



OCEAN KEYS TO ACT



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A Green Cross book

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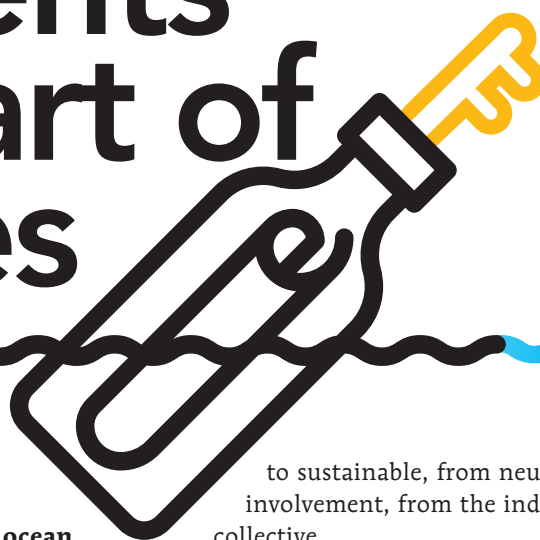


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The ocean represents the heart of our lives



Nourishing, curing, connecting and transporting us, the ocean also protects us and regulates our climate. The ocean is essential for humanity.

Yet, we know it mostly by its coastlines and by our plate. But each time their wonders are revealed, we are subjugated by its beauty.

However, this ocean, our ocean, a priceless common property that connects people, as continents and islands, is sick. Its water acidifies, its biodiversity is becoming impoverished, and the level of its waters worldwide is rising-creating floods or making lands unusable for living or cultivation. The effects of its anger are more and more devastating.

To protect us, it is therefore key to preserve it. Solutions are identified, sometimes already established, often creating jobs and economic wealth, almost always desirable, and their implementation can be easily managed. We can all act now, moving from disposable

to sustainable, from neutrality to involvement, from the individual to the collective.

THIS IS WHAT THIS PUBLICATION IS ALL ABOUT.

We hope to create and share emotions through the wonders highlighted, present the issues using key synthesis and numbers as example and, above all, give you a first set of keys to action-solutions that are unique, replicable and complementary. Together we can help restore the health of the ocean and the future of humanity.

This publication presents solutions, opportunities, and ideas while sharing experiences. We entrust it to you, open it up to debate, hope to encourage actions, and impatiently wait for your feedback.

It is now all yours; our bottle in the sea becomes your set of keys. We wish you a pleasant read and positive actions. ♦

*Jean-Michel Cousteau
And Green Cross Team*



Arrow crab
(above)



"We live on a blue planet"

by Jean-Michel Cousteau

We live on a blue planet. The ocean covers more than 70% of the Earth's surface and provides more than half of the oxygen we breathe, nourishes billions of people on the planet, and supports our economy through fishing, tourism and international trade, not to mention the countless jobs that depend on the abundance of resources from the ocean. Looking only at its economic value, the ocean represents the seventh world economy, which accounts for more than 214,000 billion euros.

The ocean, the largest physical feature on Earth, is also the largest carbon sink. Since the Industrial Revolution, the Ocean has absorbed nearly from 25% to 30 % of the carbon dioxide emissions of human origin. It has also absorbed 90% of the heat accumulated in the atmosphere since we generate greenhouse gases through our activities. It is our planetary temperature regulator, and without the ocean, life on Earth would not be possible.

However, we abuse the vital services it provides. Because of the continuous absorption of carbon dioxide from the atmosphere by the ocean, its chemical composition changes.

Acidification and warming of the water cause a sequence of ecological upheavals that threaten our survival. Above all, research shows that the ocean tends to absorb less carbon (10% less since 2004). There are limits to the absorption capacity of the ocean, and we are dangerously approaching them.

We must commit ourselves TO ACT in order to implement solutions to protect our life support, which is essential. We can do a lot of things, but I think the most crucial decision from the international community is to create many more protected ocean areas, to end destructive fishing and intensive farming practices, and also to stop using the ocean as a universal sewer.

No matter where we live on Earth, our lives are linked. Borders are a thing of the past. Rivers, rain and storms move water around the globe regardless of our human-designed borders. Our solutions must also be international. The quality of our lives depends on the quality of our planet.

While traveling aboard the Calypso, my father spent his life sharing stories about the underwater world. He already understood the destructive consequences of human activity. My father, however, did not have the



Nudibranchs

THE MAGIC OF THE 3D SLOW MOTION MAKES US DISCOVER 3 WONDERFUL CREATURES

knowledge of today. Today, solutions are within our reach. Technology is available and people need to invent a better and more sustainable future.

The fossil fuel monopoly is over; the time for energy transition to renewable resources has come. We must be inspired by nature, which captures almost all its energy from the sun, which in turn feeds the wind, the waves and the sea currents. We must exploit this energy as nature has done for millennia. We must understand that everything on our planet is a resource. Nature does not create waste. Everything we create can be reused or recycled. Setting up these industries creates jobs and boosts economies around the world.

It must also be emphasized that we are part of the same human population. As climate change continues to have a disproportionate impact on people around the world, nations must largely accommodate climate refugees in their countries. This is particularly necessary for millions of people living in areas below sea level and many Pacific Island states. The future of our human communities must be part of our international action towards progress.

The ocean is the face of our planet. The whale, the polar bear, the glacier, the rain-forest and the desert do not embody the face of climate change. We are the face of climate change. Ending greenhouse gas emissions,



Hermit crab

engaging our society in a clean energy transition, and protecting our planet's natural resources will save us.

We are the only species on this planet that can make the choice not to disappear. We are the only species that can influence the course of its future. Let us make the decisions we desperately need. Let's move our world towards a better future. ♦ **Jean-Michel Cousteau**

The ocean that feeds and cures us



Food and health of the ocean and humans

Better management of the ocean's resources is paramount to global food security. 3 billion people need the ocean for their daily lives - mostly in developing, small island states - while for more than 4 billion people, fishes now provides approximately 15% of the animal protein consumed.

This dependence on seafood will increase with the growth of the world's population. It concerns not only fish and molluscs, but also plants, including algae, coastal and deep-sea species, both visible and microscopic. The sea contributes significantly

(an estimate commonly used is 30 to 50%) to the protein intake of the 9 billion inhabitants that the planet can soon expect. These aggregate and approximate figures must not conceal the great diversity of situations, which vary depending on geographical zones. It is only recently that we have begun to see the risks of the ocean's impoverishment, both qualitatively and quantitatively.

Among the countries that are the most concerned, those pioneers and instigators of the first measures to protect marine areas, Colombia has included the preservation of the ocean in its

The ocean is subject to several issues that strongly affect its capacity to fully play its role as a food tank:



GLOBAL WARMING leads to displacement of fisheries and decreased oxygen content in water. Rising sea and ocean levels coupled with an increase in violent climatic events, as a result of climate change, will also affect coastal settlements. The activities of coastal populations will have to adapt to new constraints.



POLLUTION leads to a loss of biodiversity (39% of marine species and 25% of corals are estimated to have already disappeared between 1970 and 2010). Among the main sources of pollution, we can point at the less visible: micro-residues and microbeads of plastics, or endocrine disruptors, cause irreparable damages by affecting the reproductive capacities of many species (recent study on oysters published in Proceedings of the National Academy of Sciences⁽¹⁾).



ECONOMIC ACTIVITIES, in particular the development of harmful and illegal fishing practices, not only reduce the stocks of "overfished" species, but often cause long-term damage to the seabed and breeding areas. In addition to fishing, the destruction of mangrove areas, often for shrimp farming or tourism purposes, also contributes greatly to the disappearance of spawning sites in tropical regions.

governmental objectives since the late 1960s. The Rio Summit in 1992 sounded the alarm. Several international NGOs that focus on these objectives, including Green Cross, have been formed and mobilized as of the late 1990s.

The work undertaken by Green Cross France & Territories (GCFT), particularly on the occasion of the two days of Spring 2015, resulted in the Declaration "Climate: OCEAN Objective", initiated in Paris in 2015. They show that the "keys to act" must be sought at different levels.



THE FIRST SET OF ACTIONS IS THE RESPONSIBILITY OF THE INTERNATIONAL COMMUNITY.

It is imperative to better understand the current state, to have tools to measure its changes, and to consolidate a unique methodology to identify the imprint of each human activity. The development of scientific monitoring of ecosystems must make it possible to analyze specifically the impact of climate change, pollution and local human activities. The tools to be mobilized range from satellite observations to specialized expeditions and collection of specific data, but the processing and analysis of this data must be done by the international organizations that will orientate decisions. Recommendations and regulations adopted by these international bodies, which are not sufficiently recognized today, must then be applied by the economic actors concerned. This implies the creation of monitoring and control mechanisms coordinating all States.



PUBLIC POLICY IS THE SECOND LEVEL OF ACTION.

It is up to each national and local government to guide the adaptation of fishing practices and to define the conditions for its exercise within its economic zones to ensure its "sustainability". It is also national policies or, more likely, local policies that should encourage the development of aquaculture activities by creating favorable conditions by organizing the necessary consultations to provide a balanced sharing of activities for those using coveted areas such as coastal environments. The harmonized management of coastal activities is based on a constructive dialogue between all the stakeholders, organized at the level of living areas. Public intervention is also required to supervise

the market and consumption of seafood products: enacting appropriate labeling policies, encouraging producers and intermediate professions to use them, and providing information and education for consumers.



FINALLY, THE FUTURE OF THE OCEAN DEPENDS TO A LARGE EXTENT ON THE BEHAVIOR OF THE CITIZENS.

The citizen-consumer may be only slightly sensitive to the climatic stakes in which he feels helpless and impotent; he is, on the other hand, much more concerned about everything related to his health and his food. The consumer will have to be sensitized and educated about the fragility, origin and seasonality of the resource. The citizen-consumer must also be held responsible for his purchases of cosmetic products and for a moderate and reasonable use of plastic products, by realizing that the composition of these products and the fate of waste are determining factors in the pollution of the ocean. Although the level of consumer awareness is slowly growing, it is encouraging to note that economic actors are increasingly displaying development strategies that really integrate societal and environmental responsibility concerns: large manufacturers of cosmetic products have, on their own initiative, decided to limit the use of plastic microbeads or to substitute new components for those denounced for their effects as endocrine disruptors. Similarly, in France, fishing vessels such as Intermarché fishing fleet choose to progressively make a more sustainable fishery while a distribution group called Metro is setting up, with its partners MSC and MrGoodFish, a labeling system for products that support sustainable fishing to lead the consumer towards more virtuous habits.

