / waterway activities

Source: Compiled from annual ICC data reports, Center for Marine Conservation/Ocean Conservancy (1989-2007) in: UNEP 2009b

Further specific data on worldwide amounts of LSL and SSL are not available. There are only some older worldwide figures on the annual input of marine litter to the marine and coastal environment from 1997 which estimates approx. 6.4 million tonnes per year (Coe J.M. et. al. 1997). Other sources estimated 8 million items of marine litter entering to oceans and seas every day, about 5 million of which are thrown overboard or lost from ships (OSPAR/UNEP 2009). However, this results in a contrary distribution between LSL and SSL (>63%) than stated in the data shown above.

2.2.2 LSL and plastics

LSL is dominated by plastic debris, mainly polyethylene (PE) and polypropylene (PP) products and are present in wide variety and particle size (JEM 2010). The German government comes to the conclusion that the plastic portion has risen significantly in the last decades[11].

Numerous literatures and positions from stakeholders (i.e. governments, NGOs or research institutes) consider plastic bags as a crucial plastic item which contributes to littering on land and consequently to the LSL problem. For instance, the EC point out that large quantities of all kinds plastic bags are used each year (500 bags/capita/year)[12]. The number of used plastics bags per capita and year seem to differ significantly between European countries, e.g. for Germany the number of used plastics bags per capita and year is indicated with 65[13]. Usually plastic bags are single-use and, probably due to the fact that a plastic bag has such a low mass, they are often carelessly discarded. Additionally, wind contributes to distribute them in the environment. Plastic bags certainly cause marine litter problems; however this statement has to tackle in more detail including all stakeholders. According to the figures in Table 2 on marine debris items collected during the UNEP programmes support this observation as most of the mentioned items consist of different kinds of plastic.

The percentage breakdown of the litter items, especially for the plastic items, differs between the regional seas, coastlines, countries and the regions (e.g. between North and South Europe) or due to the different pathways and sources of the marine litter. According to the reviewed studies on marine litter (in different regions of the world) the share of the plastics items is in the range of 30% and 95% of all marine debris **(see Annex 13.1 to 13.3**). This wide bandwidth results from the fact that the monitoring data are sub-divided under the three marine sectors of floating debris (on the water surface and in the water column), debris on the bottom of the sea and debris on coastlines (shoreline).

The UNEP's Regional Seas Programme[14] provides first indications about the scale of the problem, organising the regional activities, the assessment of the status of marine litter, and determines the actions needed in order to develop and implement a regional strategy for

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11 German Bundestag (2008) mentioned that the plastic content in the total waste volume has increased significantly during the project period on the beaches of the OSPAR region from 68 percent in 2001 to 78 percent in 2006.

12 EC: Commission seeks views on reducing plastic bag use; Press release Brussels, 18 May 2011.

13 HDE, Press release June 8th, http://www.einzelhandel.de/pb/site/hde/node/1389199/Lde/index.html

14 UNEP's Regional Seas Programme aims to address the increasing degradation of the world's oceans, coastal and marine areas, through the sustainable management and use of these environments, by engaging member countries to cooperate in comprehensive and specific actions for the protection of their shared marine environment (UNEP 2009a).

addressing marine litter in 12 Regional Seas, including the Mediterranean Sea, the North Sea and the Baltic Sea.

Many other studies made investigations in different regions of the world about the quantities of marine litter (debris). Moreover, no statistically-based monitoring has been carried out, and there is no common method for reporting the data, which makes comparison of the results difficult. Beach clean-ups usually report the litter as pieces per length of coastline (1000 m, 500 m or 100m), while municipalities report the total amount of litter as kilograms (kg) or cubic metres (m^3).

A study from Ireland[15] shows that a main pathway of micro plastic items are detected from synthetic textile fibres washing out through wastewater of the numerous household and commercial washing machines. Thus micro plastics deposits appear on shorelines, beaches and in the water. In a series of experiments they have shown that synthetic fibre textiles lose about 2,000 tiny fibres during each washing process, especially from fleece clothing. Due to the very small items, they are mostly not absorbed by either the washing machine filters or by the filters of treatment plants, and finally arrive in the sea.

2.3 Analysis of quantities and pathways (discharge)

Plastics become a fairly good indicator of the amount of litter in an area because of their high share by number of items and weight. Data on LSL and plastics were collected from several international and national sources. All information has been collected through comprehensive literature review of 90 sources[16]. Before investigating specific sea sources on marine litter international data sources on the subject were **(see chapter 2.2)** identified and the relevant international sources are described. For this purpose, raw data from several studies are reviewed for the three seas (North Sea, Baltic Sea and Mediterranean Sea) including preliminary calculation data on the basis of available literature.

The aim of the present analysis of marine litter items was hence to gather and evaluate information concerning:

- Distinctions between the coastline/shoreline (beach litter), water floating (water column <40 cm and water surface) and seabed/sea floor;
- Data for total litter, plastic litter and plastic litter in percentage of total litter for all three areas;
- Data for volume in (kg) and data for the (number of items);
- Aggregated per 100 meter for beach litter;
- Other specification (e.g. reliable primary source);
- In a second step we strived to determine what type of litter concerning main discharge sources and main categories of products were responsible for LSL, differentiated by regions and the three seas.

The full data set is available in **Annex 13.1 to 13.3.**

[15] http://www.ucd.ie/news/2011/10OCT11/241011-Washing-machines-deposit-microplastic-around-worlds-shorelines.html

[16] All documents gathered and analysed in this context are listed in Annex 12.2.1.

In the following sub-chapters we describe the results concerning the quantities and pathways of LSL for the three seas in more detail.

2.3.1 Situation in terms of the Baltic Sea

There is a certain amount of information already available on the amounts of litter found on the beaches along the Baltic coasts, gathered by NGOs (Greenpeace, WWF and Ocean Conservancy), HELCOM marine litter project, the International Coastal Cleanup (ICC) - organised by Ocean Conservancy and municipalities along the Baltic coast. To date, no statistically-based monitoring has been carried out, and there is no common method for the Baltic region for reporting this data, which makes comparison of the results difficult. Nevertheless, the UNEP 2009b document represents a substantial summary of the amounts of marine debris (from 4 countries), which also includes the main types of marine litter in different riparian states.

The range of beach litter pieces per 100m is between 4 – 1 200 items resulting between 0.4 - 66 kg waste. (see Table 3). The investigated studies showed that the plastic items in the Baltic Sea constitute between 30% – 70%. However, no tendency, i.e. an increasing or decreasing trend of the amount of litter is seen. While in some countries or regions the amount rises it decreases in others. Some argue that it is seasonally related, but in general there is no homogeneity in the litter around the coasts.

The total percentage of plastic debris in all three investigated categories of debris differs between 36% in the sea bottom up to 70% on the coastline. With regard to the floating debris in the water column there are no data evaluated.

The following table gives an overview of the marine debris in the Baltic Sea and their different categories of debris[17] (beach litter, water column, sea floor). For a more detailed overview see Annex 13.1 to 13.3.

[17] Data represents rather a litter „concentration“.

Table 3: Data regarding the marine litter items (debris) in the Baltic Sea

Marine debris in the Baltic Sea	**Categories of debris**		
	Range of beach litter per 100m [*Number of studies referring to the aggregated data]**	Range of floating litter per area [*Number of studies referring to the aggregated data]**	Range of sea floor litter per area (km²) [*Number of studies referring to the aggregated data]**
Total value			
in kg	0.4 – 66 [4]	n.a.	n.a.
in number of items	4 - 1 200 [5]	n.a.	44 – 208 [1]
Plastic value			
in kg	n.a.	n.a.	n.a.
in number of items	1 - 756 [3]	n.a.	16 – 74 [2]
Percentage of plastics (in % of the total value)	30% – 70% [3]	n.a.	36% [1]

n.a. = not available

** Please see more detailed in Annex 13.1 to 13.3*

Type of litter

Plastic is the main material found at the beach monitoring projects. The primary plastic items are bottles, bags and packaging materials. Other materials or litter items found on the coasts are fishing-related litter, wood, food waste, cigarettes and filters, glass, sanitary and sewage-related litter, clothing and rubber. However, there is a different statement about the types of litter and thus also their amounts are hardly quantifiable. The data of the ICC (from 4 countries) indicates that the dominant types are cigarettes and filters, which can be interpreted as a behavioural pattern of the public. However, the other sources do not list the smoking-related materials. In the data from Estonian Coastwatch plastic items constituted on average 56% of all the litter items. Within the Naturewatch Baltic project plastic bottles were the most common type (40%) of litter pieces found.

Moreover, the differences between countries are great and do not describe the general situation of the Baltic Sea. Rather it describes a situation at a certain area in a country with no regular monitoring. The monitoring results are affected by different factors, as the number of people taking part, the classification of the litter items, the difference in sampling and measurement procedures, timeframe of the sampling, etc.

According to the data of three monitoring programmes the main types of debris in Baltic Sea are:

Table 4: Overview of the proportion of marine litter categories on Baltic Sea beaches (several sources)

Type of material	ICC data (UNEP 2009b)	WWF 2005 Naturewatch Baltic 1998 – 2005
Plastic bottles	6.5% (4)	40% (1)
Bags (paper and plastics)	2.6%	10% (4)
Lighters	n.A.	
Food package	7.7% (3)	
Caps & lids	8.8% (2)	
Straws	n.A.	
Rope and fishing line	n.A.	
Tobacco packaging	4.4%	
Cigarettes/cigarette filters *(cellulose acetate)*	37.4% (1)	
Cans	4.7%	14% (3)
Clothing/shoes	2.5%	
Glass bottles	5.9% (5)	18% (2)

Type of material	Coastwatch Estonia 1999 - 2006.
Plastics	56% (1)
Metal	16% (3)
Glass	19% (2)
Paper & Cardboard	8% (4)

In a study from 1994 plastic items constituted 54% of litter pieces found on 15 beaches along the coast of Finland (Tuomisto 1994).

Studies about marine debris at sea are quite rare. In a study 1996 1,26±0,82 items of litter per hectare were found in the waters of western Baltic Sea (Galgani et al. 2000).

Discharge sources and pathways of LSL

According to the relevant literature the most important LSL pathway can be attributed to shoreline activities and recreation activities, such as visits and picnics to the beach or by the riversides. The literature research revealed no clear data on discharge sources and pathways of LSL. But one can assume that the pathways of LSL do not remarkably differ in the Baltic Sea region from the global picture (see chapter 2.2.1). However, it needs to be considered for defined regions in order to allow measures to reduce exposure on LSL.

2.3.2 Situation in terms of the North Sea

For the North Sea data from several studies are reviewed by region, including preliminary calculation data on the basis of available literature.

A 2004 (Bennet.O. 2010) study estimated that some 20 000 tonnes of litter were deposited each year into the North Sea. A share of 70% sinks to the sea bed, 15% floats on the

surface and 15% are washed up on beaches. The amount of marine litter is not decreasing statistically.

Since 2000 surveys of beached litter have been carried out using standardized methodology on the north-east Atlantic coast as part of the OSPAR Marine Litter Beach Monitoring Program (OSPAR 2007). A further OSPAR programme measured the amount of litter in the stomachs of birds, especially of fulmars[18]. Both programmes measured the input of litter into the Wadden Sea region. The OSPAR Beach Monitoring Program covered five beaches in the Wadden Sea (see also Table 5).

A few years ago further results of surveys for the period 1991-2002 of litter in the Wadden Sea region were published (Fleet, 2003). These two studies already show completely different results in terms of plastic distribution. The OSPAR Beach Litter Monitoring found 44 – 95% of plastic items on the beaches whereas in Fleet (2003) the plastic share was only 60%. The highest proportion, over 80 % of plastic items, was found on the Northern North Sea beaches (OSPAR 2009) and in France with almost 95% (OSPAR 2007). However, the most common marine litter items were, in all references, plastic and polystyrene, even when the litter items were found in fulmar stomachs (Van Franeker 2009).

All the results of various reports are summarised in Table **5** in given data respective min/max values of debris[19] (see Annex 13.1 to 13.3.)

Table 5: Data regarding the marine litter items (debris) in the North Sea

Marine debris in the North Sea	**Categories of debris**		
	Range of beach litter per 100m [*Number of studies referring to the aggregated data]**	Range of floating litter per area [*Number of studies referring to the aggregated data]**	Range of sea floor litter per area (km^2) [*Number of studies referring to the aggregated data]**
Total value			
in kg	10 – 345 [3]*	n.a.	n.a.
In number of items	200 – 3 073 [7]*	150 – 2 400 [20] [1]*	1 – 193 [3]*
Plastic value in kg			
in kg	2 - 45 [2]*	n.a.	n.a.
In number of items	150 – 2 219 [7]*	n.a.	1 – 94 [3]*
Percentage of plastics (in % of the total value)	44% – 95% [7]*	n.a.	38% – 89% [1]*

n.a. = not applicable

** Please see more detailed in Annex 13.1 to 13.3*

[18] Fulmar Litter EcoQO Monitoring.

[19] Data represents rather a litter ”concentration”.

[20] In this case area = m^3.

The marine litter distribution of the North Sea varies considerably, but it was found that in the northern regions a higher concentration of debris (between 600 - 1400 items/100m) than in the southern countries (between 200-600 items/100m). The aggregated number of litter items per 100m are between 200 – 3 073 (see Table **5**). The data on the range in the percentage for plastics (44% – 95%) can be evaluated as quite viable with regard to information of the UNEP report.

The amount of litter found in the water column and the on the sea floor varies greatly between beaches. The monitoring of sea floor marine litter showed that plastics range between 38-48%. For the water column no data on plastic items is available.

The analysis of beached litter surveys from the North Sea was also not able to detect any general trends in the number or weight of beached litter.

The information for the North Sea is the most reliable data due the existing OSPAR assessment of the marine litter based on a harmonised methodology. Its purpose is to assess the scale of the problem, to identify the main sources of marine litter, and to set priorities. The programme is a comprehensive analysis of quantities for reference beaches (100 stretch and surveys four times per year), composition and trends of marine litter on beaches throughout the OSPAR maritime area.

Type of litter

The unique OSPAR guideline for monitoring are assessed and assigned to 121 different litter types, which are organised into eleven different main categories (OSPAR 2010). According to this list identifying litter items, the most common items found on the beaches were rope and nets which accounted for 30% of the total number of litter items. Various forms of packaging accounted for 28% of the total number of items (OPSAR 2009).

The changes during the years in the composition of marine litter items on the coast vary immensely between locations depending on weather conditions and local sources of litter.

However, during the investigation in all reference beaches the plastic items were the common material, followed by wood, paper and cardboard. The same argument is true for the results of the OSPAR Beached Litter Monitoring Program: In period 2002 – 2008 and four times a year the litter items of a 100 m stretch of beach. The monitoring represents a substantial share of 75% plastic (see also **Table 6**).

Table 6: Overview of the proportion of marine litter categories per items found on reference beaches on North Sea (several sources)

Type of material / Category	**Northern Part of the North Sea beaches, (UNEP 2009b)**	**Southern Part of the North Sea, (UNEP 2009b)**	**'Clean Beach' in Texel, (NL) 2005, (UNEP 2009b)**	**Beach-watch 2007 in UK, (UNEP 2009b)**	**French beaches in 2006, (UNEP 2009b)**	**OSPAR Beach Litter Monitoring (2002-2008, OSPAR 2009)**	**Average**
Plastics (rope & net)	80.5%	74.83%	69%	66%	95.1%	75.30%	**76,7%**
Sanitary	5.79%	1,73%	n.A.	6.1%	1.5%	0.60%	**4,5%**
Paper & Cardboard	2.59%	4.29%	2.7%	8.5%	0.5%%	3.20%	**3,8%**
Wood	3.19%	3.75%	16%	2.3%	1.2%	8.30%	**4,9%**
Textiles / Clothes	2.43%	4.23%	1%	3.4%	0.1%	1.40%	**2,4%**
Metal	2.43%	4.89%	2.4%	6.1%	0.2%	2.40%	**3,2%**
Glass	1.27%	2.75%	4.7%	3.9%	0.7%	5.40%	**2,6%**
Rubber	1.32%	2.66%	0.4%	2.4%	0.4%	3.00%	**1,5%**
Pottery & Ceramics	0.19%	0.14%	n.A.	0.6%	0%	0.20%	**0,3%**
Feaces	0.12%	0.57%	0.7%	0.5%	0%	0.10%	**0,4%**
Medical	0.17%	0.15%	n.A.	0.2%	0.1%	0.10%	**0,2%**
Others	n.A.	n.A.	3%	n.A.	n.A.	n.A.	**n.A.**

As outlined in **Table 6** the data on the plastic on beaches can be judged as quite viable; the average on which the results are based which were collected by each source is shown in **Figure 4**.

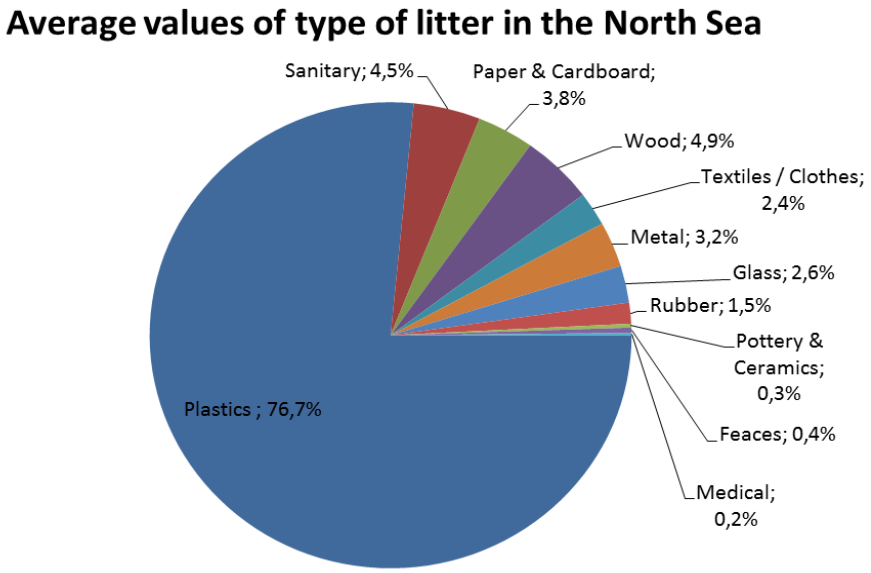

Figure 4: Average values of type of litter in the North Sea (Source: Authors' own illustration based on OSPAR 2009 and UNEP 2009b)

Discharge sources and pathways of LSL

According the literature (OSPAR 2009) the most important LSL pathway is shoreline and recreation activities, followed by the dumping activities (see **Figure 5**).

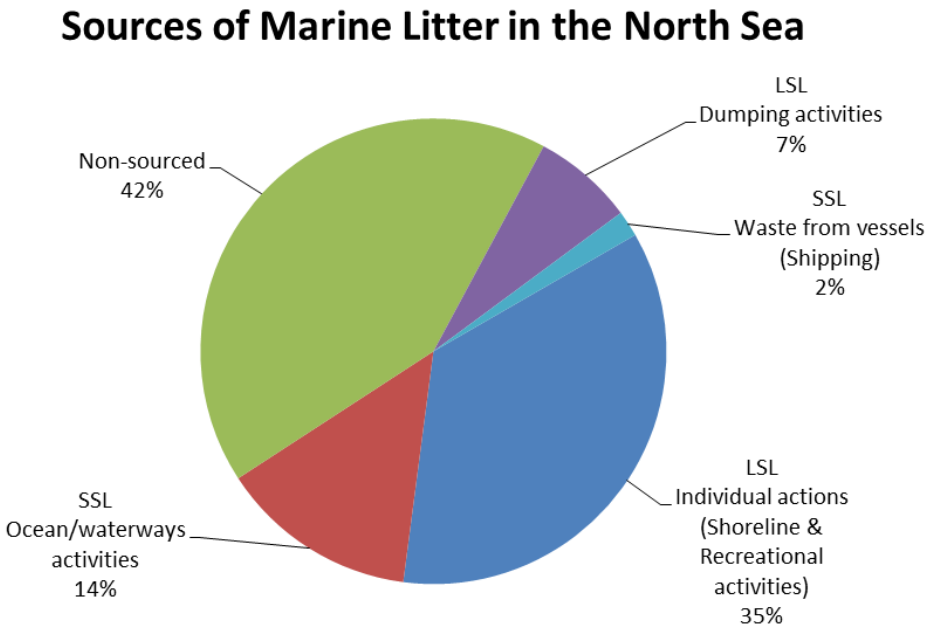

Figure 5: Source of SSL and LSL from items found on reference beaches in the North Sea (Source: Authors' own illustration based on OSPAR 2009)

The results of **Figure 5** indicated that land-based sources of marine debris accounted together for 42% in comparison to 16% from sea-based sources and 42% from non-sources. These figures correspond to the distribution of the indicator items collected in U.S. monitoring programme given in Figure 2.

Even the results of the Fulmar Litter EcoQO Monitoring a possible land-based discharge is caused by recreational activities at the coast and by industrial plastics (i.e. resin pellets). With regard to the plastic pellets the amounts in the fulmar stomachs have decreased in the last 30 years (Van Franeker 2009).

The investigations indicate that waste from shipping, including fisheries industry and offshore installations (SSL) are the main sources of marine litter found on German and Dutch beaches (Fleet 2009 and Fleet 2003). The discharge from the fisheries industry arises from lost or discarded nets. Furthermore, marine litter items (containing plastic micro and nano particles[21] through mechanical or UV disruption) might also enter the southern North Sea from the English Channel. This could be explained by the fact that one possible non-sourced pathway of microplastics comes from the sewages and industrial effluents.

In order to make practical recommendations for a regional strategy, some inconsistencies in the information on LSL pathways might be discovered in the future (for instance for Belgium).

2.3.3 Situation in terms of the Mediterranean Sea

Information on litter items do exist; however the distribution of debris in the Mediterranean Sea varies strongly between the investigated regions and countries.

Plastics range between 37% – 80% of the total items collected on beaches. The floating plastic debris at the Mediterranean Sea can be estimated at approx. 60% - 83%. Analysed monitoring data from sea floor litter results in a range of 36% - 90% composed by plastics.

The following **Table 7** gives an overview of the marine debris in the Mediterranean Sea and their different categories of debris (beach litter, water column, sea floor). For a more detailed description see Annex 13.1 to 13.3.

[21] Micro plastics have not yet been investigated in the Wadden Sea region. Analyses, however, indicate that they are widespread in the marine environment and that they are certainly already present in the Wadden Sea ecosystem.

Table 7: Data regarding the marine litter items (debris) in the Mediterranean Sea

Marine debris in the Mediterranean Sea	Categories of debris		
	Range of beach litter per 100m [*Number of studies referring to the aggregated data]**	Range of floating litter per area [*Number of studies referring to the aggregated data]**	Range of sea floor litter per area (km^2) [*Number of studies referring to the aggregated data]**
Total value			
in kg	1 – 314 [16]*	2.9 [0 / 1]*	7 - 47 [1]*
In number of items	640 - 23 100 [7]*	0.5 - 498 [3]*	0 – 8 500 [11]*
Plastic value in kg			
in kg	2 - 75 [3]*	n.A.	0.5 – 34 [2]*
In number of items	405 - 10 395 [7]*	0.12 - 1.74 [2]*	0 – 5 460 [11]*
Percentage of plastics (in % of the total value)	37% – 80% [11]*	60% - 83% [3]*	36% - 90% [12]*

n.a. = not available

** Please see more detailed information in Annex 13.1 to 13.3.*

Type of litter

Information on marine litter in the Mediterranean Sea is being prepared by MEDPOL within the global marine litter initiative of UNEP (The Regional Seas Programme).

