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Marine Litter

Causes, impacts and potential solutions

The challenge

In the last decades marine litter, especially from plastic waste, has become a major public health and environmental concern in many countries.

Marine litter or debris describes any solid material that has found its way to the marine environment - whether via transportation by rivers, drainage overflow and sewage systems, by wind or through deliberate disposal. Besides posing substantial problems for the environment and human health, it also bears great adverse effects on a country's socio-economic situation. Particularly the fishing and tourism industries are affected by economic losses caused by marine pollution. As a result of marine debris' potential to travel long distances, also remote places are affected by its pollution, making marine litter and its prevention an issue of global importance.

Causes and quantities

Increasing amounts of litter end up in the world's oceans. Improper waste management is one major cause of this problem. However, there are other causes, such as increased consumption of consumer goods, inadequate design and production processes of goods and their packaging as well as irresponsible littering behaviour.

The quantity of marine debris in the oceans can only be approximated: UNEP estimates that worldwide about 8 million items enter the oceans every day. The world's largest waste dump was found in the northern Pacific Ocean in 1997: the Great Pacific Garbage Patch (GPGP) covers an area comparable to the size of Germany and France together and is estimated to contain one million plastic particles per square kilometer.

Sources of marine litter are divided into land-based and sea-based sources. Land-based sources account for around 80 per cent of marine litter globally. The majority of land-based debris has been found to come from tourism and other recreational activities. For each of these groups the main activities generating litter are:

Land-based sources	Sea-based sources
Public littering	Fishing vessels
Tourism activities along the coast	Merchant shipping, ferries and cruises
Municipal landfills or waste dumps along the coast	Aquaculture installations
Improper waste management activities	Recreational activities
Discharge of untreated municipal sewage and storm water	Offshore platforms

The data collected in 2013 at the International Coastal Clean-ups conducted by Ocean Conservancy in 92 countries has shown that the most common items washed up on shore were in the following descending order: cigarette butts, food wrappers, plastic beverage bottles, bottle caps, straws and plastic bags.

Plastic items make up for the majority of marine litter worldwide: the German Environmental Protection Agency UBA estimated that around 140 million tonnes of plastic are floating in and lying on the grounds of oceans already today. Increased production and consumption of plastic

L. to r.:
Ghost fishing net on coral reef
Dead Albatross with plastic in its stomach
Sea turtle entangled in a ghost net

Photos: © Creative-Commons/Tim Sheerman-Chase; Chris Jordan; Doug Helton NOAA/NOS/ORR/ER

materials as well as their extremely long decomposition periods (between 400 to 600 years) favor further accumulation of plastic litter in the marine environment. A recent article from Science Magazine calculates that a new additional amount of up to 250 million tonnes of plastic will be entering the ocean between 2010 and 2025.

Another major issue of plastic debris are tiny plastic particles, also referred to as "microplastic", mainly caused by fragmentation or wastewater discharge. Today, in many parts of the ocean, the concentration of microplastics outnumbers plankton by up to six times. Through the ingestion of these particles by marine organisms, microplastics accumulate throughout the food chain – with not yet fully explored implications for human health.

The impacts

Litter in the marine environment causes a wide range of negative **impacts on marine biodiversity**. Cases of negative impacts are reported for 663 species, the most affected species are birds, marine mammals and fish. Among these impacts are:

- Loss of marine life through ingestion of and entanglement by marine debris;
- Poisoning, contamination or reduction of reproductive capacities of marine species;
- Ecosystem deterioration or destruction, e.g. damage of coral reefs by fishing gear;
- Transfer and movement of invasive species: floating debris can function as a type of "raft", carrying invasive species from one location to another.

A common problem deriving from discarded fishing gear in the ocean is called "ghost fishing". It describes the trapping and entanglement of marine mammals, reptiles, fish and shell fish in lost and abandoned nets, traps or pots. Results are immediate losses in the stock of available seafoo, and in the long-term a reduced reproductive ability of affected species.

The ingestion of debris not only leads to starvation etc., but can also cause intoxication, either by toxic substances contained in the plastic material itself or by chemicals adhering to marine litter items and concentrating on them to much higher levels than in the surrounding water column.

Also **social and economic impacts** of marine litter should not be underestimated. These include for example:

- Reduction of recreational activities and tourism;
- Loss of fishing opportunities;
- Blockage of turbines in hydropower plants.

Socio-economic impacts of marine litter include reduced recreational opportunities and loss of aesthetical value. For instance, polluted beaches are unattractive for tourists, often resulting in lost revenues for the tourism industry and for people who generate their income through tourism-related activities. In the APEC region, marine debris is estimated to cost the tourism sector USD 622 million per year. Public authorities or private companies are often faced with considerable clean-up costs.

Another indirect economic impact consists in the loss of fishing opportunities and thus presents important impacts on livelihoods: due to the time spent cleaning nets, propellers and blocked water intakes from entangled plastic bags and other debris, catch rates of Indonesian subsistence fishermen have reduced and led to lost revenues. In Scotland, these costs have been calculated to add up to USD 17 million per year.

How to address the problem?

A global problem like marine litter requires coordinated action and multi-sectorial strategies. Especially due to the potential of marine debris to travel considerable distances, conventional area-based tools are largely unsuccessful.