The coast, the sea and the ocean are at the heart of human activities, particularly international transport, and they are also the cradle of tourism and leisure. They are destined to play an increasing role in the diet of humans. The pioneer islands and the island territories have shown us the way.

The ocean is sick of our insufficient attention. It runs the risk of irremediable degradation if we do not change our practices. The keys to saving the blue lung of the planet are in the hands of every citizen consumer. ♦

(1) <http://www.pnas.org/content/113/9/2430>

The coast is at the heart of sustainable development challenges



Oceans, seas and coastal zones span several physical features on Earth:

- The water mass, which covers nearly 70% of the surface of the planet;
- Continental shelf and deep-sea

ecosystems still widely unknown today;

- The coastline, which stretches from the foreshore to a few kilometers inland, where 70% of the world's major megacities are located.

The coastal strip is the interface between water and land. It represents a very attractive area for populations lured by numerous economic activities (heavy industry linked to maritime trade, international trade activities, fishing, nautical industries, etc.). It is also an area subject to the fluctuations of tourism, whether in western countries or exotic countries.

All coastlines are facing difficulties specific to their location and deserve increasing attention with regard to the environmental and climatic issues they face.

The 18,500 km of coastal areas in France are subject to the same major challenges as all coastlines:



FRAGILITY OF NATURAL AREAS OF MAJOR ECOLOGICAL INTEREST

Estuaries, mudflats, foreshore ⁽¹⁾, and mangroves are essential areas for many animal species - birds, fishes, molluscs, marine mammals - which temporarily or permanently find their food

and often their breeding grounds in these ecosystems. Everywhere threatened by human activities, these areas must be the subject of strong-willed protection policies.



CONFLICTS OF INTEREST BETWEEN ECONOMIC ACTIVITIES

Conflicts of use are not limited to natural areas; they also apply to areas to be urbanized and those where economic activities are to be established. Some port areas that use a lot of space to store containers or logs would like to be able to spread out over flat estuaries, which are areas of high ecological value. There is also competition between certain economic activities: shellfish farming, mussel farming and seaweed farming all require high quality water that is rarely compatible with industrial discharge or material extraction. The tourism industry also does not mix well with other types of industry, nor nautical recreation with professional fishing activities.



RISK OF EXPOSURE TO FLOODING AND RISING WATERS

As a consequence of climate change, these coastal areas are increasingly exposed to violent phenomena: storms, tornadoes, torrential rains that can cause partial flooding by the sea, and inundation by violent river floods to name a few. Although they haven't reached disaster situations, like in the

Pacific Islands (as with Cyclone Winston in Fiji in February 2016) or in the Gulf of Mexico (as with Hurricane Patricia in November 2015), the Atlantic and Mediterranean shores of Europe have suffered from similar weather events which have also caused human deaths in recent years.

In the long term, rising sea levels poses a major threat to all coasts. The shifting of coastlines is now a factor to take into account when urban planning. Measures of expropriation must already be considered in certain cities to avoid the risk of landslides falling too close to fragile cliffs. Municipalities have already begun to deploy preventive measures to delay submersion.

LIMITS OF REGULATIONS, INSUFFICIENT TECHNICAL SOLUTIONS AND DIFFICULT DIALOGUE WITH STAKEHOLDERS - THE CASE OF FRANCE

The 1975 law that created the "Conservatory of coastal areas and lacustrine shores⁽²⁾" shows that France's awareness of the fragility of these areas is not recent. Nevertheless, we have a long way to go before the idea becomes reality, in particular toward the objective of organizing coordinated actions by public authorities. This objective, present since the beginning of the littoral law's initiation, struggles to become a concrete reality, regularly restrained by opposing interests.

The case of the commune of Plouvien is in many ways symbolic of these mistakes. In 2015, this municipality allowed up to 20 hectares of the neighboring commune of Tréglonou to be exempt from the littoral law, thus escaping its objectives of free access to the coast and management of land and coastal frame.

In October 2015, the National Monitoring Committee for the National Integrated Coastal Management Strategy published "40 measures for the adaptation of coastal territories to climate change and integrated coastline management." This document, inspired by a very technical approach, shows a real desire to better understand natural phenomena, calls for financial means to do so, advocates taking risks into account in planning documents and calls for a legal arsenal to adapt the law of construction and expropriations in threatened areas.

Integrated management and spatial planning tools are indeed needed. It should imperatively be developed according to the principles and recommendations of the United Nations through constructive dialogue with stakeholders. Public inquiries, as they are now practiced in France, and methods of consultation, often obsolete and

disconnected from the socio-economic reality, have often turned out to be inappropriate to lead to satisfactory decisions for all the stakeholders (inhabitants, employees, nature conservationists, local authorities, etc.).

Moreover, administrative arrangements alone can not be sufficient to prevent conflicts or disasters. More resources should be devoted to raising inhabitants' awareness, training elected representatives and even restoring the most exposed areas, which are often the same as those of ecological interest.

NEW KEYS TO ACTION

In addition to the traditional instruments of consultation, it would be necessary to develop more innovative approaches to experimentation in both developed and developing countries.

The coexistence of development zones and marine protected areas is practicable only if they are designed and delimited in partnership with the stakeholders who will be more likely to ensure their protection if they see the positive effects for their activities (tourism, fishing, etc.).

New activities to be implemented in coastal areas, in particular renewable energy facilities, should likewise contribute to improving the living conditions of local populations and should never be imposed without the assent of local actors.

THE PRINCIPLES OF CIRCULAR ECONOMY⁽³⁾

should guide reflections on the economic development of coastal zones so that discharge and emission of waste are limited, but also to better preserve and enhance the natural resources of these zones (sand and other aggregates, aquatic or terrestrial plants, by-products of fishing boats, shellfish aquaculture).

Finally, specific financial needs will be requested from the Green Fund for the Climate⁽⁴⁾ to help the most vulnerable populations, who are often the most deprived, to strengthen their resilience without giving up the protection of fragile ecosystems. The Green Fund for women also presents a segment "women, coasts and oceans". ♦

(1) *Foreshore: Maritime zone between the low water mark and high water mark*

(2) <http://www.conservatoire-du-littoral.fr/>

(3) See article page 22 and 23 for examples

(4) *Financial institution of the United Nations, linked to the United Nations Framework Convention on Climate Change, with the objective of transferring funds from the most advanced countries to the most vulnerable countries.*



Innovating for the ocean, the role of the blue economy

The seas and the ocean have always played a major role in the evolution of human civilizations. There is an intimate link between innovation and the ocean that we find in the "Mare nostrum" of the Roman Empire, the discovery of the maritime journey to the Indies via the Cape of Good Hope, and the inventions of sailing, the compass and steam propulsion.

The 21st century will experience the most maritime activity in history. The economy being more and more nautical is both a cause and an effect of globalization. Innovations in the marine world can be classified into three broad categories: those that will improve the existing economy, emerging practices that will bring new products or services to the market, and innovations we have yet to imagine!

INNOVATION THAT SERVES THE BLUE ECONOMY

Fisheries and fish farming now produce 160 million tons of fish and crustaceans every year. Thanks to research, diet and reproductive cycle control have improved, and livestock structures in coastal areas are better integrated. These are necessary conditions for the development of these economic activities on which a large part of the population will depend as a food supply

by the end of this century. Even fishing, which is an ancient profession, has new technologies: fishing gear with higher performance, onboard preservation equipment, and radar-based or satellite-based detection technology to optimize time spent at sea.

Maritime transports have increased substantially over the last thirty years and in 2020 will represent between 14 and 16 billion tonnes compared to about 10 billion today. This growth is made possible by: the increased capacity of modern ships, the savings generated by improving vessels' energy performance, and shorter docking times enabled by new generations of port equipment. Transporting a refrigerator from Shanghai to Le Havre by ship is now cheaper than transporting it from Le Havre to Paris by road.

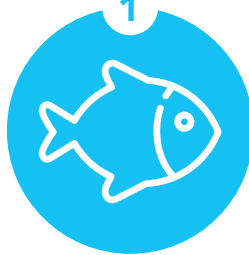
Unimaginable less than a century ago, the use of submarine cables for communication abolished the barriers that these hostile sites represented for centuries. Even the development of satellite communications cannot, at the beginning of the 21st century, compete with the data transmission capacity of submarine cables.

NEW INDUSTRIES FROM THE SEA

The ocean will provide solutions to many of the great challenges we face in the coming decades. A few can certainly be taken as examples:

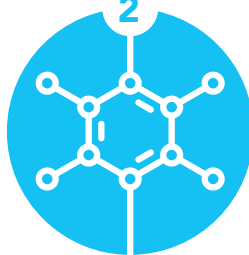
5 DIMENSIONS FOR THE BLUE ECONOMY

1



FISHERIES AND
AQUACULTURE

2



LIVING KNOWLEDGE

3



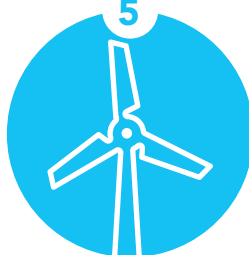
SEABEDS

4



COASTAL AND
MARINE TOURISM

5



RENEWABLE
ENERGIES

The food challenge. Quickly diminishing fish stocks will not be replenished solely by the aquaculture development mentioned above. Seaweed farming and the potential to produce proteins originating from plankton allow us to see the future contributions of the ocean to our diet.

The freshwater challenge. In many coastal regions, particularly island regions, freshwater supply will not be able to rely solely on seawater desalination in the foreseeable future. The technology currently in use is evolving rapidly but will have to improve further so that energy needs are compatible with the scarcity of fossil fuel sources and so that local "circular" economies are able to avoid the disposal of brine in natural environments.

The energy challenge. Windfarms are becoming more and more common in seashores and coastal areas. These are shoreline infrastructure with renewables energies more than marine energies. The key energy challenge is now to invent or propagate sustainable marine energies, in 4D (Deconcentrated, Decarbonated, Diversified, Democratic), locally adapted to context and culture, so that they are at the same time resilient, efficient, and affordable.

LOOKING FORWARD

A few hundred men climbed Everest, a few dozen have gone to space and visited the moon ... but only two have been able to access one of the deepest seabeds on our planet: the ocean remains the final frontier!

Some individuals are predicting that mineral resources from the deep seabed is as promising as it is unknown: sulfurized mixtures, rare soils, all kinds of metals exist at disproportionate concentrations with those minerals mined in land mines. Two things are proven: first, we know today only 5% of the deep seabed content, and second any exploration or exploitation can only happen if the prevention and precaution principles are met.

