roncaglia&wijkander

Mare Mostro

By 2050, there will be more marine litter than fish and
the sea, as we know it, may never be the same again.

Awareness campaign on the impact plastic has on our seas.

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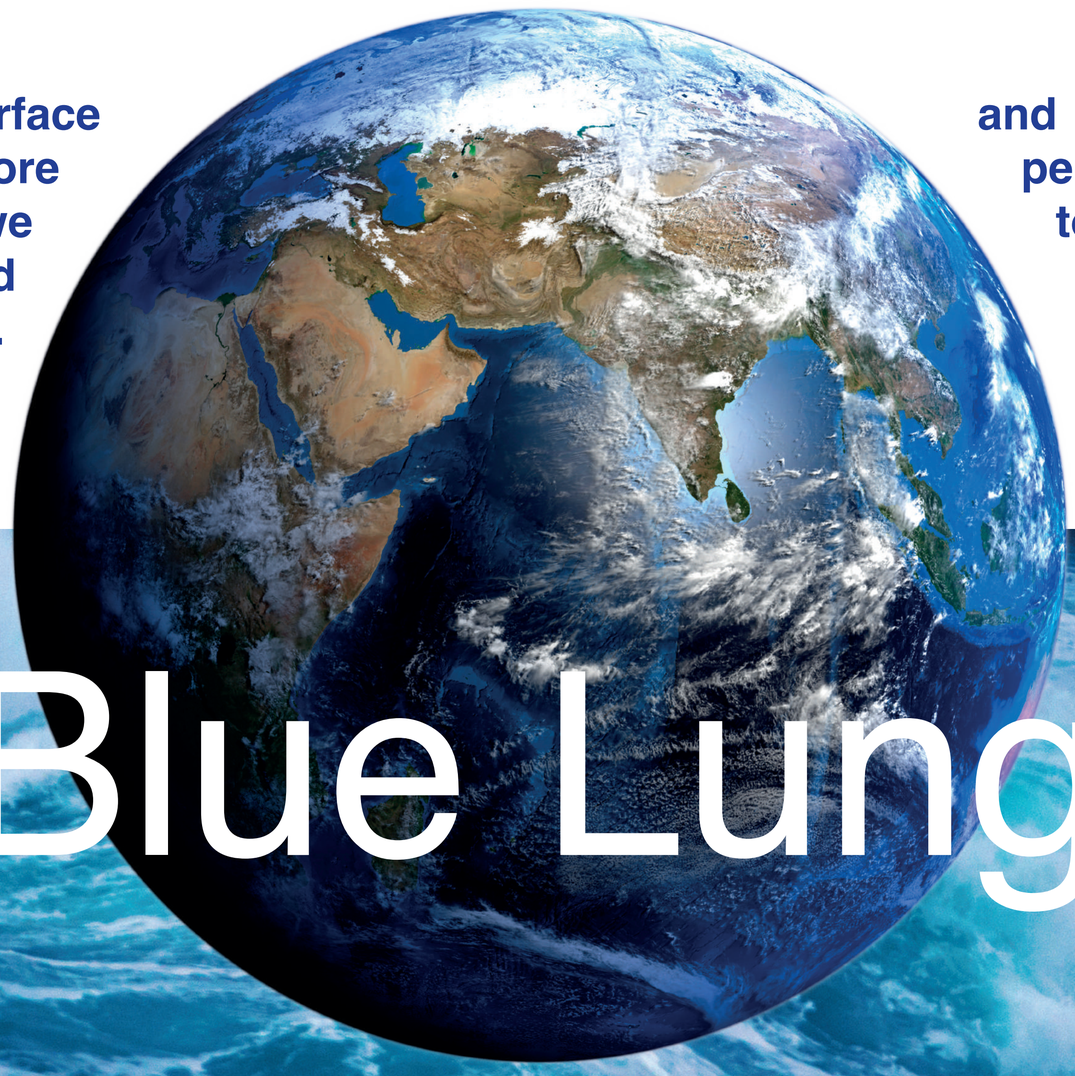
The Earth's

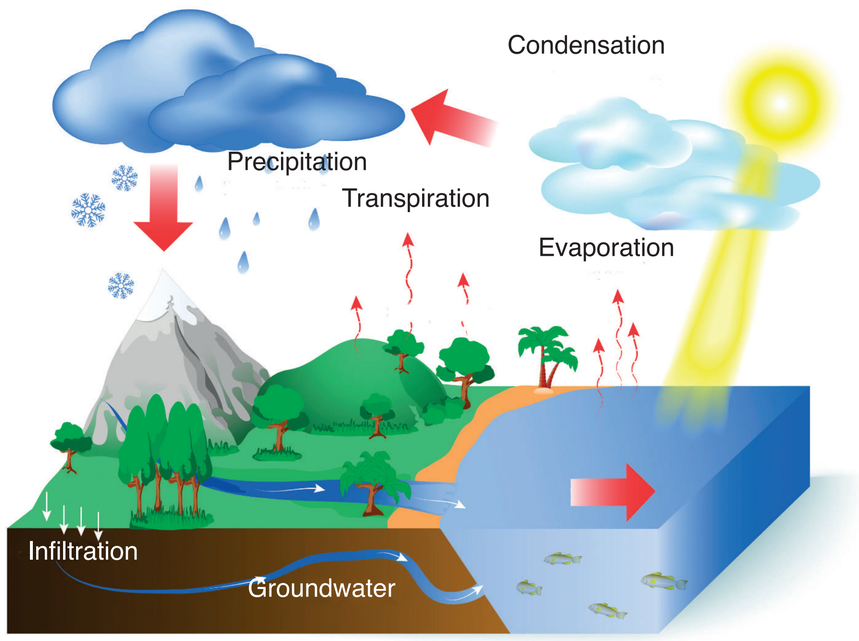
The sea covers 71% of the surface of the planet, it produces more than half of the oxygen we breathe and it absorbs one third of the excess carbon dioxide. Seas and oceans of the world are connected to each other



and form a unique element which performs its function thanks to a dynamic equilibrium achieved in millions of years between atmosphere, water, rocks, animals, vegetables and minerals.

Blue Lung

The Earth seen from space appears as the only blue planet of our solar system. On Planet Earth the Oceans are the most widespread environment. Despite this, yet we still know little about them as there is a lot more to be explored of the oceanic abyss.



The water cycle
Water on Earth has a continuous movement that includes different phases and many different processes not yet completely understood.

Ocean is

the air we breathe

the food we eat

medicines we use

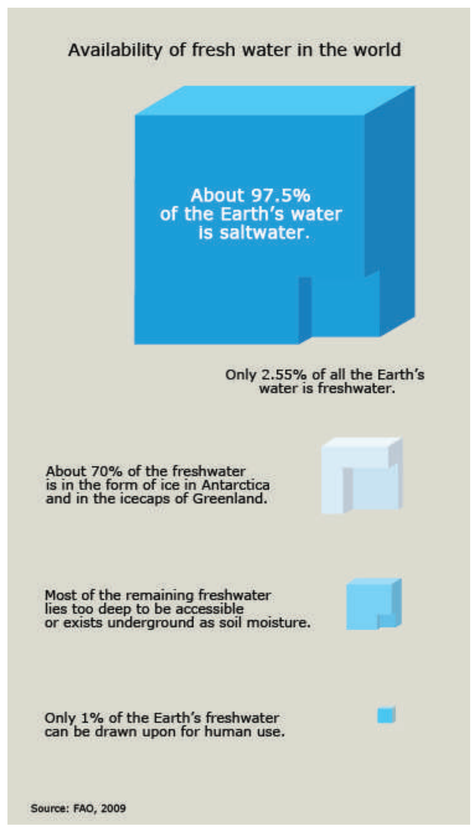
7
REASONS TO PROTECT THE SEA

well-being, art and sport

jobs and the economy

human history

the origin of life



Availability of water on Earth

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A sea

In the world there are 5 main ocean gyres where trash accumulates.
The 'Great Pacific Garbage Patch' is as large as the entire Mediterranean Sea.