Useful data on marine debris exists in the region (types, quantities, etc.); however it is inconsistent and geographically restricted mainly to parts of the North Mediterranean. Barely any information on marine litter of Mashreq and Maghreb countries bordering the Mediterranean Sea are available. Nevertheless, there are clear indications that the plastic items are the main litter items found on Mediterranean beaches, floating on the sea surface or on the seabed.

The main types of litter collected from beaches and the seabed during ICC campaigns are cigarettes and cigarettes filters or tips, cans, plastic bottles and plastic bags (see also Figure 2). It is noticeable that smoke relevant debris is for the Mediterranean region is considerably higher than in the other sea regions. This issue could be addressed by policy makers and targeted by awareness raising campaigns. Other types of litter as glass bottles, clothing, dishes, sanitary or sewage-related litter are less characteristic items.

Discharge sources and pathways of LSL

Identifying sources of marine litter is difficult as many types of items can come from multiple sources. In a number of reports it was found that >50 percent of the main litter items originated from recreational and shoreline activities. Other pathways could not be worked out for an estimation of the LSL quantities. Marine litter in the Mediterranean Sea is closely related to tourism especially in summer (UNEP 2009b). In 2005 an increase in the waste volume of the NMCs by 19 % compared to 2000 was detected, especially with waste

coming from packaging and plastics (MAP 2009). A strong correlation between marine litter and tourism exists, for example in the Island of Mallorca (Spain); during the summer season the waste increases nearly 45 %. In the EMCs and SMCs, a high trend of poor waste management is perceived, increasing the amount of LSL into the sea. In the southern states especially, waste treatment consists of disposing wastes in largely uncontrolled waste dumps in the outskirts of cities as national environmental policies are still precarious. Additionally, the food packaging industry account for 15 % of the discharge of pollutants, followed by 12 % of energy production and 10 % of the metal industry in all the surrounding countries (MAP 2009).

Furthermore, agriculture (vegetables and citrus fruits) in the Mediterranean region is an important economic activity (UNEP 2009a) and might therefore be a possible LSL pathway.

Overall the Mediterranean region may need comprehensive standardised guidelines for the problem of litter in the Mediterranean. Furthermore, information sharing between and among all stakeholders regarding litter data needs to be improved.

2.3.4 Challenges and recommendations resulting from the analysis

The data of marine litter for the three seas should be reviewed, taking into account the following challenges:

- Data refers to the situation in a defined area at the time of the investigation or monitoring programme, thus constituting a spot check.
- Results depend heavily on local conditions such as winds, water currents, beach conditions (sand or gravel) and also on people taking part (amount of collectors), the classification of the litter items, the difference in practice and the frequency of the sampling.
- Thus data of marine litter items do not facilitate the calculation of the overall litter amount per year for the specific location and no calculation of “average” values for the entire shore is possible.
- The intention of the data collection is more geared to monitoring purposes (change observed for time series).

Recommendation:

Reviewing data on marine litter and deriving trends of discharge (e.g. for LSL) requires detailed information on local conditions and appropriate methodology. Up to now no effective trends can be observed due to dominating changes of other local conditions.

Concerning the classification of the litter items and their relevant interpretation, the following challenges must be kept in mind:

- Some studies give each litter item different “identification names”;
- The spectrum of litter items differs in the different studies;
- The plastic content of some litter items (e.g. food packaging) is sometimes not clear and is also not discussed transparently in the monitoring reports;
- Items have no unique correlation to LSL and SSL;
- Thus, different classification approaches make it difficult to aggregate the data from the various studies.

To date, there are no standard monitoring programmes in Europe and not even voluntary agreements between all regional seas for a consistent and applied measurement methodology for the description of the litter items, the sources of marine debris, volume in kg, data on the number of items, and detailed information on the conditions of the reference beaches.

This means that data provided by the current monitoring programmes is currently neither comparable nor subject to any control.

Recommendation

As already initiated by OSPAR standardised guidelines of the terms and respective monitoring programmes will be necessary.

3 Plastics production and use

For the purpose of this study and considering the available funds for the current project it is appropriate to refer to published data on the European market (including Norway and Switzerland). It might be feasible to provide a more detailed breakdown by the different countries bordering a European Sea and the non-EU countries. However, the general figures for Europe display the more general settings.

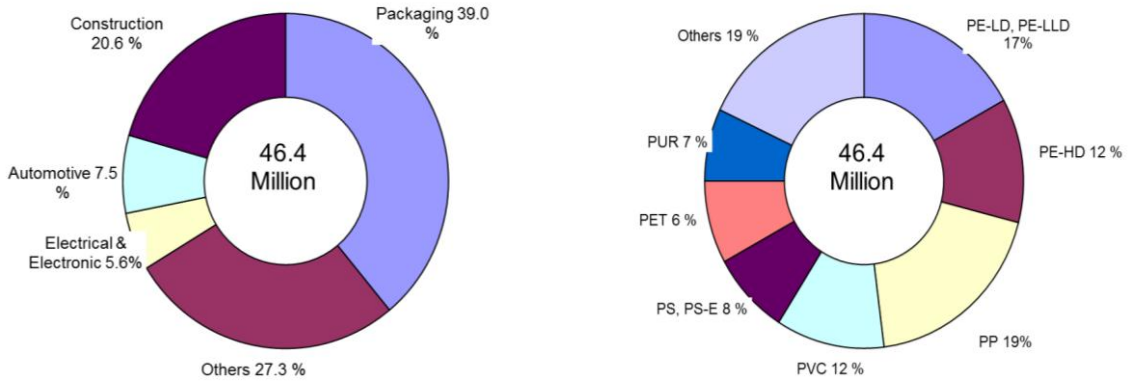

Figure 6: Left : Total plastics demand from European Converters in 2010 by segments; Others refers to furniture, leisure, sport and medical applications
Right: Total plastics demand from European Converters in 2010 by resin types
Both: Values for EU-27 + Norway + Switzerland; Source: PlasticsEurope 2011

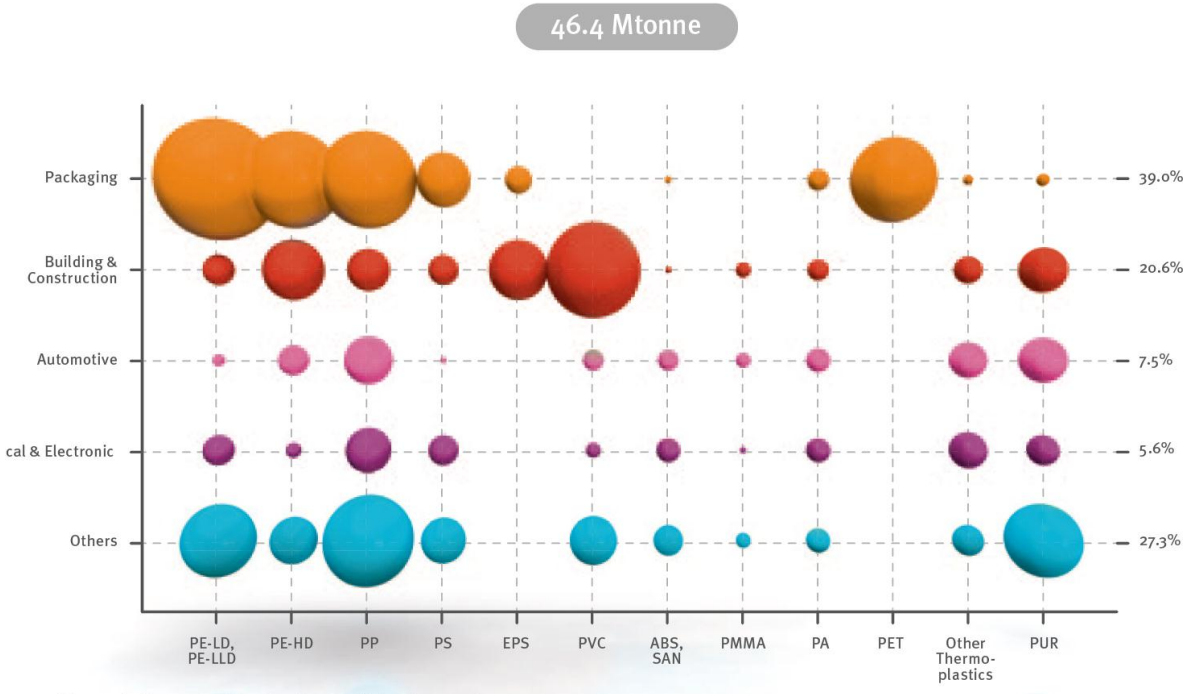

Figure 7: Breakdown of the plastics demand from European Converters in 2010 by segments and resin types in EU-27 + Norway and Switzerland; Source: PlasticsEurope 2011

The demand of the converters is not directly linked to the post-consumer waste as the effects of

- import and export and of
- rising / declining stocks

are not considered.

The total amount of post-consumer waste is reported by the European Plastic Industry to be 24.7 million tonnes in 2010 for EU-27 + Norway and Switzerland (PlasticsEurope 2011). However, more effort needs to be invested in showing the whereabouts of plastics and the loopholes and gaps of information.

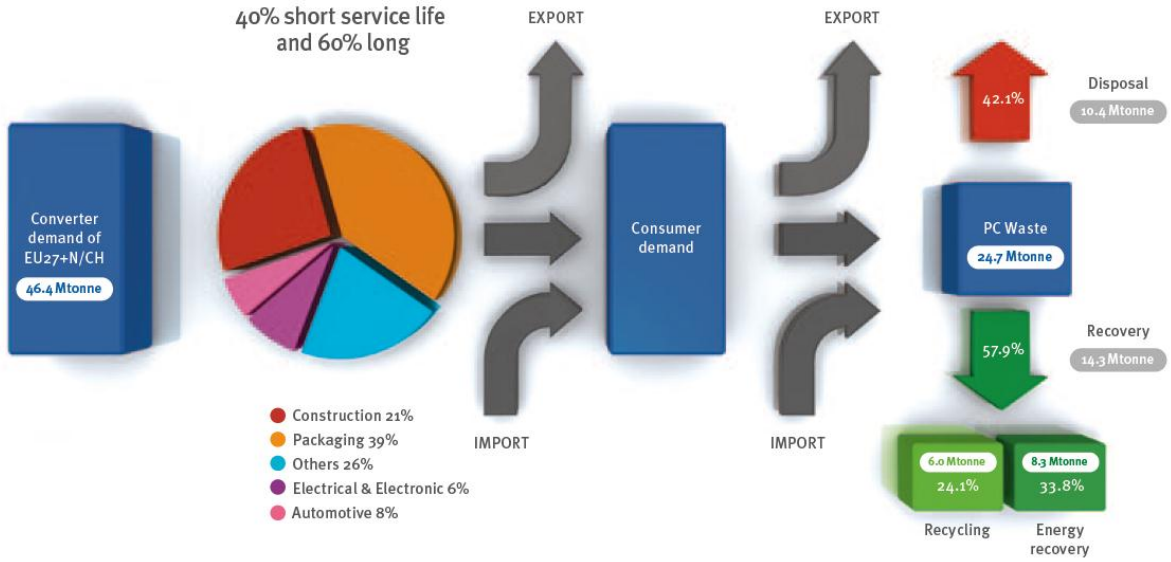

Figure 8: Main Steps in plastics' lifecycle for EU27 + Norway Switzerland in 2010 Source: PlasticsEurope 2011

A major part of the post-consumer waste is plastic packaging as shown in **Figure 9**. The total amount of plastic packing waste for EU-10 rose from 9.8 million tonnes per year in 1998 to 13.2 million tonnes per year in 2008, and 14.5 million tonnes for EU-25. Even if the recycling and recovery and incineration at waste incinerators with energy recovery nearly doubled, the remaining amount to be disposed of decreased by 22% only, from 6.6 million tonnes per year in 1998 to 5.2 million tonnes per year in 2008 for EU-15, and 6.0 million tonnes for EU-25.

More detailed information on the composition and treatment of the post-consumer plastic waste management in European countries in 2010 have been prepared by Consultic Marketing & Industrieberatung GmbH, on behalf of PlasticsEurope.

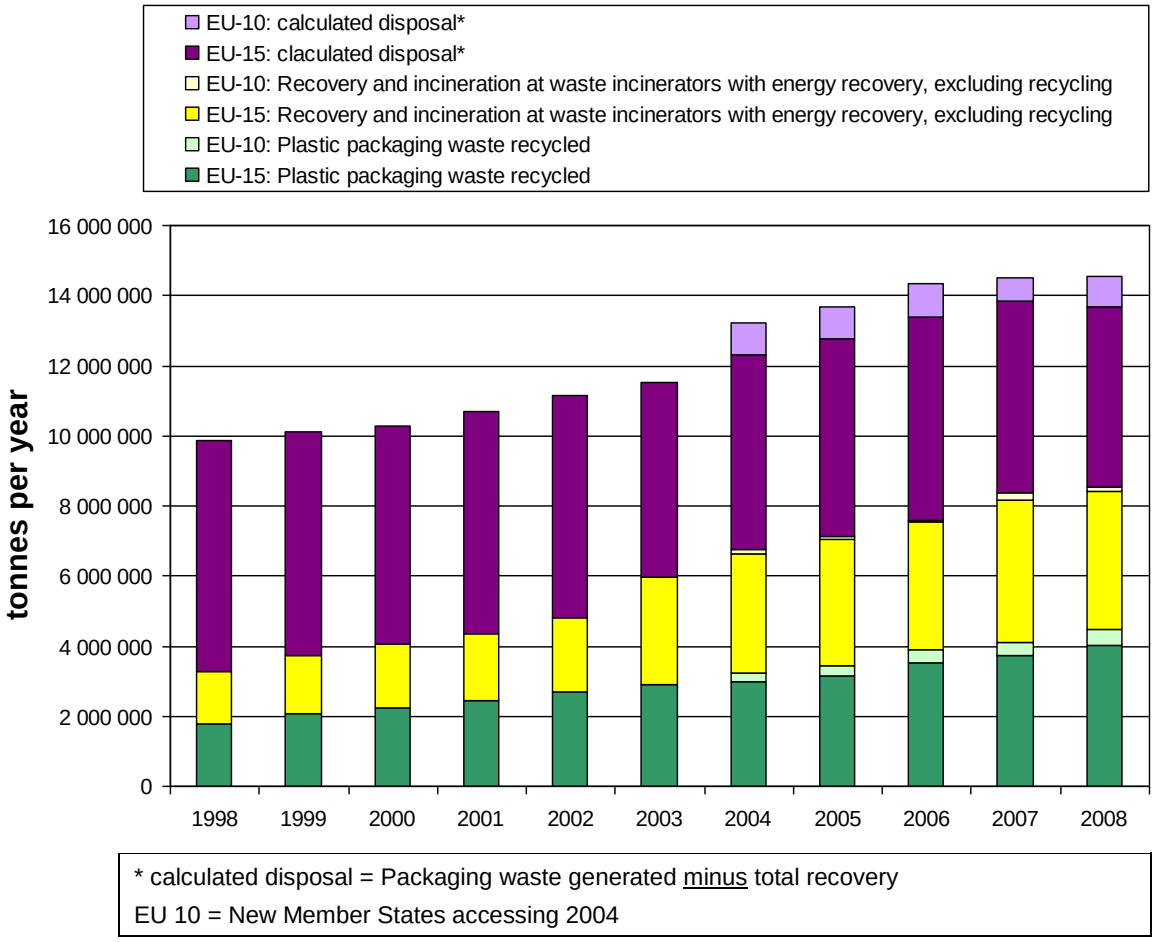

Figure 9: Data on plastic packaging in Europe; Source: Eurostat 2011b, env_waspac 2011

4 Pressure indicator for the risk of pollution with LSL

As it is for the time being all but impossible to describe in detail the exact material flows of (plastic) waste directed to the marine environment, we propose to establish a set of indicators displaying the risk of marine pollution with plastic waste. The higher the risk, the higher is the probability that a relevant amount of plastic waste is littered to the marine environment. At the same time high risks indicate the need for improvement. The subsequent section will try to identify different sources and impacts for LSL among the three seas in question. Therefore the following potential sources and impacts for LSL are reviewed:

- Population density
- Tourism / recreation
    - Level of littering (inland / seashore)
    - Littering caused by tourism / recreational visitors / events to the coast
- Activities at ports
- Solid waste management
    - Collection and treatment of municipal waste
    - Wastes from dumpsites located on coast or riverbanks / river management
    - Plastic packaging waste management
    - Waste management of commercial and industrial waste
    - Waste management of agricultural plastic waste
- Waste water treatment
    - Coverage of collection (sewer) and treatment
    - Sewer overflow, combined sewer overflow[22].

As this study focuses on LSL we will not address the impacts and sources for SSL; however a similar systematic might be developed for SSL as well considering issues as:

- Marine traffic of freight, ferry boats, cruise ships
- Fishing activities
- Off-shore activities and constructions (e.g. oil platform / wind farms)
- Type of waste services for vessels at ports[23].

Furthermore we will refer to UNEP's Report on "Marine Litter: A global Challenge" addressing in detail the legal frameworks for both LSL and SSL, the programs which are in force and intended, and recommendations in place and in preparation for the three seas in question (UNEP, 2009b).

[22] Under normal weather conditions, sewage is carried to a wastewater treatment (various proportion of population served by connections to sewerage systems and central wastewater treatment in EU-27). However, during heavy rains the handling with the capacities of the wastewater treatment systems may be exceeded and the sewage plus storm water is then not treated and is directly discharged into rivers and seas.

[23] For this issue see also a NABU report from 2011: http://www.nabu.de/meeresschutz/studie_schiffsabfaelle.pdf.

4.1 Population density

The population density is a general indicator for potential pressure to the marine environment and in particular for Land-Sourced Littering. The effective impact of this potential pressure depend on mitigation measures, as for instance the establishment of advanced waste and waste water management. Thus it is important to consider this indicator as a potential pressure, to be considered in combination with the mitigation measures. The data for the population and the data for the area of regional units (NUTS 3 level) for most of the countries and regions are available at Eurostat; for some countries other sources as Wikipedia complete the data for the countries bordering the seas in question. The population density is provided in **Map 14.1.**

4.2 Tourism and recreation

A significant share of the waste at coasts is generated by leisure activities and tourism at beaches and other coastal spots. During the summer months many tourism regions put great effort and money into cleaning up the beaches. But as this effort is made at local level, no aggregated information is available to monitor this effort. Thus a direct indicator has not been available. A potential indicator for the potential pressure is the total number of overnights. Relevant data are provided by Eurostat at NUTS 2 level for most of the European countries. For some other countries estimates or other sources are considered. The level of overnights for the different regions is displayed in **Map 14.2**.

However, the number of overnights indicates the potential littering only. The effective level of littering is difficult to identify, as it is a result of cultural attitudes, waste management and beach cleaning in place, and other factors. Thus the values given in Annex 13.2 need to consider (similar to the population density above) the level of the mitigation activities.

4.3 Activities at ports

The EU Directive 2000/59/EC[24] on port reception facilities for ship-generated waste and cargo residues established the legal conditions for waste facilities at ports to avoid SSL. However, due to general operations, carelessly discarded waste and wind there is still a high risk for LSL at ports. Data on littering / lost material at ports is not available. For a first idea on the regional relevance, we investigated in load and unload of freight in the regions in question. The annual amount of goods loaded and unloaded in ports of the each country is shown in **Map 14.3**. Again this indirect indicator is for a potential pressure and needs to be considered in combination with mitigations measures (mainly the national level of waste management established). The passenger traffic in the different regions might be considered as an additional indirect indicator.

The effects of the implementation and enforcement of the Directive 2000/59/EC on Sea Sourced Littering (SSL) is beyond the scope of this report.

[24] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0059:EN:HTML.

4.4 Solid waste management

4.4.1 Collection and treatment of municipal waste

Referring to the publication of Eurostat on Municipal Waste (Eurostat, 2011a) three different strategies for waste management have been identified for European Countries and accessing countries.

The first group covers countries that apply a combined strategy with high rates of more than 25 % for material recovery (composting and recycling) as well as incineration. The second group consists of countries where systems for recycling and composting are established to an extent that a high rate of material recovery of more than 25 % is achieved, but incineration rates fall short of 25%. The third group relies mostly on landfilling as a treatment option with equally low rates of less than 25 % for incineration and material recovery.

Considering the information on waste management available for the Mashreq and Maghreb countries (SWEEP-Net 2010) these countries shall be considered to match, in the best case, with the criteria for Group 3 or even less advanced (Group 4) as in all these countries dumping alongside riverbanks and shores is still massively applied (see next chapter below). In consequence the 3rd and 4th group have the highest potential for waste littering as the waste management is not yet fully developed with the aim to establish comprehensive recycling and recovery but still refers mainly to disposal. Table 8 shows the grouping by countries and **Map 14.4** shows the geographical situation of the municipal waste management. The combination of Group 3 and 4 with a high population density and high numbers of overnight demonstrate a high risk of Land-Sourced Littering.

Table 8: Level of waste management referring to the level of material recovery and incineration of municipal waste; *Source: Eurostat, 2011a ,including estimates for non EU countries*

Group 1 Incineration > 25% recovery > 25%	Group 2 Incineration < 25% recovery > 25%	Group 3 Incineration < 25% recovery < 25%	Group 4 “less advanced” (estimate by Öko-Institut)
Germany	Italy	Estonia	Albania
Netherlands	Finland	Poland	Bosnia and Herzegovina
Sweden	United Kingdom	Malta	(Kosovo)
Denmark	Spain	Greece	Croatia
Belgium	Ireland	Cyprus	(fYR of Macedonia)
Norway	Slovenia	Latvia	Montenegro
France		Lithuania	(Serbia)
(Luxembourg)		Portugal	Turkey
(Switzerland)		Romania	Lebanon
(Austria)		Bulgaria	Syria
		(Slovakia)	Egypt
		(Czech Republic)	Libya
		(Hungary)	Tunisia
			Algeria
			Morocco

With regard to the three seas in question for Palestinian territories, Israel Monaco and Gibraltar no information is available.

(in brackets) = countries not bordering a sea[25]

[25] The Black Sea is also under consideration.

4.4.2 Dumpsites located on the coast or riverbanks

Waste disposal along streets and riverbanks in drainage channels and small rivers is observed in many countries bordering the Mediterranean Sea. The figure below displays an example observed in summer 2011 in Albania.

Rainfalls or floods mobilise the waste dumped and (plastic) waste is discharged to the sea. In result rivers are deemed a major source of plastic in marine environment. Based on our literature review the total contribution to LSL and or even the order of magnitude of this pathway is currently not known. However, we take into consideration that a high population density and a low level of waste management is considered as a high risk for LSL from rivers.

Figure 10: Effects of littering and dumping alongside rivers in Albania (2011), Photo: Markus Blepp

4.4.3 Plastic packaging waste management

The European Directive on Packaging and Packaging Waste (Directive 94/62/EC) stipulates the framework and the requirement for the national management of packaging material including plastic packaging.

The EU first introduced measures on the management of packaging waste in the early 1980s. Directive 85/339/EEC covered the packaging of liquid beverage containers intended for human consumption only, but it was too vague to bring about the effective harmonisation of national policies. As a consequence, diverging national legislation appeared in several Member States.

Only some EU Member States introduced measures on packaging and packaging waste management with a view to reducing their environmental impacts. Serious internal market problems arose when cheap secondary materials from countries with recycling schemes that provided funding for collection and recycling appeared on the markets of other Member States, where no such schemes were in place. Collection and recycling activities that relied on cost recovery through the sale of secondary raw material were threatened by collapse.

For this reason, economic operators and Member States approached the Commission to introduce comprehensive legislation on packaging. In 1992, the Commission produced a proposal for a Council Directive on Packaging and Packaging Waste. Following a prolonged discussion in the European Parliament and the Council of Ministers, Directive 94/62/EC was adopted.