The potentialities of flora and fauna and, more broadly, of biotechnologies also constitute vast fields of research for the food and pharmacy

industries. There are applications in surprising fields: a startup company is using the light emitted by marine animals (luminescent bacteria present in jellyfishes or plankton) to substitute "bionaturel" lighting sources for electric lighting in a large number of situations.

A FRAGILE ECONOMIC RESERVOIR

The previous lines show potential development of the blue economy, which is crucial for the future of our planet. They also describe the fragility of this development and the risks that it generates in addition to the monumental pollution already affecting the ocean.

Delicate ecosystems are increasingly disrupted by overfishing and maritime transport, (in particular accidental pollution in high traffic areas) and damage caused by the use of the seabed.

The unconsidered risks of exploitation if new technologies focus on highly favorable areas without sufficient analysis of the consequences of equipment put in place or samples taken from natural environments that are not always favorable.

Lack of regulations. The establishment of an International Authority for the Large Funds is the first step to addressing future problems regarding exploitation of underwater wealth. But is its jurisdiction sufficient? Are its means of action, surveillance and control capable of handling the immense scope of these issues? The current inability to enforce international fisheries regulations is not a great sign for the future.

The sea is the future of the earth. But the sea can only provide for the planet if man respects her. It is humanity's duty to protect the ocean and to organize the sustainable development of the blue economy.

France, because of its position among the very first maritime powers with more than 11 million km² of Exclusive Economic Zone, must be exemplary in its management of the seas and the ocean, and must also be a world leader in raising awareness surrounding humanity's rights and duties towards the ocean. ♦

To understand and regulate the ocean

why and how?

Studying the ocean's conditions on a daily basis is essential to better understanding and anticipating meteorological and climatic phenomena. It also allows us to assist or regulate navigation as well as access to coastal, maritime and oceanic resources, as well

as to inform with both possible objectives: pacifist or hawkish.

Until the emergence of space technology, the observations of our oceans were mainly coastal, via the land strip and navigation. By allowing 24-hour surveillance of its surface from multiple points, space observation has not only brought



WHAT DOES THE OCEAN LOOK LIKE FROM SPACE? Some answers with the European Space Agency (ESA)

The European Space Agency (ESA), an intergovernmental agency set up by European states, is developing joint projects in space research and technology, and their applications are exclusively for peaceful purposes (safety and security issues). It has twenty-two member states as of 2016 (including twenty from the European Union), and Canada. The ESA covers all fields of space activity: earth observation, telecommunications, navigation, space science, manned flights and exploration, launchers, and technology (www.esa.int). These activities are at the service of security, safety and sustainability of the oceans. Satellites are one of the indispensable tools. Many spatial applications, once validated, are transferred to an external operator.

Since 1991, earth observation data has been regularly collected and analyzed in Europe. Thanks to this 24-hour spatial observation, scientists are convinced of the reality of global warming and its link to human activities.

Satellites measure the evolution of the planet's parameters: ocean surface temperatures, ocean currents, chlorophyll concentration, ice and sea ice conditions, rising sea levels, and analysis of the evolution of coastal zones. Satellites also measure the ice in the Arctic where warming is occurring twice as much as elsewhere and has an impact on sea level as well as the physical survival of many countries and populations.

Meteorological satellites provide an early warning of cyclones and promote the optimization of sea routes. Thanks to telecommunications satellites, ships remain connected and can navigate more safely.

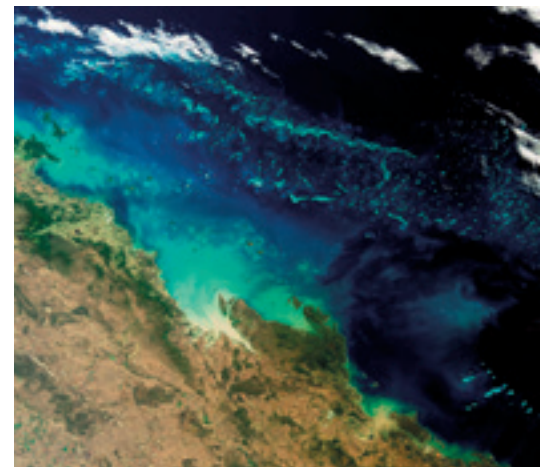
Satellite positioning systems (fourteen for Galileo) optimize transportation, fleet management and safety. Equipped with stations that receive distress signals from mobiles, they participate in the global rescue network. They help maritime surveillance (navigation, coastal approach, detection of oil leakage, piracy, illegal fishing, etc.), and satellites for the AIS (Automatic Identification System) complete the coastal

network by providing global coverage of all seas for the monitoring of ships.

In addition, technologies developed for satellites can be "transferred" for applications in extreme environments like the ocean.

The non-space actors are numerous: the European Maritime Safety Agency (EMSA), to which operational services have been transferred by the ESA; fleet operators; development agencies; and developers and scientists who analyze the conditions of the ocean and their interaction with the atmosphere and global warming.

To learn more about space and the ocean, visit [ESA: http://www.esa.int/Our_Activities/Preparing_for_the_Future/Space_for_Earth/Oceans](http://www.esa.int/Our_Activities/Preparing_for_the_Future/Space_for_Earth/Oceans)



us a new perspective, but also changed our vision of the ocean.

Today, participatory sciences strengthen our knowledge of the ocean; participants include the general public who are interested in the ocean as well as the numerous vessels at sea either for work or pleasure. It is now possible, through a simple application, to compare the perception of the ocean to the databases, and to enrich knowledge. Although this application does not yet exist at sea, it is possible to implement it

very quickly. The technology is currently being developed.

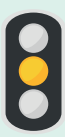
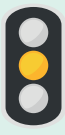
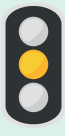

The ocean, the common good of the planet essential for all life, has a double feature: the high sea, beyond territorial waters, belongs to both no one and everyone. Vessels flying the flag from a particular state must apply the law of that state. The legislation of the flag plays an essential role, representing both the influence of the state, its maritime and economic power, but also its ecological and societal positioning. ♦

Climate OCEAN Objective

On June 8, 2015, more than 60 heads of network, representing 30,000+ organizations in 30 countries, found themselves creating ParisClimat2015: OCEAN Objective, a mobilization around

the signature and implementation of proposals for a better ocean health, an improved climate and an unburden humanity. On December 12, 2015, the Paris Declaration was signed, positioning the terrestrial and aquatic environments at the heart of the climate issues, and our proposals have been perpetuated under the name Climate: OCEAN Objective. On April 22, 2016, for the ratification of the Paris Agreement, Jean-Michel Cousteau distributed to all delegations his "Message to the Leaders of the Ocean", available at <http://bit.ly/OceanLeaders>, now referenced by the United Nations under the Sustainable Development Objectives: <https://sustainabledevelopment.un.org/partnership/?p=11966>. The signatories, in view of the work undertaken since 2016, wished to complete their commitments by three additional initiatives: one on the elimination of micro-debris, plastic waste and endocrine disruptors, one on migrants, and one to reference the Declaration of the Rights – and duties – of Humankind. This work is regularly updated on www.climateocean.eu.

IN SYNTHESIS OF OUR WORK:

-  • **Harmonized management of coastal activities** has been at the heart of the territories agenda. Keywords are resilience, adaptation, mitigation. **Points of attention:** protected marine areas to be better equipped and organized (Coral Sea in particular), mobilization of the Green Climate Fund to better manage territories. **Satisfactions:** good mobilization and consolidation in non-state and multi-stakeholder forums (Oceania Meetings, MEDCOP, CoP22 and 23) ...
-  • **Food and ocean health** have seen the development of a more transparent and precise information on the content of our plates, the intensification of scientific research and new pedagogical insights. **Points of attention:** progress in France and Europe on display, transparency and information is slower than expected... **Satisfactions:** success of symposiums and mobilizations of the food value chain representatives.
-  • **Transportation and ships of the future** have seen a strong mobilization of professionals and territories. **Points of attention:** carbon price not yet implemented, and pollution via maritime transport (SOx NOx particles + CO2) inciting to accelerate the ecological transition of transport. **Satisfactions:** gas powerplant offers that develop, shipowners and shippers playing their part of duties.
-  • **Security and surveillance for sustainable development** has benefited from strong international and multi-stakeholder mobilization, while piracy has developed, particularly for industrial fisheries, and specifically threatening West Africa, the Mozambique Channel, And the South Pacific. **Points of attention:** the necessary legislation for public ownership of data and standards. **Satisfactions:** the IPCC report on the ocean and the cryosphere, and the progress of the regional forums.

Portfolio



Arctic serenity disturbed by our daily detritus
© Christophe Boisvieux



Vitality of a still life coast © Xavier Desmier



Sandy thresholds, return from coastal fisheries © Christophe Boisvieux



Mooring, incentive to travel between quay and ocean © Younes Benseddik



Power of the wave, resilience of the lighthouse © Xavier Desmier



Hand on the ocean? © Ania Friendorf



Trawling with calm sea © Christophe Boisvieux



Beauty and fragility of mammals, ambassadors at the surface © Christophe Boisvieux



Coastal islands and territories

Traditional reception of Oceania meetings

in the face of ecological transition

It is customary to say that islands are the sentinels of the climate. In the face of global warming, they are affected not only by terrestrial events (rising water levels, erosion, magnification of extreme climatic phenomena, etc.) but also by impacts on marine ecosystems (i.e. acidification of the ocean, changes in marine life and impacts on corals and other ecosystems).

These combined phenomena do not anticipate human as a species are evolving, and they most heavily impact those societies under strong economic and social constraints.

To combat the effects of climate change, island and coastal people must be proactive. We all remember the image of the government of Tuvalu sitting in the water and the speech of the Prime Minister Saufatu Sapo, who told the United Nations that global warming poses a threat tantamount to a "slow and insidious

form of terrorism".

For that reason, Green Cross is strongly mobilized around its president Jean-Michel Cousteau to accompany the advocacy and actions of the islands and island territories which are engaged.

THE OCEANIA MEETINGS - AN ESSENTIAL MULTI-PLAYER GATHERING

In the South Pacific, the Oceania Meetings are now playing an essential role in advocacy and bringing concrete projects to the table. A multi-actor gathering, this is the only meeting to coordinate the traditional authorities; political, territorial and non-state actors, companies and associations, whether they represent states or island territories linked to a country. Involving the declarations of Lifou (2015) and Bourail (2016), these meetings, which are now referenced by the Climate summits (CoP21, CoP22...), aim at consolidating the voices and the strategies of Pacific Islands.

