# MarineClean

## Marine debris removal and preventing further litter entry

LAYMAN'S REPORT

Co-funded by the Eco-innovation Initiative of the European Union

**CONTENT**



The project MarineClean deals with decreasing marine litter – one of the major ecological threats. The great majority of marine litter consists of plastics, which have become one of the major contaminants in the world's oceans. As most types of plastics do not biodegrade, plastic debris poses a serious threat to fish, seabirds, marine reptiles, and marine mammals, as well as to boats and coasts.

A regional common framework, in tune with on-going global efforts, is necessary to create the conditions for curbing the problem of marine litter in terms of proper solid waste management practices and education and public awareness.

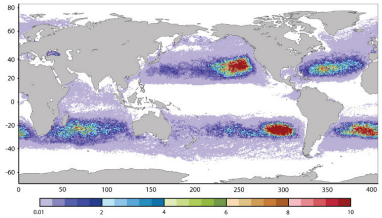



Figure 1: A model simulation of the distribution of marine litter in the ocean after ten years shows plastic converging in the five gyres: the Indian Ocean gyre, the North and South Pacific gyres, and the North and South Atlantic gyres. The simulation, derived from a uniform initial distribution and based on real drifter movements, shows the influence of the five main gyres over time (IPRC, 2008)

# Background

Marine debris, also known as marine litter, is human-created waste that has deliberately or accidentally been released in the marine or coastal environments. Floating oceanic debris tends to accumulate at the centre of gyres and on coastlines, frequently washing aground, known as beach litter. Deliberate disposal of wastes at sea is called ocean dumping. The great majority of marine litter consists of plastics, which have become one of the major contaminants in the world's oceans, with significant negative influence on the marine environment and living organisms. As most types of plastics do not biodegrade, plastic debris poses a serious threat to fish, seabirds, marine reptiles, and marine mammals, as well as to boats and coasts. Dumping, container spillage, litter washed into storm drains and waterways, and wind-blown landfill waste all contribute to this problem.

There are strong indications from many regions that the quantities of marine litter are increasing. Consequently, the resulting environmental and socio-economic problems are worsening. Funding, awareness and participation of individuals in good waste management practices are insufficient in this region. Current legal and illegal waste handling practices contribute to the presence of marine litter. A regional common framework, in tune with on-going global efforts, is necessary to create the conditions for curbing the problem of marine litter in terms of proper solid waste management practices and education and public awareness.

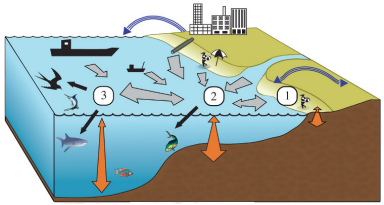



Figure 2: Main sources and movement pathways for plastic in the marine environment. Most plastic accumulates on beaches (1), in coastal waters and their sediments (2), and in the open ocean (3). Dark blue arrows depict wind-blown litter, grey arrows water-borne litter, orange arrows vertical movement through the water column, including burial in sediments; and black arrows ingestion by marine organisms (Ryan et al., 2009)


# Project Overview

The project MarineClean deals with decreasing marine litter – one of the major ecological threats. The MarineClean consortium aims to launch on the market two innovative products:
- **marine litter removal equipment** that is easily trawled with only one vessel and
- **edible** and in marine conditions **biodegradable packaging**

The proposed products were beyond the state of the art in polymer technology at the beginning of this project. Both products promote sustainable use of polymer materials.

Besides new products, the project also fights its battles with **networking** among product users and **lobbying on national and EU levels** to promote and enlarge eco-friendly product usage as well as for intensified surveillance of the return of ship waste.

The MarineClean consortium, lead by Turna d.o.o. (Turna), involves altogether eight partners from three EU member states: Slovenia, Croatia, and Lithuania. The consortium involves two industrial producers, Turna (producer of trawling equipment) and EcoCortec d.o.o. (EcoCortec) (packaging producer), one company dealing with water management (VGP DRAVA PTUJ, d.d. - Drava), four research organisations (Technology Centre PoliEko - TC PoliEko, National Institute of Biology-Marine Biology Station Piran - NIB-MBS, University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture - UZ-FMENA, Klaipeda University, Air Pollution from Ships Laboratory - KU-APS) and one technology and science park (Klaipeda Science and Technology Park - KSTP).

# MarineClean Technologies

## Litter removing equipment

TC PoliEko and Turna have developed a **very light and easy to operate trawling net** for the collection of litter on sea and inland waters. Turna is planning to launch production and market entry with the new litter removing equipment, while TC PoliEko is research  organization.