This Directive aims to harmonise national measures in order to prevent or reduce the impact of packaging and packaging waste on the environment and to ensure the functioning of the internal market. It contains provisions on the prevention of packaging waste, on the re-use of packaging and on the recovery and recycling of packaging waste.

In 2004, the Directive was reviewed to provide criteria clarifying the definition of the term 'packaging' and increase the targets for recovery and recycling of packaging waste. In 2005, the Directive was revised again to allow new Member States transitional periods for attaining the recovery and recycling targets. Detailed monitoring data are available for packaging materials by Eurostat[26].

Even if some inconsistency of the data might be observed in detail, for instance regarding the breakdown by incineration and recovery, some general trends can be derived:

- As demonstrated in **Figure 11**, most of the newer Member States generated less plastic packing compared to EU 15 in 2008. Thus rising values for those countries behind might be expected.
- The specific amount recycled has no relationship to the total level generated or the level of recovery as demonstrated in **Figure 12**.
- The specific amount of “calculated disposal” of plastic packaging waste displays the calculated difference between the amount put on the market minus recycling and energy recovery. Thus the remaining is either incinerated without energy recovery or disposed in sanitary landfills (which is due to the high volume a wasted volume of the landfills) or even littered to the environment. This calculated disposal of packaging waste is shown in **Figure 13**. We propose to use this value as indicator for the pressure to the environment.

[26] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Packaging_waste_statistics.

Regarding the Mashreq and Maghreb countries bordering the Mediterranean Sea, Tunisia has introduced a successful program ECO-LEF for collecting and recycling plastics by small enterprises and Algeria is trying to establish a similar system under its ECO-JEM program (SWEEP-Net 2010). Outreach campaigns and public education are weak across all SNPC[27], to induce a change in behaviour and reduce or separate household waste (SWEEP-Net 2010). For the time being no reliable data are available on plastic packaging waste for these countries. For those countries were no information is available as a best guess we propose to consider a level of 12.5 kg per capita and year of "calculated disposal", which is equivalent to the average of Poland, Latvia, Romania, Hungary and Lithuania.

The data shown in **Figure 13**, including the estimations described above are displayed for the three seas in question in **Map 14.5**. Again this indicator shall be considered as an indirect indicator, demonstrating the potential littering only, thus needing the consideration of the mitigation measures.

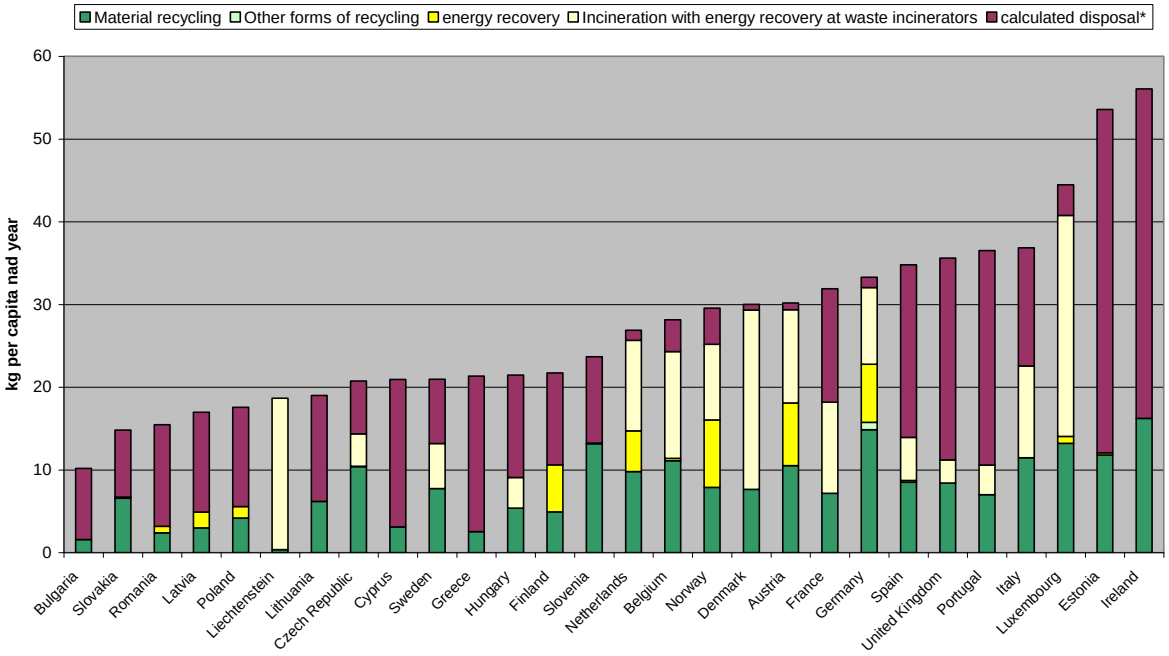

Figure 11: Data on plastic packaging generated[28] and treated in Europe (2008): Sorted by the specific amount generated per capita; Source: Eurostat 2011b, env_waspac

[27] SWEEP-NET Partner Countries: Mauretania, Morocco, Algeria, Tunisia, Egypt, Palestine Territories,. Lebanon, Syria, Jordan, Yemen.

[28] Plastic packaging generated is the total of all categories shown. "Calculated disposal*" is not an expression of the source / statistics referred to. It is simply the difference between generated and total recovered.

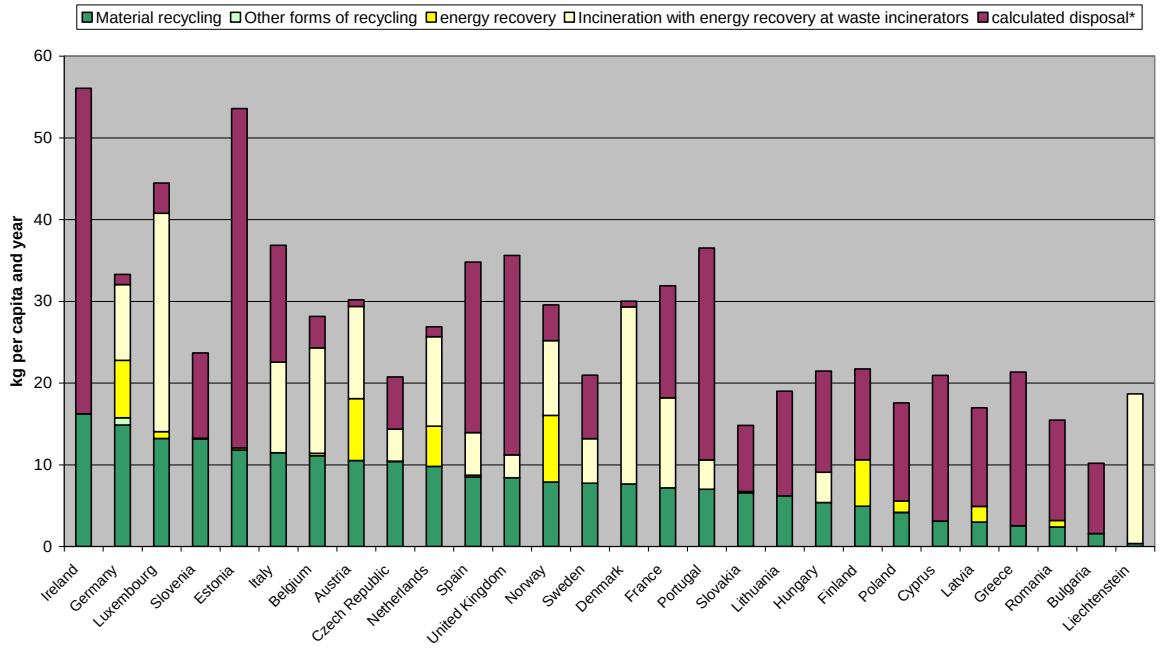

Figure 12: Data on plastic packaging generated and treated in Europe (2008): Sorted by the specific amount of material recycling; Source: Eurostat 2011b, env_waspac 2011b

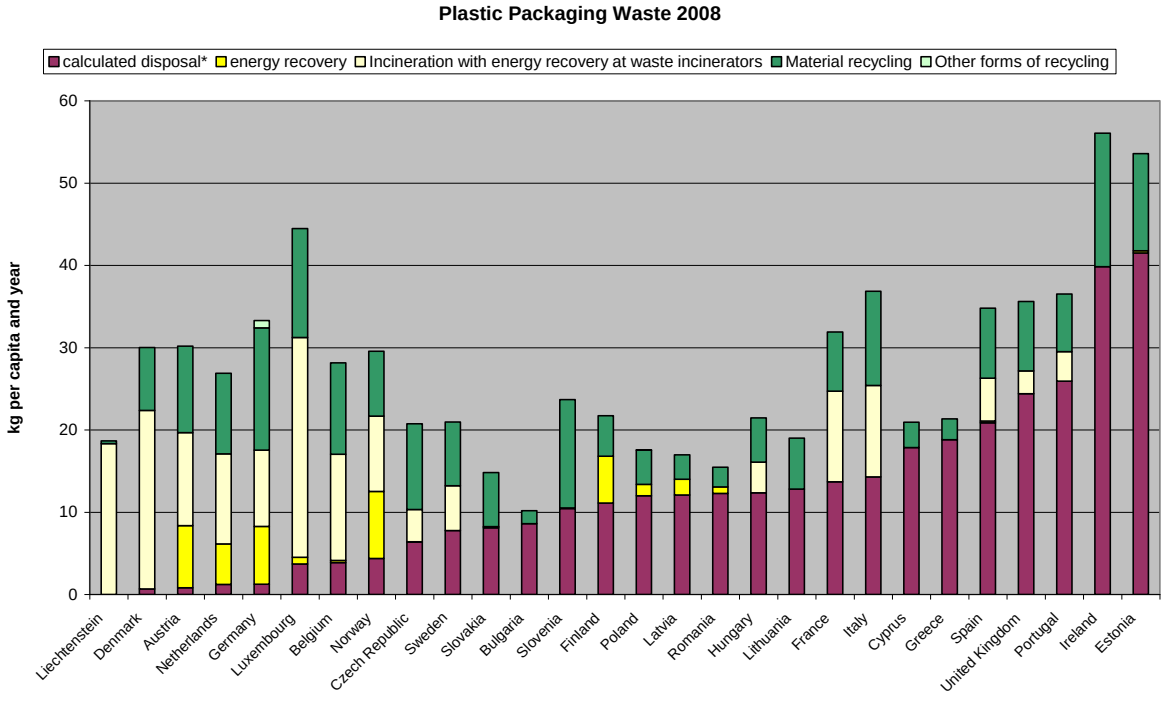

Figure 13: Data on plastic packaging generated and treated in Europe (2008): Sorted by the specific amount for calculated disposal[29]; Source: Eurostat 2011b, env_waspac

[29] "Calculated disposal*" is not an expression of the source / statistics referred to. It is simply the calculated difference between generated and total recovered.

4.4.4 Waste management of commercial and industrial waste

The following commercial sectors might contribute to pressure of the seas.

- industrial or manufacturing outfalls (e.g. by-products, plastic resin pellets)
- construction and demolition sites
- ship-breaking yard
- on shore fish-processing industry activities
- agriculture activities.

It is difficult to establish an indicator referring to the quantity of commercial waste and the quality of waste management of commercial waste. Thus the effects are deemed to be considered “in principle” by the indicator for the municipal waste management.

4.4.5 Waste management of agricultural plastic waste

According to PlasticsEurope the total plastic waste from agriculture amounts to 1.3 million tonnes in 2010. Further, PlasticsEurope shows recovery and disposal (at landfills and incineration installations) with rates totalling up to 100%. It seems that more discussions on the understanding of the total waste generation is required. Probably for some material flows the same approach as for plastic packaging material flow analysis is required. For instance it might be necessary to consider plastic foils put on the market for agricultural purposes for short service life and thus equivalent to waste generation.

As for the time being, sufficient information for a specific indicator is not available we propose to consider the indicator for solid waste management as mentioned above.

4.5 Waste water treatment

Raw waste water contains debris as hygiene articles and material flushed from paved or unpaved surface to the sewer. If no sewer and no waste water treatment is established, these materials are discharged to rivers. If the material is not (biological) degradable, there is a high risk that the final disposal is the marine sea (especially the rates of microparticles). If at least a primary waste water treatment is established with, for instance, grids at the entrance of the WWTP, a certain per cent of such materials is removed. However, we have not been able to identify data with acceptable geographical coverage for the level of the waste water treatment or on the (plastic) material discharged with untreated waste water. Further investigations are required for this issue.

4.5.1 Coverage of collection (sewer) and treatment

The data published by Eurostat has a limited coverage; thus it is not useful to investigate further or to display the figures in detail in this report. Other comprehensive data with relevant coverage have not been identified.

4.5.2 Sewer overflow, combined sewer overflow[30]

For the sewer overflow, almost no data has been identified.

[30] Under normal weather conditions, sewage is carried to a wastewater treatment (various proportion of population served by connections to sewerage systems and central wastewater treatment in EU-27). However, during heavy rains the handling with the capacities of the wastewater treatment systems may be exceeded and the sewage plus storm water is then not treated and is directly discharged into rivers and seas.

4.5.3 Pressure indicator for waste water management

For the time being no indicator is established, even if the waste water is considered for several countries as a relevant source for LSL. In the first instance the level of waste management and the level of waste water treatment might correspond, as they depend on the level of public services in general. Thus, as long as no other indicator is available, we recommend considering the indicator for waste management to display the level of waste water management as well.

4.6 Proposed set of indicators

Table 9 shows the proposed set of indicators and the required combinations to derive the effective pressure.

Table 9: Overview of impacts and related indicators for land-sourced litter

Pressure	Indicator
Population density (4.1)	Population density (4.1) *- in combination with-* groups for municipal waste management (4.4.1)
Tourism / recreation (4.2)	
Level of littering (inland / seashore)	-/-
Littering caused by tourism / recreational visitors / events to the coast	Nights spent by residential and non-residential in tourist accommodation establishments (4.2) *- in combination with-* groups for municipal waste management (4.4.1)
Activities at ports (4.3)	
Level of littering at ports	-/-
Littering caused by commercial activities at ports	Marine transport of freight; loaded and unloaded (4.3) *- in combination with-* groups for municipal waste management (4.4.1)
Solid waste management (4.4)	
Collection and treatment of municipal waste (4.4.1)	Groups for municipal waste management (4.4.1)
Dumpsites located on the coast or riverbanks (4.4.2)	Groups for municipal waste management (4.4.1)
Plastic packaging waste management (4.4.3)	Plastic packaging waste disposed off (4.4.3) *- in combination with-* groups for municipal waste management (4.4.1)
Waste management of commercial and industrial waste (4.4.4)	Groups for municipal waste management (4.4.1)
Waste management of agricultural plastic waste (4.4.5)	Groups for municipal waste management (4.4.1)

Continuation of Table 9: Overview of impacts and related indicators for land-sourced litter

Pressure	Indicator
Waste water treatment (4.5)	
Coverage of collection (sewer) and treatment (4.5.1)	Groups for municipal waste management (4.4.1)
Sewer overflow, combined sewer overflow(4.5.2)	Groups for municipal waste management (4.4.1)

5 Baltic Sea

5.1 Geography

The Baltic Sea is a cool-temperate shallow sea bordering the Atlantic and one of the world's largest brackish water seas of the earth. It is only linked with the open sea areas by the narrow and shallow waters (e.g. the Sound and the Danish Belts). Thus the average salinity gradient is lower than compared to the global oceanic average salinity. The Baltic Sea has an area of 374 000 km^2 and an average depth of 53 m. Due to its special geographical, climatological, and oceanographic characteristics, the Baltic Sea is highly sensitive to the environmental impacts of human activities in its sea area (HELCOM 2011). The volume is about 20,000 km^3 of water and every year approximately two-hundred rivers bring about 2% of this volume of water (equal to approx. 430 m^3) into the sea as run-off. The catchment area is almost four times larger than the sea itself and is home to over 85 million people (HELCOM 2011). The following table gives an overview of the coastline and their share of the Baltic Sea.

Table 10: Riparian states and their coastline in km and the share in percentage (Source: Policy Research 2009)

Riparian states of the Baltic Sea	Coastline km	Coast share in %
Denmark	3 070	8.29%
Finland	14 018	37.84%
Sweden	13 567	36.63%
Estonia	2 549	6.88%
Germany	2 009	5.42%
Poland	634	1.71%
Latvia	534	1.44%
Russia	400	1.08%
Lithuania	262	0.71%
Total	**37 043**	**100%**

5.2 Convention on the prevention of the Baltic Sea

The **1974[31] Helsinki Convention** on the prevention of the Baltic Sea entered into force in 1980. In 1992, a new convention was signed by all states bordering the Baltic Sea. The Convention covers the entire Baltic Sea area, including inland waters, the water of the sea itself, and the seabed. Measures are also taken in the whole catchment area of the Baltic

[31] Signed in 1974 by seven Baltic coastal states.

Sea to reduce land-based pollution. The Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1992, entered into force on 17 January 2000.

5.3 Pressure

5.3.1 Population density

Around 27 million people are living in the administrative units (level NUTS 3) bordering directly to the shore with different density as displayed in Figure 14.

Of course the size of the area has direct influence to the average density, however it provides, in the first instance, a good impression on the general pressure the Sea is exposed to. A comparison with the population density to the other seas is shown in **Map 14.1**.

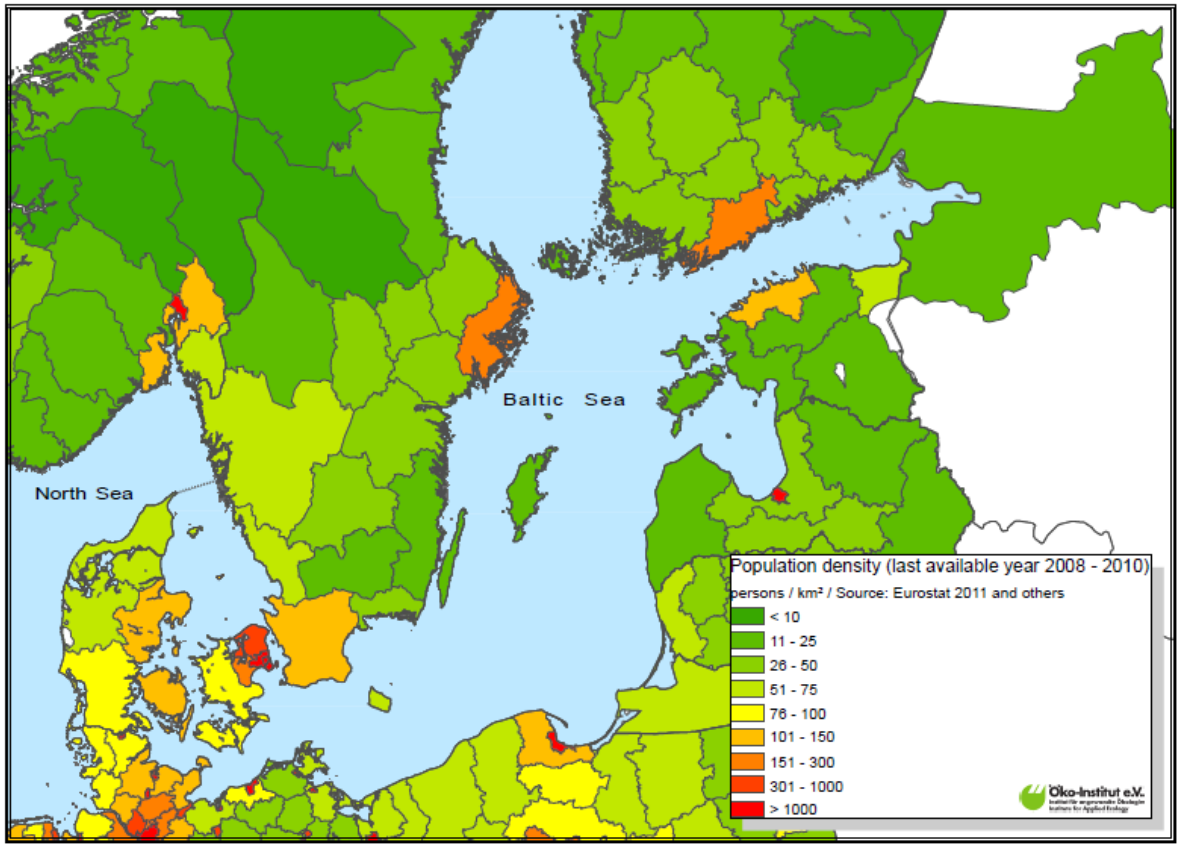

Figure 14: Population density in administrative areas (NACE 3), bordering the Baltic Sea,. Source: Eurostat

5.3.2 Tourism and recreation

The relation between littering at beach and tourism is described in chapter 4.2. Data are available for most countries available at NUTS 2 level as displayed for all regions / seas in **Map 14.2**. As shown the pressure by tourism is concentrated to the German and Danish area, while the northern and eastern areas of the shore are less harmed by tourism. In total a number of approx. 128 million nights per year are spent in the NUTS 2 areas bordering the Baltic Sea.

5.3.3 Waste management at ports

The activity at ports is shown in **Map 14.3.** In total approximately 486 million tonnes have been loaded and uploaded per year on average for 2008 to 2010 (+approximately 150 million tonnes for Russia not displayed in the map so far). This accounts for around two thirds of the freight loaded and uploaded in North Sea ports. Accordingly there is a relevant activity, but compared to the activities at ports and the length of the shore in the area of the North Sea, the level is more moderate.

5.3.4 Collection and treatment of municipal waste

The different level of municipal waste management is addressed in chapter 4.4.1. The level of the countries bordering the Baltic Sea is shown in Table 11 below and **Map 14.4.** Accordingly improvements in waste management are expected for Poland, Estonia, Latvia and Lithuania complying more and more with the European acquis communautaire. The effects of Russia, bordering the Baltic Sea, appear limited due to the limited extent of shore line.

5.3.5 Management of plastic waste

The different level of plastic waste management is addressed in chapter 4.4.3. The level of the countries bordering the Baltic Sea is shown in Table 11 below and **Map 14.5**. The performance of the countries differs remarkably. While Germany and Denmark have an amount of calculated disposal of 0.7 and 1.2 kg per capita and year only; for most of the other countries a disposal of more than 10 kg per capita and year is displayed; in maximum even more than 30 kg per capita. Accordingly there is a lot of space to improve collection and recycling (or at least energy recovery) of plastic packaging. Even if some inconsistences in the data might be discovered in the future (for instance for Estonia), the general trend remains true. However, it needs to be considered that the total amount of plastic waste disposed of is not displayed in the figure but only the specific pressure (disposal of plastic waste per capita).

Table 11: National pressure, indicating potential LSL

Member of Helsinki convention	Member of EU-27	Population density and tourism	Different municipal waste management strategy	Calculated level of plastic packaging waste to be disposed of in 2008 [kg per capita and year]	Commercial freight at ports (unload and upload) 1000 t / year, average 2008 - 2010
Denmark	X	Please refer to **Figure 13:** The majority of the population lives around the south western shores of the Baltic Sea, The population density and tourism activity in the northern and eastern areas is much smaller.	1	0,7	77 337 [2)]
Estonia	X		3	41,5	29 339
Finland	X		2	11,1	15 991
Germany	X		1	1,2	51 441 [1)]
Latvia	X		3	12,1	49 179
Lithuania	X		3	12,8	29 498
Poland	X		3	12,0	40 520
Russia	-		4*	12,5*	ca. 150 000
Sweden	X		1	7,8	128 642

* No detailed information available, default value only; more information see Chapter 4.4.3

n.a. = not available

[1)] Including Country Schleswig Holstein partly to be considered for the North Sea

[2)] Including those to be considered for the North Sea

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6 The North Sea

6.1 Geography

The North Sea as one of the busiest maritime areas is regarded as being bound by the coastlines of England, Scotland, Norway, Sweden, Denmark, Germany, The Netherlands, Belgium, and France, and by imaginary lines delimiting the western approaches to the Channel (5° W), the northern Atlantic between Scotland and Norway (62° N, 5° W), and the Baltic in the Danish Straits (OSPAR 2009).