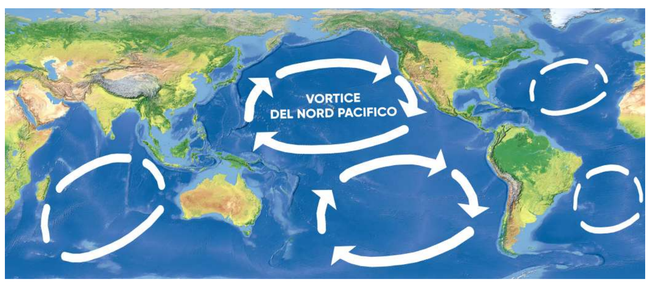
# of plastic

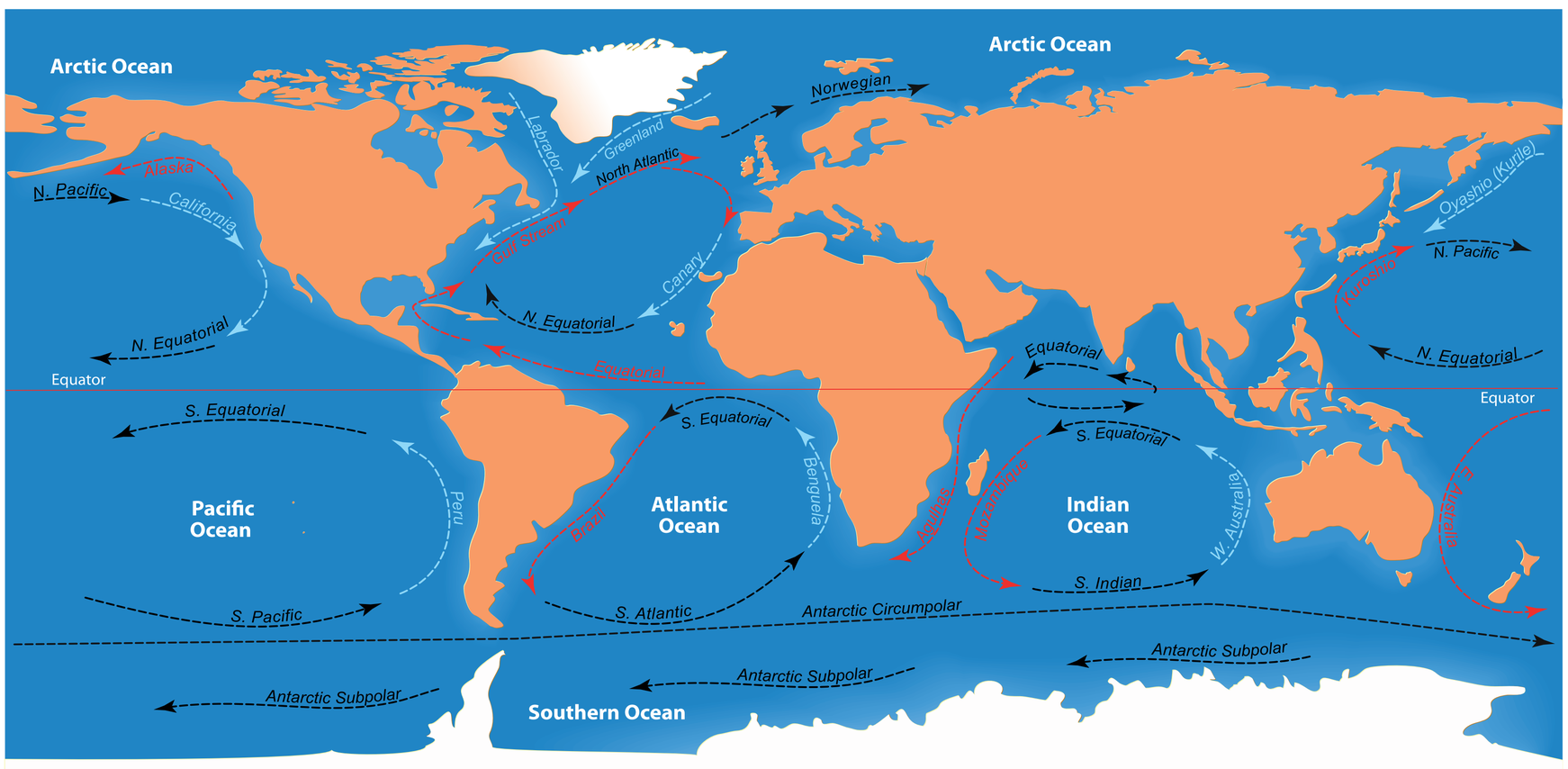
Islands (of plastic) in the ocean circulations

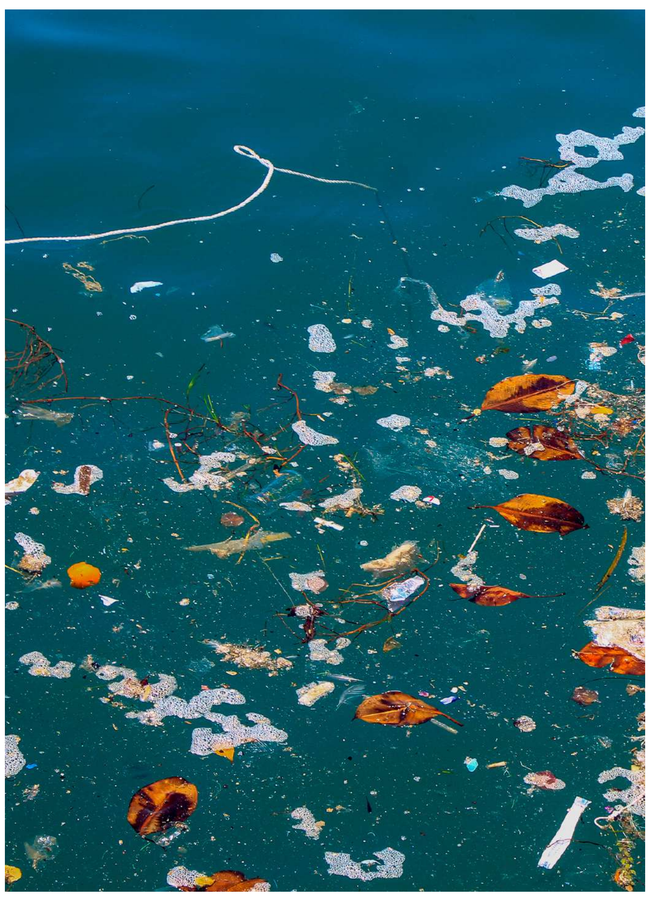
For decades now, high concentrations of plastic debris have been found in the oceans in the form of real floating islands. Although plastic is a relatively new product, that has been present just for a little more than 60 years on the planet, it has become the most polluting debris of the oceans due to its indiscriminate use by man.

