CIRCULARSEAS

NEWSLETTER #4

FROM OCEAN
TO GREEN PRODUCTS

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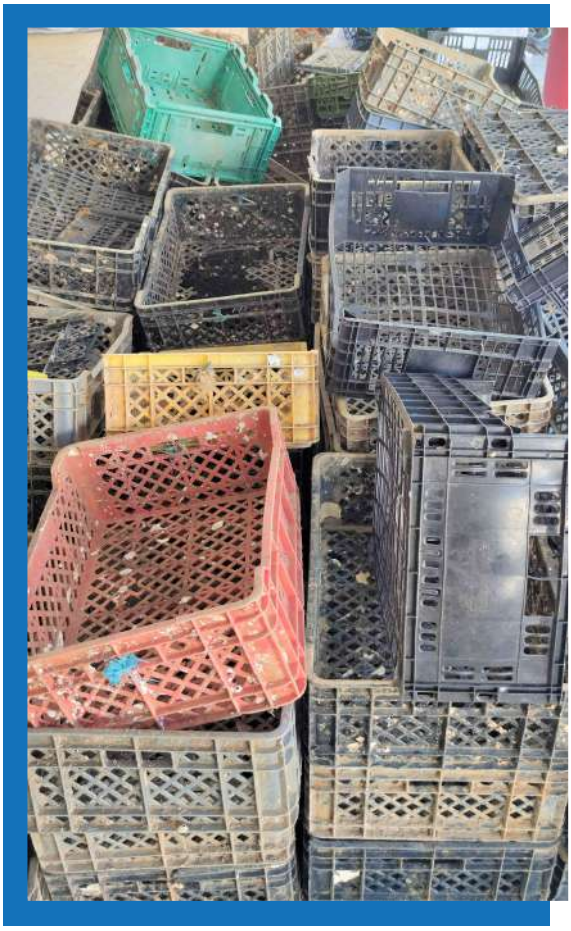
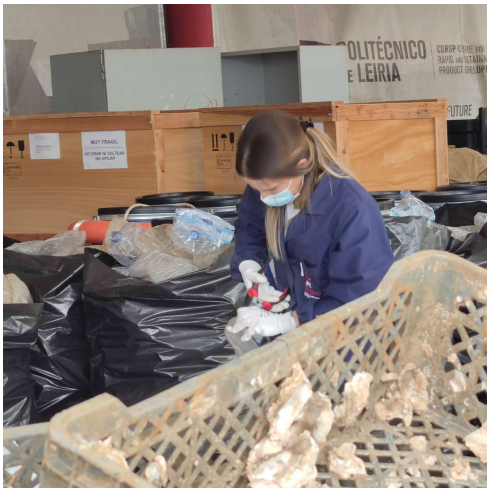
Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION
CIRCULARSEAS

CIRCULARSEAS transforms collected ocean plastic waste into ecological products through 3D printing



The main goals are to increase the valorization of marine plastic waste, resulting from the maritime industries and also left on the beaches (pollution) to be converted into a useful product (for example, boxes for fish or thermoplastic molds for boats), through the use of 3D printing , for the economic activities of the maritime industries. It is also intended to encourage the community to collect plastics from the oceans, promoting its depollution, reducing the use of plastic base parts in the maritime industry, particularly for the fishing and shipyards sectors, and diversifying economic activities linked to green growth.

Taking into account the partners involved in CircularSeas, the places where the practical activities of plastic waste collection take place are: Peniche (Portugal); Ondarroa and Vigo (Spain), La Rochelle (France); Cork (Ireland); and Plymouth (United Kingdom). In Portugal, the separation and selection, washing and destruction of plastic (creation of granules) took place in recent weeks, and the objective is to carry out the treatment process of this marine plastic in order to create new green products.



Images of the activities at CDRSP - PLeiria

Transnational workshop involved different maritime stakeholders from different countries

This workshop took place on 15th February 2021, and focused on the creation of products through marine residues, consequently combating pollution of the seas.

The Transnational Business Case workshop brought together stakeholder business owners from across the Atlantic Area countries participating in CircularSeas. The workshop facilitated the elaboration of the business cases and products developed during the regional partner workshops.

On the day, a total of 47 participants came together with a common goal to take actions in the direction of changing the European paradigm in ocean plastic waste recycling and remanufacturing using 3D printing technology. This process, although very well-known and utilised in technology sectors across Europe, is new and can be shown to be of dramatic benefit in maritime sectors that have previously been operating using traditional processes in recycling and manufacture.

...finding solutions to alleviate the strain put on our oceans in the form of plastic waste...

This workshop brought together attendees from a multitude of both public and private organisations across the Atlantic Area, to share experiences, values and technical expertise towards adopting a Circular Economy strategy aligned with the work of this project CircularSeas. This approach and philosophy were echoed in all collaborations across the three selected sectors represented, with a shared goal and vision to raise awareness of these issues but also commit to finding solutions to alleviate the strain put on our oceans in the form of plastic waste.