The North Sea is situated in temperate latitudes with a climate that is strongly influenced by the inflow of oceanic water from the Atlantic Ocean and by the large scale westerly air circulation which frequently contains low pressure system. Extreme weather conditions have a direct impact on hydrography, which is characterised by water exchange with surrounding ocean areas, and strong tides (OSPAR 2011).

The North Sea has a surface of about 750 000 km^2 (including its estuaries and fjords) and a volume of about 94 000 km^3, with depths not exceeding 700 m. Major activities in the North Sea include fishing, the extraction of sand and gravel, and offshore activities related to the exploitation of oil and gas reserves including the laying of pipelines. Moreover, the North Sea is one of the most frequently traversed sea areas of the world with two of the world's largest ports situated on its coasts (Rotterdam and Hamburg), and the coastal zone is used intensively for agriculture and recreation. The North Sea is surrounded by densely populated (around 185 million people in the catchment area[32]), highly industrialised countries.

The following table gives an overview of the coastline and their share of the North Sea.

Table 12: Riparian states and their coastline in km and the share in percentage (Source: Policy Research 2009)

Riparian states of the North Sea	Coastline, km	Coast share in %
Denmark	1 535	11.6%
UK	8 691	65.9%
Germany	1 515	11.5%
Netherlands	1 275	9,7%
Belgium	98	0,7%
France	~ 70[33]	0,5%
Norway	No data available	
Total	**13 184**	**100%**

[32] Environmental Guidebook on the Enclosed Coastal Seas of the World. International Center for the Environmental Management of Enclosed Coastal Seas. 2003. Reviewed 2008, http://www.emecs.or.jp/guidebook/eng/pdf/05north.pdf.

[33] http://www.frankreich-experte.de/modules.php?name=Pages&pa=showpage&pid=221.

6.2 Convention for the protection of the marine environment of the north-east Atlantic

With respect to the **North Sea**, the Convention for the Protection of the Marine Environment of the north-east Atlantic, or **OSPAR Convention,** is the current legislative programme regulating the international cooperation on environmental protection in the north-east Atlantic. The following countries bordering the North Sea are members of the OSPAR convention: Norway, United Kingdom, Denmark, Netherlands, Germany, Belgium and France.

6.3 Pressure

6.3.1 Population density

Around 26 million people are living in the administrative units (level NUTS 3) bordering directly on the shore with different density as shown in Figure 15. Of course the size of the area has direct influence to the average density; however it provides, in first instance, a good impression on the general pressure the sea is exposed to and a first comparison with the population density to the other seas is given in **Map 14.1**.

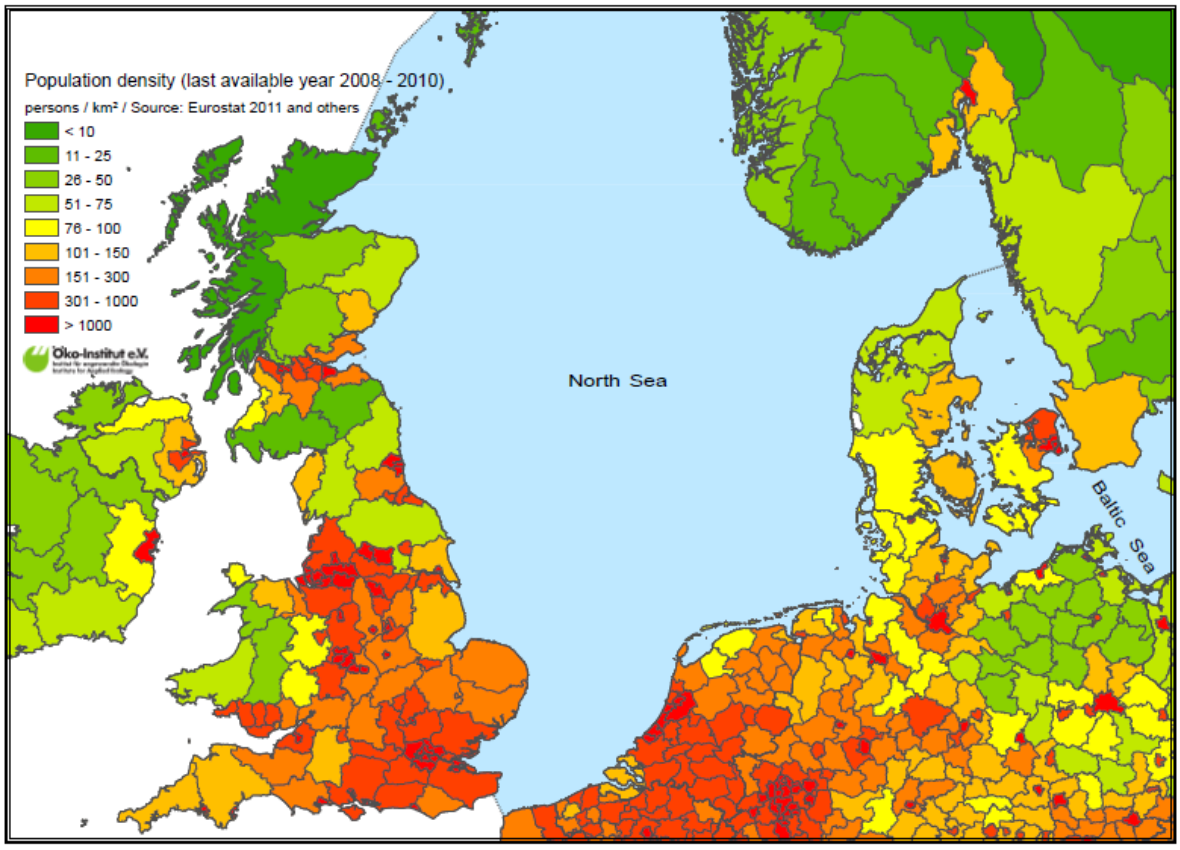

Figure 15: Population density in administrative areas (NACE 3), bordering the North Sea. Source: Eurostat (2011)

6.3.2 Tourism and recreation

Littering at beach is described by the tourism indicator as addressed in chapter 4.2. It is for most countries available at NUTS 2 level and displayed for all regions in **Map 14.2.** As displayed the area is not only exposed to a high population density but also to a high level of tourism at shore. In total a number of approximately 136 million overnights are spent in the NUTS 2 areas bordering the North Sea.

6.3.3 Waste management at ports

The activity at ports is displayed in **Map 14.3**. In total approximately 987 million tonnes have been loaded and uploaded per year on average for 2008 to 2010. Accordingly the area is one of the busiest areas within Europe (and the world) with two of the world's largest ports situated on its coasts (Rotterdam and Hamburg).

6.3.4 Collection and treatment of municipal waste

The different level of municipal waste management is addressed in chapter 4.4.1. The level of the countries bordering the North Sea is displayed in Table 13 below and in **Map 14.4**.

6.3.5 Management of plastic waste

The different level of plastic waste management is addressed in chapter 4.4.3. The level of the countries bordering the North Sea is shown in Table 13 below and in **Map 14.5**. For UK a remarkably high level of plastic packaging waste disposed of is to be observed.

Table 13: National pressure, indicating potential LSL for the North Sea

Members of OSPAR convention	Member of EU-27	Population density at tourism and shore	Different level of municipal waste management	Calculated level of plastic packaging waste to be disposed of in 2008 [kg per capita and year]	Commercial freight at ports (unload and upload) 1000 t / year, average 2008 - 2010
Norway	EEA	The area is one of the most populated area in Europe and at the same time exposed to a high level of tourism	1	4.4	n.a.
UK	EU-27		2	24.4	427 054 [2)]
Denmark	EU-27		1	0.7	77 337 [1)]
Netherlands	EU-27		1	1.2	419 444
Germany	EU-27		1	1.2	184 899 3)
Belgium	EU-27		1	3.9	184 593

[1)] Including those which might be considered for the Baltic Sea

[2)] including those which might be considered for the North Atlantic

[3)] excluding western shore of Schleswig- Holstein but including Hamburg

7 The Mediterranean Sea

7.1 Geography

The Mediterranean Sea is the largest sea of the three seas and it covers an approximate volume of 3.7 million km³, an area of 2.5 million km² and 55 000 kilometres of coastline. The average depth is around 1,500 meters, the deepest water in the Mediterranean reaches more than 5 000 meters[34]. In the west the Strait of Gibraltar connects the Mediterranean with the Atlantic Ocean and in the north-east the Sea of Marmara and the Bosporus link it with the Black Sea as well the through the Suez Canal with the Red Sea.

The Mediterranean Sea can be divided into several sections the north (NMCs), the eastern (EMCs) and the southern Mediterranean countries (SMCs). The NMCs include EU members, the “Serbian area” and Turkey; the EMCs are composed by Israel, Lebanon and Syria and the SMCs are the northernmost countries of the African continent.

Several activities have been organised since 1970 to prevent marine littering in the Mediterranean Sea. But governments and specially NGOs have been working on the marine litter problem with partially good results, since there is still some incongruence in the data analysis and littering reporting.

The Mediterranean region, with 460 million inhabitants[35], is located at 22 coastal countries and boarded to three continents with a high level of biological diversity and important habitats. The most important economic value is tourism[36] with almost a doubling of total population during the summer months. Though not as economically important as tourism, fishing is considered to be very much part of the Mediterranean identity and is important in relation to local economies and fishing.

[34] 5,267 meters in the Ionian Sea.
[35] In year 2008 (UNEP 2009).
[36] Approximately one third of the world's international tourists choose the Mediterranean coast (UNEP 2005a).

Table 14: Riparian states and their coastline in km and the share in percentage (Source: Policy Research 2009)

Riperian states in the Mediterranean Sea	Coastline, km	Coast share in %
Greece	17.400	31,28%
France	8.245	14,82%
Italy	7.468	13,42%
Spain	6.583	11,83%
Croatia	6.278	11,29%
Turkey	2.200	3,95%
Libya	1.770	3,18%
Tunisia	1.298	2,33%
Algeria	998	1,79%
Egypt	955	1,72%
Morocco	512	0,92%

Riperian states in the Mediterranean Sea	Coastline, km	Coast share in %
Albania	418	0,75%
Cyprus	367	0,66%
Montenegro	294	0,53%
Lebanon	225	0,40%
Israel	190	0,34%
Syria	183	0,33%
Malta	173	0,31%
Slovenia	45	0,08%
B&H	23	0,04%
Monaco	4,1	0,01%
Total	55.629	100,00%

7.2 Convention for the protection of the Mediterranean Sea against pollution[37]

In 1975, 16 Mediterranean countries and the European Community adopted the Mediterranean Action Plan (MAP), the first-ever Regional Seas Programme under UNEP's umbrella. In 1976 these parties adopted the Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention). Seven Protocols addressing specific aspects of Mediterranean environmental conservation complete the MAP legal framework:

- Dumping Protocol (from ships and aircrafts);
- Prevention and Emergency Protocol (pollution from ships and emergency situations);
- Land-based Sources and Activities Protocol;
- Specially Protected Areas and Biological Diversity Protocol;
- Offshore Protocol (pollution from exploration and exploitation);
- Hazardous Wastes Protocol;
- Protocol on Integrated Coastal Zone Management (ICZM).

Although the MAP's initial focus was aimed at marine pollution control, over the years its mandate gradually widened to include integrated coastal zone planning and management.

[37] The entire subsequent section is taken from the home-page of the UNEP-MAP, describing the Barcelona Convention http://www.unepmap.org/index.php?module=content2&catid=001001004.

In 1995, the Action Plan for the Protection of the Marine Environment and the Sustainable Development of the Coastal Areas of the Mediterranean (MAP Phase II) was adopted by the Contracting Parties to replace the Mediterranean Action Plan of 1975.

At the same time, the contracting parties adopted an amended version of the Barcelona Convention of 1976, renamed Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean.

Six Regional Activity Centres (RACs) are responsible for the implementation of respective components of Mediterranean Action Plan (MAP) under the supervision of the Coordinating Unit (MEDU).

With respect to the Mediterranean Sea the Union for the Mediterranean (UfM) is a major initiative connected to the Barcelona Process. During the summit of 2008, where 43 Ministers of Foreign Affairs gathered in Marseille, six concrete projects were launched. One of these projects addresses de-pollution of the Mediterranean Sea.

7.3 Pressure

7.3.1 Population density

Around 186 million people are living in the administrative units (level NUTS 3) bordering directly to the shore with different density as shown in Figure 16 and **Map 14.1**. Of course the size of the area has a direct influence on the average density; however it provides, at first instance, a good impression of the general pressure to which the sea is exposed and a first comparison with the population density to the other seas.

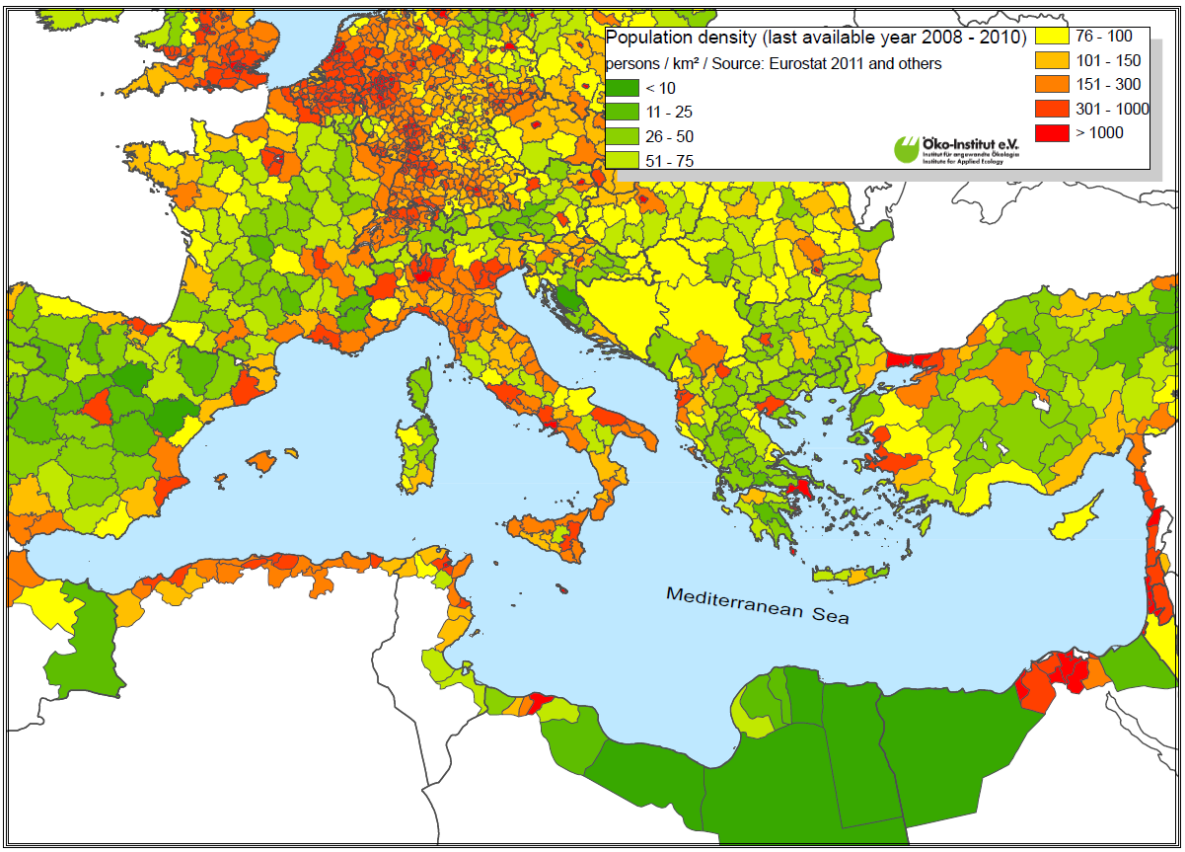

Figure 16: Population density in administrative areas (NACE 3) bordering the Mediterranean Sea. (Source: different data, consolidated by Öko-Institut)

7.3.2 Tourism and recreation

Littering at beaches is described by the tourism indicator as addressed in chapter 4.2. It is for most countries available at NUTS 2 level and displayed in **Map 14.2**. As visible in this Annex, the entire Mediterranean Sea is not only exposed to a high population density, but also to a high level of tourism at shore. In total a number of at least 650 Million nights are spent in the NUTS 2 areas bordering the Mediterranean Sea by residents and non-residents in tourism accommodation establishments. Thereof 315 Million for Spain, France, Italy, Slovenia, Croatia, Greece, Cyprus, and 216 million for Tunisia, Israel, Egypt (where the percentage spent at the border of the Mediterranean Sea is not known).

For Turkey no detailed figures for nights spent by residents and non-residents in tourism accommodation establishments are available. However the Turkish Embassy in Germany reports for 2008 for the Ägäis 4.5 for Maramara 10.8 (including Istanbul) and for the other Mediterranean Sea 8.3 million non-residents entering the country. For the Map 14.2 we considered a number of at least 150 million night spent by residents and non-residents. Data for Syria, Palestinian Authorities, Libya, Algeria, Morocco and Malta, Albania, Bosnia Herzegovina, Montenegro are missing.

7.3.3 Waste management at ports

The activity at ports is displayed in **Map 14.3.** In total approximately 1100 million tonnes have been loaded and unloaded per year on average for the years 2008 to 2010; thereof

814 million are attributed to Spain, France, Italy, Slovenia, Croatia, Cyprus, Malta and Greece and another 312 million to Morocco, Algeria, Tunisia, Libya, Egypt, Israel and Syria.

7.3.4 Collection and treatment of municipal waste

The different level of municipal waste management is addressed in chapter 4.4.1, where three or four different groups have been identified.

The first group contains countries that apply a combined strategy with high rates of more than 25 % for material recovery (composting and recycling), as well as incineration. The second group consists of countries where systems for recycling and composting are established to an extent that a high rate of material recovery of more than 25 % is achieved, but incineration rates fall short of 25%. The third group relies mostly on landfilling as a treatment option with equally low rates of less than 25 % for incineration and material recovery. However, this grouping refers to data maintained by Eurostat for EU-27 plus Turkey and Bosnia Herzegovina. Thus the Mashreq and Maghreb countries are not covered by this classification.

For a selected number of Mashreq and Maghreb countries bordering the Mediterranean Sea (Morocco, Algeria, Tunisia, Egypt, Lebanon and Syria) comprehensive information is provided by the SWEEP-NET as displayed in Table 15. Compared to the average specific waste generation of 520 kg per capita in Europe, the displayed countries produce approximately half of municipal waste. For some of them the coverage of the collection of municipal waste needs to be improved and for most of these countries, the level of composting (less than 10%) and recycling (less than 10%) is rather low or even non-existent and the disposal at (uncontrolled) dumpsites it high. In summary these countries are less improved compared to Group 3; thus we propose the introduction of a group 4 for those countries where the collection rate is below 90% and the disposal at dumpsites is more than 50%. According to our expert knowledge Tunisia and Lebanon are somehow advanced within this group, but there not enough evidence to consider them for Group 3. As Libya is not included in the SWEEP-Net, no detailed information are available for the generation and treatment of waste, however it is deemed that the situation is similar to the less advanced countries in the region, thus it is considered for Group 4. The same applies for the Gaza Strip.

Table 15: Municipal solid waste situation in selected SWEEP-Net Countries (SWEEP-NET 2010)

	Morocco	Algeria	Tunisia	Egypt	Lebanon	Syria
Population (million)	31.8	35.1	10.3	78.2	4.5	22
MSW generation (MT/year)	5	8.5	2.25	19.7	1.57	4.5
MSW generation (kg/year and capita)	160	240	220	250	350	200
MSW annual generation growth (% per year)	2.8	3	2.5	3.4	1.65	2.5
MSW collection coverage in urban areas (%)	82	85	80 - 100	40 - 90	100	90 - 100
MSW collection coverage in rural areas (%)	n.a.	60	50 - 100	0 - 35	99	60 -90
% of MSW landfilled	28	15	65	5	53	≈20
% of MSW composted	1	0	weak	9	9	1,2
% of MSW recycled	9	4-5	weak	2.5	8	2-3
% of MSW in open dumps	62	80	not available	83,5	30	≈80
Number of sanitary landfills operational	10	10	10	5	3	7
Number of sanitary landfills constructed	3	42	4	0	0	6
Number of sanitary landfills planned	50	27	6	3	0	not available

For the western Balkan counties Albania, Bosnia Herzegovina and Montenegro no statistics on solid waste management have been identified. However, these countries are considered to have a similar performance as Morocco, Algeria, Egypt and Syria.

For Israel and Monaco no statistics on solid waste have been identified to date.

7.3.5 Management of plastic waste

The different level of plastic waste management is addressed in chapter 4.4.3. The level of the countries bordering the Mediterranean Sea is shown in Table 16 below.

Table 16: National pressure, indicating potential LSL for the Mediterranean Sea

Countries / Areas bordering the Mediterranean Sea	Contracting party of Barcelona Conv.	Member of EU-27	Candidate for EU	SEEP-NET	Arab League	Population density and tourism	Different level of municipal waste management	Calculated level of plastic packaging waste to be disposed of in 2008 [kg per capita and year]	Commercial freight at ports (unload and upload)
Albania	×		X[38]			Please refer to GIS maps in Annex 13.5 and 13.3	4 *	12.5 *	n.a.
Algeria	×			×	×		4	12.5 *	78 430
Bosnia and Herzegovina	×		X[39]				4	12.5 *	n.a.
Croatia	×		×				4 *	12.5 *	n.a.
Cyprus	×	×					3	17.8	6 004
Egypt	×			×	×		4	12.5 *	96 833
France	×	×					1	13.7	84 760
Greece	×	×					3	18.8	89 531
Israel	×						n.a.	n.a.	30 561
Italy	×	×					2	14.3	395 262
Lebanon	×			×	×		3	12.5 *	n.a.
Libya	×				X[40]		4 [1)]	12.5 *	9 235
Malta	×	×					3	n.a.	3 217
Monaco	×						?	n.a.	n.a.
Montenegro	×		×				4 *	12.5 *	n.a.
Morocco	×			×	×		4	12.5 *	48 835 [2)]
Slovenia	×	×					2	8.1	12 377
Spain	×	×					2	20.9	213 805
Syria	×			×	×		4	12.5 *	16 174
Tunisia	×			×	×		3	7.7 *	32 414
Turkey	×		×				3	12.5 *	n.a.
Gaza Strip[41]				×	×		4 [1)]	12.5 *	-
Gibraltar (UK)		×					2	24.4	n.a.

* No detailed information available, default value only; more information see Chapter 4.4.1 and 4.4.2.

[1)] No information available, default value only; more information see Chapter 7.3.2

[2)] Including those which might be considered for the Atlantic.

[38] Potential Candidate.
[39] Potential Candidate.
[40] Currently suspended (Dec. 2011).
[41] Palestinian territories.

8 Comparison of structure and pressure for the three seas

For the time being no combined pressure indicator has been developed. It might be an indicator per country or an indicator for the entire sea.

However, differences in structure and pressure for different regions became visible as demonstrated in Table 17. For instance the following observations apply:

- The indicators population density, tourism activity and activities at ports are, in relation to the length of the shore, at the lowest level for the Baltic Sea.
- The North Sea has the highest level (in relation to the shore) of the economic activities at ports.
- The Mediterranean Sea has the highest pressure from inhabitants and tourism compared to the other two seas.

