



BLUE

BEYOND

# BLUECYCLE

## The Problem



- 640,000 tonnes of fishing gear are lost in the sea annually
- 46% of the Great Garbage Patch is fishing gear



- 80 – 85 % of marine litter is plastic
- 27% of marine litter is fishing gear
- Approx. only 1.5% of the fishing gear is recycled



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## A timeline

Production of **Second Nature**

**Documentary** which focuses of following Research and Design Duo **The New Raw** in creating 3d printing filament from ghost nets.

The film was shown in Athens, Sydney and was a finalist at the Global Sustainability Film Awards

### Industrial Design Competition

on products that combine Marine Plastic Waste, Blue and Circular Economies and New Technologies

### Opening BlueCycle Lab

A dedicated space for research, recycling and developing products that have originated from marine plastic waste

09/2017

05/2018

07/2018

05/2019

10/2019

10/2020

### Marine Plastic Waste, Blue and Circular Economies and New Technologies

Second Nature First Symposium & Exhibition in Greece at the Aikaterini Laskaridis Foundation

### Launch of BlueCycle

The first programme in the EU with a holistic approach to the problem of marine plastic waste

**Almost 255 tonnes of plastic waste collected from more than 22 locations around Greece**



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## Who are we

BlueCycle is an **integrated** blue & circular economy company in Europe focusing mainly on the recycling of plastic fishing and shipping equipment through a **holistic approach**.

Fishing nets and mooring ropes are transformed in high-quality raw material, ready to be reintroduced to the plastics industry.

We rely on current research, new technologies, innovation and creativity and we propose sustainable solutions to the marine plastic waste problem.

Unique 3-step holistic approach: from material collection to processing and creation of the final product.





# Step 1

## Material Collection

An expanding network all over Greece

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## Step 1 Material Collection – An expanding network all over Greece

Our sources

- BlueCycle fishing equipment collection points in collaboration with local authorities and fishermen
- Aegean Rebreath NGO marine litter collection stations
- Manufacturers of fishing and shipping gear
- Aquacultures & Mussel farms
- Marine and coastal clean-ups of collaborating institutions and NGOs