FRAGILE AND PRECIOUS TERRITORIES

Islands and island territories face many challenges. They must:

- Combat coastal erosion and extreme climatic events (often worsened by human activities that have led to the weakening of mangroves, coral reefs and the artificialization of the coast);
- Develop security of access to water, sanitation, food and energy for all people and improve the resilience of the territory and its inhabitants;
- Ensure sustainable development through sustainable tourism, fisheries and aquaculture

Impact of greenhouse gas emissions on the health of the ocean (Compared to 1990)

		2016	Scenario 2°C (35,6°F)	Scenario 3,5° (39,3°F)
			(by 2100)	
On marine life	Acidity (pH)		-0,15	-0,4
	Average increase in sea level		+ 0,6 m	+ 0,8 m
	Plants	LOW	MEDIUM	HIGH
	Plankton	LOW	MEDIUM	HIGH
	Fish	LOW	MEDIUM	HIGH
	Corals	MEDIUM	HIGH	HIGH
On activities	Shells	MEDIUM	HIGH	HIGH
	Climate regulation	LOW	MEDIUM	HIGH
	Coastal projection	MEDIUM	MEDIUM	HIGH
	Fishing	LOW	MEDIUM	HIGH
	Tourism	MEDIUM	MEDIUM	HIGH



Jean-Michel Cousteau and the president of the Oceania 22 meetings in full discussion



Elaboration of the Bourail Declaration

that are harmonious with ecosystems, and ensure that waste management and circular economy policies sufficiently meet the existing challenges.

Solutions exist through an inclusive approach combining scientific knowledge, innovations, and traditional knowledge. For example, Pacific Island habitats are particularly adapted to extreme climatic events. Traditional knowledge provides valuable weather information, and the development of the circular economy can both create local jobs and develop resource-efficient activities using the limited natural resources.

The challenges of climate change are often enhanced by the evolution of our lifestyles. For example, many islands in Vanuatu, Kiribati and New Caledonia (Ouvéa, Tige, etc.) are experiencing regular water shortages, even though they have developed traditional methods of water management. Costly and energy-intensive solutions, such as desalinators, can only be proposed if the ecological impacts have been anticipated and managed, in particular by neutralizing the brine generated and by using local, renewable energy.

This can only be done through concerted territorial cooperation, particularly regional (Caribbean, Indian Ocean, South Pacific...), mobilizing funds at a territorial level.

Therefore, the islands and island territories in the face of climate change must establish ambitious policies for ecological transition, and they need the international community. On April 22, 2016, the day of ratification of the Paris Agreement resulting from the CoP21, Green Cross published a message to the leaders of the ocean transmitted to the presidents of the CoP21, CoP22 and CoP23. Green Cross broadcasts this message and follows the progress of the Climate actions: Objective OCEAN. ♦



Find "the message to the leaders of the Ocean", the declaration of Bourail and the Climate commitments: Objective OCEAN on climateocean.eu



SOME PACIFIC TERRITORIES PROVIDING AN EXAMPLE OF ECOLOGICAL TRANSITION

Cook Islands get Green Fund financing to better prepare for climate disruption

The Cook Islands is the first country in the Pacific region and the first developing island state (SID) to receive Green Fund money to better prepare for the effects of climate change. With a very moderate amount (US \$100,000), this funding will be valuable to them in structuring the Climate Change Cook Islands (CCCI). In addition, the Cook Islands benefits from the adaptation fund to reach a 100% renewable energy target by 2020 (already 50% of renewables by the end of 2015).

Papua New Guinea accelerates ecological transition

With 463,000 square kilometers and 600 small islands and atolls, Papua New Guinea is the largest state in the Pacific. Its population is 7 million people, with more than 50% living below the poverty line, and it contains 7% of the world's biodiversity.

In July 2015, a US \$24 million funding was used to enhance resilience to climate change. The main impacts identified included the loss of coral reefs, with impacts on tourism, coastal protection, fishing, and seawater intrusion into the interior. The response is built around better early warnings, infrastructures designed to be less vulnerable, and the development of sustainable fisheries and food security.

In addition, an inclusive biomass energy project is being set up via FSC-certified forest plantations, in which chips of wood will feed the power grid through a modern thermal power plant, resulting in the creation of 500 local jobs.



The poles, sentinels

of the climate, to better understand and keep safe

The Earth is comparable to an immense thermal machine with, on the one hand, the tropical zones as a source of heat and, on the other hand, the poles as refrigerants. These temperature differences, combined with differences in the salinity of the water masses, result in permanent large-scale ocean circulation, also known as thermohaline circulation. The poles play a fundamental role in the overall climate balance, and it is essential to

study them to measure the extent of climatic changes.

THE ARCTIC AND THE ANTARCTIC: TWO VERY DIFFERENT GLACIAL TERRITORIES

The Arctic, at the North pole, is composed of the Arctic Ocean, a large part of which is frozen permanently, and the land bordering the Arctic Ocean. Russia and Siberia, northern Alaska, Canada, Greenland, the Scandinavian Peninsula.

The land border of the Arctic is difficult to determine. In 2005, the surface area of the Arctic ranged from 15 million km² in winter to

THE CRYOSPHERE

The entire surface of the Earth where the water is in the solid state, in the form of ice or snow, is called the cryosphere. This includes pack ice, frozen lakes and rivers, snow covered areas, glaciers, and temporarily or permanently frozen soils.

This cryosphere plays a role in global climate, due to its strong capacity to reflect the energy of the Sun and thus to maintain a cold temperature, and witness the evolution of the climate, because any climate fluctuation impacts on a more or less long term, their balance, volume or area. Snow-covered surfaces represent, depending on the season, between 40 and 85 million km², or between 7 and 17% of the surface of the Earth.

According to the 5th report of the IPCC, the volume of the cryosphere is now constantly decreasing. In particular, it shows that Arctic ice extent has declined by about 11% (between 9% and 13%) per decade between 1979 and 2012.

8 million km² in summer. This area is shrinking year after year, at an alarming rate: during the first months of the year 2016, the pack ice has recorded an extraordinary ice melting.

The Antarctic, at the South pole, is a continent, covered with an immense ice cap, the ice sheet. It is the highest continent in the world with an average altitude of 2300 m, and its surface area, with its permanent floating ice platforms, covers an area of 14 million km².

The Southern Ocean borders Antarctica is home to the world's most powerful marine current: the Antarctic Circumpolar Current (ACC). It is the main driving force of the thermohaline circulation, and thus plays a major role in the global ocean circulation. A better understanding of the ACC's dynamics would enable scientists to better measure the long-term impacts of climate change on the oceans.

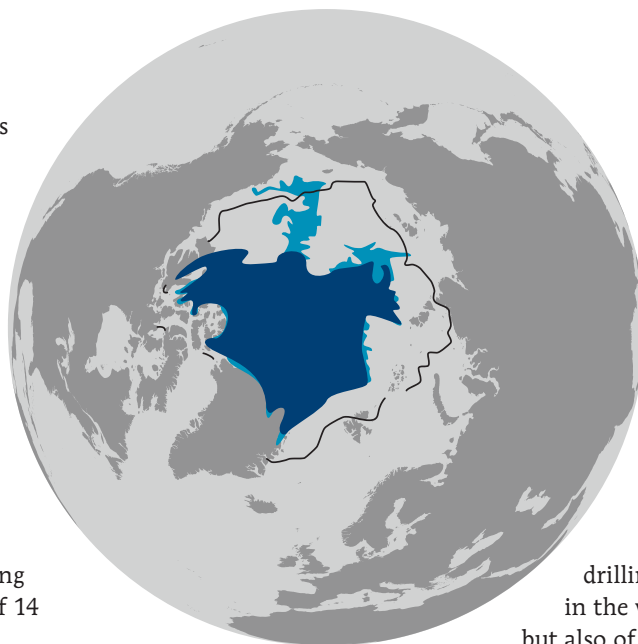
It was in this context that, following CoP 21, the Intergovernmental Panel on Climate Change (IPCC) was asked to produce a special report on the oceans and the cryosphere.

AN ENDANGERED ECOSYSTEM...



by human activity

Whether it is deep-sea fishing or overfishing, particularly in the Arctic, heavy metal pollution, or micro-plastics, the origins of pole damages are diverse and dangerous. Similarly, the wishes of deep-water



Ice-covered areas,
in % for Sept 10, 2016

50-75

75-100

Average ice extension
since 1981

2016: WARMER YEAR OF THE MODERN ERA IN ARCTIC

Average ocean surface temperature in August : 5°C higher than the average on the period 1982-2010

2015-2016
average temperature above the ground : 3,5°C higher compared to 1900

drilling, notably for oil exploitation, are in the vanguard of the claims of the States, but also of certain companies specialized in petroleum exploration or exploitation.

by global warming



The global rise in temperatures causes the melting of the ice.

The area of the Arctic sea has strongly declined in 2016, while Antarctica is extending its continental ice because of the ice barriers melting and floating on the ocean. Both play a crucial role in the stability of continental glaciers: their mass makes it possible to maintain the layer of ice on the continent and prevents it from slipping and melting in the ocean.

"Larsen C" is the fourth largest ice barrier in Antarctica: in recent years a large glacier has been separated from it to form an impressive 350-meter iceberg with a surface area of more than 5,000 km². Such an event, an obvious testimony to the melting of the ice, could completely destabilize the entire Antarctic platform. ♦

THE CLIMATE SITUATION IN 2016: THE YEAR OF ALL RECORDS

(DATA FROM THE WORLD METEOROLOGICAL ORGANIZATION)



• Concentration of CO₂ in the atmosphere reached unprecedented records, with the 400 ppm exceeded by the Mauna Loa Observatory in Hawaii.



• The year 2016 broke a heat record with 1.1 °C above the pre-industrial period.



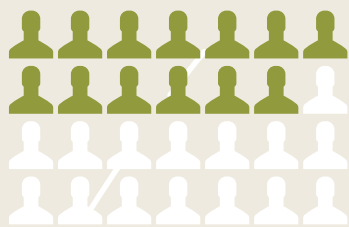
• Sea level, particularly during El Niño, which was particularly strong during the period 2015/2016, reached its maximum by early 2016.



• Ocean temperature was the second warmest recorded, contributing to coral bleaching and mortality.