Different international conventions at global and regional level assist in addressing the marine litter problem. However, they often lack translation into national and local measures. At a local scale, mostly "end of pipe" clean-up solutions have been adopted, including litter collection from beaches and seas, seabed cleaning in ports or litter blocking in rivers through booms. This way the quantity of marine debris can be reduced temporarily in a specific area but the primary input of debris is not reduced.

In order to address the problem at source, investments and efforts need to focus on reducing the generation of litter in the first place. Different complementary measures are needed, including the improvement of municipal solid waste management, the strengthening of public awareness as well

as market-based, co-operative or regulatory instruments at national level or related to specific regions and stakeholders (such as packaging producers, tourism, fisheries or port authorities).

Operationalizing the three R's – reduce, reuse, recycle - in order to reduce the quantities of waste and especially plastic packaging should be adopted as one central strategy to reduce marine litter. This principle can be enforced through a fourth ´R` - for redesign – including redesigning plastic items via green chemistry approaches aiming at a quicker degradation of plastic items.

Development cooperation's contribution

Development cooperation can be an important intermediary between the key actors – including companies, industry associations or other private stakeholders, local communities and/or national governments –, whose cooperation is necessary in order to tackle the marine litter problem in a holistic way. Development cooperation offers advice in the following areas that can contribute to reducing marine litter:

1. Municipal solid waste management:

- Improving waste management infrastructure and equipment;
- Extending and intensifying the collection of waste;
- Increasing the presence of waste bins;
- Improving landfilling procedures;
- Combating illegal dumping;
- Setting up effective structures and partnerships to increase recycling and energy recovery rates.

2. Awareness-raising:

- Marine litter campaigns in coastal communities and touristic areas;
- Sharing of information, research, and best practices between stakeholders;
- Consumer information systems, such as eco-labelling.

3. Regulatory instruments:

- Bans on certain materials, chemicals or products;
- Bans on illegal dumping activities and penalties;
- Sustainable public procurement regulations;
- Clear standards and criteria.

Litter on Mauritanian Beach

4. Economic incentives:

Market based Instruments (MBIs) including taxes, charges, fees, fines, penalties, liability and compensation schemes affect the price of a certain good in the market and can provoke an incentive effect that can result in a change of people´s behaviours. Examples of these instruments are:

- Environmental taxes (tourist taxes, plastic-bag tax, landfill tax, etc.);
- Environmental charges and fees;
- Port/ship/fishing fees;
- Product fees and charges (to surcharge the price of a product with potential negative environmental impact);
- Extended Producer Responsibility (EPR) schemes and associated mechanisms such as deposit refund systems;
- Fines, penalties, non-compliance fees (i.e. to combat illegal dumping);
- Buy-back programmes for collected marine debris to generate alternative income.

5. Voluntary or collaborative instruments

Instead of or in addition to regulations imposed on private stakeholders, voluntary engagement by industry sectors contributing to or affected by the problem can be stimulated with the help of development cooperation. Partnerships between industry (e.g. consumer products, plastic, retail, tourism and leisure industry sectors, etc.) and local communities could for example cover voluntary commitments for:

- Reduced use of packaged products (e.g. in hotels), plastic bags, packaging materials or certain substances in packaging materials (in the plastic/ packaging sector);
- Financial, logistical or technical support to improve waste collection and recycling systems;
- Provision of appropriate equipment and awareness-raising measures among customers in order to reduce littering behaviour;
- Setting-up of own deposit-refund systems;
- Organising of regular clean-up activities;
- Commitments to ban the use of micro-plastics in cosmetics products.

Many of these instruments have already been tested around the world providing encouraging results in terms of beach and marine litter reduction. The challenge now is to improve and systematically implement an appropriate package of measures where approaches already exist, and to adapt them for countries where marine litter generation is still not sufficiently monitored and controlled.

The recent initiatives on the issue, handled at the level of the European Union and the United Nations, indicate that the problem needs to be tackled in an international collaborative effort and cannot be left to the capacities of each individual country.

Photo: © GIZ/Tangmar Marmon; Dieter Rothenberger

L. to r.:

Households as source of marine litter, Colombia

Waste bin on a beach of Grenada

Floating litter in Grenada

Instruments reducing marine litter - Examples from the field

The GIZ sector project "Concepts for sustainable Solid waste management" conducted two studies on the applicability and effects of selected instruments for reducing the input of plastic bottle waste into the marine environment around the islands of Grenada and around Cozumel, a Mexican island in the Caribbean Sea. Both studies propose regulatory and economic instruments as well as awareness-raising campaigns.

In Grenada, the main idea is to implement a deposit-refund system for PET bottles, which could benefit from the awareness of locals created by the already existing one for glass bottles. The existing environmental levy should be extended and used to finance a system of collection points. A deposit could be introduced under the environmental leyy act, so that collection points can refund people bringing back waste bottles. In the medium term it would be a viable and practical solution to add a system for separate waste collection at source.

On the island of Cozumel, the introduction of a separate collection system with deposit-refund elements accompanied by awareness-raising campaigns seems to be the optimal choice. Financial support should be derived from waste management or recycling fees and/or tourist environmental fees. In view of the municipal elections taking place in 2016, short-term voluntary initiatives with the private sector are proposed, whereas the medium term objective includes the separate collection of recyclables and organics. In addition, options for the establishment of a deposit-refund system and other measures strengthening Extended Producer Responsibility should be further explored with national and state governments.

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