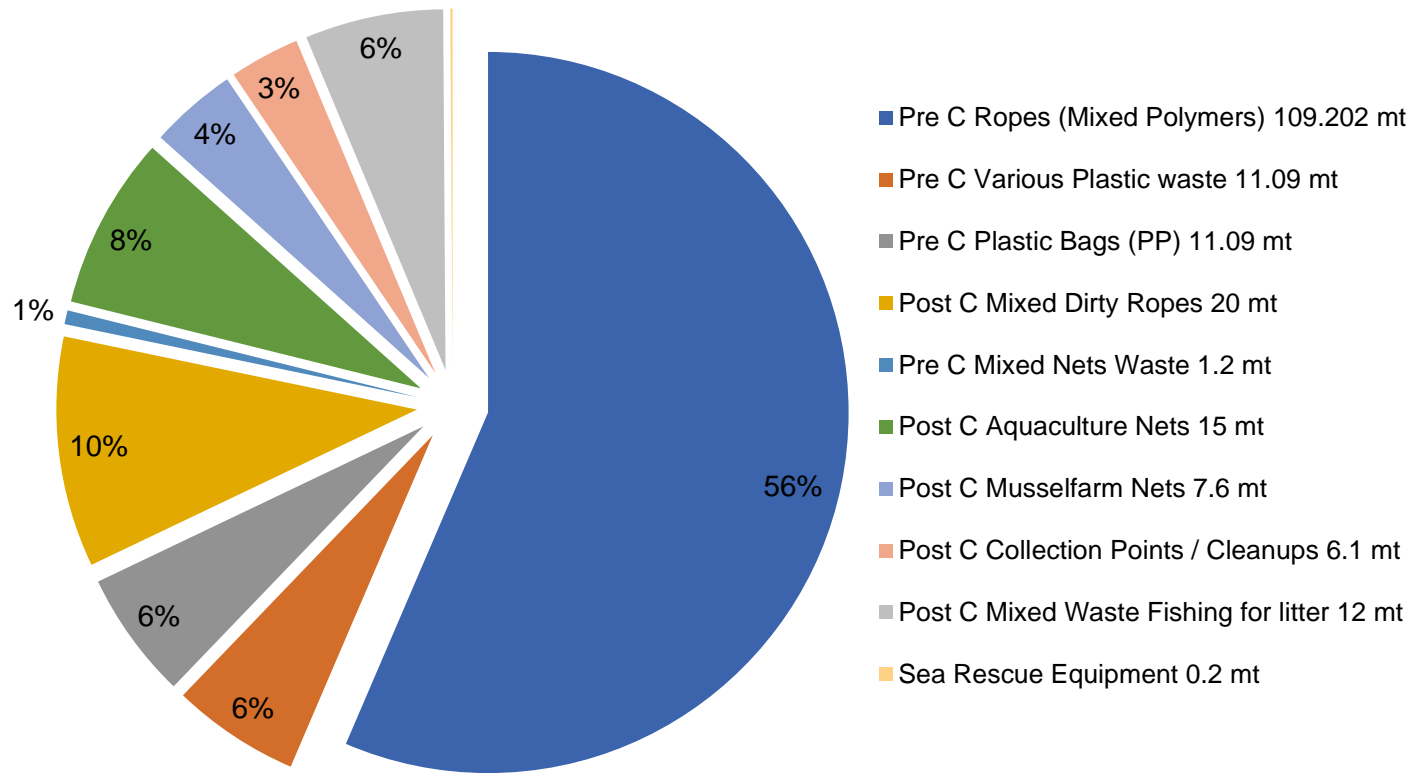
Our network

- ▲ Rope & Net Manufacturers
- ▲ Collection Points / Cleanups
- ▲ Aquaculture / Mussel farms
- ▲ BlueCycle Facilities

Not for circulation

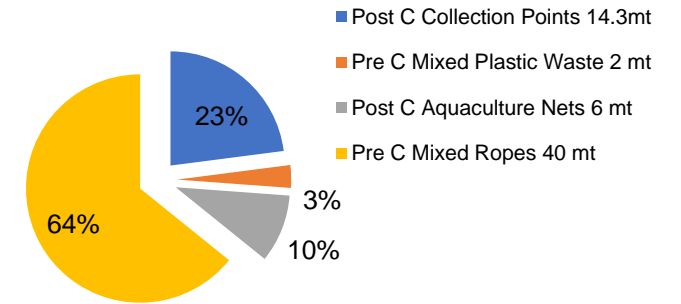


## Material 2019-2020 currently in BlueCycle facilities



**Total 193 mt**

## Currently in collection points awaiting pick up \*



**Total 62 mt**

**\* Delayed due to Covid-19**







Not for circulation



## Material is categorized depending on condition (BlueCycle Condition Scale)

### ▲ Category 1a.

Pre Consumer - Almost excellent condition (waste matter 0-5%)

### ▲ Category 1b.

Pre Consumer - Medium condition (waste matter 5-10%)

### ▲ Category 2a.

Post Consumer - Good Condition. Minimal organic and other matter detected. (waste matter 10-25%)

### ▲ Category 2b.

Post Consumer – Obvious organic and other matter and possible degradation detected (waste matter 25-50%)

### ▼ Category 2c.

Mixed Waste - Maximum organic and other matter and possible degradation detected (waste matter 50-100%)



▲ Suitable for upgrading

▼ Suitable for downgrading / extended life cycle / durable plastics

Not for circulation



# Step 2

## Material Processing



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## Step 2 Processing

- **Material Sorting**

Different polymers: PP, PE, PES, Nylon 6, HDPE, Dyneema

Different material state

Pre-consumer: Fabrication wastage

Post-consumer: Used material / Ghost nets (special category)

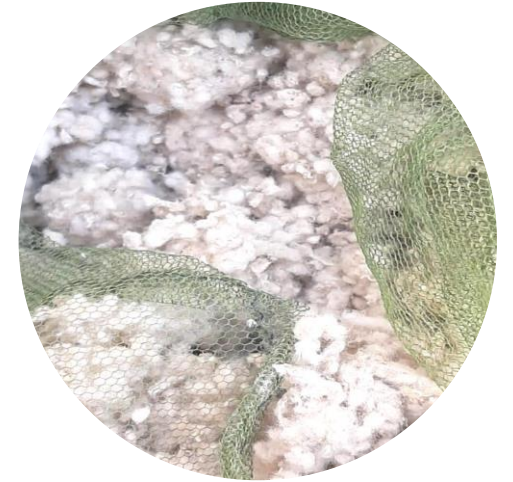
**Goal: Keeping the incoming material separated by type and by state to achieve maximum product quality**

Mixes cause degradation of material properties

- **Shredding**

- **Cleaning**

Unique eco-friendly zero-discharge washing system



**A close-loop water recycling method** for cleaning plastic waste that combines; friction washer, rotatory washer and pre-washer in the same machine. The method and the alkali solution are particularly useful for cleaning plastic surfaces with a heavy organic and chemical contamination.

1. Separation into material groups: ropes, nets, metal, wood, stone, shells, other.

In case of mud present, material is immersed in a water bath.