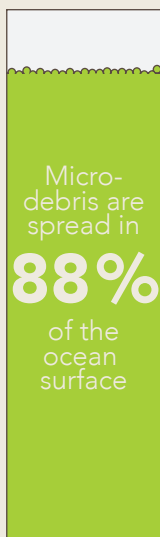


• The extent of the pack ice has fallen by more than 4 million km² below the average.



OCEAN IS KEY FOR
THE DAY-TO-DAY
LIVING OF

3bn
PEOPLE



50% OF THE PROTEINS WE ARE EATING
ARE GENERATED BY THE **OCEAN**



IN BETWEEN 1970 AND 2010
39 % OF MARINE SPECIES
DISAPPEARED, AND SO DID
25% OF CORALS

80%
OF EARTH
SPECIES
ARE LIVING
IN THE OCEAN



12%
OF THE
WORLD
OCEAN
SURFACE IS
CURRENTLY
PROTECTED



FEEDS US AND
CURES US

THE
OCEAN
WHICH

±50%
OR
50%

OF THE
OXYGEN
WE BREATHE
COMES FROM
THE SEAS



IN 2016

NO NEW ICE
HAS BEEN
FORMED
IN THE ARCTIC



**18 &
59 CM**

GLOBAL WARMING
CAUSES A RISE IN
THE GLOBAL
SEA LEVEL,
AT AN AVERAGE OF
BETWEEN 18 AND
59 CM IN AVERAGE
BY 2100



FISH, CRUSTACEANS AND CORALS SUFFER
FROM THE COMBINED EFFECTS OF RISING
TEMPERATURES, OCEAN ACIDIFICATION
AND RISING WATER LEVELS, **WHICH GREATLY
ALTERS THEIR LIVELIHOOD AND REPRODUCTION**



PROTECTS AND
REGULATES THE CLIMATE



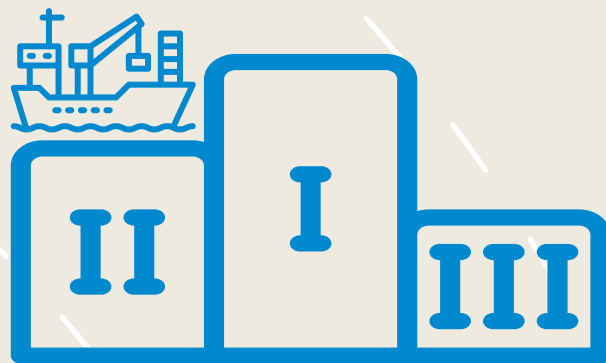
ABSORBING
30%
OF THE CO₂
WE BREATHE,
OCEAN IS
THE MAIN CLIMATE
REGULATOR

90 %
OF GOODS AND DATA
TRAVEL BY SEA

1 TONNE EQ.
PETROLUM (PET) MOVES
200,000 TONS OF GOODS
OVER 1 KM AT SEA



WITH 179
VESSELS
100 UMS*
OR MORE,
FRENCH-
FLAGGED FLEET RANKS #1
IN THE WORLD FOR QUALITY
AND SAFETY IN 2015



MARITIME ACTIVITIES ARE
THE 2ND LARGEST
INDUSTRY IN THE WORLD

10 %
OF JOBS
IN EUROPE
ARE RELATED
TO MARINE
ACTIVITIES



THE
OCEAN
RICH



PROMOTES
THE TERRITORY

TODAY, 1 INHABITANT OVER 2
LIVE WITHIN 100 KM
OF THE COAST,
THEY WILL BE
3 INHABITANTS
OUT OF 4 IN 2030



70 %
OF INHABITANTS
FROM
MEGACITIES
LIVE ON
THE COASTAL
AREAS



WORLD COASTLINE
LENGTH IS CIRCA
1,635 000 KMS

8M
TONNES
OF WASTE



ARE DUMPED AT
SEA EVERY DAY,
MORE THAN 80%
OF WHICH FROM
COASTAL AREAS
AND RIVERS



FRANCE IS THE
WORLD'S SECOND
LARGEST MARITIME
AREA, WITH
11 MILLION KM²,
97% OVERSEAS



The circular economy,

an opportunity for sustainable aquaculture feeding?

Nature is a formidable example of a circular economy. The symbiosis between living organisms in ecosystems is a perfect illustration. Humanity was inspired in particular during the development of its agriculture. Thus, the agro-forestry mechanisms of mutual fertilization, or the integrated systems of rice - terrestrial farming - fish ponds analyzed by FAO show the value creation brought by these circular natural systems.

Current production, distribution and consumption systems have focused on the linear "design-manufacture-use-dispose" model. This model has made some progress and improvements in life quality, but shows more and more its limits via:

- Intensive use of resources, in particular energy, contributing to the depletion of fossil fuels and adding to their induced impacts (contribution to carbon dioxide emissions for example);
- Difficulties in managing the product over its lifetime, resulting in high costs during production, use and disposal. These costs are often negative externalities borne by the community. Moreover, the systematic competition between territories and companies degrades ecological and social performances while economically favoring the behavior of the "stowaway" and the associated distortions of competition;
- Long-distance transport and massive transformation operations generate consumer doubts about the origin of the product, the transparency of the process of transformation, as well as many negative environmental and social externalities.

It is therefore necessary to work on new approaches that reconcile economic, ecological and social performances in operational, shared and replicable large scale governance, economic and territorial models. The circular economy, transcribed since 2016 in France in the law on the energy transition³, provides solutions. It allows not only to identify synergies between actors, but also to set up an industrial symbiosis which, like any natural ecosystem, supposes diversity (complementarity between companies and other territory's stakeholders), proximity (to reduce the cost and environmental impact of transport which becomes prohibitive), transparency of data and practices, and finally cooperation between actors. This makes it possible to combine economic performance with ecological, technological and societal efficiency and improves the resilience of production and consumption systems.

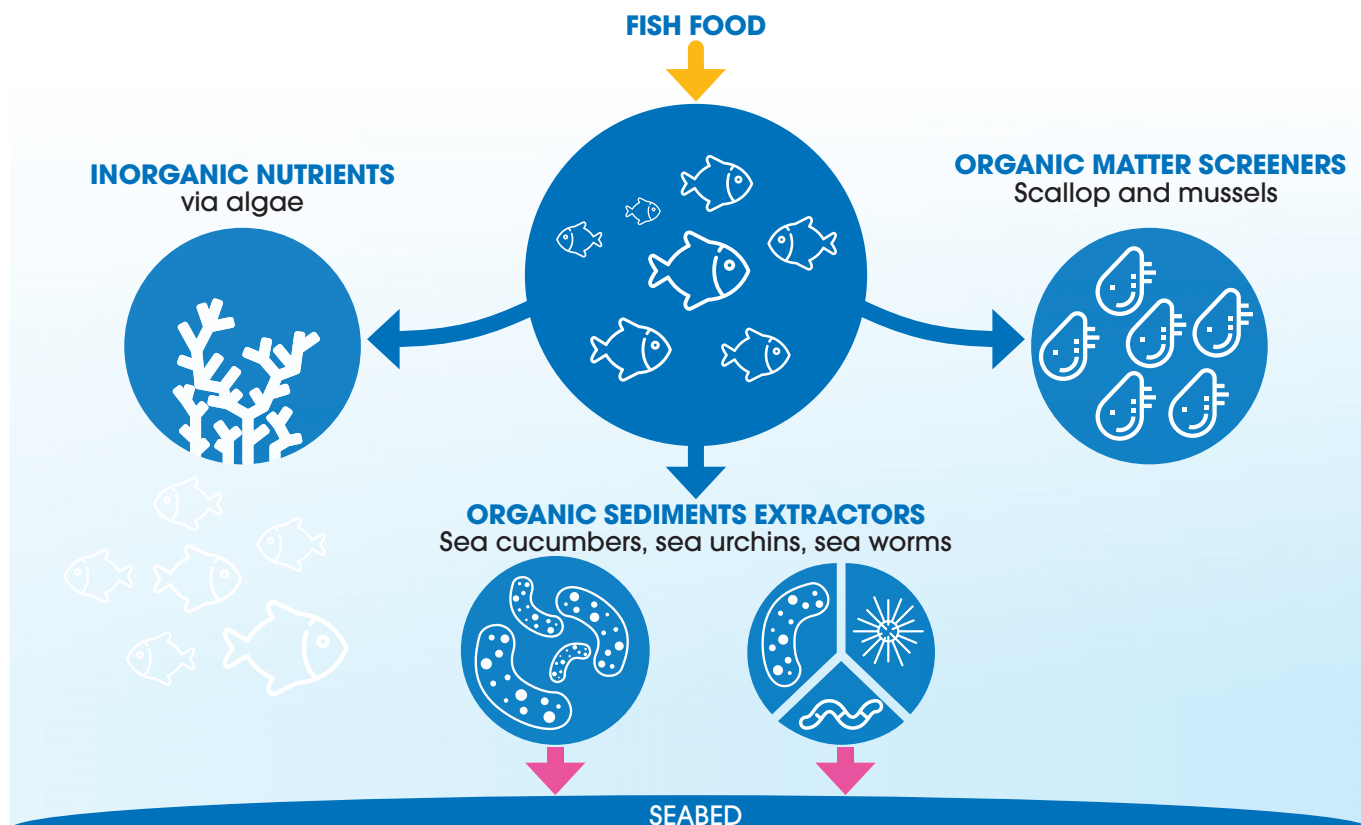
Behaviors change while regulations adapt and evolve, to facilitate the re-use of resources after they have served their purpose.

HOW CAN AQUACULTURE AND FISH FARMING FIT INTO THIS CIRCULAR ECONOMY?

Integrated fish farming - livestock that can be found in Asia - is an example of a circular economy, based on the flow of effluents from terrestrial farms to stimulate the natural productivity of ponds. Similarly, fish releases can provide important nutrients to other crops (micro and macro algae, land crops). IMTA systems in Canada explore synergies on marine sites (salmon-macroalga-shellfish associations).

Circular economy facilities are also being

SIMPLIFIED CARTOGRAPHY OF INTEGRATED MULTISPECIFIC AQUACULTURE



developed in a dense urban context, some of which are above ground. These systems are designed for compact and efficient food production in relation to the intended objectives (vegetable and fish farming). Aquaculture productions can benefit from the heated waters of an energy plant.

These systems, in particular in aquaponics⁽¹⁾, are sometimes criticized for their low genetic and production diversity, imperfect looping, especially with waste and co- or by-products, and a process of energy-intensive production of upstream inputs. Solutions exist to overcome these difficulties.