Some statistics:

- It is estimated that between between 4.8 and 12.7 million tons of plastic waste end up in the oceans every year.
- There are between 700 thousand and 3.5 million plastic fragments per km^2 in the North Pacific Ocean.







Oceans and Seas are characterized by large and small movements of masses of salt water called *currents*, due to factors such as salinity, density, temperature, wind and waves. Large circular systems of constant currents (Gyres) move clockwise in the Northern hemisphere and anti-clockwise in the Southern hemisphere.

Currents:

- **Affect the climate both locally and globally**
- **Contribute to the survival of plant and animal species, including man**
- **They carry plankton, which is at the base of the food chain**

Ocean gyres are areas where large quantities of smaller plastic fragments converge with larger pieces around them moving in circles. In the world there are also other marine and oceanic areas with plastic vortex.

The ways of plastic

World plastic production exceeds 380 million tons per year. In 2050 it is estimated that it will exceed 500 million. Plastic that ends up in the sea over time breaks into smaller and smaller fragments but it does not decompose.

are endless

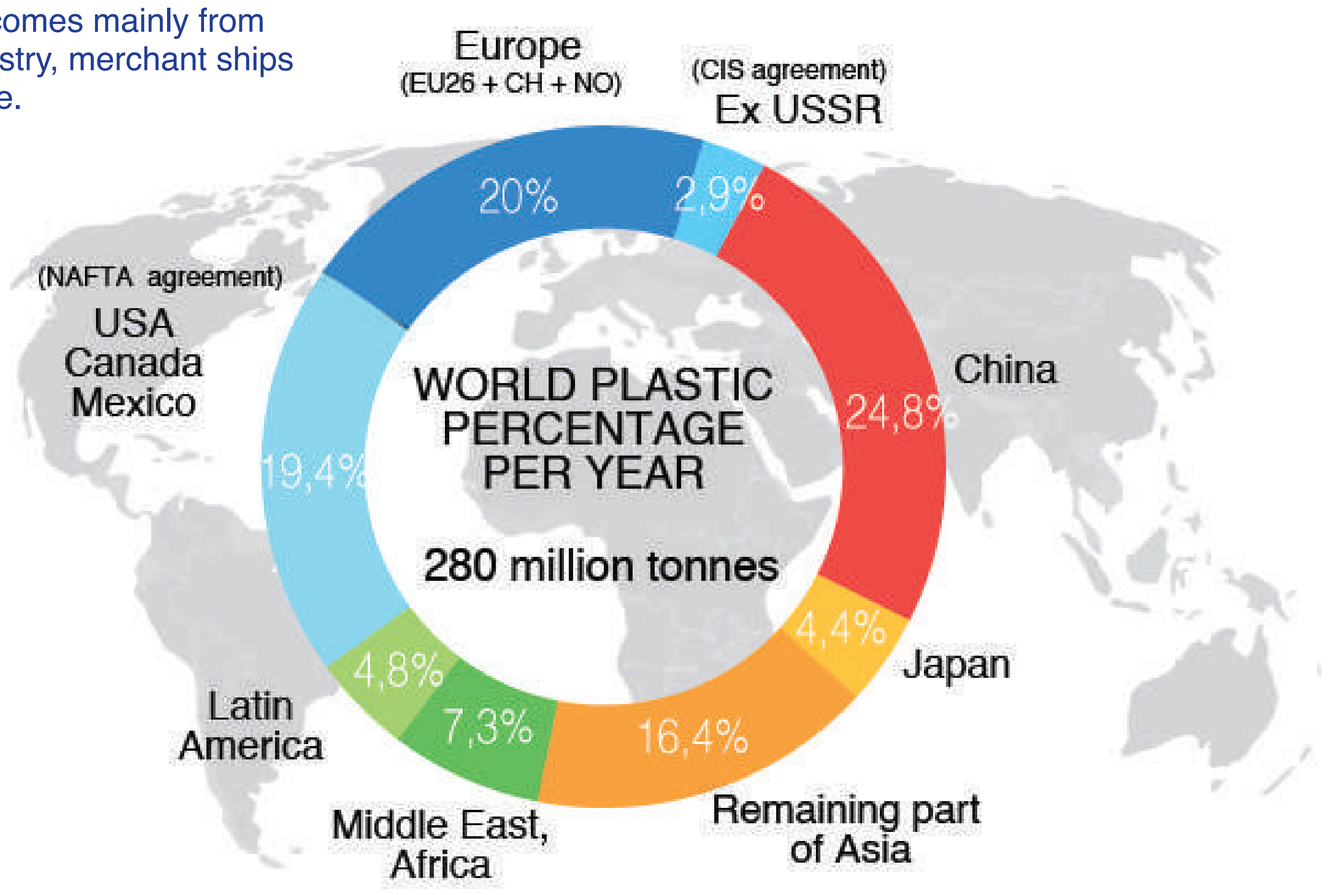
Agenzia roncaglia&wijkander

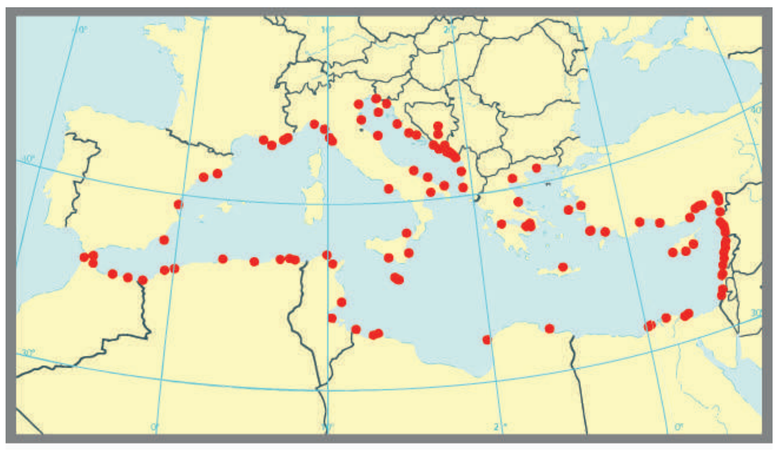
Microplastics, *Macro* problems

The floating plastic debris accumulating in the oceanic vortex resemble a “soup” in continuous movement, formed by pieces of variable sizes, in particular by smaller particles, that are distributed just below the surface, along the entire water column, until reaching the bottom with consequences yet to be discovered. Fragments that are smaller than 5 millimeters are called **microplastics**.

How does plastic arrive in the sea?

Most of the plastic close to the coasts reaches the sea from the mainland through rivers, city waste, industrial emissions, constructions, fierce tourism, illegal disposals.
Ocean plastic comes mainly from the fishing industry, merchant ships and aquacolture.