The equipment is being tested by three project partners: KU-APS (measuring air pollution during usage of MarineClean trawling equipment), Drava (testing behaviour of trawling the nets in different weather and water conditions), and UZ FMENA (mechanical testing). These partners are all involved also in demonstration and marketing activities to support Turna.

The MarineClean trawling net is equipped with side elements (slides) that enable steering and trawling of the net with only one vessel. The equipment is very light and therefore especially useful for **cleaning in tight spaces** such as harbours, ports, small bays, etc. Equipment without side elements can be used as stationary prevention of swimming areas in sea or lakes as well as prevention net on streams and rivers.

## Edible and biodegradable packaging

EcoCortec is one European producers of packaging made from renewable sources. Some of their products are biodegradable and these are promoted via the MarineClean project.

EcoCortec uses two new proprietary technologies of biodegradable and compostable films; EcoFilm®, which is a polyester based film designed to replace traditional nondegradable films such as low density and high density polyethylens, and EcoWorks® film that is derived in part (30%) from annually renewable, biobased content and it is a PLA based construction. Both materials offer a certified biodegradable alternative to polyethylene films and bags while still offering performance characteristics superior to both low and high density polymer films.

EcoCortec's special focus is the introduction of **EcoOcean™ material**: film and bags constructed from the latest biobased polymer technology on the market, PHA. Designed with the environment in mind, EcoOcean™ contains **77% biobased** content and is **fully marine biodegradable**. EcoOcean™ is designed to biodegrade in marine environments, by anaerobic digestion, in natural soil and water environments, backyard composting systems, and municipal composting facilities. EcoOcean™ film products are durable and versatile with the added value of biodegradability in a wide range of environments. EcoOcean™ is also marine protective. Although we do not promote marine disposal, in the event this product should reach the waterways it will biodegrade in months instead of remaining in the ocean for years like ordinary plastic films. EcoOcean™ can help reduce the increasing and persistent problem of marine litter. EcoOcean™ is heat and moisture resistant making it ideal for compostable bags and many flexible film packaging applications.

Together with TC PoliEko EcoCortec develops **edible packaging on a basis of zein**, protein isolated from corn. Edible packaging was produced and tested on edibility for marine animals at the National Institute of Biology, Marine Biology Station Piran. Sensory analysis was done at TC PoliEko and very negative feedback was gained during presentation of the material to the consumers. The consortium therefore decided not to push this material on the market because it would not gain success at the moment. Instead the spreading of knowledge regarding edible packaging, practical demonstrations and market development is being done in the project. Activities are ongoing in all three participating countries, besides the already mentioned partners also Klaipeda Science and Technology Park are  taking part in the promotion of innovative packaging materials.

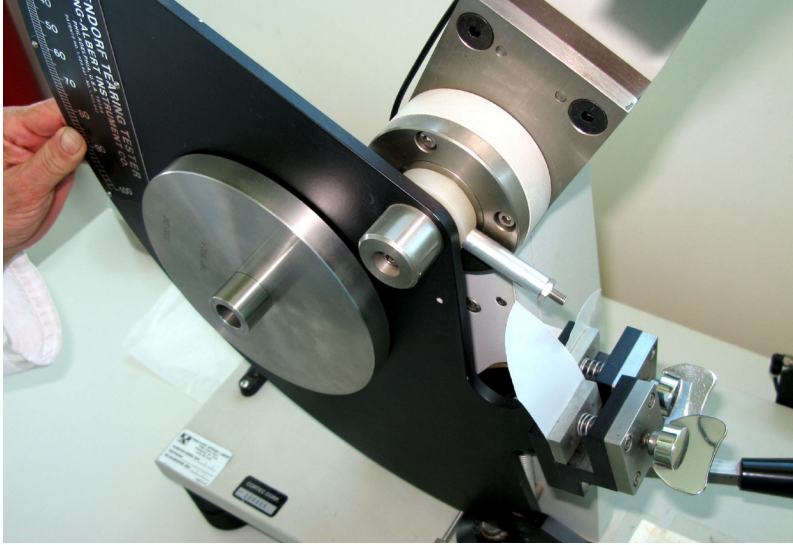
# EcoOcean™

## Biobased Film and Bags for Marine Biodegradable and Anaerobic Digestion Markets


USDA CERTIFIED BIOBASED PRODUCT
PRODUCT 77%

**FEATURES**

- High renewable content: 77% biobased
- USDA BioPreferredSM certified packaging material
- BPI certified to meet ASTM D6400 for compostable plastics
- Marine biodegradable per ASTM D7081 standard specification
- 100% anaerobically digestable per ASTM D5511 standard test method




# Networking and Lobbying

The main objective of our networking is to **understand the current status** of the marine litter problem and how it is being dealt with in the Mediterranean and Baltic countries, and to make practical recommendations in view of the Regional Strategy for the Sustainable Management of Marine Litter in the Mediterranean. It is essential that governments, local/port authorities, the maritime industry and other stakeholders enhance their cooperation in order to address all remaining problems regarding the availability of port reception facilities, and the collection, treatment and disposal of waste. This need is more urgent in the case of smaller fishing harbours and marinas where even greater problems exist.