Table 17: Regional differences for the three seas

	Baltic Sea	**North Sea**	**Mediterranean Sea**
Coastline (km)	37 043	13 144	55 629
Volume (km^3)	21 547	94 000	3 700 000
Average depth (m)	53	125	ca. 1500
Surface (km^2)	374 000	750 000	2 500 000
Inhabitants in catchment area	85 Million	184 Million	460 Million
People in the administrative area* bordering directly to the shore	27 Million	26 Million	77 Million
Nights spent by by residents and non-residents in tourist accommodations in the administrative area** bordering the shore	128 Million	136 Million	>650 Million
Load and unloaded freight (million tonnes) at ports	636	987	>1100

* NUTS 3

** NUTS 2

In addition to the geographical differences shown in Table 17 it is important that the waste management (also an indicator for the waste water treatment) around the Mediterranean Sea is less developed as for the other seas (see Map 14.4) and the same applies for plastic waste disposal (Map 14.5).

Countries in which a high population density and a high level of tourism is combined with less developed waste management and a relevant level of plastic packaging waste disposed of must be deemed as those regions with the highest risk for LSL.

Thus even if for instance Estonia has an extreme level of packaging waste disposed of (which needs to be verified) and the waste management is still under development in terms of recycling, the marine environment is exposed to a limited pressure due to the fact that the population density and tourism are limited (except for the capital). The situation is

different for instance in Tunisia or Egypt, where waste management and packaging recycling is weaker and in addition a high population density and (partially) a high level of tourism is observed.

As mentioned earlier in chapter 4, a combination with pressure indicators for SSL will complete the picture to identify regional patterns and needs for action.

9 Behavioural aspects

Behaviour aspects could be a very relevant input for the assessment of the environmental impact and the costs of a marine littering. One aim of this task is to quantify relevant aspects that influence the environmental impact. A second aim is to identify trends in future concerning the impact of pressures on European Seas.

Many of these trends and aspects are interdependent and likely to unfold over decades. They can significantly affect Europe's resilience in the long term or temporally.

Such behaviour aspects also offer unique opportunities for action. But effective measures require better information and better understanding of a highly complex and evolving situation.

9.1 Phenomenon of littering

Littering is an important environmental issue. Litter discarded in municipalities, beaches, parks and riverbanks can travel through the storm water or water drains to the oceans. The reasons for littering are both cultural and multi-sectorial, rooted in poor solid waste management practices, extensive use of marine resources, lack of infrastructure, indiscriminate human activities and behaviours, and an inadequate understanding on the part of the public of the potential consequences of their actions (UNEP 2009b).

Furthermore, today more than ever in the public space meets the social identities since the public space has become the mobile space. We are traveling broader and faster than before and we are increasingly outsourcing activities from the private sector into the public domain (Seecon 2008).

The major release of plastics to the environment is the result of inappropriate waste management and improper human behaviour, e.g. littering. However, it is difficult to give a litterer stereotype and key behavioural aspects. According the literature review the most common reasons for littering are laziness and no available waste bin.

The main causative factors of littering behaviours are:

- Pedestrians dropping garbage in the street or rivers;
- Passing motorists discarding garbage out of windows;
- Litter is thrown at a bin, it misses the bin and the person walks away;
- On arriving at a place where others have littered, waste is swept onto the ground;
- Litter is left and the person slowly moves away from it;
- Litter is buried, often under sand at the beach;
- Disposable mentality, relying that the garbage is collected.

All of these behavioural characteristics and the existing technical infrastructure (e.g. available waste bins or recycling programmes) differ in varying degrees in the specific countries. For instance, in areas with significant recycling programmes, the difference between waste generation and waste disposal could be 20%–40% (RSB 2009) and waste composition will change as recyclables are removed.

In order to establish the similarities as well as country-specific features of the "littering" phenomenon, we have also tried to carry out an assessment of the behaviours of citizens in

different countries. But there was no clear information (e.g. country specific social structure analysis) available concerning conducive and limiting factors in the different countries.

Education and public awareness campaigns, either at the national stage or at the community stage were essential tools for environmental protection, and that raising public awareness and encouraging people to change their attitudes and behaviours related to solid waste management were essential components in efforts to mitigate marine litter (UNEP 2009b).

9.2 Trends

Most trends are slow long-term processes of transformation that shape future societies' development in terms of social, economic, political, environmental and technological change. Normally trends are projected over a time span longer than a decade and have impacts on the societal system and their subsystems. Once in place, trends influence a wide range of activities, processes and perceptions, both in government and in society. Moreover, ongoing developments in the plastics industry enable the appearance of new plastic applications and in turn affect plastics consumption and waste generation. Due to the fact that plastics are an essential part of modern life, the information gathered in this section has focused on plastics and the regional coverage.

9.2.1 Economic growth

Economic changes have important impacts across almost all areas of society (e.g. economic fortune and prosperity, poverty, government debt, environmental impacts, etc.).

Although in many areas resource efficiency is increasing and the relative pollution content of our lifestyles is tending to fall, the sheer volume of economic activities is pushing resource use and pollution volumes to higher absolute levels.

This trend will have both a direct and an indirect effect on Europe's environment. Directly, economic growth increases the burden on the natural systems that sustain us. Indirectly, global economic development affects Europe's position and competitiveness, with economic, social and environmental consequences (SOER 2010).

The European population is demanding an even higher quality living environment. Achieving this will depend on the success of coordinated environmental (climate, biodiversity, pollution) policy measures creating a level playing field for European economic sectors, e.g. waste management systems.

9.2.2 Demographic characteristics

Nowadays, the population of the EU-27 was estimated to be 502.5 million (Eurostat 2011). Of this total, almost half of the EU’s population lives less than 50km from the sea and the majority concentrated in urban areas along the coast (see also chapters on population density for the three seas).

From 2015–2030 onwards, most of the countries of the EU are still growing despite ageing, mostly due to migration (IIASA 2007). However, there are obvious demographic differences between the European countries as well as within and between the administrative units. In some EU countries (e.g. Sweden, UK, Malta) and regions the population increased while in other countries the number of inhabitants declined (e.g. Germany, Italy).

Furthermore, there are changes in the demand for housing. The household structure is also interesting in terms of its relationship to a number of important outcomes (e.g. culture and

norms; in the cost and availability of housing, poverty, social policy, divorce rate, higher life expectancy). As one result, the number of single households is increasing in the European Union and this trend will continue in the coming decades. However, there are also cross-national differences in household composition of the European Union. Single adult households are most common in the Nordic and north-western groups of countries and least common in the southern countries.

Due to this demographic trends and in terms of littering some regions or administrative units (especially close to sea) could face new challenges on the intensity and speed of littering.

9.2.3 Tourism

This sub-chapter describes in rough outlines the travel behaviour of European tourists. The importance of tourism to Europe is large and it is a growth industry in Europe. The three seas in Europe are the most popular holiday destination (especially in the Mediterranean region). In general, the number of nights spent both at home and abroad by all tourists living in EU-27 countries would be dominated on trips of 4 nights and more. However, in recent years the number of short holiday trips[42] has increased than for long trips (> 4 days) and will continue to play an essential role in the next decade. Looking within Europe shows a different trend between western and southern countries and northern and eastern Europe (Eurostat 2008). Seasonally considered the most popular travel time in all EU member states is the period from June to September.

Generally, holidays are synonymous with mobility and tourist expenditure being without them is inconceivable. Tourist expenditure refers to the consumption expenditure made by a visitor for and during the trip and stay at destination. Tourism expenditure encompasses a wide variety of items, ranging from the purchase of consumer goods and services inherent to travel and stays (e.g. accommodation, transport, food and drinks, recreational, cultural and sporting activities) to the purchase of small durable goods for personal use, souvenirs and gifts for family and friends.

9.2.4 Major events

Major events, whether concerts, art exhibitions or sports partly cause significant environmental impacts. They consume energy and water, cause greenhouse gases and leave rubbish.

Metropolitan regions are centres of economic, political and cultural life and become a focal point of public interest. The performance of the metropolitan regions play a central role in these processes. As a junction of national and international currents they also have a high degree of international networking. Because of this role these metropolitan areas have also strengthened international competition..To succeed in this growing international competition, the metropolitan areas react with strategies of place-marketing initiatives, charity-events or the implementation of major events (Knieling 2004).

[42] Short trips are trips with 1 to 3 overnight stays.

9.2.5 Biodegradable plastics and bio-based plastics

In general, plastics are very persistent in the natural environment, which is also one of its assets in other areas (e.g. in construction). However, with regard to littering this poses a problem as plastics – especially conventional ones – do not degrade and remain and accumulate in the landscape and the seas for decades (and centuries).

Bio-based plastics are derived from renewable raw materials and can be biodegradable or not. Possible feedstocks are plants (e.g. starch, cellulose and derived sugars) or products derived from animals (e.g. proteins). The technical qualities of bio-based plastics in some cases still lag behind those of fossil equivalents, while in other cases they perform equally or even better, offering new innovative qualities.

The plastics market is currently dominated by petroleum-based plastic products. Today the market share of bioplastics is still small (0.1-0.2 % in Europe)[43].

The biodegradability of certain plastics indicates that littered plastic items disappear[44] more or less rapidly by decomposing into mainly CO_2 and water, thereby solving the problem "by themselves". Even if biodegradable plastics have been developed and are already on the market, there is reason to doubt that they contribute to solve the problem of littering and particularly of marine litter. Degradation in seas proceeds under different conditions than ambient degradation on land (e.g. cooler temperatures, "loss" of specified biomass). Without clarification of what is meant by the different terms related to biodegradation, littering might be adversely affected if consumers start to carelessly discard those plastics into the environment, assuming that the bags will easily decompose and disappear. In order to avoid misleading assumptions it is hence vital to assess whether the promised biodegradability really takes place in the (marine) environment and can thus contribute to a reduction of marine litter.

As an example, it might be the case that public confusion over "biodegradable" and "bio-based" leads to increased discarding of these plastics into the environment under the assumption that they would (rapidly) disappear by degradation. This would then need to be addressed by appropriately informing the public.

9.2.6 Consumer trends

Convenience products and take away

The out-of-home sector and snacks achieved positive growth during the past years. Nowadays the consumers are constantly compared to a wider range of offerings. In

[43] First life cycle assessments have been carried out on the environmental effects of bio-based plastics but they have not arrived at a clear statement (UBA, 2009; BIOIS, 2011; EC, 2011b). In general it seems that bio-plastics can have a positive effect in terms of fossil fuel use and global warming potential whereas categories linked to agricultural production (e. g. eutrophication, acidification, ecotoxicology) have more negative results than for fossil-based plastics. Further feedstock-related adverse effects are the potential competition of food and feed, the use of GMO as well as (indirect) land-use change which is up to now not properly quantifiable and may worsen the global warming potential result of bio-based plastics.

[44] A study on the degradation (O´Brine et. al 2010) of plastic bags in the marine environment found that compostable plastic effectively disappeared within four to six months whereas oxo-biodegradable and conventional plastic remained basically unchanged . However this is a single observation only and more effort needs to be spent to understand bio-degradation in natural environment and in particular environmental effects of additives etc.

particular, the offer of drinks and snacks has increased significantly and differentiated. Thus bakeries and butcher shops, cafes, bars and food retailing offering a variety of quickly served meals, as vegetarian, meat products, regional and international meals (Nestlé 2011). Especially young singles and young couples without children replace the main meals in this way.

Moreover, in recent decades there was an increase in convenience products due to the mentioned changes in the working world and the increase in single households. For instance in Germany the frozen and chilled products (e.g. pizza) recorded a continuous rise in the per-capita consumption[45], as thus means an increase in packaging material. A major part of the convenience products consist plastic packaging. The most significant impact, however, is likely to come from the increased trend towards environmentally friendly or organic foods[46]. This trend is growing very rapidly and the question must immediately be asked: What will be the long term impact on the growth of the convenience food market?

Furthermore, since the mid-1980s bottles of polyethylene terephthalate (PET), becomes more and more market share in beverage packaging. For instance in Germany more than three quarters of all water and soft drinks are now packed in plastic bottles. Even in the other beverage segments there has been a general increase of PET bottles[47].

Online-trading

The development of the internet and e-commerce, the convergence between information and communication technologies (ICT) and multimedia, the spread of mobile technologies (GSM, UMTS, etc.) and more recently the emergence of social networking and Web 2.0, are all factors that have a strong impact on consumers buying decisions. The proportion of companies who have sold their products in addition to the traditional distribution channels over the internet has risen sharply than the total retail sales. The consequence of this is that more consumer products sending by parcel service and thus on with packaging material, especially plastic waste[48].

Nearly, one in four companies uses the internet for national distribution. For comparison: in 2008 only 11% of companies were doing this. In 2010 the sale of goods in Europe via the internet has continued to increase markedly. Compared to the year 2009 the online sales increase in the trade sector by almost 20 percent[49].

45 http://www.tiefkuehlkost.de/publikationen/cool-facts-2010/
46 http://researchwikis.com/Convenience_Foods_Marketing_Research
47 http://www.forum-pet.de/statistik_4263.html?psid=fb1272172aeb16a37237a5e39311a506
48 For the year 2020 it is assumed that the majority (thought to be as much as 60-65%) of plastic waste will be plastic packaging waste (BIOIS 2010).
49 http://www.verivox.de/nachrichten/umsatz-im-onlinehandel-stieg-2010-in-europa-um-knapp-20-prozent-66197.aspx

10 Stakeholders

Another important element to consider is the different levels of relevant expertise or knowledge that different stakeholders possess. In order to assess the impact of marine litter it is essential that the different stakeholders are specified. There has only been a limited amount of research into stakeholders of marine litter and there are many aspects that require further research, especially in relation to the definition of economic costs. During the comprehensive literature review we have listed all possible stakeholders being separated to the three seas and outline them in certain main groups. Stakeholders that will influence LSL either positively or negatively could be NGO's, individuals, industries, governments, organisations or institutions whose interests through the implementation of the LSL are to be touched.

All information has been collected through a self-administrated list amongst stakeholders including a link on the website and an introductory notice of contents, see **Annex 13.4.**

Of this, in a further step (Phase 2) the list of groups has been generated; we intend to evaluate/analyse the influence of the stakeholders in terms of impacts, influence and the extent to which they are affected by the LSL. Moreover, it is a valuable asset to have a more in-depth review of stakeholders and derive challenges which are suitable for all groups which takes support as well as resistors into account.

11 Conclusions and outlook

This study provides a comprehensive overview of the currently available literature and studies on land-sourced litter (LSL) in the Mediterranean Sea, the North Sea and the Baltic Sea which demonstrate the level of waste at the beach, the floating litter and the litter at the sea floor. To better understand the LSL we analysed of course marine debris from numerous references and the sources that generate or transport marine debris.

LSL is seen as a problem of lack of coordinated national and international strategies and of deficiencies in the implementation and enforcement of existing standard monitoring programmes, waste management systems, and regulations.

According to the literature for all the three seas the main litter items found at the beach are originated by recreation and beach visitors, but for more than 40% the origin cannot be classified as land-sourced litter (LSL) or sea-sourced litter (SSL). It should be noted that this applies for beach areas only.

Even if the problem of land-sourced littering ending up in the marine environment is evident, it is difficult to come up with exact figures or even to estimate the amount of plastic ending up in the marine environment as:

- Data refers to the situation in a defined area at the time of the investigation or monitoring programme, thus constituting a spot check.
- Results heavily depend on local conditions such as winds, water currents, beach conditions (sand or gravel) and also on people taking part (amount of collectors), the classification of the litter items, the difference in practise and the frequency of the sampling.
- Sampling methods are not harmonised as:
    - Some studies give each litter item a different “identification name”;
    - The spectrum of litter items differs in the different studies;
    - The plastic content of some litter items (e.g. food packaging) is sometimes not clear and is also not discussed transparently in the monitoring reports;
    - Items have no unique correlation to the LSL and SSL;
    - Thus, different classification approaches make it difficult to aggregate the data from the different studies.

In result, data on marine litter requires detailed information on local conditions and appropriate methodology to derive trends of discharge (e.g. for LSL).

Based on the review of the relevant data collection the following assumptions are supported:

- Numerous international data demonstrates that LSL has a share of 75% to 90% LSL of the total marine litter items (see **Figure 2** and **Figure 3**) at beaches. These observations are mainly based on the collection of beach litter. No valid data is available for volume in kg or for the water column or the sea floor.
- The patterns for the three European seas in question differs from the global picture. as less plastic bags are detected (in per cent of all detected items).
- However for the Mediterranean Sea and the Baltic Sea LSL is predominant; all “top ten” items are SSL (see **Table 2**).

- For the North Sea (and the north-east Atlantic) LSL is also predominant but in contrast to the above-mentioned seas more than 20% of the detected items found on reference beaches of the North Sea are SSL, more specifically they are waste from fishing activities.
- In terms of marine litter, plastics is the predominant material. Regardless of whether reported as items or volume or for beach or water column or sea floor, no report refers to plastics having less than a 30% share; some refer to shares of up to 90%.
- Data refers to the situation in a defined area at the time of the investigation or monitoring programme as a spot check. Due to the prevailing local conditions it is very difficult to detect trends. However the German government reported that the plastic content in the total marine waste observed at beach of the German North Sea has increased from 68% in 2001 to 78% in 2006.
- Considerably more literature and details which might serve as a reference for future discussions are provided in the main report and the annex.
- Harmonisation of monitoring programs is most advanced for the North Sea covered by the OSPAR convention. In order to ensure a better combination of different data sources it is strongly recommended that joint guidelines are developed, at least for a regional sea such as the Baltic Sea or the Mediterranean Sea.

The comprehensive collection of literature on marine pollution for the three seas can be used as a reference for subsequent activities. In particular the collection of monitoring data might be an opportunity to develop / provide an open access area for further data collection with more detailed geographical references in combination with marine currents and other information as data on biological monitoring or the results of the “fishing for litter”. Even if registered users will contribute to the public content of such open access area, continuous administration effort has to be spent to maintain such platform.

Having the above-mentioned systematic limitations on data in mind, there is no doubt that LSL is an evident harm to the marine environment. Thus it is necessary to increase activities to avoid the pollution of the marine environment and to continue with action for clean-up[50].

Comprehensive analyses have been carried out to identify the potential reasons for LSL (=pressure) and indicators demonstrating the level of this pressure. As displayed below, most of the indicators need to be considered in combination with the level of the municipal waste management. The different level of the indicators is displayed in Map 14.1 to Map 14.5.

In this context it is important to understand the characteristic of an indicator. It is not sufficient to change the drivers of the indicator alone: rather the pressure (respectively the effects of the pressure) needs to be taken into account under realistic conditions. This applies, for instance, to the waste water treatment being an important source for LSL but no valid data is available to establish an appropriate indicator. Thus data on municipal waste management is considered as an approximation. But changes in municipal waste management will not be sufficient to change the effects of poor waste water treatment.

[50] Please note, that the discussion of such measures / activities is not covered by the scope of this report

Table 18: Overview of impacts and related indicators for land-sourced litter (Numbers are referring to the relevant chapter)

Pressure	Indicator
Population density (4.1)	Population density (4.1) *- in combination with-* groups for municipal waste management (4.4.1)
Tourism / recreation (4.2)	
Level of littering (inland / seashore)	-/-
Littering caused by tourism / recreational visitors / events to the coast	Nights spent by residential and non-residential in tourist accommodation establishments (4.2) *- in combination with-* groups for municipal waste management (4.4.1)
Activities at ports (4.3)	
Level of littering at ports	-/-
Littering caused by commercial activities at ports	Marine transport of freight; loaded and unloaded (4.3) *- in combination with-* groups for municipal waste management (4.4.1)
Solid waste management (4.4)	
Collection and treatment of municipal waste (4.4.1)	Groups for municipal waste management (4.4.1)
Dumpsites located on the coast or riverbanks (4.4.2)	Groups for municipal waste management (4.4.1)
Plastic packaging waste management (4.4.3)	Plastic packaging waste disposed off (4.4.3) *- in combination with-* groups for municipal waste management (4.4.1)
Waste management of commercial and industrial waste (4.4.4)	Groups for municipal waste management (4.4.1)
Waste management of agricultural plastic waste (4.4.5)	Groups for municipal waste management (4.4.1)
Waste water treatment (4.5)	
Coverage of collection (sewer) and treatment (4.5.1)	Groups for municipal waste management (4.4.1)
Sewer overflow, combined sewer overflow(4.5.2)	Groups for municipal waste management (4.4.1)

Maps 14.1. to 14.5 demonstrate that a lot of progress is still possible within the EU27 and EEA countries to improve waste management and to avoid LSL. This includes activities addressing behaviour in particular for the use of the shores for tourism and recreation. With regard to the Mediterranean Sea much more attention needs to be spent to the Mashreq and Maghreb region and also to some western Balkan counties, as here the combination of a high population density is combined with low waste management standards.

Behavioural aspects and general trends could be very relevant to understanding reasons for LSL. Different attitudes can cause different volumes and characters of material flows. Attitudes might also differ according to activity, for instance individuals spend much less

attention to littering during recreation periods than during time spent at home. The effects of behaviour on volume and characteristics of LSL are difficult to detect.

Behavioural aspects need to be explored in each specific country and the findings analysed in order to improve understanding of the reasons for LSL. The overall purpose of these efforts is to make people familiar (e.g. special activities for children at school) with the concept and reality of marine litter and to make them care about it. Educational programmes (e.g. focusing on waste management in general and/or marine litter specifically), public awareness and information activities are an important pillar of future measures to be taken in order to reduce marine litter in the oceans.

With regard to the stakeholders the national and even the sub-national level is crucial, as it is here that decisions are taken on the appropriate enforcement of strategies, measures and objectives. Further, this includes a better understanding of the above-mentioned behaviour aspects in the specific countries as well as the consideration of the future trends and aspects concerning the impact of pressures on European seas.