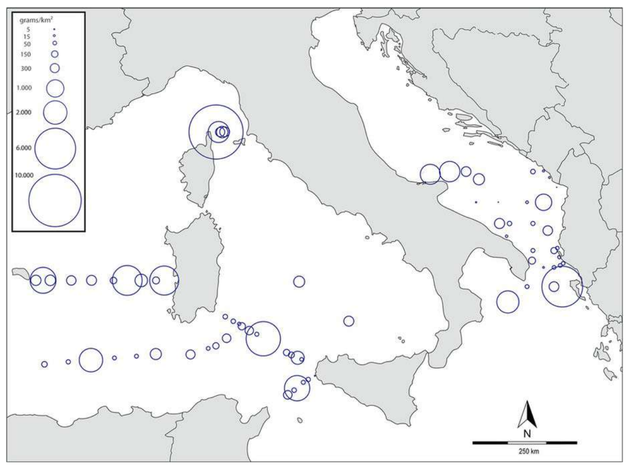


POLLUTION HOT POINTS ALONG THE MEDITERRANEAN COASTS

Hot spot

The situation in the Mediterranean

The ***Mare nostrum***, due to its characteristics of semi-closed basin, highly populated coasts and the presence of numerous freshwater rivers that flow into it, is one of the most polluted seas of the world with an average density of plastic fragments of 1.25 million per km^2.
In the coastal area that goes between Tuscany and Corsica, has been documented the presence of 10kg/km^2 plastic fragments.



Data and map Isomar CNR-Lerici, Univ. Salento and Ancona, Algalita Found CA

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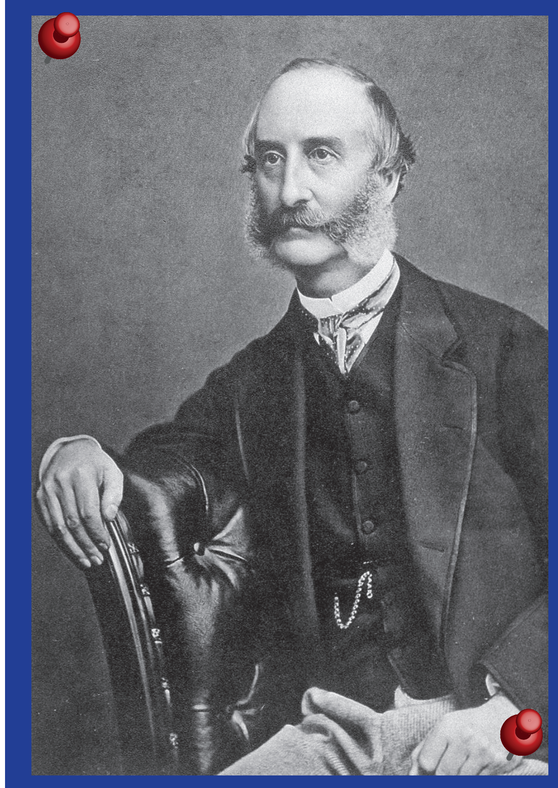
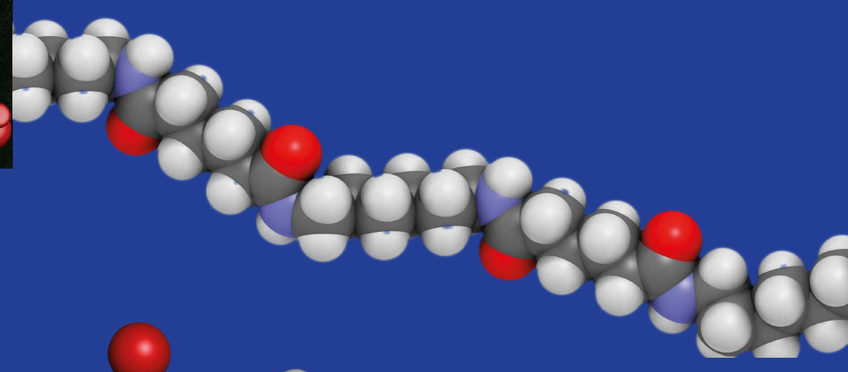
Good or bad?

From an indispensable solution of our daily life to an indestructible monster present everywhere on the planet

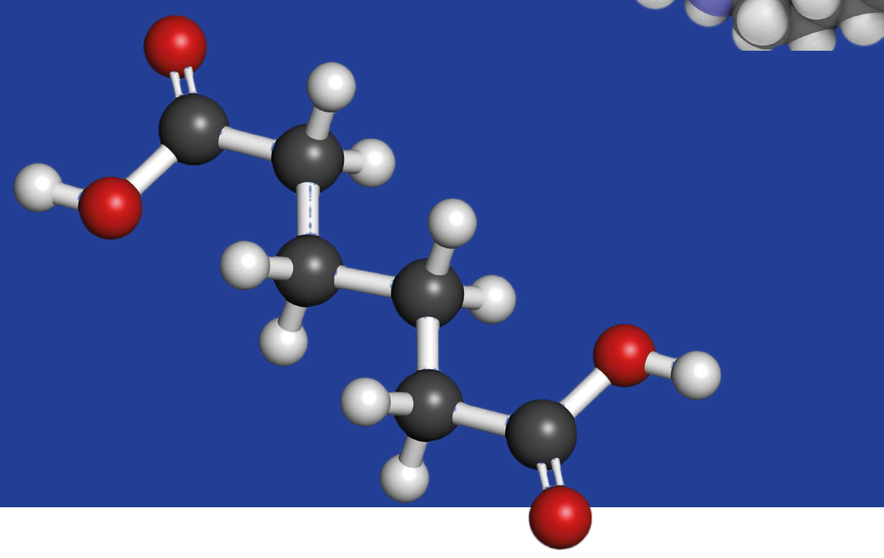


The history of plastic begins in the 19th century when the English chemist Alexander Parkes (1813-1890) patented, in 1856, the first semi-synthetic plastic, known as the *Parkesina*, then registered as *Celluloid*.

Italy also made its important contribution with the discovery of new materials: in 1963 the scientist Giulio Natta (1903-1979) won the Nobel Prize on Chemistry for his studies on crystalline polymers, which laid the foundation for the synthesis of polypropylene (industrially produced by 1957 known as *Moplen*) revolutionizing the houses of the world and entering Italian mythology as a symbol of the 'economic boom'.



Since then there have been many other patented semi-synthetic or synthetic materials introduced in the market for the most diverse uses (bakelite,cellophane, polyvinyl chloride or PVC, nylon, polyester, polyethylene terephthalate or PET and many others).



Plastic, a malleable material

The term *plastic* comes from Latin language, which in turn derives from the Greek πλαστική τέχνη meaning "art of modeling" and is generally referred to synthetic polymers. The raw materials for plastics synthesis are mainly derived from petroleum.
Depending on the purpose, these pure polymeric materials can be mixed with additives such as modelers, dyes, stabilizers and lubricants. This results in resins, rubbers and materials provided with a remarkable mechanical resistance. 'Synthetic fibers' , obtained from primary artificial materials, are added to these.

Indestructible

Much petroleum-derived plastics do not decompose into components that can be assimilated by organisms but maintain their characteristics almost unchanged.

The Plastisphere

Recent research has highlighted that part of the plastic of synthetic origin present at sea and on mainland can be colonized by some pioneer microorganisms offering them a support for growth.

These bacterial communities (biofilms) vary and include autotrophic organisms, predators, symbionts and pathogens.

The biofilm activates chemical and physical degradation of the plastic on which it forms.

So many different plastics!

All plastic packaging can be placed in the recycling. The code and the number inside the triangle, symbol of recyclability, indicate the kind of plastic material. Code 7 generically refers to all other polymers.