The MarineClean project is not only offering technical solutions for the decrease of marine litter but is also raising awareness about the marine litter problem, its presence worldwide and in certain countries, its main sources and presents possible routes to tackle this problem. The majority of marine litter is of plastic materials. One way of spreading info about marine litter is the **networking of all stakeholders** in this area: producers of plastics (especially of packaging material), users of plastics, marine biology research organizations, non-governmental ecological organizations, decision makers on the national and EU level, operators of ports and marinas, hotel/resort managers etc.

The MarineClean consortium is active also in **lobbying**: its target is to reach **stricter national and EU legislation** in the field of **waste return from ships** and the **promotion of usage of biodegradable packaging on ships and in coastal areas**.

The same proposal will be presented in different countries. National decision makers as well as EU will have to consider passing on a legislation change. Joint forces of several European nations and their representatives are needed to gain success and this is covered by participation of the three European countries, Slovenia, Lithuania and Croatia. All three countries have access to the sea and are aware of the marine litter problem, because they have to face its consequences: direct (entanglement, injuries) and indirect (intoxications, carcinogenesis) damage to marine organisms and humans, negative influence on tourism (debris floating in the coastal sea and stranded on shores), etc.

# MarineClean Market

## Marine Litter Removal Equipment

As most competitive products are heavy and difficult to operate (at least a few men are needed and two boats with heavy machines), the consortium has decided to focus on development and production of lighter equipment intended to be used in coastal waters, in marinas, in front of hotels and camping beaches. The main goal is equipment that can be **operated with only one boat** or even a boat and a person walking on the strand. Such equipment has much **lower production costs** and much **less material** is needed, which results in a lower price in comparison to competitive products that are mainly intended to be used on a large surfaces and need plenty of space to operate with.

## Biodegradable Packaging

The use of biodegradable and/or edible packaging materials is one promising approach to reduce the accumulation and negative impact of marine debris. Of the two, **biodegradable plastics are more technically advanced** and in a better position for near term commercial use. However, these materials still have a **significant cost disadvantage** relative to conventional plastics. It is likely that widespread commercial adoption will require some combination of **legislative restrictions of conventional plastics** and/or **economic incentives for use of biodegradable plastics**. With the development of a significant market, and ongoing technical innovations, biodegradable plastics should become more cost and performance competitive over time.

# The European Added Value

Clean and healthy seas and continental waters are the need of all countries and the EU commission has decided to resolve the problem on the European and not on the national level by supporting the MarineClean project. The problem of marine litter is emerging, but at the moment this threat is not yet widely-known as is for instance $CO_2$ emission. The MarineClean project suggests several routes to solving this problem and to reduce the amount of marine debris floating near the coasts as well as in the middle of the sea currents' paths. Because the problem is worldwide, coordinated actions at the continental level are the right way towards solution.

The level of European cooperation is high in the MarineClean project, because the project consortium connects partners from two different water basins (Adriatic Sea and Baltic Sea) and, moreover it connects "old" and newly accessed EU member states. Decision-makers on the national and European level are being addressed with the proposal of stricter legislation on the field of garbage return from ships and of subventions when using edible and biodegradable packaging on ships as well as in coastal areas, because it is known that the majority of marine debris enters the sea from land by rivers, streams and wind. The same proposal for legislation change is being presented in different countries and at the same time.

# Project Information

PROJECT TITLE:
Marine debris removal and preventing further litter entry
PROJECT ACRONYM:
MarineClean
PROJECT START DATE:
01/11/2011
PROJECT END DATE:
31/10/2014
TOTAL PROJECT DURATION:
36 months
EC TOTAL CONTRIBUTION:
584.995 €
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# Eco-Innovation Programme

The initiative CIP Eco-Innovation First Application and Market Replication Projects (CIP Eco-Innovation) is part of the Entrepreneurship and and Innovation Programme (EIP) which seeks to support innovation ans small and medium-sized enterprises (SMEs) in the EU. EIP aims at achieving better access to finance SMEs, at support services for business and innovation delivered through a network of regional centres, at the promotion of entrepreneurship and innovation and at support for policy-making that encourages entrepreunership and innovation.

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