In aquaculture nutrition, the use of by-products as raw materials, whether of aquatic origin (by-products from fishing or aquaculture, parallel production of algae, microalgae, raising of marine worms for medicinal purposes), or terrestrial organisms (crabs, grains, gluten) is part of the logic of a circular economy. This is subject to the condition that the production of all these by-products does not further increase

the ecological impact of these models. Similarly, aquaculture by-products (eg valued by-products derived from salmon and farmed shrimps, etc.) may also be rewarding provided that food safety and the quality of all these by-products from aquaculture are guaranteed, and that aquaculture production is itself sustainable.

To go further, it will be necessary to collectively conceive of a global local project, where aquaculture productions interact with other human activities, socio-ecosystems, throughout the territory, which is organized around virtuous cycles and economically profitable at each level. The vision of sustainability will have to change, and this vision should involve all stakeholders from the territory. This will make it possible to install a co-construction and progressive approach which, through the dissemination of circular economy projects (including aquaculture and its nutrition), will achieve better economic, ecological and societal performance, and thus contribute to the societal acceptance of the activities of each sector. ♦

(1) Aquaponics : Culture of fish and plants together in a closed ecosystem, using natural bacterial cycles to transform fish waste into nutrients for plants.

Maritime transport and shipping:

an essential role for the health of the ocean

Who could be better than the daily users of the sea (in particular those involved in maritime

transport and navigation, whether for pleasure, cabotage, fishing or defense activities) to observe the health of the ocean, but also to act?

For a long time, few acted to preserve the ocean but now, these networks of actors mobilize strongly and make commitments that, beyond the carbon issue, limit the impact of their activities and contribute to a better health of the ocean.

CLIMATE COMMITMENTS: OCEAN OBJECTIVE

In 2015, the signatory organisations of Climate: Objective OCEAN, made a proposal and took 3 commitments on "Transport and Ships of the Future", followed annually and referenced on the United Nations website: <https://sustainabledevelopment.un.org/partnership/?p=11966>

The proposal: Facilitate and encourage the adaptation of the port and marine infrastructure needed to implement new emission standards

(sulfur and CO₂ guidelines) and ballast water treatment.

Means of realization: use existing national and european examples

The engagements :

- Use existing examples (european and national) to develop port equipment in LNG terminals,
- Establish better industry to recycle ballast water waste, treat oil residue, and develop port circular economy,
- Introduce a greentax system in the economy (in particular CO₂), and then to defend it at an international level for real efficiency.

SAILORS' COMMITMENT: NOTHING OVERBOARD, ALL MY WASTE AT THE PORT

The detestable practices of navigators who threw waste or material overboard no longer have any excuse. For the past few years, boaters, sportsmen and sailors, harbor infrastructure managers and renters have committed themselves to a cleaner ocean, to sort aboard ships, and bring waste back to the port.

For the 7th consecutive year, the "I Navigate, I Sort" initiative of the asso-

ciation Vacances Propres, dedicated to the prevention of marine waste, will be present in French, Italian and Monaco's marinas. In 2016, 41 ports were associated with this operation, for 191,000 mobilized boaters, 29,000 distributed sorting boxes, which allowed the waste to be collected and sort and be valorized. Developed with the Blue Flag, under the Ramoge and Elipso agreements, or as a result of commitments made at MEDCoP or other climate conferences, similar initiatives are taking place throughout the Mediterranean, but also in the Caribbean, the Indian and Pacific Oceans.

France, because of the size of its territorial waters, and because of its touristic influence, could not miss out on this issue. Recreational professionals have fully understood this and place sustainable development, notably the preservation of the ocean and the coastline, but also the circular economy, at the heart of the development project of the Federation of Nautical Industries (FIN) , which federates the professionals of the leisure boat industry. ♦



NEW NAVIGATORS: PLASTIC ODYSSEY

To raise awareness, learn, educate on the collection of waste, but also to bring out new ways of valorisation, there is nothing like a local expedition. This is the solution that Plastic Odyssey (www.plasticodyssey.com) develops, which for 3 years from the beginning of 2020 will

sail along the coasts of the world aboard a 25m boat-workshop. And this, in order to show that waste can be a resource.

In each port, Plastics Odyssey will clean up the coasts and transform plastic wastes to give them a new life: furniture, building bricks, insulation, fabrics ... by developing reusable systems that can be used locally, where technologies of the southern countries will cross the practices of

the northern one, and vice versa. This boat will be motorized by using the plastic waste collected (the best valorisation). It will also carry micro-algae to treat its wastewater and CO₂, particulate filters to reduce carbon emissions, and better routing techniques to reduce consumption. Like the Delorean of "Back to the Futur", the ship will provide concrete evidence that well-managed waste is a valuable resource.



THE MARITIME TRANSPORT CURRENTLY MOVING FORWARD

Shipping accounts for 80% of global transport expressed in tonne.kilometres but only 36% of total greenhouse gas emissions. It is a very massive mode of transport, which has optimized its economic performance. It is, however, at the origin of serious health nuisances, because of its emissions of sulfur oxide, nitrogen and particles, unrecognized and thus ignored by legislators, with strong impact on the health of humans and the planet. According to the University of Rostock and the German environmental research center Helmholtzzentrum Munich, emissions from maritime transport cause nearly 60,000 deaths and cost 58 billion euros to health services every year in Europe. And this, in a context where the flow of maritime transport should follow an increase of between + 50% and + 250% by 2050.

Fortunately, solutions do exist and are being displayed. For example, gas-fueled engines, now facilitated by European legislation, considerably reduce particle emissions, but also consumption. Recent Tier 3 standard vessels have reduced NOx emissions by 80%. Large container ships reduce the environmental footprint per container transported by about 50% compared to the previous generation.

Principals can make choice at a comparable price, between a standard ship and a ship certified as virtuous, which contributes to improve its

environmental footprint and social responsibility, while encouraging the profession to invest on the long term.

The international agency TK'Blue (www.tkblueagency.eu), whose core business is to measure the nuisance of transport, allows each one to measure the progress achieved, indicating precisely the health, ecological and social impact of a load. For example, the ecological footprint of a container on a large modern container ship is divided more into CO₂ nuisances (52% of the total footprint) than in air pollution (37%), where a normal one will generate 63% of its footprint in air pollution, and 30% in CO₂. A systemic approach, based on real consumption and pollution figures, is therefore essential to make good choices, and the contractors now have different possibilities to take adapted decisions in total transparency.

Legislation is no longer left behind in these evolutions. The European and world programs MRV from the International Maritime Organization, the Clean Shipping label of the Environmental Shipping Index, and the extension of the Sulfur Emission Control Areas in the Mediterranean, create the rapid evolution of practices. The eco-responsible transport practices mobilizes the consumer and taxpayer citizen to weigh heavily in these behavioral changes.

Tomorrow's ships and infrastructures



A2V REINVENTS FAST AND ECOLOGICAL TRANSPORT

Based on the observation that there were no vessels less than 70 meters capable of reaching high speeds, ie 40 knots (70 km/h) or more, in a cost-effective manner, the French company, Advanced Aerodynamic Vessels (A2V), launched the prototype of its ultra-fast transport ship in 2015.

This vessel brings together two worlds, aeronautics and maritime design, allowing it to both exceed speeds of 40 knots and to consume less fuel. Using a bearing structure that is very energy-efficient thanks to aerodynamic lift, As the boat increases its speed, lift decreases, its weight and drag on the water, thus reducing fuel consumption.

With a fleet of vessels ranging between 10 and 40 meters in length accommodating up to 100 people, A2V opens up new possibilities of intervention adaptable to the diversity of uses: from water taxi to crewboat to national naval activity. Ecological and economical issues are important. This technological innovation would save thousands of tons of fuel during the lifetime of a ship. ♦

For more information: <http://www.a2v.fr/>



TOWARDS AUTONOMY AT SEA

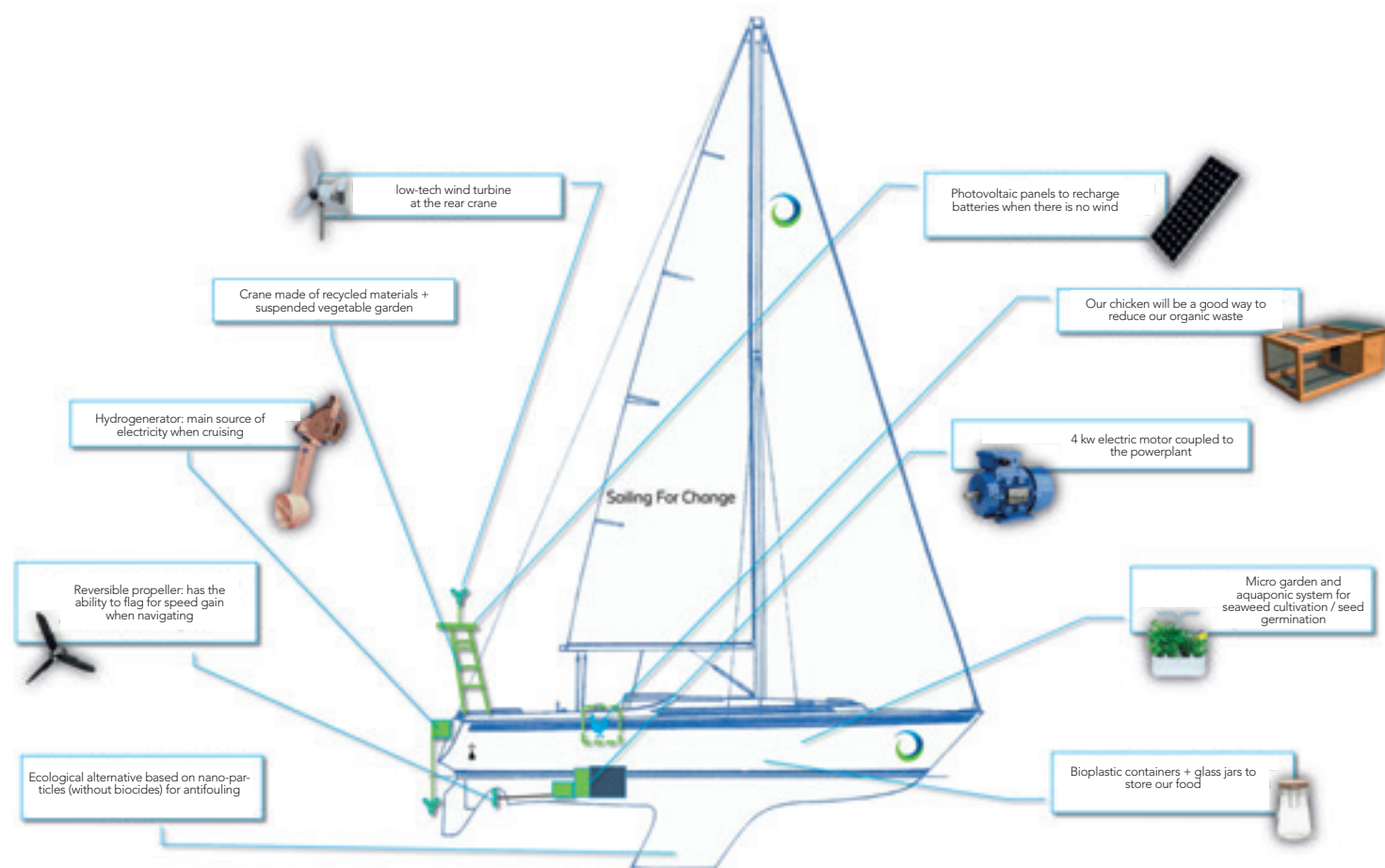
In Bangladesh, after constructing a small sailboat made entirely out of a composite of jute fiber with his team, "Gold of Bengal," the young engineer Corentin de Chatelperron decides to test the prototype himself. His objective: to get as close as possible to autonomy at sea. Corentin embarks therefore with two laying hens, a mini-greenhouse sheltering potato plants, and tinkered various systems that for six months of cabotage in the deserted islands of the Gulf of Bengal.