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Along the food chain

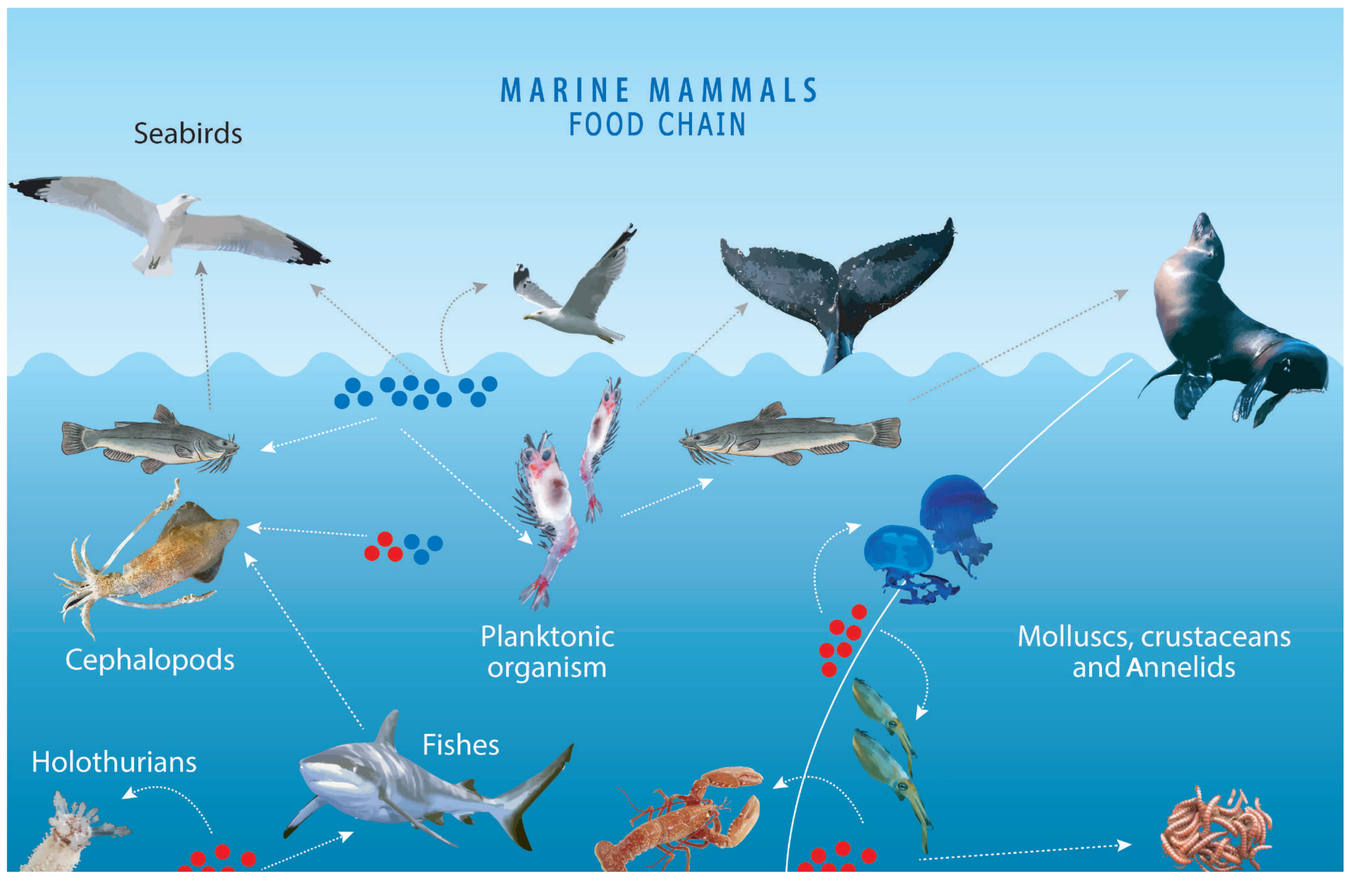
Microplastic, mistaken for food, are ingested by marine organisms, from plankton to large cetaceans and enter the food chain.

The term *plankton* refers to the set of animal and plant organisms that live in suspension in the water medium and that are passively carried by waves and currents, being unable to overcome the motions of the sea with their own movements. Plankton is at the base of the marine food pyramid and at the apex we find man: the last consumer. Being composed by non-selective organism they indiscriminately feed on any ingestible particle surrounding them, plankton is seriously exposed to microplastic pollution.

Microplastics, once ingested by plankton, piles up along the trophic chain reaching man with possible accumulation effects known as: ***biomagnification.*** Because of this phenomenon a concentration of pollutant compounds may occur becoming highly dangerous for human health due to the presence of chemical substances.

Gelatinous plankton

Fragment of plastic



The most immediate effects are easily observed especially in large filter-feeding vertebrates, such as the fin whale ***(Balaenoptera physalus)*** or basking shark ***(Cetorhinus maximus)***, but plastics has also been found in the stomach of many predators such as birds, reptiles, marine mammals, fish and cephalopods.

It has been estimated that every year 1.5 million animals are killed by plastic, a number destined to grow if we do not take measures to contain that horrible pollution.

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Deadly traps

Plastic waste in the sea traps, injures and suffocates (leading to a very painful death), thousands of large and small marine animals. In the last decade, the effects of these deadly traps have been detected amongst at least 663 different species.

Every year hundreds of thousands of reptiles, birds and mammals die because of plastic, directly or indirectly.

Abandoned plastic fishing nets and gears into the sea represent the most frequent cause of death of marine organisms; from fish to turtles and from birds to mammals.

The widespread diffusion of plastic particles into the marine environment creates harmful effects to the birds that inhabit the oceans. Especially for one species the effect of this type of pollution is dramatically evident: the Laysan albatross (*Diomedea immutabilis*).
Adults collect fragments of plastic that have been mistaken for food and feed with them their chicks. However, while adults can regurgitate the plastic they have ingested, the chicks are unable to do so and for this reason they are destined to die.

The physiological effects associated with the ingestion of plastics include obstruction of the gastrointestinal tract, failure of food to transit, stop of secretion of digestive enzyme, decreased appetite, lowering of the level of steroid hormones, delayed ovulation and reproductive failure.

Given the increase in the production of plastic products and the consequent increase of their diffusion in the sea, the impact of plastic on the life of marine animals is destined to dramatically increase.

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We are what we eat

Fish and shellfish are the primary source of protein for 1/5 of the world population, the microplastics ingested by these animals eventually reach humans.

Microplastics enter every day as waste into the marine environment. They are found in common use product such as:

- detergents and cosmetics (e.g. hand and face scrub, shampoo, toothpastes, sun creams, soaps in which microplastics have replaced natural ingredients such as pumice powder, almonds and oats).

- abrasive powders or sands, acrylic paints, anti-rust and other materials found in industry and construction.

Moreover, microplastics are a residue of the disintegration of larger plastic or synthetic fibers from clothing such as acrylic or nylon.

Without realizing we contribute every day to the release of a large high number of microplastics in river waters and sea: just one washing machine load can release over 1900 microfibers per item of synthetic clothing, about 100 fibers per liter of water and 180% more fiber released from a woolen garment. During the winter season in fact (using more sweatshirts or other synthetic clothing), the release of microplastics increases by about 700%. Everyone of us produces on average 2.4 mg of microplastics per day.