2. Fine shredding of material

3. Washing in purpose built zero- discharge washing system



## Preliminary results from washing process

It was estimated that for washing 1 ton of the input material, 10 m<sup>3</sup> of water would be required.

For the washing an alkali solution (KOH) was added to the pre-washing process in order to maintain  $8.2 < \text{pH} < 9.3$

Rinsing with H<sub>2</sub>O for further extraction of alkali solution and friction washing achievement.

Resulting fibers **very high** humidity of 40%.

Humidity to be not more than 12% for subsequent extrusion = **Purpose built drying room.**

To evaluate the results, we are using our own yellowness and whiteness Index, which we expect in the future calculated from spectrophotometric data that describes the change in color.



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Nylon Aquaculture Net



Stage 1. Shredded



Stage 2. Washed



Nylon Net



Stage 1. Shredded & washed



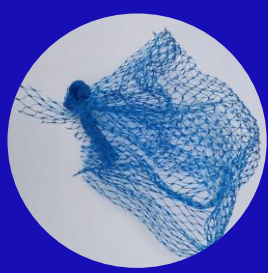
Stage 2. Extruded



Stage 3. Printed



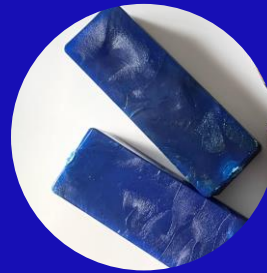
PE Mussel Farm Net



Stage 1. Plain H2O wash



Stage 2. Shredded



Step 3. Injected



Stage 1. Plain H2O Wash



Stage 2. Shredded



# Step 3 Production





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## Step 3 Production – The BlueCycle Lab

The first zero-waste specialized center for the treatment and recycling of marine plastic waste.

Cutting-edge technology. Hosting the first robotic Large-Scale 3D Printing Lab in Greece. Operated by The New Raw

A place to test innovative ideas and develop solutions to the marine plastic waste problem.

Product design and development (**according the material**)

**All products are recyclable and traceable**

**Traceable material**



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Collection

Processing

Production



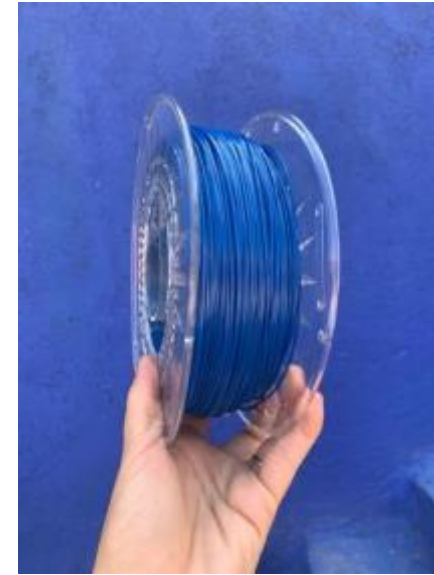
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## 3 Production – The BlueCycle Lab

Recycling the plastic fishing and shipping gear through mechanical process

Main production lines

- 3D printer filament
- Raw material (recycled plastic pellet) for the plastics industry
- 3D-printed furniture
- *Pilot production for recycled plastic yarn*
- *Pilot Production for Tiling and Building Materials*



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## 3 Production – The BlueCycle Lab

### *Second Nature Furniture*

- Made from marine plastic waste
- 100 % recyclable by us
- Material collected from Greece
- Unique production features
- High aesthetic value
- Ability to apply custom solutions
- Designed by **The New Raw**



## Awards

- Second Nature furniture line was the **winner** in the Industrial Design Category of the prestigious Rossana Orlandi Guiltless Plastic Prize 2020 ([www.guiltlessplastic.com](http://www.guiltlessplastic.com))
- Second Nature furniture line **longlisted** for this 2020 Dezeen awards
- Second Nature Furniture Line  
Green Home Product of the Year - **GOLD**
- BlueCycle. Beyond Marine Plastic Waste  
Green Project of the year – **SILVER**
- BlueCycle. Beyond Marine Plastic Waste  
Green Start up of the year - **GOLD | PLATINUM**

**Ro** GUILTLESSPLASTIC®  
Rossana Orlandi

**dezeen**



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## Our work outside the lab

Engagement with all stakeholders (government, industry, local community)

Highlight the qualities of fishing and shipping equipment and its potential as a high-quality material and not as a waste

Go to the source (fishing harbors, industry)

Apply circular economy principles at every stage of the process.



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## Goals

Continuing research for fishing & shipping gear recycling

Optimization of the 3-step “BlueCycle holistic process”

Creation of smaller “BlueCycle Labs” at key harbors for in situ material processing





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