It is through this journey that he has the opportunity to reflect, alone and then in a team, on the potentials of "low technologies:" ecological tricks, inexpensive and accessible to most people, to answer the problems of access to water, energy and food.

From these reflections comes a project: a three-year world tour to meet ingenious inventors and inspiring innovations aboard a catamaran of 45 feet called "Nomade des Mers".

Starting in February 2016 in Brittany, 15 major stopovers are planned for the first year to address the main low-techs. ♦

For more information: <http://nomadedesmers.org/>



"SAILING FOR CHANGE" AIMS TO PAVE THE WAY TO ZERO WASTE

Every year, nearly four billion tons of waste are generated worldwide. There are now over 270,000 tonnes of plastic waste in the ocean. And the resources on Earth are, just like on a boat, very limited.

Sailing for Change: a zero-waste world tour is the challenge that four young Bretons have launched to respond to the problem. This expedition lasting two years will take place aboard a sailing boat in total autonomy. The objective: to show that it is possible to consume differently and drastically reduce our phenomenal production of waste

everyday.

The expedition aims at being both technical, scientific and educational. During their two years on board, the crew will be studying marine pollution in partnership with scientific organizations, associations and NGOs. New equipment will also be developed with innovative companies and tested throughout the project.

From October 2016 to October 2018, *Sailing for Change* features fifteen reports on circular economy and sustainable development initiatives discovered around the globe and a monthly web series "How to live with zero-waste?". ♦

For more information: <http://sailingforchange.com/>

Corals, humans,

sunscreen: any link?

To protect themselves from the harmful effects of the sun, users of the sea use sun products. Chemical creams contain several types of active molecules, some of which, in particular "Benzophenone-2" (BP2), are suspected, by their nature as an endocrine disruptor, to affect all living organisms: not only us, but also coral reefs. They are suspected to have an impact on the symbiosis between the polyp and its "domesticated" unicellular plant. When this balance is broken for physical (warming), chemical or biological reasons, corals bleach and die.

In France, 15 million sunscreens are sold each year, and the quarter that we spread on our skin is suspected to remain 20 minutes in the water after swimming, the equivalent to 4 to 6,000 tons per year on the planet. Today, 75% of coral reefs worldwide are considered endangered, sunscreens representing a real danger to corals by reducing their resistance to viral and bacterial diseases. This phenomenon is particularly obvious in areas with high tourist attendance, to the extent that some marine protected areas - for example in Mexico - have banned their use. The impact on other marine organisms remains to be investigated. Micronized titanium dioxides commonly used in creams as a filter and whitening agent represent nanoparticles for the plankton.

For humans, sunscreens may have harmful consequences on the hormonal system, female reproductive functions, the immune system and

thyroid functions.

It is therefore the responsibility of tourists to protect themselves by means of anti-UV clothing, to escape the sun at the hottest hours and/or to use mineral or biosourced sunscreens, with no impact on the health of the reefs (note that the presence of BP2 in sunscreen must appear on packaging as of July 11th 2013).

According to a survey carried out in Réunion in 2014, less than 1% of the respondents took into account the ecological impact of the product when it was purchased. Other powerful figures: 70% of tourists have never heard of the risk for corals and 95% of all people are willing to opt for a coral-friendly approach. So, consumers' positive intention does exist. Action must be encouraged through information and a voluntary economic approach on this subject. A possible

answer to this paradox could be the creation of a certified label "Coral Reef Friendly."

The fact that coral reefs are today heavily threatened by a combination of human and natural pressures is now well known. In this particular case, users can act by using non-coral impacting sunscreens. The objective is now to encourage organic cosmetics of exclusively natural origin, without BP2 or nanoparticles and having an SPF> 50, to protect especially the children. ♦

For further information:
<http://gcft.fr/WP/cremes-solaires-pourquoi-et-comment-bien-les-choisir/>



Microalgae, the ancestors

on which we may build our future

The first organisms living on our planet, microalgae, gorged the carbon dioxide of the terrestrial archeo-atmosphere, which was then glowing, to fuel their metabolism and multiply. They then emitted a waste that still led to our own existence: the oxygen of our atmosphere.

For 3.5 billion years, they have diversified into millions of species, colonizing the planet. They are found in the oceans from which they formed as oceanic plankton, and also on our walls, on tree trunks and even public benches.

Like the relationship that unites us with our intestinal flora, they have established very improbable relationships, like their symbiosis with fungi to become lichen, and their necessary mutualism with coral polyps. Some, as photosynthetic bacteria, have colonized the cells of multicellular organisms; they evolved into chloroplasts, thus allowing the higher plants to exist.

All microalgae have developed their own strategies for the metabolism of pigments: some must defend themselves from direct sunlight, while others, in the depths of the oceans, must optimize the capture of the few photons that reach them.

They can be blue, like spirulina, used for its antioxidant qualities in accompanying chemotherapies, or simply for preventative measures in anti-aging. Others may temporarily become red when stressed. This was the case of the haematococcus, which caused the Nile to "blush" in biblical times and which we identify as the

explanation of one of the "wounds of Egypt." Its pigment, astaxanthin, is considered an antioxidant and is consumed worldwide in food.

Some microalgae produce proteins with high nutritional and health value, the extracts of which are sold for thousands of euros per kilo. Others emit methane, which could one day replace natural gas. Other species produce their own oil, providing an alternative source of oil. Finally, some types of algae offer us the stratified trace of the accumulation of their exoskeletons called limestone; these are found in the cliffs along the channel between France and England and the limestone mountains like those where the Colorado River has dug its Grand Canyon.

In summary, it can be said that microalgae are everywhere, and in considerable quantities. Their "bloom" - their flowering in the oceans - takes place at the same exact time on the whole surface of the planet. This event can be seen from space because of the immense magnitude of the phenomenon.

It is possible to produce these microalgae industrially and take advantage of their incredible yield, sometimes more than ten times that of cereal or oleo-protein crops. The infrastructure to produce them, photobioreactors, do not compete with agricultural soils and actually enhance the capture of carbon dioxide and effluent water, while feeding a wide range of downstream sectors (animal and fish nutrition, cosmetic-pharmaceutical products, resources of green

chemistry). They will produce tomorrow or even the day after tomorrow, fuels for aviation allowing oil to be left where it is, as a reserve for petrochemical use. The prerequisites for this step are to find suitable microalgae, suitable production processes and adapted infrastructures such as microfluidics that are extremely promising. So it seems reasonable to think that airplanes will fly using only microalgae extracts by the year 2035-40...

Unfortunately, during the return of its plankton inventory campaign conducted in the world's seas, the scientific team of the Tara ship made the observation that the microparticles of suspended plastics outnumbered that of the microalgae composing the plankton!

Let us remain positive, however, because extracts of microalgae will enter the ingredients of natural sunscreen products, without oxides of titanium or endocrine disruptors that bleach and kill corals. Thus, the virtuous loop can be established in a slightly revised version of the circular economy according to which microalgae will save each other, which themselves will preserve the fate of thousands of people on the planet. It is very encouraging and promising. ♦



**stromatolites
formed by
microalgae**

Micro-debris and debris at sea

In nature, waste does not exist. As Lavoisier stated in the 17th century: "Nothing is lost, nothing is created, everything is transformed." The circular economy is a natural principle that explains the reuse of matter. Death is the source of life.

In the 20th century, plastics from petrochemicals appeared for the first time. This material has properties that explain its success: low cost of production, lightweight, impermeable, non-biodegradable, and malleable; it has therefore invaded our environment.

In 1950, world production of plastic was 1.5 million tons per year; by 2015 it had reached 288 million tons per year. It continues to increase and is only likely to stop with the end of oil fields.

THE ORIGIN OF WASTE AT SEA

Humanity has recently reached the threshold of 7 billion people. The vast majority consume and throw away the same non-perishable products with very limited useful life. However, the waste treatment methods did not necessarily follow the evolution of the materials that make up the waste of today. All solid, non-perishable, non-biodegradable waste dumped in the city gutters, thrown into sewage dumps outside the waste treatment circuits will follow the water route. The runoff in the cities will join a stream and then a river and finally the sea or the ocean. Finally, when we consider the notion of a watershed, all municipalities are coastal and what makes plastics so convenient for daily use becomes a problem for the environment. Nature does not "digest" our synthetic products.