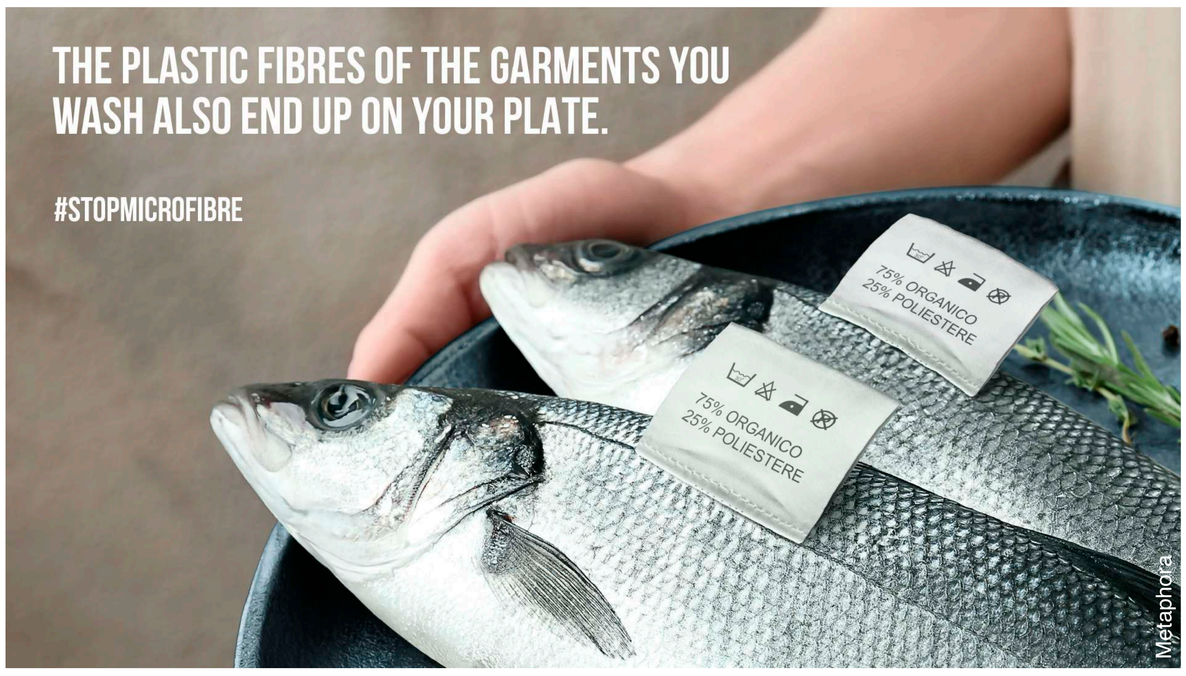
Illustration Alberto Gennari. Concept: Ferdinando Boero

Microplastics in the dish
It is important to consider that, since fish and crustaceans constitute the primary source of protein for about 1/5 of the population in the world, microplastics ingested by these animals can accumulate in their cells and arrive at the end of the food chain, reaching humans.

Studies conducted in the United States on 18 types of commercial fish, confirm the presence of variable layers of microfiber plastic in each of them. These fibers, moreover, were found to be chemically associated to metals and other toxic contaminants and their impact on human health remains still to be known. At least half of the plastics introduced into the marine environment float, but a large part also ends on the bottom interfering with the organisms that live in the sediments and influencing the processes of gas exchanges that take place between the surface of the sea and the seabed and photosynthesis.

#StopMicrofibre
Acrylic is one of the fabrics that releases the highest number of microfibers: a single 5kg load in the washing machine produces between 6 and 17.7 million microfibers. These invisible particles are now everywhere. Microfibers are found more and more often in aquatic filtering organisms such as mussels and oysters, but also in the stomachs of fish and sea birds, in sediments, in table salt and in bottled water. **#Stopmicrofibre** is a Marevivo Campaign that was created for awareness raising on the problem.

For the first time in history particles of microplastics have been found in the human placenta.
It is the result of a study conducted by prof. Antonio Ragusa and his team of the Fatebenefratelli Hospital of Rome and the Polytechnic University of Marche. The scientists defined the results “worrying”. Unfortunately more and more often microplastics are found where they are not expected to be found: in the Mariana Trench or on top of Everest, but the fact that they are also in the placenta leaves us speechless for the potential impacts on human health.



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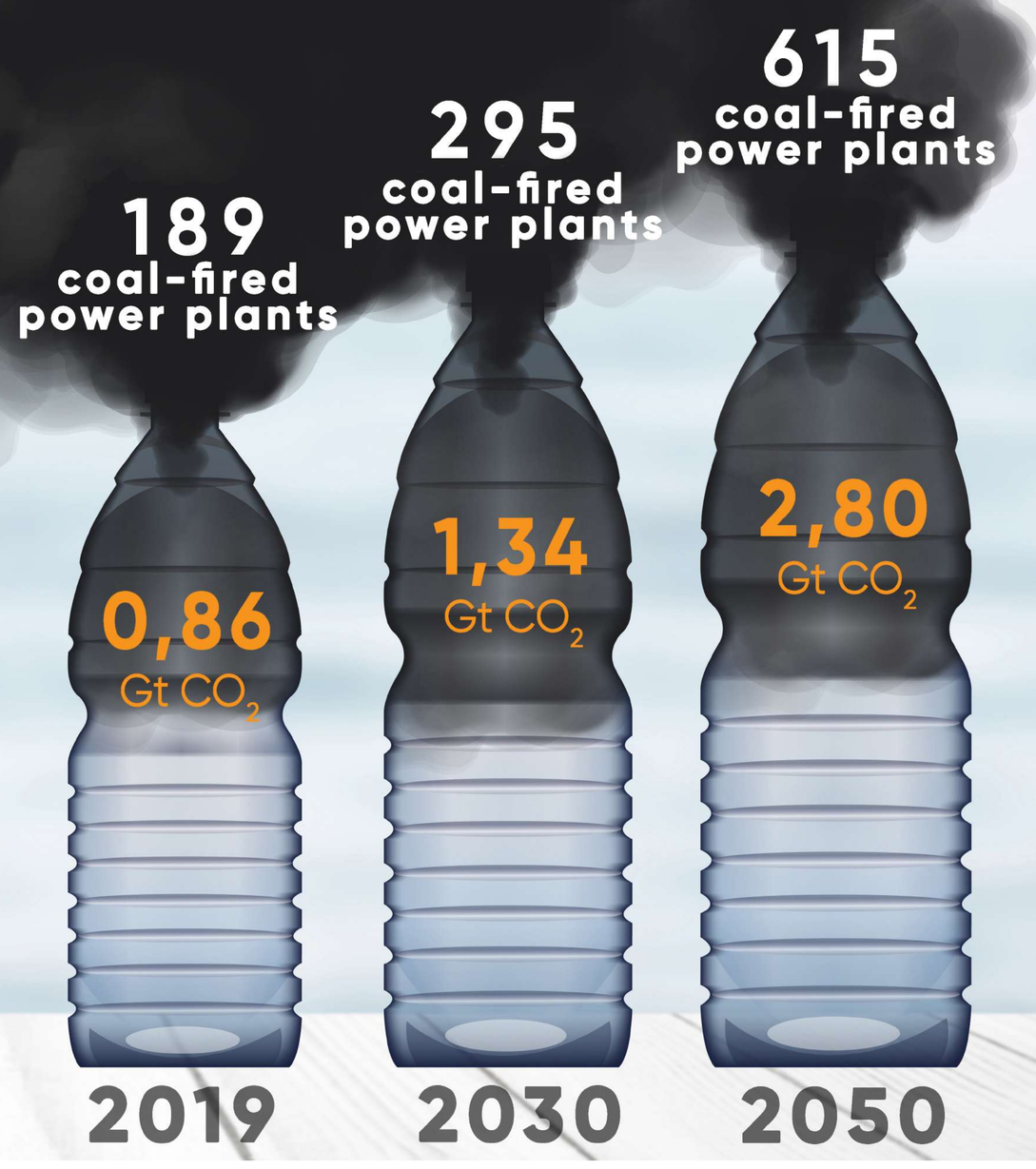
Plastic