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12.2 General literature on marine littering

12.2.1 Further references available electronically (CD ROM)

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02	Aquatic 2009	Recommendations for a coordinated plan to reduce litter in inland waters, ports, on coastlines and in the ocean	Grenelle de l'Environnement	2009	Report	http://www.robindesbois.org/english/Aquatic_litter_rdb.pdf
03	AUS 2011	Litter facts and impacts	Australian government	2011	Brochure	http://trashmyad.com.au/upload/documents/LitterFactsAndImpacts.pdf
04	Barnes 2005	Drifting plastic and its consequences for sessile organism dispersal in the Atlantic Ocean	D. K. A. Barnes and P. Milner	2005	Journal Paper	http://www.springerlink.com/content/n1m1xr1wtwrgynqg/
05	Barnes 2009	Accumulation and fragmentation of plastics debris in global enviroments	David K. A. Barnes, Francois Galgani, Richard C. Thompson and Morton Barlaz	2009	Scientific Paper	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2873009/
06	Bennet 2010	Marine litter: 'continents' of rubbish	Bennett, Oliver	Jul 10	Scientific Paper	http://www.parliament.uk/briefing-papers/SN05622
07	BIOIS/AEA 2011	Plastic waste in the environment - Revised version	Shailendra Mudgal, Lorcan Lyons, Jonathan Bain, Débora Dias, Thibault Faninger, et al	Apr 11	Research Report	http://ec.europa.eu/environment/waste/studies/pdf/plastics.pdf
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11	Deutscher Bundestag	Antwort der Bundesregierung auf die kleine Anfrage der Abgeordneten Sylvia Kotting-Uhl, Undine Kurth (Quedlinburg), Nicole Maisch, weiterer Abgeordneter und der Fraktion BÜNDNIS 90/DIE GRÜNEN, Deutscher Bundestag Drucksache 16/8989, 2008	Deutscher Bundestag	2008	Other	http://dipbt.bundestag.de/dip21/btd/16/089/1608989.pdf
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18	Eurostat 2011a	Generation and treatment of municipal waste	Eurostat	June 2011	Statistical Report	http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-11-031/EN/KS-SF-11-031-EN.PDF
19	Eurostat 2011b	Data Base Packaging and Packaging Waste	Eurostat	June2011	Statistical Report	http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_waspac&lang=en
20	FAZ 2010	Das alte Meer und das Müll	Rüdiger Schacht	24. Jan 11	Newspaper Articel	http://www.faz.net/frankfurter-allgemeine-zeitung/natur-und-wissenschaft/meeresforschung-das-alte-meer-und-der-muell-1578445.html
21	Franeker 2009	Fulmar Litter EcoQO Monitoring in the Netherlands 1979-2007 in relation to EU Directive 2000/59/EC on Port Reception Facilities.	IMARES Report nr C032/09 (Van Franeker, J.A., Meijboom A., De Jong, M. & Verdaat, H.)	Apr 09	Research Report	http://edepot.wur.nl/143301
22	Gabrielides 1991	Man-Made Garbage Pollution on the Mediterranean Coastline	G. P. Gabrielides, A. Goliki, L. Loizides, M. G. Marino, E Bingel and M. V. Torregrossn	1991	Research Report	http://www.sciencedirect.com/science/article/pii/0025326X91907133

#	Acronym	Title	Author	Date	Classification	Web source
23	Galgani 1995	Distribution and Abundance of Debris on the Continental Shelf of the north-western Mediterranean Sea	F. Galgani, S. Jaunet, A. Campillot, X. Guenegent and E. His	1995	Scientific Paper	http://www.sciencedirect.com/science/article/pii/0025326X9500055R
24	Galgani 1996	Accumulation of debris on the deep sea floor off the French Mediterranean coast	Galgani F, Souplet A and Cadiou Y	Okt 96	Scientific Paper	http://www.int-res.com/articles/meps/142/m142p225.pdf
25	Galgani 2000	Litter on the Sea Floor Along European Coasts	Galgani F, J.P Leauteb, P Moguedetb, A Soupletc, Y Verind, A Carpentierd, H Goraguere et al.	2000	Scientific Paper	http://www.sciencedirect.com/science/article/pii/S0025326X99002349
26	Galil 1995	Litter at the Bottom of the Sea: A Sea Bed Survey in the eastern Mediterranean	B. S. Galil, A. Golik and M. Tirkayt	1995	Scientific Paper	http://www.sciencedirect.com/science/article/pii/0025326X9400103G
27	Greenpeace 2006	Marine Reserves for the Mediterranean Sea	Greenpeace	2006	Research Report	http://www.greenpeace.org/international/en/publications/reports/marine-reserves-for-the-medite/
28	Greenpeace 2006	Plastic Debris in the World's Oceans	Greenpeace (Michelle Allsopp, Adam Walters, David Santillo, and Paul Johnston)	2005	Research Report	http://www.greenpeace.org/international/Global/international/planet-2/report/2007/8/plastic_ocean_report.pdf
29	GTI 2011	The plastic industry in Germany	Germany Trade & Invest	2011	Brochure	http://www.gtai.com/fileadmin/user_upload/Downloads/Industries/Plastics/IndustryOverview_Plastics_October2010_GTAI.pdf
30	Hall 2000	Impacts of Marine Debris and Oil - Economic and Social Costs to Coastal Communities	Hall, K / KIMO	2000	Research Report	http://library.coastweb.info/810/1/Karensreport.pdf
31	HELCOM 2009	Overview of the shipping traffic in the Baltic Sea	HELCOM	2009	Report	http://www.helcom.fi/stc/files/shipping/Overview%20of%20ships%20traffic_updateApril2009.pdf
32	IKZM 2008	Wasserqualität an europäischen Küsten und ihre Bewertung durch Touristen - eine wahrnehmungsgeographische Untersuchung in Hamburg und auf Sylt	Stephanie Preißler	Sep 08	Thesis	http://databases.eucc-d.de/files/documents/00000738_IKZM-Oder_Berichte54.pdf
33	IQL 2010	What is marine litter?	Make mine Blue-green (NGO)		Internetsource	http://www.makeminebluegreen.org/pdf_files/MarineLitter_FACTPAGE.pdf
34	IQL 2010a	Transparency: The Great Pacific Garbage Patch	Good Magazine	Mai 09	Internetsource	http://www.good.is/post/transparency-the-great-pacific-garbage-patch/
35	IQL 2010b	Müllstrudel - Great Pacific Ocean Garbage Patch	Verschiedene Autoren		Internetsource	See our report

#	Acronym	Title	Author	Date	Classification	Web source
36	Jochem 1998	Plastic streams in Germany	E. Jochem and P. Radgen	1998	Book	http://igitur-archive.library.uu.nl/dissertations/1894529/c3.pdf
37	JRC 2010	Main Strategy Framework Directive; Task Group 10 Report Marine litter; Joint Report	F. Galgani, D. Fleet, J. Van Franeker, S. Katsanevakis, T.Maes, J. Mouat, et al	Apr 10	Research Report	http://publications.jrc.ec.europa.eu/repository/handle/111111111/13625
38	KAB 2009	Littering behaviour in America - results of a National study	Action research	Jan 09	Research Report	http://www.kab.org/site/DocServer/KAB_Report_Final_2.pdf?docID=4581
39	Katsanevakis 2004	Influences on the Distribution of Marine Debris on the Seafloor of Shallow Coastal Areas in Greece (Eastern Mediterranean)	Stelios Katsanevakis und Anastasia Katsarou	2004	Journal Paper	http://www.springerlink.com/content/g86747767m031842/
40	KIMO 2010a	Marine Litter Monitoring – Implications for plastic waste management and legislation	Mayor Albert de Hoop	Jan 10	Presentation	www.waddensea-forum.org/archive/MeetingsArchive/WSF%20docs/WSF18documents/Marine_plastic_Hoop.pdf
41	KIMO 2010b	Ecomomic Impacts of Marine Litter	John Mouat, Rebeca Lopez Lozano, Hannah Bateson	Sep 10	Research Report	www.kimointernational.org/.../Marine%20Litter/Economic%20Impacts%20of%20Marine%20Litter%20Low%20Res.pdf
42	KLN 2006	EU hilft deutschen und dänischen Ostseebädern bei Strandsäuberung	Kieler Nachrichten	Dez 06	Newspaper Articel	http://www.kn-online.de/artikel/2019283
43	Liebezeit 2008	Marine litter on the Kachelotplate, Lower Saxonian Wadden Sea	Gerd Liebezeit	Dec 2008	Newspaper Articel	
44	MGU 2010	Umwelt für Europäer; Ein weiterer Schritt hin zu gesunden europäischen Meeren; Nr. 40-S.6	European Commission	Nov 10	Journal Paper	http://ec.europa.eu/environment/news/efe/pdf/efe40/DE-EFE40-101119.pdf
45	MGU 2011	Umwelt für Europäer; Maritime Plastiksuppe - Nein danke!; Nr. 42/12	European Commission	Mrz 11	Journal Paper	http://ec.europa.eu/environment/news/efe/pdf/efe42/DE-EFE42-110328.pdf
46	Moore 2008	Synthetic polymers in the marine environment: A rapidly increasing, long-term threat	Charles James Moore	22. Jul 08	Scientific Paper	http://www.sciencedirect.com/science/article/pii/S001393510800159X
47	OC 2007	National Marine Debris Monitoring Program: Final Program Report, Data Analysis and Summary."	S.B. Sheavly / Prepared for U.S. EPA by Ocean Conservancy	Sep 07	Research Report	http://act.oceanconservancy.org/site/DocServer/NMDMP_REPORT_Ocean_Conservancy__2_.pdf?docID=3181
48	OC 2010	Trash Travels	Ocean Conservancy	2010	Brochure	http://www.oceanconservancy.org/our-work/marine-debris/program_marinedebris_iccreport.html

#	Acronym	Title	Author	Date	Classification	Web source
49	OSPAR 2007	OSPAR Pilot Project on Monitoring Marine Beach Litter - Monitoring of marine litter in the OSPAR region	OSPAR Commission	2007	Research Report	http://www.telefonica.net/web2/ollalomar/marine_litter/docs/Litter-Pilot-Project-Final-Report.pdf
50	OSPAR 2009	Marine litter in the north-east Atlantic Region: Assessment and priorities for response	OSPAR (Rebeca Lopez Lozano and John Mouat)	2009	Research Report	http://qsr2010.ospar.org/media/assessments/p00386_Marine_Litter_in_the_North-East_Atlantic_with_addendum.pdf
51	OSPAR/UNEP 2009	Marine Litter - Preventing a Sea of Plastic	UNEP/OSPAR Commission	Feb 09	Brochure	
52	OSPAR 2010	Guideline for monitoring marine litter on the beaches in the OSPAR maritime area	OSPAR (Barbara Wenneker and Lex Oosterbaan)	2010	Research Report	www.robindesbois.org/macrodechets/Ospar_Guideline_lr.pdf
53	OSPAR 2010	Other Human Uses and Impacts. In: Quality Status Report 2010	OSPAR Commission	2008	Journal Paper	http://qsr2010.ospar.org/en/media/chapter_pdf/QSR_Ch09_EN.pdf
54	Pinardi 2005	The physical, sedimentary and ecological structure and variability of shelf areas in the Mediterranean Sea	N. PINARDI, M. ZAVATARELLI, E. ARNERI, A. CRISE AND M. RAVAIOLI	2005	Book	http://doga.ogs.trieste.it/doga/echo/eo/pdf/TheSea1-30.pdf
55	PlasticsEurope 2010	PlasticsEurope's Views on the Marine Litter Challenge	Plastics Europe	Apr 10	Journal Paper	http://www.plasticseurope.org/documents/document/20101005110258-plasticseurope_views_on_marine_litter_rev1__april_2010.pdf
56	PlasticsEurope 2010a	Plastics – the Facts 2010 - An analysis of European plastics production, demand and recovery for 2009	PlasticsEurope et.al.	Sep 10	Report	http://www.plasticseurope.org/documents/document/20101006091310-final_plasticsthefacts_28092010_lr.pdf
57	PlasticEurope 2011	Plastics – the Facts 2011 - An analysis of European plastics production, demand and recovery for 2010	PlasticsEurope et.al.	2011	Report	http://www.plasticseurope.org/Document/plastics---the-facts-2011.aspx?Page=DOCUMENT&FolID=2
58	Plasticticker 2011	Grüner Punkt: Erstes „Fishing for Litter"-Projekt in Deutschland gestartet - DSD analysiert Meeresabfall in eigener Kunststoffverwertungsanlage in Hörstel	PlasticTicker	Mai 11	Newspaper Articel	http://plasticker.de/news/shownews.php?nr=14075&uid=10050
59	Pruter 1987	Sources, Quantities and Distribution of Persistent Plastics in the Marine Environment	Pruter A.	Jun 87	Scientific Paper	http://www.sciencedirect.com/science/article/pii/S0025326X87800164
60	RC/IOI 2006	Evaluation of Integrated Coastal Zone Management (ICZM) in Europe	Rupprecht Consult / International Ocean Institute	Aug 06	Research Report	http://ec.europa.eu/environment/iczm/pdf/evaluation_iczm_report.pdf

#	Acronym	Title	Author	Date	Classification	Web source
61	Rios 2010	Quantitation of persistent organic pollutants adsorbed on plastic debris from the Northern Pacific Gyre's ''eastern garbage patch''	Lorena M. Rios, Patrick R. Jones, Charles Moore and Urja V. Narayan	30. Sep 10	Journal Paper	http://www.algalita.org/uploads/Riosetal2010.pdf
62	Ryan 2009	Monitoring the abundance of plastic debris in the marine environment	Peter G. Ryan, Charles J. Moore, Jan A. van Franeker and Coleen L. Moloney	2009	Journal Paper	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2873010/
63	SAO 2010	The European environment state and outlook 2010 - Marine and coastal environment	European Economic Area (EEA)	2010	Book	http://www.eea.europa.eu/soer/europe/marine-and-coastal-environment
64	SaveNorthSea 2004a	Reduce marine litter - Save the North Sea Project Results	Several Project Partners	2004	Brochure	www.savethenorthsea.com/… North-Sea/save_the_north_sea_low.pdf
65	SaveNorthSea 2004b	Establishing attitudes and behaviour on marine litter	Several Project Partners	2004	Brochure	http://www.google.de/search?hl=de&sa=X&ei=mnTnTrXQD6rV4QSH65zxCA&ved=0CB0QBSgA&q=Establishing+attitudes+and+behaviour+on+marine+litter&spell=1&biw=1344&bih=694
66	Stefatos 1999	Marine Debris on the Seafloor of the Mediterranean Sea: Examples from Two Enclosed Gulfs in western Greece	A. Stefatos, M. Charalampakis, G. Papatheodorou and G. Ferentinos	1999	Scientific Paper	http://www.sciencedirect.com/science/article/pii/S0025326X98001416
67	Sweepnet 2010	Challenges and Opportunities for solid waste management in the Mashreq and Maghreb region	Sweepnet, S. Arif	July 2010		n.A.
68	Takada 2010	Global distribution of organic micropollutants in marine plastics	Hideshige Takada, Hisashi Hirai, Yuko Ogata, Masaki Yuyama, Kaoruko Mizukawa, et al	Apr 10	Brochure	http://www.algalita.org/uploads/ReportToAlgalita.pdf
69	Takada 2010	Global distribution of organic micropollutants in marine plastics	Hideshige Takada, Hisashi Hirai, Yuko Ogata, Masaki Yuyama, Kaoruko Mizukawa, et al	Apr 10	Presentation	http://www.algalita.org/uploads/ReportToAlgalita.pdf
70	UBA 2010	Abfälle ins Meer - ein gravierendes ökologisches, ökonomisches und ästhetisches Problem	Siehe Nr. 29	Apr 10	Brochure	http://www.umweltbundesamt.de/uba-info-medien/dateien/3900.htm
71	UBA 2010	Abfälle im Meer - ein gravierendes ökologisches, ökonomisches und ästhetisches Problem	UBA (Stefanie Werner)	Apr 10	Strategy Document	http://www.umweltdaten.de/publikationen/fpdf-l/3900.pdf

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72	UNEP 2001	Marine Litter - Trash that kills	UNEP / EPA	Nov 01	Journal Paper	http://www.epa.gov/owow/oceans/debris/toolkit/files/trash_that_kills508.pdf
73	UNEP 2005	Marine Litter, an analytical overview	UNEP	Jun 05	Report	http://www.unep.org/regionalseas/marinelitter/publications/docs/anl_oview.pdf
74	UNEP 2006	Marine Litter	UNEP/GPA & UNEP/RS	Okt 06	Presentation	http://www.un.org/depts/los/consultative_process/documents/6_guchte.pdf
75	UNEP 2007a	Recycling Plastic Marine Litter - Northwest Pacific Action Plan (NOWPAP)	UNEP/NOWPAP/CEARAC	Okt 07	Research Report	
76	UNEP 2007b	Marine Litter – UNEP Regional Seas Programme addressing a Global Challenge	Dr. Ellik Adler	Jun 07	Presentation	http://www.unep.org/regionalseas/marinelitter/publications/docs/Marine_Litter_A_Global_Challenge.pdf
77	UNEP 2008	Regional Report on Sea-based Marine Litter in the NOWPAP Region	NOWPAP/MERRAC	2008	Research Report	http://dinrac.nowpap.org/documents/NOWPAP_MERRAC_Regional_Report_Seabased_Marine_Litter.pdf
78	UNEP 2009a	State of the Environment and Development in the Mediterranean	UNEP/MAP-Plan Bleu	2009	Research Report	http://www.planbleu.org/publications/SoED2009_EN.pdf
79	UNEP 2009b	Marine Litter: A Global Challenge	UNEP (Ljubomir Jeftic, Seba Sheavly, and Ellik Adler)	Apr 09	Research Report	http://www.unep.org/pdf/unep_marine_litter-a_global_challenge.pdf
80	UNEP 2009c	Guidelines on Survey and Monitoring of Marine Litter. UNEP Regional Seas Reports and Studies	UNEP (Cheshire, A.C., Adler, E., Barbière, J., Cohen, Y., Evans, S., Jarayabhand, S., et al)	Mrz 09	Research Report	www.unep.org/regionalseas/marinelitter/publications/docs/Marine_Litter_Survey_and_Monitoring_Guidelines.pdf
81	UNEP 2009d	Converting Waste Plastics into a resource	UNEP	2009	Report	http://www.unep.or.jp/ietc/Publications/spc/WastePlasticsEST_AssessmentGuidelines.pdf
82	UNEP 2010	Global Synthesis - A report from the Regional Seas Conventions and Action Plans for the Marine Biodiversity Assessment and Outlook Series	UNEP	Okt 10	Research Report	http://www.marinebiodiversityseries.org/reports/UNEP%20Global%20Synthesis%20Marine%20Biodiversity%20Series.pdf
83	UNEP 2011	Assessment of the status of marine litter in the Mediterranean Sea - MAP- Meeting of ED POL Focal Points Rhodes (Greece), 25-27 May 2011	UNEP / WHO	May 2011	Research Report	www.oceans.greenpeace.org
84	UNHQ 2005	UNEP Regional Seas Programme, Marine Litter and Abandoned Fishing Gear	Regional Seas Coordinating Office, UNEP, Nairobi; April 2005	Apr 05	Book	http://www.unep.org/regionalseas/marinelitter/publications/docs/RS_DOALOS.pdf

#	Acronym	Title	Author	Date	Classification	Web source
85	USOP	Chapter 18: Reducing marine debris	U.S. Commission on Ocean Policy		Book	http://www.oceancommission.gov/documents/full_color_rpt/18_chapter18.pdf
86	VIT 2002	Statistical Analyses of the Baltic Maritime Traffic	VIT (Jorma Rytkönen, Liisa Siitonen, Timo Riipi, Jukka Sassi, Juhani Sukselainen)	Sep 02	Research Report	http://www.helcom.fi/stc/files/shipping/VTTreport.pdf
87	Wattenmeer 1999	Die Müllbelastung im Mündungsbereich von Elbe, Weser und Jade	Hartwig E, Clemens T	1999	Journal Paper	
88	WDCS	UK - Marine Litter -	Whale and Dolphin Conservation Society (WDCS)		Journal Paper	
89	Williams 2002	Beach litter sourcing in the bristol channel and wales, U.K.	Williams, A. T., Tudor, D. T., & Randerson, P.	2002	Journal Paper	http://www.springerlink.com/content/nm0126177825tx1v/
90	WSE 2009	Marine Litter. Thematic Report No. 3.8. In: Quality Status Report 2009. WaddenSea Ecosystem No. 25.	David Fleet, Jan van Franeker, Jeroen Dagevos, and Merijn Hougee	2009	Research Report	http://www.waddensea-secretariat.org/QSR-2009/03.8-Marine-Litter-(10-08-25).pdf

12.2.2 Further internet libraries

Website	Comments
http://dinrac.nowpap.org/MarineLitter.php?page=marine_litter_references	Reference materials listed here contain several categories such as NOWPAP (North West Pacific Action Plan) workshop proceedings, leaflets, sectoral guidelines for shipping, fishing and tourism, general information on marine litter including legal aspects, public education, marine litter monitoring and port reception ties
http://www.plasticdebris.org/bibliography.html	A bibliography of research related to debris and trash
http://www.globalgarbage.org/blog/index.php/books-and-reports/	A bibliography (books, reports and guidelines) of research related to marine litter
http://marine-litter.gpa.unep.org/framework/region-4.htm	Global marine litter information
http://www.gesamp.org/publications	The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection GESAMP produces a number of reports and documents annually
http://www.unep.org/regionalseas/marinelitter/publications/default.asp http://www.unep.org/regionalseas/marinelitter/other/default.asp http://www.unep.org/regionalseas/marinelitter/other/cleanups/default.asp	UNEP Marine Litter Publications

13 Annex

13.1 Beach litter

BEACH LITTER		BALTIC SEA											
		Baltic Sea					*Country specific*						
							Estland		Finnland	Latvia	Poland	Russia	
Total [kg litter/area]	min	0.4					25.2		1				
	average	33				1.5	35.0		11			1128m²*	
	max	65.6					44.8		45				
Total [item litter/area]	min	6		4	6		9.3		21				
	average	603		92.5	603		14.1		260				
	max	1200		181	1200		18.8		691				
Plastic [kg litter/area]	min								0.3				
	average								3.6				
	max								14.9				
Plastic [item litter/area]	min	3.0			1.8		1.0		11.3				
	average	340.7			271.4		1.5	1.6	140.4	2.2			1.1
	max	756.0			720.0		2.0		373.1				
Percentage of plastics [% kg]	min												
	average								33%		48%		
	max												
Percentage of plastics [% item]	min	50%	50%		30%								
	average	57%	60%		45%		52%	57%	54%	42%			48%
	max	63%	70%		60%								
Type of plastics		Plastics	Plastic bags + Bottles		Plastics		Plastics	Plastic bags + Bottles	Plastics	Plastic Bottles	Plastics		Plastic bags + Bottles
References		UNEP (2009b), pp. 29-31	WWF, 1998-2005. Naturewatch Baltic Report. http://www.naturewatchbaltic.org/. 13.2.2008.	Tuomisto (1994)	SAO (2010)	UNEP 2009b, 191	UNEP 2009b, 29-31	WWF (2006)	Toumisto (1994)	WWF (2006)	UNEP 2009b, 31	UNEP 2009b, 30	WWF (2006)
Comments		Total highest amount 700-1200 pieces/100m; lowest amount 6-16 pieces/100m. 58% litter attributed to shoreline activities. Values items from UNEP 2009b Figure 1 p.29	Plastic bottles: 31-43%; Plastic bags: 19-27%			ICC Data			Surveys in 15 beaches. 40% of the litter comoes from Russia, Estonia, Latvia and Lithuania and 21% from Poland		Fisheries Protection Board of Poland	Over an area of 540m² in St. Petersburg collected in 2006	
Raw data	Calculated												

BEACH LITTER		NORTH SEA													
		North Sea					*Country specific*								
							Belgium	Denmark	Germany			France	Netherlands	Norway	UK
Total [kg litter/area]	min														
	average					9.8			344.7		15.8				
	max														
Total [item litter/area]	min		600	200											
	average	542	910	365					2602		118.1	3073			323
	max		1400	600											
Plastic [kg litter/area]	min														
	average								44.8		2.0				
	max														
Plastic [item litter/area]	min		483	150											
	average	407	733	273	435				1146		82.6	2919			
	max		1127	449											
Percentage of plastics [% kg]	min														
	average								13.00%	7.7%	12.7%				
	max														
Percentage of plastics [% item]	min	66%													
	average	75.01%	80.50%	74.83%					44.00%	48.90%	61.60%	95.00%			
	max	84%													
Type of plastics		Plastics	Plastics	Plastics	Plastics										
References		OSPAR (2007), 31	OSPAR (2007), 51	OSPAR (2007), 49-52	OSPAR (2007), 35	UNEP 2009b, 191			Wattenmeer (2009)	Wattenmeer (2009)	Wattenmeer (2009)	OSPAR (2007), 44-45			OSPAR (2007)
Comments		Varying sizes. Survey on 100m reference beaches in 2007. Min value found in 1km survey	Greater North Sea. Most common item = plastic/polyestyrene pieces	Southern North Sea. Most common item = plastic/polyestyrene pieces		ICC Data	Large items (>50cm)/km = 3		Tabelle 2. Not normalized to 100m	Tabelle 1.	Tabelle 3.	Amount collected per 100m/year	Large items (>50cm)/km = 103	About 500 nets are found a removed every year	Southwest England