The products that have been selected to be trialled include.

- **Nylon wheel bearings** (Cork)
- **Tuna fish tags** (Ondarroa)
- **Surfboard components e.g., fins** (La Rochelle)
- **Moulds for boat hulls or/and other green maritime devices** (Peniche)
- **Machinery components e.g., bearing mount** (Vigo)

These products have been selected and considered through the consultation with business owners and using the plastic material sourced from local authorities like ports/harbours or sectors like aquaculture and fisheries to reuse and repurpose. The upcoming phase of CircularSeas which is the prototyping and pilot work package will see the first trialled products in the coming months. The success of the 3D printing of these components will showcase the opportunities that a novel set of technologies developed as part of CircularSeas can feed into a realistic framework for circular design and manufacture. These being the utilisation of additive manufacturing across a broad range of applications while using recycled plastic material and mixtures of multiple materials where necessary.

The compilation and publication of the eco-products and business cases conceived will be included in a portfolio which will help to document and showcase the outcomes of this project for the public sector i.e., government/public service and the private sector industry. The publication will serve as a proof of concept but also the technological innovation behind building a more resilient and sustainable circular use and manufacture of plastics in the maritime sectors of Atlantic Area European countries and beyond.

A very good example of how circular production and use of 3D printed recycled plastic on a large scale can be accomplished is in the organisation of the Tokyo 2020 Olympics this year. Due to the waste issues that afflicted the Rio de Janeiro games in 2016, Japanese organisers took the circular economy approach to building materials and structures for the games.

Using 3D printing to build the Olympic podiums with donated recycled plastic.

The podiums designed were made from 24.5 tonnes of discarded household plastics.

"The podiums were created with the purpose of showing the world the different ways in which a sustainable society can be realised and also engagement with the whole population of Japan in the podium production process for the games."

Also, the bedframes for each athlete (18,000) were built using recycled and strengthened cardboard.

Tokyo 2020 Olympic podium - dezeen website

Find out more - https://www.dezeen.com/2021/07/15/podiums-tokyo-2020-olympics-asao-tokolo/

Integrated User-Oriented Service for 3D Printing Environments with Recycled Material from Maritime Plastic Waste

Under the developments of the WP6, Leartiker and the University of Vigo have recently published a scientific publication about a new integrated user-oriented framework using open and economically feasible technologies for enabling the use of recycled materials from maritime plastic waste generated by maritime industries.

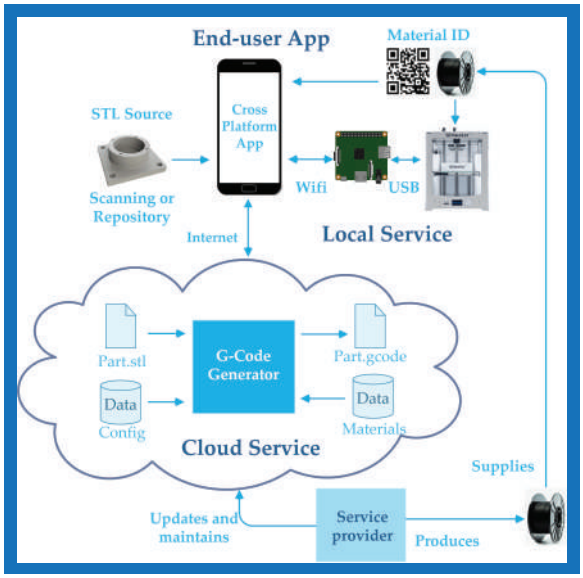
First, a survey phase was performed to obtain information about the current plastic waste generation in the maritime sector and the requirements to introduce there the 3D technology. This conclude that maritime industries use a lot of plastic that can be valorisated and they currently manage, in many different wastes and plastic types. The maritime industries show the need for cost-effective and oriented/user-friendly applications for unqualified staff to 3D print and inject materials. Therefore, 3D printing applications should be able to work with an unlimited variability of plastic qualities and nonstandard characteristics; and have to adapt 3D applications in a feasible way for non-expert users, considering both the use of the apps and their maintenance and parameterization.

The proposed framework is composed of :

1. Local service. Print the final part. It consist of a commercial 3D printer and a printer host to manage printer operations remotely. *Ultimaker 2+ with Octoprint service (Raspberry Pi 4)*

2. Cloud service. Service provided by an external agent to generate the machine code automatically and to manage the recycled material data & stock in the node.
API Rest serivce with PrusaSlicer core

3. End-user app. Easy-to-use interface: selection of the 3D model & requirements (quality and material) and the basic management of the operation in the 3D printer. *Smart application developed in Xamarin.Forms (C#) with the MVVM sofware design pattern*



Scientific article publication: https://doi.org/10.3390/app11093787

Plastic waste material recycling and developed framework first trials

Starting from the strapping tape of the frozen fish packaging, it has been cleaned, shredded and transformed into filaments to manufacture by 3D printing. In addition, the developed environment was tested, reducing the time to carry out the printing operation by 87% for the end-user.