The greenhouse gas emissions due to the current level of plastic production from oil seriously jeopardize the ability to keep the global average temperature rise of the planet below 1.5 degrees centigrade.

and climate change

In 2019, plastic production and incineration added more than 850 million tons of greenhouse gases to the atmosphere, equivalent to the emissions of 189 500-megawatt coal-fired power plants.



Gt = Giga tonne
Giga tonne = a billion tons

Grafica tratta da © CIEL - Plastic and Climate, 2019

In 2050, due to the greenhouse gas accumulation effect in the atmosphere amplified by the decreased ability of the oceans to subtract CO_2, the current level of production, dispersion and incineration of plastic could cause the presence of 2,8 giga tons of CO_2/year, equivalent to the emissions of 615 500 megawatt coal-fired power plants. Global and local climate effects would be devastating.

Atmosphere and ocean, an indissoluble bond

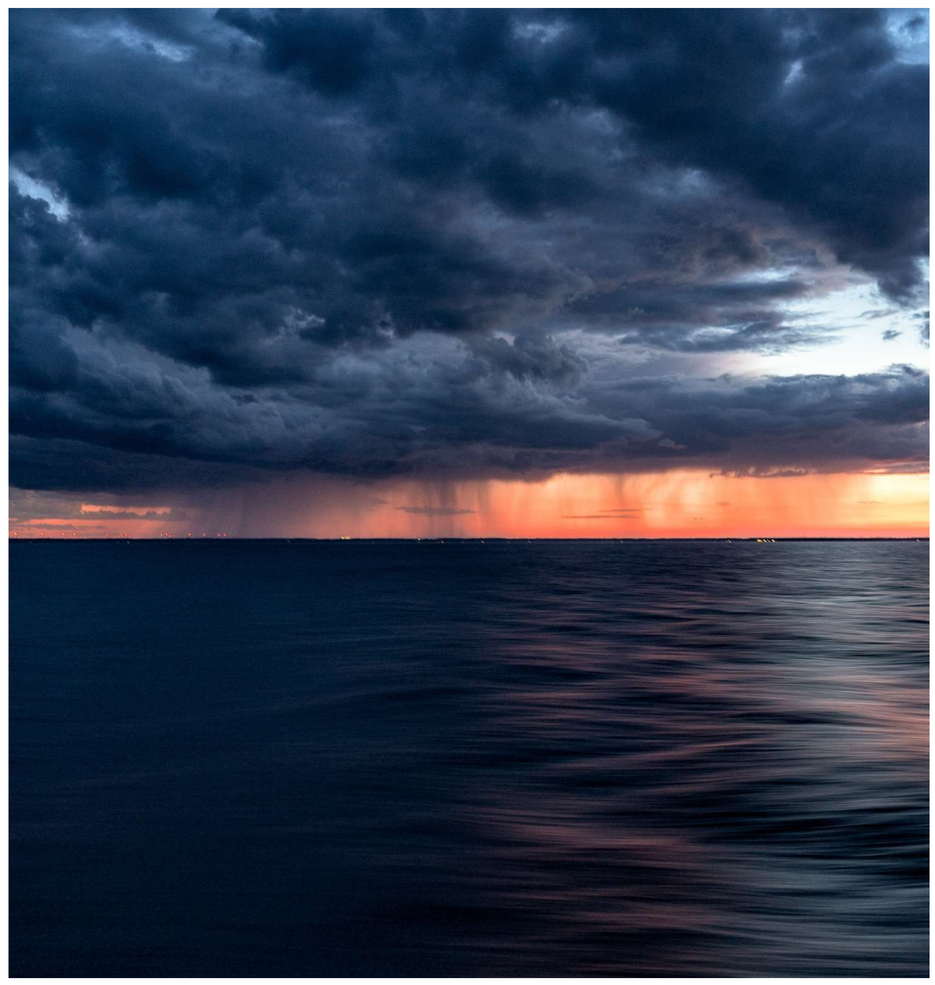
The gaseous exchange between the atmosphere and the ocean surface is a chemical-physical process fundamental in regulating the climate on the planet. It is controlled by the quantity of gases and the speed with which a gas molecule moves across the boundary between air and water. The increase in the amount of gas in the atmosphere due to human activities changes the climate, affects ocean circulation and the way the gas spreads in the air-water interface. These variations make very difficult to predict how the ability of the oceans to absorb atmospheric CO_2 will change in the future.

Danger in danger

It has been discovered that exposure of plastic to light and its consequent breaking into fragments unexpectedly triggers the emission of significant amounts of greenhouse gases. These studies have shown that the most common plastic in the ocean today (low density polyethylene), releases twice the amount of methane and 76 times the amount of ethylene (released by the non-fragmented plastic immersed in water). As the plastic continues to break, the exposed surface increases and the emission continues.

A cascading effect

Microplastic affects phytoplankton and zooplankton ability respectively to fix the carbon subtracted from the atmosphere and to transport it in depth seizing it for centuries. The Earth's oceans represent the largest reservoir of conservation and reserve of many elements that constitute the greenhouse gases including Carbon, if they were no longer able to perform that function, the climate impact of fossil fuels combustion would be significantly greater.



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What should be done?

Reduce, Reuse, Recycle. In short, be a responsible and active citizen, respect all forms of life on the planet. At the same time help to activate new technologies, scientific research, education and also a careful and responsible environmental policy.

Scientific research to face plastic pollution

Scientists from all over the world have been studying plastic pollution for years, looking for solutions to the problem.
In Italy several universities, within the National Interuniversity Consortium for Marine Sciences (CoNISMa), are dealing with the plastic pollution problem under different aspects: from the ecological effects on coastal environments to the processes of ingestion and transfer of microplastics into the food chains, up to the study of the "marine garbage" transport mechanisms by the currents.

Makers of the change

Just in Italy, between 6 and 7 billion disposable plastic cups are consumed per year (16-20 million per day), most of which are abandoned in the environment. We all can be makers of change by positively modifying simple daily habits such as, for example, eliminate the use of disposable plastic.

The 3 R's

The "Halykòs" project

Halykos project, carried out with the support between CON IL SUD Foundation and Marevivo Sicilia, put in place an "anti-marine litter barrier" near the mouth of the Platani River, a Nature Reserve in the province of Agrigento. The barrier helps to intercept the waste transported by the river and is useful to recover plastics before they end up in the sea.