Raw data | Calculated

BEACH LITTER		MEDITERRANEAN SEA													
		Mediterranean Sea			*Country specific*										
					B&H*	Croatia		Cyprus		Egypt	France	Greece	Israel		
Total [kg litter/area]	min							5.1							
	average	2.4			3.5		4.7	7.6	2.5	18.4	18.8	12.7			66.2
	max							10.1							
Total [item litter/area]	min					640		870					730	600	
	average							1035					800	717	
	max							1200					870	900	
Plastic [kg litter/area]	min							2.0							
	average							3.0							
	max							4.0							
Plastic [item litter/area]	min							556.8					475	420	
	average					352		662.4					520	502	
	max							768.0					566	630	
Percentage of plastics [% kg]	min		25%												
	average		48.0%					40.00%							
	max		71%												
Percentage of plastics [% item]	min		49%	60%											
	average	36.8%	60.0%	70.0%		55.00%		64.00%					65.00%	70.00%	
	max		71%	80%											
Type of plastics		Bottles, bags, cap/lids, etc	Fragments, sheets, bags, containers			Plastics		Fragments, sheets, bags, containers					Plastics	Fragments, sheets, bags, containers	
References		UNEP 2009b, 97, 191	Gabrielides et al (1991), 438	Derraik (2002)	UNEP 2011	Barnes and Milner (2005), 819	UNEP 2011	Barnes and Milner (2005), 819; Gabrielides et al (1991), 439	UNEP 2011			UNEP 2011	UNEP 2009b, 99. Barnes and Milner (2005), 819	Gabrielides et al (1991), 439	UNEP 2011
Comments		ICCC Data. More than 75% of the annual waste production is generated in summer (p.99) 52-55% the share comes from shoreline activities (p.98) See Table (p.96)	Along 5 countries (Spain, Italy, Turkey, Cyprus and Israel)	Table 1	Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006		Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006		Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006	Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006	Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006	Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006	30% reduction of littered beaches. Cleaning programmes between 2005-2006 have increased the 'clean' beaches from 27% to 80%		Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006
Raw data	Calculated														

BEACH LITTER		MEDITERRANEAN SEA											
		Country specific											
		Italy		Lebanon	Libya*	Malta	Spain			Tunisia	Turkey		
Total [kg litter/area]	min	20.5					0.7						
	average	154	18	8.2		3.6	3.2	15.9	25.4	13.6	7.2		
	max	313.7					5.7						
Total [item litter/area]	min	900					3320						
	average	9800					3600	3300					
	max	23100											
Plastic [kg litter/area]	min	4.9											
	average	36.9						11.1					
	max	75.3											
Plastic [item litter/area]	min	405					2092						
	average	4410					2268	2178.0					
	max	10395											
Percentage of plastics [% kg]	min												
	average	24.00%						70%					
	max												
Percentage of plastics [% item]	min												
	average	45.00%					63%	66%				68.00%	
	max												
Type of plastics		Plastics					Plastics	Fragments, sheets, bags, containers				Fragments, sheets, bags, containers	
References		Barnes and Milner (2005), 819; Gabrielides et al (1991), 439-440	UNEP 2011	UNEP 2011		UNEP 2011	Barnes and Milner (2005), 819. UNEP 2009b, 102	Gabrielides et al (1991), 439-440	UNEP 2011		UNEP 2011	Gabrielides et al (1991), 439	
Comments		Sicily	Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006	Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006		Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006	In winter plastics account for 67% (UNEP 2009b, 102). Error is ± 25g/m	Values taken from bar-graphs and tables	Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006	Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006	Figures from the Mediterranean countries that participated in ICC campaigns 2002-2006		
Raw data	Calculated												

13.2 Floating litter

WATER COLUMN		Baltic Sea (no data)	North Sea	MEDITERRANEAN SEA							
				Mediterranean Sea			Greece	Israel	Italy		Lebanon
Total [kg litter/area*]	min			0.002							
	average			230.8	2.90						
	max			2627							
Total [item litter/area]	min		150	0.5					1.5		
	average		1275	2.1					2.25	498	
	max		2400	432					3		
Plastic [kg litter/area]	min										
	average										
	max										
Plastic [item litter/area]	min										
	average			1.74			0.12				
	max										
Percentage of plastics [% kg]	min										
	average										
	max										
Percentage of plastics [% item]	min					60%					
	average			83.0%		65.0%					77.68%
	max					70%					
Type of plastics			Microscopic plastic litter	Plastics			Floating debris				
Reference			Thomson et al. (2004)	UNEP 2009b, 97	UNEP 2009b, 97	Derraik (2002), 843	Stefatos et al (1999), 392		Aliani et al. (2003)	Galgani et al (2000), 522	UNEP 2009b, 103
Comments			Area = m³ (in this case). In the range of micro and milimeters	Area=km².	Higher concentrations of LSL obseved along routes close to coastal areas		Area=km². Ionian Sea.		Lugurian Sea. Area km² (in 2000)	Sicilian channel. Area = km²	Mostly found in areas of intense human activities, at the mouth of the Abou Ali river

Raw data | Calculated

* = ** = km² (or sometimes km³, see comments)

13.3 Sea bed litter

SEA FLOOR		BALTIC SEA		NORTH SEA				Mediterranean Sea				
		Baltic Sea	Country specific	*North Sea*		Country specific		*Mediterranean Sea*				
			Sweden			France	UK					
Total [kg litter/area*]	min											
	average											
	max											
Total [item litter/area]	min	44		119		1	11	127	1302	200		36
	average	126		156		7	18	378	1935	4350		2710
	max	208		193		13	24	629	2568	8500		6978
Plastic [kg litter/area]	min											
	average								34			
	max											
Plastic [item litter/area]	min	16		57,4		1	9	155	1004	72		
	average	45	24km	75,4		6	15	263	1492	1566		
	max	74		93,4		12	21	371	1980	3060		
Percentage of plastics [% kg]	min											
	average											
	max											
Percentage of plastics [% item]	min											
	average	35,71%		48,33%	38,00%	88,89%	84,66%	69,58%	77,1%	36,0%	70,0%	
	max											
Type of plastics			Fishing nets									
Reference		Galgani et al (2000), 518	Larsson et al. (2003)	Galgani et al (2000), 518	SaveNorthSea, (2004)	Galgani et al (2000), 518	Galgani et al (2000), 518	Galgani et al (2000), 518	Galgani et al (2000), 518; Galgani et al (1995), 713-717	Galil et al (1995), 23	UNEP 2009b, 103	Galgani et al (1995), 715
Comments		Area=km².	Fishing sources		Greater North Sea	Bay of Seine. Area=km².	Channel East. Area=km².	Adriatic Sea. Area=km².	NW Mediterranean. Area=km².	Eastern Mediterranean . Area=km².		

Raw data	Calculated
* = km²	

SEA FLOOR		MEDITERRANEAN SEA							
		Country specific							
		France				Greece			
Total [kg litter/area*]	min								6,7
	average								27,05
	max								47,4
Total [item litter/area]	min		124	157	0				72
	average	991	143	229	3900	89	240	166	255
	max		162	301	7800				437
Plastic [kg litter/area]	min								
	average	0,5							
	max								
Plastic [item litter/area]	min		79,8	69	0				40,3
	average	892	92	105	2730	70,3	199,2	92,9	143
	max		104,2	141	5460				244,7
Percentage of plastics [% kg]	min								
	average								
	max								
Percentage of plastics [% item]	min								
	average	90,00%	64,34%	45,85%	70,00%	79,00%	83,00%	56,00%	56,00%
	max								
Type of plastics			Plastics	Plastics	Plastic bags				Plastics
Reference		Galgani et al (1995), 716	Galgani et al (2000), 518	Galgani et al (2000), 518	Galgani et al. (1996)	Stefatos et al (1999), 392	Stefatos et al (1999), 392	UNEP 2009b, 101	Koutsodendris et al (2008)
Comments		Gulf of Lion. Area=km².	Gulf of Lion. Area=km².	East-Corsica. Area=km².		Echinades Gulf. Area=km².	Patras Gulf. Area=km².	University of Patras study	Greek gulfs. Area=km².

Raw data | Calculated

* = km²

13.4 Identified stakeholders

13.4.1 Baltic Sea

No.	Stakeholders	Website	Comments
A	**Organisations, actitvities and Institutions**		
A1	**International Organisations**		
A1.1	United Nations Convention on the Law of the Sea (UNCLOS) and General Assembly (GA) - Division for Ocean Affairs and the Law of the Sea	http://www.un.org/Depts/los/index.htm	Advices, studies, assists and researches on the implementation of the UNCLOS
A1.2	UNEP, Regional Sea Prgramms	http://www.unep.org/regionalseas/	Aims to address the accelerating degradation of the world's oceans and coastal areas through the sustainable management and use of the marine and coastal environment
A1.3	International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) and Annex V	http://www.imo.org/about/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx	Main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes pollution by ships
A1.4	London Convention 1972, Convention on the Prevention of Maritime Pollution by Dumping of Wastes and Other Matter	http://www.imo.org/About/Conventions/ListOfConventions/Pages/Convention-on-the-Prevention-of-Marine-Pollution-by-Dumping-of-Wastes-and-Other-Matter.aspx	Prohibits the dumping of certain hazardous materials
A1.5	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	http://www.basel.int/	Aims to protect human health and the environment against the adverse effects of hazardous wastes.
A1.6	FAO Code of Conduct for Responsible Fisheries	http://www.fao.org/docrep/005/v9878e/v9878e00.htm	Sets out principles and international standards of behaviour for responsible practices to ensure effective conservation, management and development of ecosystems and biodiversity
A1.7	Convention on Biological Diversity	http://www.cbd.int/convention/	Aims to recognize that biological diversity also includes populations needs and a clean and healthy environment to inhabit
A1.8	International Maritime Organization (IMO)	http://www.imo.org/Pages/home.aspx	UN specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships

No.	Stakeholders	Website	Comments
A1.9	Greenpeace International	http://www.greenpeace.org/international/en/	Independent global campaigning organisation that acts to change attitudes and behaviour, to protect and conserve the environment and to promote peace
A1.10	WWF International	http://wwf.panda.org/	Independent natural environment conservation organization, active over 100 countries on five continents
A1.11	The Algalita Marine Research Foundation	http://algalita.org/index.html	Focuses on the “coastal ocean", specifically on restoration of disappearing giant kelp forests and improvement of water quality along the California coast
A2	**Global activities**		
A2.1	International Coastal Cleanup (ICC)	http://www.oceanconservancy.org/site/PageServer?pagename=press_icc	World largest volunteer effort to remove trash and debris from the world's beaches and waterways, providing a clear picture of the items impacting the marine ecosystems
A2.2	Clean Up the World	http://www.cleanuptheworld.org/en/	Community based environmental campaign that inspires and empowers communities from every corner of the globe to clean up, fix up and conserve their environment.
A2.3	The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)	http://gesamp.org/	Advises the UN system on the scientific aspects of marine environmental protection
A2.4	Plastics Are Forever	http://www.plasticsareforever.org/	International youth summit (see A1.11)
A2.5	Local beach- local garbage	http://www.globalgarbage.org/blog/index.php/books-and-reports/	Blog
A3	**Regional Institutions**		
A3.1	Helsinki Commission (HELCOM) "Convention on the Protection of the Marine Environment of the Baltic Sea Area"	http://www.helcom.fi/	Intergovernmental organization that protects the marine environment of the Baltic Sea from all sources of pollution through intergovernmental co-operation between riparian states
A3.2	Kommunenes Internasjonale Miljøorganisasjon (KIMO) Local Authorities International Environmental Organisation	http://www.kimointernational.org/Home.aspx	KIMO finds methods to reduce the volume of litter discharged into our seas, including projects (see A4.2) and provides members with the latest information on serious environmental issues
A3.3	NABU	http://www.nabu.de/themen/meere/plastik/	German organization dedicated to research and report environmental issues world wide.

No.	Stakeholders	Website	Comments
A4	**Regional activities**		
A4.1	BSP Coast Watch	http://www.b-s-p.org/home/programmes/coast_watch/	Student programm for awareness rising to study animals, plants and aspects of human impacts on the seashore
A4.2	Fishing for Litter - KIMO Initiative	http://www.kimointernational.org/FishingforLitter.aspx	Aims to reduce marine litter by involving one of the key stakeholders, the fishing industry, to collect Sea Sourced Litter (SSL). All have reported a marked decrease in litter levels on their beaches.
A4.3	Seafood Cornwall Training	http://www.seafoodcornwall.org.uk/	
B	**Governments**		see Chapter 4.3.
B1	European Commission	http://ec.europa.eu/environment/water/marine/pollution.htm	
B2	**Riparian States & National Governments**		
B2.1	Denmark		
B2.2	Estonia	http://www.envir.ee/1157795	
B2.4	Finland	http://www.environment.fi/default.asp?contentid=392641&lan=EN	Focused on oil spills pollution
B2.5	Germany	http://www.umweltbundesamt.de/wasser/themen/meere/nordostsee.htm	
		http://www.bmu.de/english/water_management/marine_environment/doc/3471.php	
B2.6	Latvia	http://www.varam.gov.lv/eng/darbibas_veidi/water_protection/	
B2.7	Lithuania		
B2.8	Poland		
B2.9	Russia		
B2.10	Sweden	http://www.sweden.gov.se/sb/d/3884	
B3	**Regional Goverments**		
B4	**Municipalities according the administrative units (level NUTS 3)**		
C	**Plastic Industry**		

No.	Stakeholders	Website	Comments
C1	PlasticsEurope, European Association of Plastics Manufacturers	http://www.plasticseurope.org/	Plastic Association (Declaration of the Global Plastics Associations) for Solutions on Marine Litter
C2	IK Industrievereinigung Kunststoffverpackungen e.V, Bad Homburg V.D.H, Germany	http://www.kunststoffverpackungen.de/	
C3	WVK, Wirtschaftsvereinigung Kunststoff, Bad Homburg, Germany	http://www.wv-kunststoff.org/	
C4	Muoviteollisuus ry, Finnish Plastics Industries Federation, Helsinki, Finland	http://www.luemuovia.net/	
C5	P&K, Plast och Kemiforetagen, Stockholm, Sweden	http://www.plastkemiforetagen.se/Pages/default.aspx	
C6	Plastindustrien, the Danish Plastics Federation, Copenhagen, Denmark	http://www.plast.dk/	
D	**Facilities and construction**		
D1	Industrial or manufacturing sites		
D2	Construction and demolition sites		
D3	Fishing industry activities		
D4	Harbours		
D4.1	Operating habours in riparian countries	http://www.helcom.fi/stc/files/shipping/VTTreport.pdf f	List of harbours along the Baltic Sea ,
D4.2	Harbour Rostock	http://www.rostock-port.de/fileadmin/user_upload/pdf/entgelte/Hafenentgelte_01-04-2011.pd	Bestimmungen und Entgelte 2011für die Benutzung des dem öffentlichen Verkehr zugänglichen Hafens der Hafen-Entwicklungsgesellschaft Rostock mbH und des Passagierkais in Warnemünde / Neuer Strom
D4.3	Harbour Lübeck	http://www.lhg-online.de/Schiffsentsorgung.292.0.html	Lübecker-Hafengesellschaft mbH, Schiffsentsorgung,
D4.4	Harbour Copenhagen	Affaldsplan 2011 Copenhagen-Malmö	http://www.cmport.com/en-GB/Port%20Info/~/media/Docs/MARITIME%20SERVICE%207/Rules%20And%20Regulations/Copenhagen/2011/affaldsplan%202011%20English.ashx.
D5	Ship-breaking yard		
D6	Agriculture activities	http://www.agwasteplastics.org.uk/	Information about the Agricultural Waste Plastics
E	**Individuals**		
E1	Littering in general (inland and coastal)		

No.	Stakeholders	Website	Comments
E2	Tourism (recreational visitors to the coast)		
E3	Events		

13.4.2 North Sea

No.	Stakeholders	Website	Comments
A	**Organisations, actitvities and Institutions**		
A1	**International Organisations**		
A1.1	United Nations Convention on the Law of the Sea (UNCLOS) and General Assembly (GA) - Division for Ocean Affairs and the Law of the Sea	http://www.un.org/Depts/los/index.htm	Advices, studies, assists and researches on the implementation of the UNCLOS
A1.2	UNEP, Regional Sea Prgramms	http://www.unep.org/regionalseas/	Aims to address the accelerating degradation of the world's oceans and coastal areas through the sustainable management and use of the marine and coastal environment
A1.3	International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) and Annex V	http://www.imo.org/about/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx	Main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causespollution by ships
A1.4	London Convention 1972, Convention on the Prevention of Maritime Pollution by Dumping of Wastes and Other Matter	http://www.imo.org/About/Conventions/ListOfConventions/Pages/Convention-on-the-Prevention-of-Marine-Pollution-by-Dumping-of-Wastes-and-Other-Matter.aspx	Prohibits the dumping of certain hazardous materials
A1.5	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	http://www.basel.int/	Aims to protect human health and the environment against the adverse effects of hazardous wastes.
A1.6	FAO Code of Conduct for Responsible Fisheries	http://www.fao.org/docrep/005/v9878e/v9878e00.htm	Sets out principles and international standards of behaviour for responsible practices to ensure effective conservation, management and development of ecosystems and biodiversity

No.	Stakeholders	Website	Comments
A1.7	Convention on Biological Diversity	http://www.cbd.int/convention/	Aims to recognize that biological diversity also includes populations needs and a clean and healthy environment to inhabit
A1.8	International Maritime Organization (IMO)	http://www.imo.org/Pages/home.aspx	UN specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships
A1.9	Greenpeace International	http://www.greenpeace.org/international/en/	Independent global campaigning organisation that acts to change attitudes and behaviour, to protect and conserve the environment and to promote peace
A1.10	WWF International	http://wwf.panda.org/	Independent natural environment conservation organization, active over 100 countries on five continents
A1.11	The Algalita Marine Research Foundation	http://algalita.org/index.html	Focuses on the “coastal ocean", specifically on restoration of disappearing giant kelp forests and improvement of water quality along the California coast
A2	**Global activities**		
A2.1	International Coastal Cleanup (ICC)	http://www.oceanconservancy.org/site/PageServer?pagename=press_icc	World largest volunteer effort to remove trash and debris from the world's beaches and waterways, providing a clear picture of the items impacting the marine ecosystems
A2.2	Clean Up the World	http://www.cleanuptheworld.org/en/	Community based environmental campaign that inspires and empowers communities from every corner of the globe to clean up, fix up and conserve their environment.
A2.3	The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)	http://gesamp.org/	Advises the UN system on the scientific aspects of marine environmental protection
A2.4	Plastics Are Forever	http://www.plasticsareforever.org/	International youth summit (see A1.11)
A2.5	Local beach - local garbage	http://www.globalgarbage.org/blog/index.php/books-and-reports/	Blog
A3	**Regional Institutions**		
A3.1	OSPAR Commission	http://www.ospar.org	Mechanism by which governments of the western coasts and catchments of Europe and the EC cooperate to protect the marine environment of the north-east Atlantic

No.	Stakeholders	Website	Comments
A3.2	Wadden Sea Secretariat (CWSS)	http://www.waddensea-secretariat.org/	Supports, initiates, facilitates and coordinates the activities of the trilateral (The Netherlands, Denmark and Germany) cooperation for the protection and conservation of the Wadden Sea
A3.3	Marine Conservation Society (MSC)	http://www.mcsuk.org/	Charity, non-profit company that protects UK marine wildlife and seas
A4	**Regional activties**		
A4.1	Ecomare	http://www.ecomare.nl/	Visitor center for wadden and North Sea on Texel, NL
A4.2			
A4.3			
B	**Governments**		see Chapter 4.3.
B1	European Commission	http://ec.europa.eu/environment/water/marine/pollution.htm	
B2	**Riparian States & National Governments**		
B2.1	Belgium		
B2.2	Denmark		
B2.3	France	http://www.developpement-durable.gouv.fr/-Mer-et-littoral,2045-.html	
B2.4	Germany		
B2.5	Luxembourg		Due to their catchment of the river Rhine
B2.6	The Netherlands		Fifth Note on Environmental Planning
B2.7	Norway		
B2.8	Sweden		
B2.9	Switzerland		Due to their catchment of the river Rhine
B2.10	United Kingdom	http://www.defra.gov.uk/environment/marine/	
B3	Regional Goverments		
B4	Municipalities according the administrative units (level NUTS 3)		
C	**Plastic Industry**		

No.	Stakeholders	Website	Comments
C1	PlasticsEurope, European Association of Plastics Manufacturers, Headquartered in Brussels, Belgium with regional centers in Frankfurt Germany, London United Kingdom, Madrid Spain, Milano Italy and Paris France	http://www.plasticseurope.org/	Plastic Association (Declaration of the Global Plastics Associations) for Solutions on Marine Litter
C2	PAFA, Packing and Film Association, Nottingham, United Kingdom	http://www.pafa.org.uk/	
C3	BPF, British Plastics Federation, London, United Kingdom	http://www.bpf.co.uk/	
C4	Essencia, Belgium federation of the chemical industry and van life sciences, Brussels, Belgium	http://www.essenscia.be/	
C5	EuPC, European Plastics Converter Association, Brussels, Belgium	http://www.plasticsconverters.eu/	
C6	EuPR, European Plastics Recyclers, Brussels, Belgium	http://www.plasticsrecyclers.eu/	
C7	Federplast, Belgian Federation of Plastics producers and Rubber products, Brussels, Belgium	http://www.federplast.be/	
C8	NRK, Dutch Rubber & Plastics Federation, Leidschendam, the Netherlands	http://www.nrk.nl/web/Pages/default.aspx	
C9	Plastindustrien, the Danish Plastics Federation, Copenhagen, Denmark	http://www.plast.dk/	
C10	IK Industrievereinigung Kunststoffverpackungen e.V, Bad Homburg V.D.H, Germany	http://www.kunststoffverpackungen.de/	
C11	WVK, Wirtschaftsvereinigung Kunststoff, Bad Homburg, Germany	http://www.wv-kunststoff.org/	
D	**Facilities and construction**		
D1	Industrial or manufacturing sites		
D2	Construction and demolition sites		
D3	Fishing industry activities		
D4	Harbours		
D4.1	Rotterdam	http://www.ecomare.nl/en/ecomare-encyclopedie/man-and-the-environment/shipping/harbours/ http://www.greenaward.org/346-requirements.html	

No.	Stakeholders	Website	Comments
D4.2	Antwerp		
D4.3	Hamburg	http://www.hamburg.de/contentblob/137246/data/plan.pdf	Bewirtschaftungsplan für Schiffsabfälle und Ladungsrückstände für den Hamburger Hafen (Hafenabfallbewirtschaftungsplan)
D4.4	London		
D5	Ship-breaking yard		
D6	Agriculture activities	http://www.agwasteplastics.org.uk/	Information about the Agricultural Waste Plastics
E	**Individuals**		
E1	Littering in general (inland and coastal)		
E2	Tourism (recreational visitors to the coast)		
E3	Events		

13.4.3 Mediterranean Sea

No.	Stakeholders	Website	Comments
A	**Organisations, actitvities and Institutions**		
A1	**International Organisations**		
A1.1	United Nations Convention on the Law of the Sea (UNCLOS) and General Assembly (GA) - Division for Ocean Affairs and the Law of the Sea	http://www.un.org/Depts/los/index.htm	Advices, studies, assists and researches on the implementation of the UNCLOS
A1.2	UNEP, Regional Sea Prgramms	http://www.unep.org/regionalseas/	Aims to address the accelerating degradation of the world's oceans and coastal areas through the sustainable management and use of the marine and coastal environment
A1.3	International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) and Annex V	http://www.imo.org/about/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx	Main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causespollution by ships
A1.4	London Convention 1972, Convention on the Prevention of Maritime Pollution by Dumping of Wastes and Other Matter	http://www.imo.org/About/Conventions/ListOfConventions/Pages/Convention-on-the-Prevention-of-Marine-Pollution-by-Dumping-of-Wastes-and-Other-Matter.aspx	Prohibits the dumping of certain hazardous materials
A1.5	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	http://www.basel.int/	Aims to protect human health and the environment against the adverse effects of hazardous wastes.
A1.6	FAO Code of Conduct for Responsible Fisheries	http://www.fao.org/docrep/005/v9878e/v9878e00.htm	Sets out principles and international standards of behaviour for responsible practices to ensure effective conservation, management and development of ecosystems and biodiversity
A1.7	Convention on Biological Diversity	http://www.cbd.int/convention/	Aims to recognize that biological diversity also includes populations needs and a clean and healthy environment to inhabit
A1.8	International Maritime Organization (IMO)	http://www.imo.org/Pages/home.aspx	UN specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships

No.	Stakeholders	Website	Comments
A1.9	Greenpeace International	http://www.greenpeace.org/international/en/	Independent global campaigning organisation that acts to change attitudes and behaviour, to protect and conserve the environment and to promote peace
A1.10	WWF International	http://wwf.panda.org/	Independent natural environment conservation organization, active over 100 countries on five continents
A1.11	The Algalita Marine Research Foundation	http://algalita.org/index.html	Focuses on the “coastal ocean", specifically on restoration of disappearing giant kelp forests and improvement of water quality along the California coast
A2	**Global activities**		
A2.1	International Coastal Cleanup (ICC)	http://www.oceanconservancy.org/site/PageServer?pagename=press_icc	World largest volunteer effort to remove trash and debris from the world's beaches and waterways, providing a clear picture of the items impacting the marine ecosystems
A2.2	Clean Up the World	http://www.cleanuptheworld.org/en/	Community based environmental campaign that inspires and empowers communities from every corner of the globe to clean up, fix up and conserve their environment.
A2.3	The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)	http://gesamp.org/	Advises the UN system on the scientific aspects of marine environmental protection
A2.4	Plastics Are Forever	http://www.plasticsareforever.org/	International youth summit (see A1.11)
A2.5	Local beach - local garbage	http://www.globalgarbage.org/blog/index.php/books-and-reports/	Blog
A3	**Regional Institutions**		
A4	**Regional activties**		
B	**Governments**		see Chapter 4.3.
B1	European Commission	http://ec.europa.eu/environment/water/marine/pollution.htm	
B2	**Riparian States & National Governments**		
B2.1	Albania		
B2.2	Algeria		
B2.3	Bosnia/Herzegovina		Federal Environment Strategy was elaborated in December 2007 - not yet approved.