There is a whale "hunting" plastic on two beaches in Leiria, Portugal.

The initiative belongs to the Coimbra " Centro Ciência Viva" and aims to raise awareness of pollution. The objective is to make bathing areas more environmentally friendly and make people aware of the importance of keeping these spaces clean.

The iron structure and hammocks in the shape of a whale, image of the "Plastic Hunting" project, created last year and developed by Exploratório - Centro Ciência Viva in Coimbra, is back on the Paredes da Vitória and São Martinho do Porto beaches , both in the municipality of Alcobaça, city of Leiria.

Images of the structure at the S. Martinho beach

Last year, this initiative won the third prize in the "good practices" competition, which led to international recognition by the "Blue Flag" and by the "Foundation for Environmental Education" and returns with new features in 2020.

One of the new challenges launched is a hunt for plastics, inviting those who pass there to take a walk along the beach and "collect plastic objects" so that they can fill the whale's interior with them".

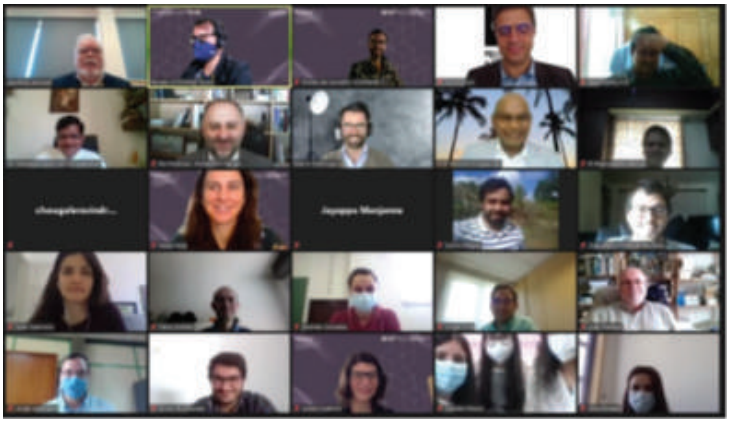
Next to the giant animal is a panel with the phrase "Join the plastic guns", in order to encourage all those who pass by the beach to adopt good environmental practices.
Environmental activities are for all ages and can be an alternative program to sunbathing or building sand castles. Through the QR (Quick Response) codes, available on the panel next to the whale, interested parties can access, via their mobile phone, pages for environmental awareness and other activities.

The two beaches in the municipality of Alcobaça have the Blue Flag and Accessible Beach - Praia para Todos awards.

CIRCULARSEAS project presented at ICDDMAP21 Conference

Turning Ocean plastic waste into 3D printed thermoplastic moulds for boats and for other green maritime devices" was a topic presented on 21th May, in the international Conference ICDDMAP 2021 in the scope of CircularSeas project.

The conference provided an innovative environment for the discussion of the emerging technologies associated with direct digital manufacturing, its wide-based applications and the new materials associated with this exciting technology including polymers, ceramics and metals. The three day meeting included an exposition of the CircularSeas project stand at the CDRSP facilities, as well as a poster presentation on thermoplastic moulds for boat keels, fabricated by 3D printing, were shared with stakeholders as a sustainable solution.



Conference printscreens

CircularSeas project participated in the exhibition and demonstration around the Sustainable Development Goals (SDGs) at Médiathèque Michel Crépeau Library of La Rochelle

As part of their awareness-raising and citizen participation actions, the Communauté d'agglomération de La Rochelle and L3i laboratory from La Rochelle Université have organized a flagship action around the Sustainable Development Goals. The aim was to raise awareness of the collective commitment of the 193 United Nations Member States and to involve citizens locally in this process, through an exhibition and dedicated programming.

This event, which took place from May 31 to June 5, gathered 17 workshops on various topics. The L3i laboratory and the CDA La Rochelle developed an exhibition activity around the CircularSeas project. Some explanations were provided to explain the main objective of the project (turning ocean plastic waste into green products for maritime industries). A focus was made on waste collected in La Rochelle node and how they could be recycle to produce some fins for surfboard, or even building some spat recipients to grow oysters and mussels.This event, which tool place on the afternoon of June 5, developed a demo of the 3D scanner, of the 3D printer and of the technologies developed since the beginning of the project (3D model recognition using a smartphone) to all participants. Around 50 peoples participated to the event, which allowed the spread of the CircularSeas project to the general public.