To global problems, globals solutions

Problems that have a common cause must have a common solution. For this reason, in addition to the contribution that each of us can make individually, it is necessary to intervene with international laws and agreements that can involve the largest number of nations. Among solutions aimed at improving a Healthy Global Ocean, particular importance should be given to the following:

European Marine Strategy Framework Directive

The Marine Strategy Framework Directive, issued in 2008 and implemented by Italy in 2010, is a tool to prevent degradation, reduce pressure and promote the restoration and conservation of the best conditions of ecological diversity, productivity, health and thriving of the seas and oceans.

United Nation Agenda for Sustainable Development

Italy has developed the National Strategy for Sustainable Development 2030 based on 4 guiding principles of the Agenda: Integration, Universality, Transformation and Inclusion.
The Strategy is structured in five areas, the so-called "5Ps" of the 2030 Agenda: People, Planet, Prosperity, Peace and Partnership.

Deccade of Ocean Science for Sustainavle Development

The decade 2021-2030 is the Decade of Ocean Science for Sustainable Development. This initiative underlines the importance of science in policy and decision-making processes and mobilizes governments, the private sector and civil society for a common innovative and technologically advanced agenda.

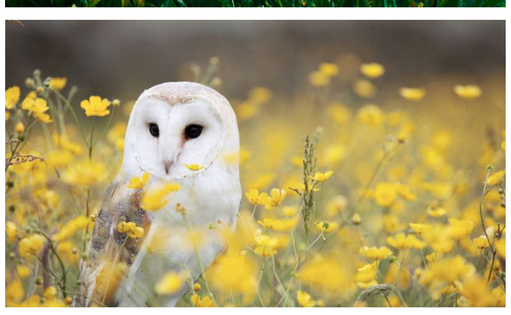
Natural Capital and the circular economy

Natural Capital **is the world's heritage consisting of all natural resources: rocks, soil, air, water, ecosystems and living organisms. Knowing and defending Natural Capital means defending our own future.**









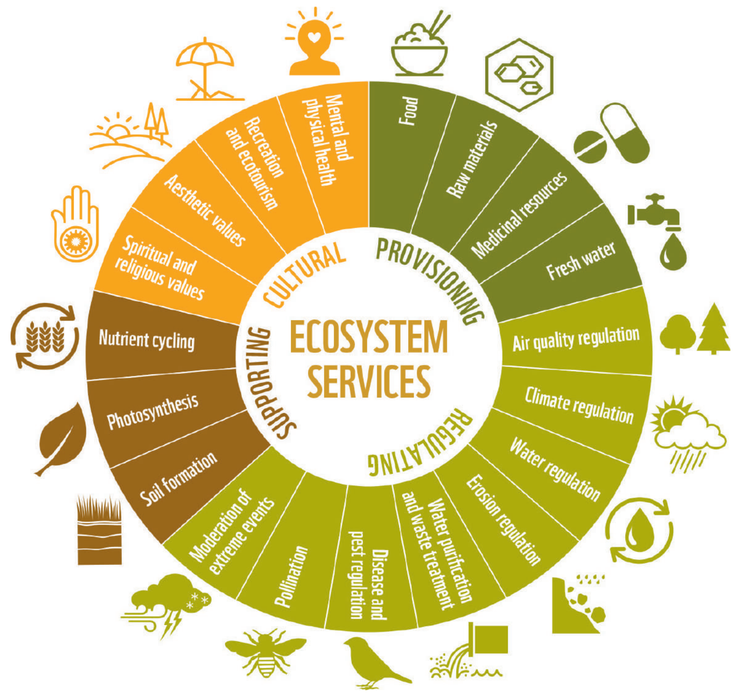






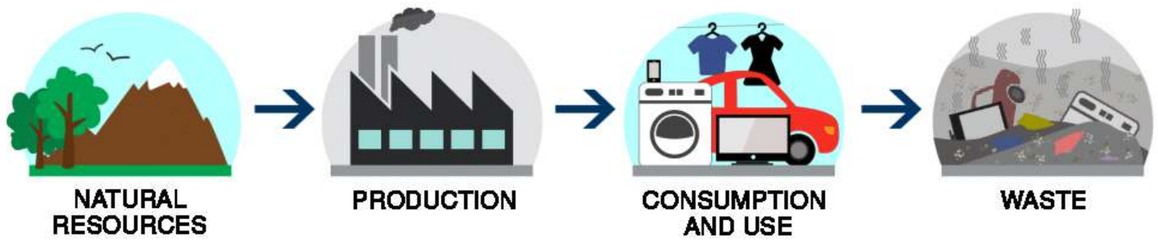
Natural Capital provides humanity with resources, goods and services called *ecosystem services*, indispensable to human life and well-being.
Ecosystem services can be grouped into four types:

- **Life support services** (soil formation, photosynthesis, nutrient cycle)
- **Supply services:** raw materials, energy, food, medicines (traditional and synthetic), drinking water
- **Regulatory services:** regulate climate and air quality, control soil erosion, water purification, spread of diseases, ensure pollination, moderate extreme weather events
- **Cultural services:** relating to our health, psycho-physical and spiritual well-being, beauty, religion, aesthetic values, cultural diversity, recreation, tourism, leisure, sport, leisure.



Economy and Ecology

Nowadays, Earth's natural systems and the benefits we enjoy are compromised, they no longer function as they should because of human intervention. We need to rethink how our societies operate. An economy that does not take into account ecology generates more damage than benefits, because it irreversibly depletes the most important resources, the natural ones.



Linear Economy

Linear Economy traditionally follows the path "take-produce-dispose": the raw materials are extracted or collected, then transformed into products that are used until they are thrown away as waste.

Circular Economy

Circular Economy represents the sustainable evolution of the present Linear Economy through the lengthening of the useful life of the products and a recycling that puts again in production the *Second Raw Materials*, obtained from waste and waste of the first production cycle.
According to the Ellen Macarthur Foundation's definition, *"The circular economy is an economic system designed to regenerate itself".*
The material flows are divided into two types:
- Material flows from biological waste that can be reintegrated into the biosphere;
- Flows of materials from technical waste intended to be upgraded without entering the biosphere. In this perspective the life of raw materials is potentially infinite, or almost: when a product is at the end of its useful life can be disassembled into its components and these reused to create something else.

Ecological Transition and Green New Deal

The Green New Deal, the New Green Pact of Europe, is a set of political initiatives and investments promoted by the European Commission with the aim of achieving climate neutrality by 2050 by moving to a circular economy, restoring biodiversity and reducing pollution. The action plan, which explains how to ensure a fair and inclusive transition, is not only an environmental and economic project, but also implies a profound cultural renewal for the Europe of the Next Generations.

Sea

**The sea may still be a “paradise”, but we must not grasp the *forbidden fruit*,
that is to go beyond the limits imposed by the Planet itself.
Stop indiscriminate fishing, overbuilding of the coasts, killer discharges,
let’s stop the acidification of the waters, loss of biodiversity and global warming.**

Last Eden

Photo by Alberto Luca Recchi

**The life of the Sea is in our hands, it is an irreplaceable element for our life.
From the goddess Gaia to Pope Francis, the Earth is our and only common home
that we must continue to share and preserve.**

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Since 1985, the Marevivo association has been committed to promoting knowledge and protection of the sea through awareness campaigns, education, scientific research, actions on the territory and civil battles. The health of the sea is essential for human life on the planet and spreading this awareness has always been the most important mission of the association. Visit our website: **marevivo.it**

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