No.	Stakeholders	Website	Comments
B2.4	Croatia	www.mzopu.hr/doc/WASTE%20MANAGEMENT%20PLAN%20OG%2085-207.pdf	Waste Management Strategy in the Republic of Croatia
B2.5	Cyprus		Revision of Strategic Waste Management Plan is in process, Waste reception facilities at ports since 1982 but now being carried out according to EC Directive 2000/59/EC and the P.I. 771/2003
B2.6	Egypt		National environmental action plan, Strategy for Prevention of and response to marine pollution from ships in the Mediterranean
B2.7	France	http://www.developpement-durable.gouv.fr/-Mer-et-littoral,2045-.html	
B2.8	Greece	http://www.ypeka.gr/Default.aspx?tabid=245&language=en-US	
B2.9	Israel	http://www.sviva.gov.il/bin/en.jsp?enPage=e_BlankPage&enDisplay=view&enDispWhat=Zone&enDispWho=cleancoast05&enZone=cleancoast05	Clean Coast Programme
B2.10	Italy		
B2.11	Lebanon		
B2.12	Libya		
B2.13	Malta		
B2.14	Monaco		
B2.15	Morroco		
B2.16	Slovenia		
B2.17	Spain	http://www.marm.es/es/costas/temas/proteccion-del-medio-marino/	
B2.18	Syria		
B2.19	Tunisia		National Programme on Waste Management includes coastal zones
B2.20	Turkey		
B2.21	European Union		

No.	Stakeholders	Website	Comments
B3	Regional Goverments		
B4	Municipalities according the administrative units (level NUTS 3)		
C	**Plastic Industry**		
C1	PlasticsEurope, European Association of Plastics Manufacturers	http://www.plasticseurope.org/	Plastic Association (Declaration of the Global Plastics Associations) for Solutions on Marine Litter
C2	ANAIP, Spanish Association of Plastics Industry, Madrid, Spain	http://www.anaip.es/	
C3	ANAPE, Asociación Nacional de Poliestireno Expandido, Madrid, Spain	http://www.anape.es/	
C4	ANDIMAT, Asociación Nacional de Fabricantes de Materiales Aislantes, Madrid, Spain	http://www.andima.es/	
C5	APIP, Associacao Portuguesa da Industria de Plasticos, Lisbon, Portugal	http://www.apip.pt	
C6	ASECONP, Asociación Española de Fabricantes de Contenedores Plásticos para Residuos Urbanos, Madrid, Spain	See ANAIP	
C7	ASEMUPLAST, Asociacíon de Empresarios del sector Plástico de la región de Murcia, Spain	http://www.asemuplast.com/pub/index.html	
C8	ASEPUR, Asociación Española de empresas de polyuretano , Madrid, Spain	See ANAIP	
C9	ASETUB, Asociación Española de fabricantes de tubos y accesoros plasticos, Madrid, Spain	http://www.asetub.es/	
C10	ASOVEN, Asociacíon Ventanas pvc, Madrid, Spain	www.asoven.com	
C11	CEP, Centro Español de Plásticos, Madrid, Spain	http://www.cep-inform.es/	
C12	Cicloplast, Madrid, Spain,	http://www.cicloplast.com/home.php	
C13	Elipso, Les entreprises de l'emballage plastique et souple, Paris, France	http://www.elipso.org/index.php?page=home-page	
C14	FAMA, Asociación de Fabricantes de Articulos Monouso Reciclables, Madrid, Spain		
C15	Federation de La Plasturgie, French Association of Plastic Converters, Paris, France	http://www.laplasturgie.fr/index.php	

No.	Stakeholders	Website	Comments
C16	Fetraplas, Federacion Espanola de transformadores y manipuladores de plasticos, Madrid, Spain	http://www.fetraplast.org/	
C17	HGK, Croatian Chamber of Economy, Zagreb, Croatia	http://www2.hgk.hr/en/	
D	**Facilities and construction**		
D1	Industrial or manufacturing sites		
D2	Construction and demolition sites		
D3	Fishing industry activities		
D4	Harbours		
D4.1	e.g. Marseille		
D5	Ship-breaking yard		
D6	Agriculture activities	http://www.agwasteplastics.org.uk/	Information about the Agricultural Waste Plastics
E	**Individuals**		
E1	Littering in general (inland and coastal)		
E2	Tourism (recreational visitors to the coast)		
E3	Events		

13.5 Classification as ocean sourced, land-sourced or „general items“(NMPDM 2007)

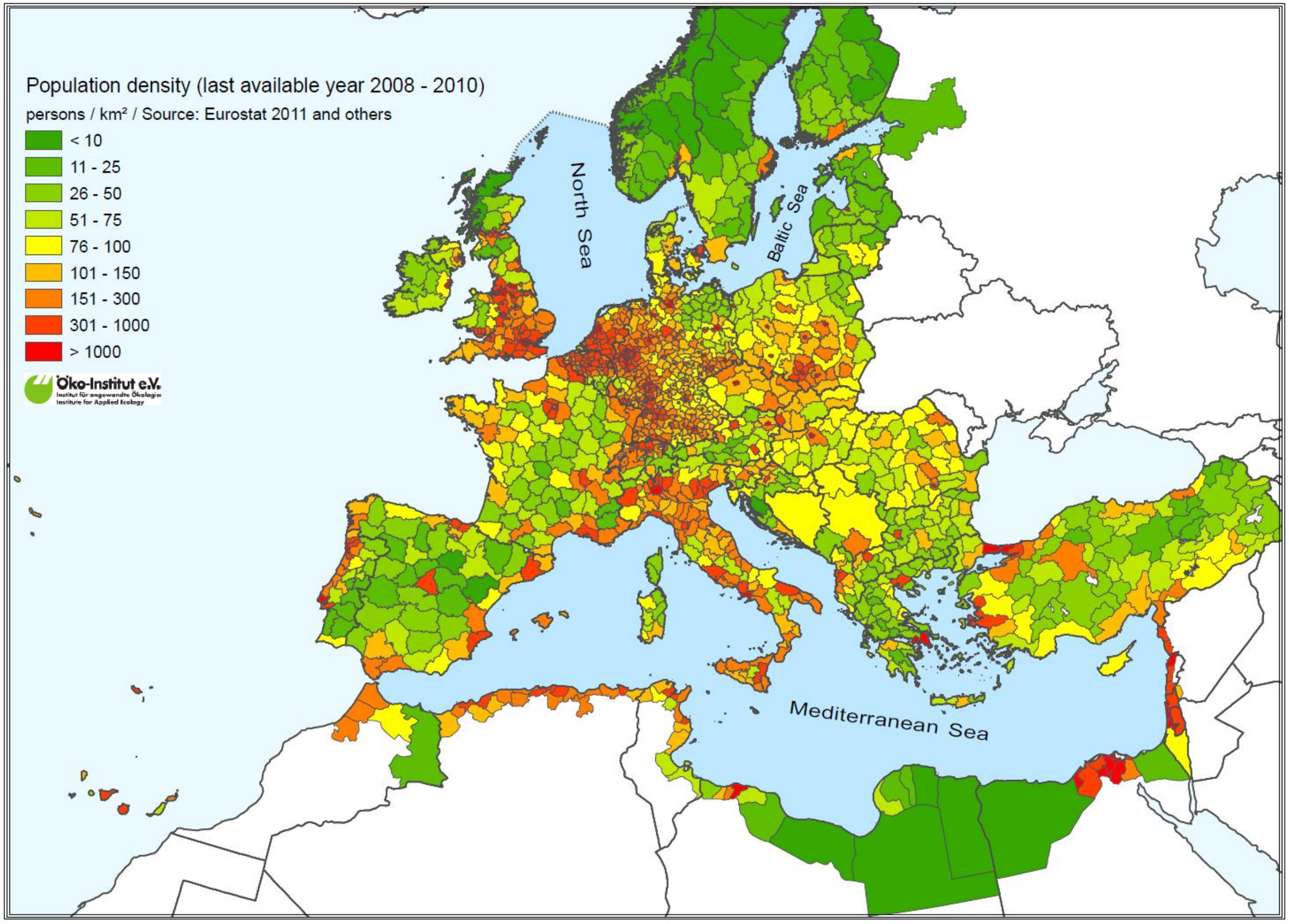
Probable Source		Indicator Items
Ocean-based		• All gloves • Plastic sheets (≥ 1 meter)* • Light bulbs & light tubes • Oil/gas containers (≥ 1 qt)
	Oil/gas platforms	• Pipe-thread protectors
	Commercial Fishing	• Fishing nets (≥ 5 meshes)* • Traps & pots* • Fishing line* • Floats &buoys* • Light Sticks • Rope (≥ 5 meter in length)* • Salt bags • Fish baskets*
	Cruise ships	• Cruiseline logo items (sm. bottles & plastic cups)

Probable Source		Indicator Items
Land based		• Syringes • Condoms • Metal Beverage Cans • Motor Oil Containers (1-qt) • Balloons –Mylar or rubber* • Six-pack rings* • Straws
	Urban Combined-sewer Overflows (CSOs)	• Tampon applicators • Cotton Swabs
General based		• Plastic bags with a seam (< 1 meter & ≥ meters)* • Strapping bands (open & closed)*
	Various Plastic Bottles	• Beverage & food • Milk/ water • Bleach/cleaner • Oil/lubricant • Personal hygiene • Other

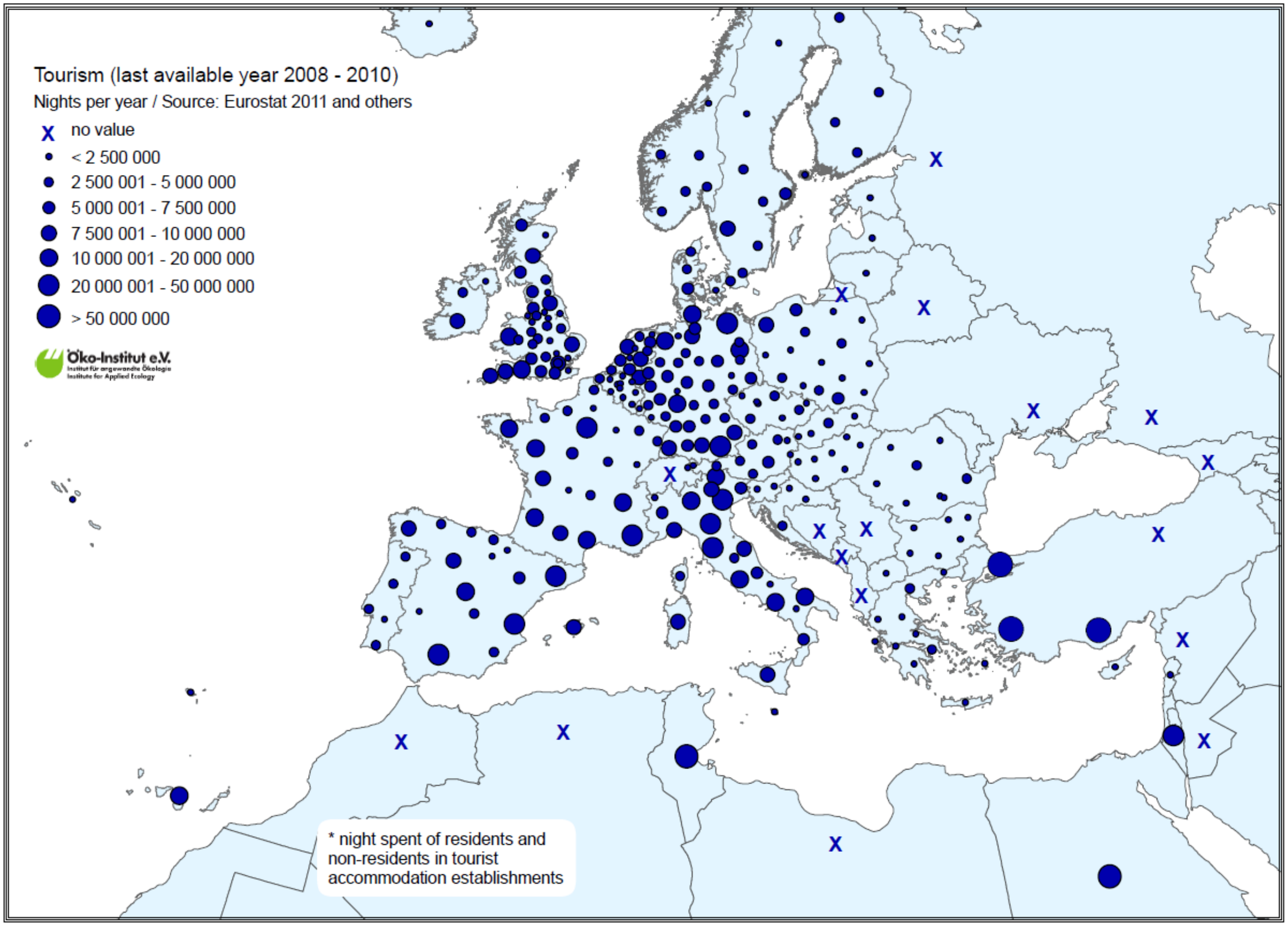
* Indicates a debris form associated with biological impacts

14 Maps

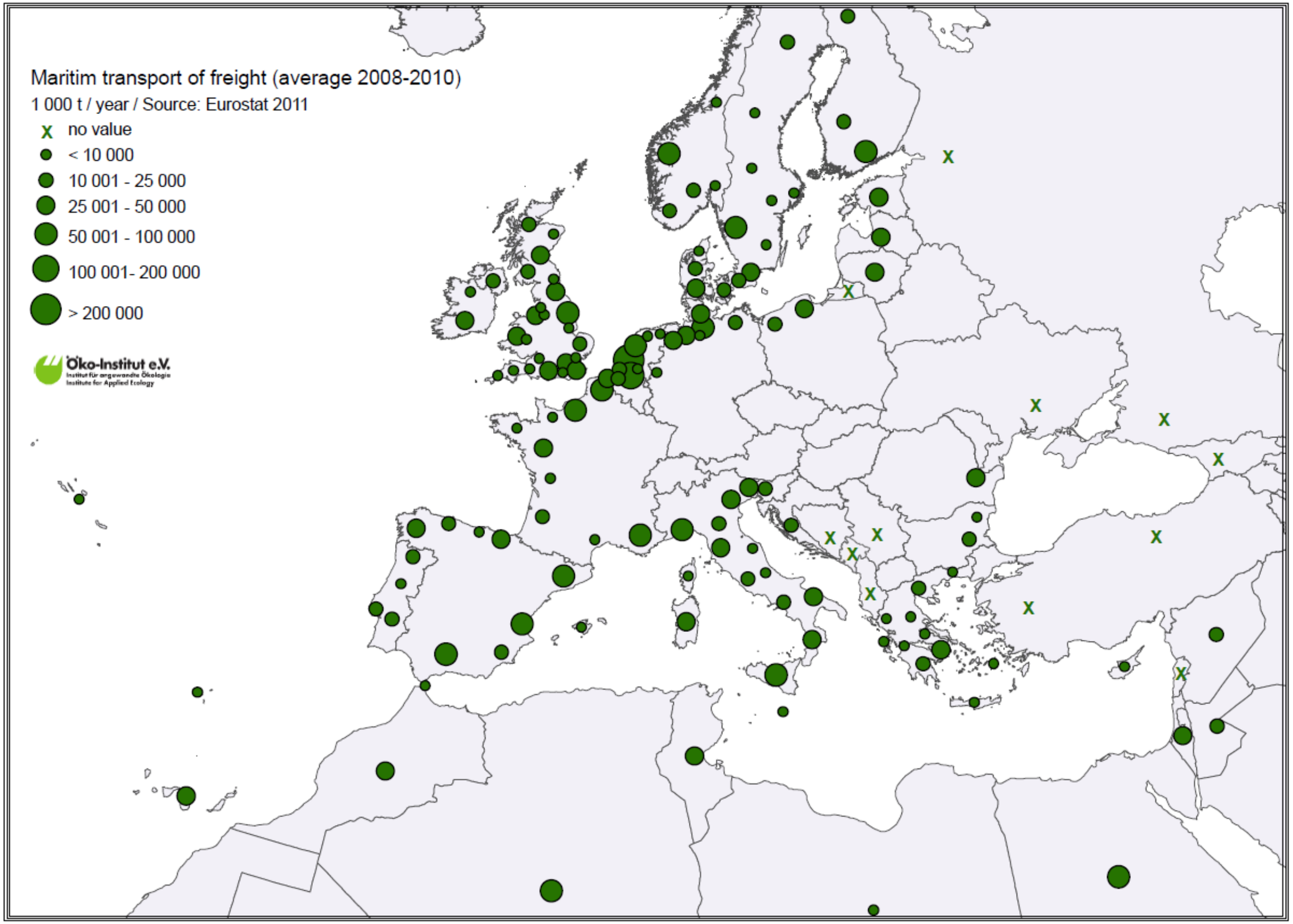
14.1 Population density of administrative areas (NUTS 3); Source: Eurostat and other data sources, consolidated by Öko-Institut 2011



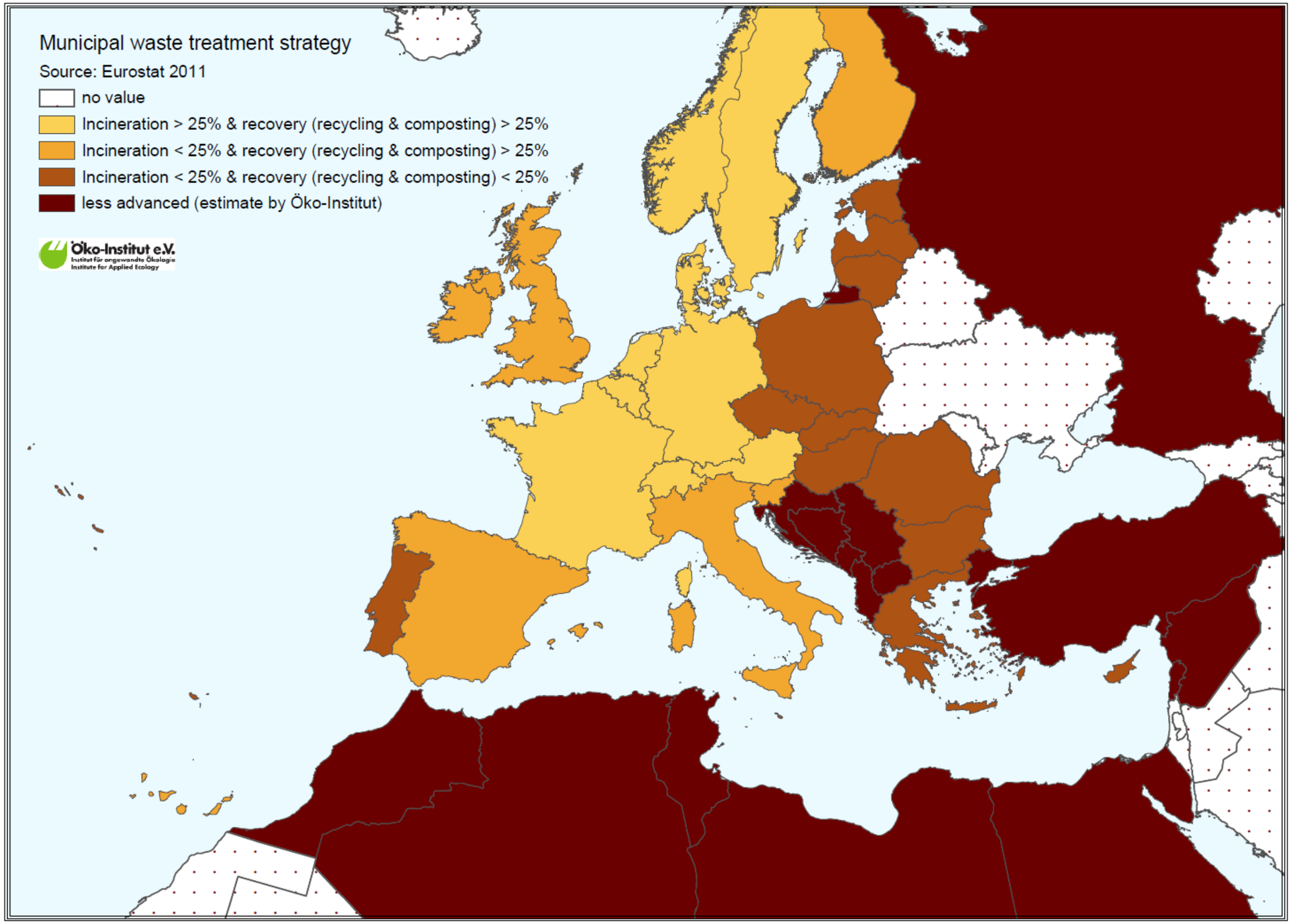
14.2 Nights spent by residential and non-residential in tourist accommodation establishments (NUTS 2); Source: Eurostat (2011) and other.



14.3 Maritime transport of freight: Total goods loaded and unloaded, average 2008 – 2010; Source: Eurostat (2011) and other



14.4 Current Waste Management; Source: Eurostat (2011) and estimates.



14.5 Plastic packaging waste disposed off; Source: Eurostat (2011) and estimates.