MACRO-WASTES

Solid and visible to the naked eye wastes, abandoned by human In marine environment, they are named macro-wastes to be differentiated from micropollutants

THE ORIGIN OF WASTE AT SEA

1

NATURAL ELEMENTS

Rain, wind, water streams

2

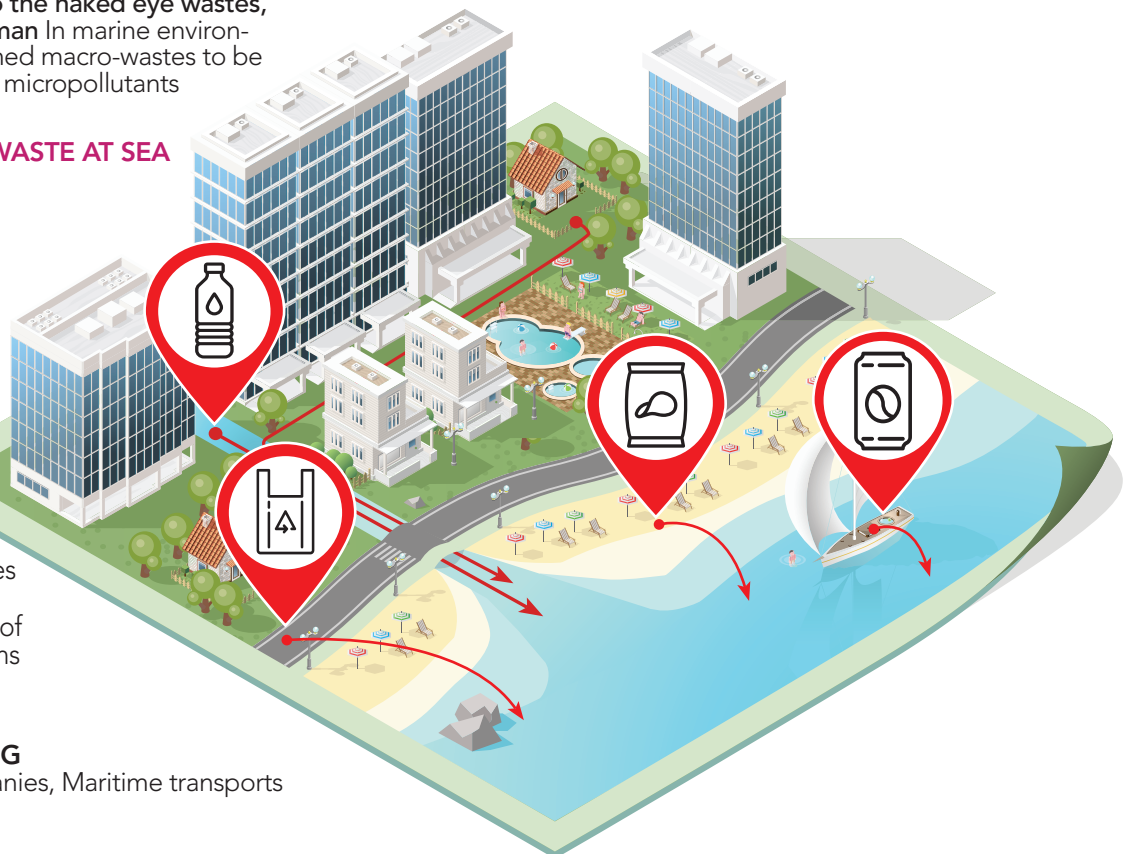
INAPPROPRIATE PUBLIC MANAGEMENT

Streets, drainage system, rocky shores and beaches, harbors dumpings of waste, water streams

3

PRIVATE DUMPING

Individuals, Companies, Maritime transports



THE CONSEQUENCES OF WASTE AT SEA

The sun's ultraviolet (UV) rays will break the bonds between the atoms that make up plastics. They degrade into smaller and smaller pieces and disappear from sight. The number of plastic objects likely to interact mechanically with fauna, flora and ecosystems is thus multiplied. The most well-known phenomena are:

- The entanglements of animals and plants trapped in waste,
- Ingestion of objects: the smaller they are, the greater the number of individuals able to ingest them,
- Seafloor recovered by micro-plastics and transport of invasive species on micro-plastics. This waste also contains toxic chemicals.

These phenomena have impacts on human activities:

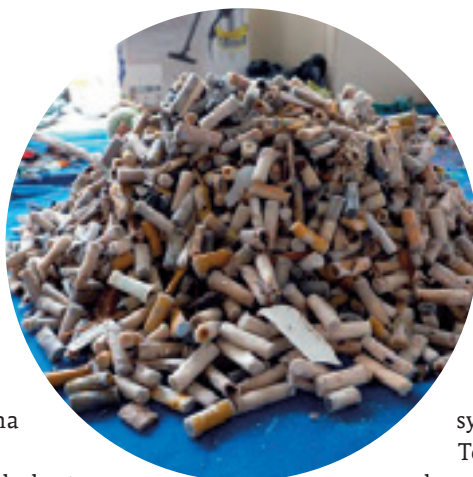
- Loss of profits for fishermen who collect them in their nets,
- Financial costs related to collisions and mechanical accidents of merchant vessels and pleasure boats caused by floating waste,
- Health and injury risks for coastal users,
- Large amount of money spent on cleaning beaches by local authorities,
- The aesthetic degradation of landscapes that has consequences for the tourism economy.

Reduce waste at sea - what does it mean?

Men, women and children throwing garbage into the streets and down storm drains are unaware they are polluting; they often believe that waste will be treated in a sewage treatment plant. In most cases, the pluvial network and sewage system are separate, and runoff is discharged into the sea without treatment.

Moreover, the notion of pollution is often associated with toxic chemical molecules in water or in the air, nuclear waste or oil spills. It is difficult to imagine that our food packaging, those familiar and everyday objects, could also be pollutants.

Because pollution has only been recognized as such since 2008 by the Marine Strategy Framework Directive, there is not yet a monitoring mechanism with quantitative and qualitative data to implement local reduction programs.



Outcome of a 18m long beach clean-up on the Mediterranean Sea, after five days of wind from East and two days of rain

HOW TO ACT?

It is possible to take action at the national level before the waste reaches the sea by reducing the production of waste and consuming more responsibly, but also more directly by improving the cleaning procedures of our cities. It is essential to encourage communities to act as a bulwark against the entry of waste into water systems.

Technical services are the key players who pick up and collect waste in streets and gutters. It is therefore a question of informing the staff of the cleaning and sanitation services of the importance of their mission and the role they play in reducing waste that penetrates rivers and the sea via rainwater networks. Service providers can develop technical solutions that retain waste within their networks. Finally, it is a matter of informing the population, inhabitants and companies of their responsibility in the production of this pollution.

No gesture is innocuous. It is the small rubbish thrown into the gutters and streams that make the great rivers of trash and ultimately the concentrations of waste in the middle of the Ocean. ♦

MERTERRE: AN ASSOCIATION COMMITTED TO CHARACTERIZING AND REDUCING MACRO-WASTE.

Pollution from macro-waste is still too poorly understood and poorly characterized. In order to reduce this pollution, it is important to awaken awareness of this new challenge for our industrialized civilization. To this end, the MerTerre association is giving keys to understand the sources of the problem and thus reduce the quantities of waste that pollute the seas and the ocean.

MerTerre has therefore developed methods for the characterization of wastes on beaches, rivers and small coastal waters which enable several types of actors to carry out surveys and to understand waste streams and production mechanisms of this pollution throughout its life cycle. Increasing the frequency and quantity of data collected in the same area will make it more useful to a community or a company in reducing waste in the sea.

For more information: <http://www.mer-terre.org/>



Isabelle Poitou,
Head of MerTerre

Stopping waste at some solutions

The Sea Cleaners

A boat to remove plastic from the seas



The Sea Cleaners is a project launched in 2016 by Yvan Bourgnon, sailor and adventurer, and Patrick Fabre, founder of OcéaNOplastic. They imagined a huge plastic waste collector, carried by a giant multihull, the Manta, capable of operating at sea, as well as near the coast.

DIMENSIONS

Total width: 71,50 m
Width (wings folded): 49 m
Overall length: 70 m
Waterline: 60 m
Total height: 58 m
Storage capacity: 600 m³,
+/- 100 tons

After two years devoted to Research and Development, to optimize the ship's architecture, meet the energy challenges, or organize the management and recycling of plastic, Manta's construction will be launched in 2019, and the boat should be at sea by 2021.

The Sea Cleaners has three missions: collect, observe and raise awareness.

The Manta will collect macro-waste on oceans from all over the world, with priority being given to coastal areas where their concentration is greatest.

In addition to cleaning the seas, the collected macro-waste will be studied by scientists (geolocation, quantification and chemical and biological qualification).

Finally, the ultimate goal is to promote the development of a circular economy of plastic materials by raising awareness and supporting the coastal populations concerned.

The Sea Cleaner is also committed to responding to natural disasters knowing that, a cyclone, a tsunami or a flood can spill a tremendous amount of waste into the seas. ♦

For more information: <http://www.theseacleaners.org/>



Yvan BOURGNON

"When I was around the world on a non-habitable sailing boat between 2013 and 2015, I was shocked to see how much the ocean is polluted by plastic compared to

my first round of the world with my parents, 30 years ago. Once back, I decided to ACT against that. I chose to put my experience as a skipper, sailor and adventurer at the service of this cause by imagining a giant ship to clean the sea from plastics: the MANTA. With a collecting system of more than 70 meters wide, and nearly 600 m³ of storage, our action will be massive."



Patrick FABRE

"For many years I have been fighting ocean plastic pollution on coastal areas. User's is strong, the awareness by the public authorities is effective. But, unfortunately

on an international scale all indicators are red. The generation of plastic waste is exponential, as coastal demography. When Yvan told me about his idea, I was immediately convinced that our action would be the best support for the prevention of this scourge. Creating a circular economy with plastic in emerging countries is suddenly on a strong leverage."

Gestes propres Vacances propres

Gestes Propres - Vacances Propres is the name of the national advocacy campaign led by the association Progrès et Environnement, an NGO created in 1971 on the initiative of manufacturers of mass consumption products and packaging.

The association enables the community of actors, citizens, local and national authorities, NGOs and companies to take concrete action to prevent waste. It allows a global and coordinated action, consisting of a national communication campaign, awareness campaigns and operational tools offered to local authorities to encourage their citizens to sort their waste at home.

In 2016, the association conducted its offensive and engaging outreach campaign, understood by 95% of the French people, who said it was an "incentive to pay more attention to our waste when outside". It won the Audience Award and the mention of the Grand Prix for outdoor communication.

A mechanism to facilitate clean action is offered to local authorities. In 2016, more than 2,200,000 Vacation-Clean bags (notoriety of 1 French / 2) were used by the 1,000 partner communities, which also have a customizable communication kit to sensitize their citizens, to relay the national campaign.

The 6th edition of Operation "I sail, I sort", which the association dedicates 100% to the prevention of marine litter and sorting, was open to Europe in 2016 thanks to the partnership with the Ramoge Agreement. The operation helped raise awareness among 131,000 sailors to the good behavior to adopt on board "Nothing overboard, all my waste at the port!", thanks to the 42,000 garbage bags and 29,000 mailboxes distributed by the 41 participating ports. The association is also a partner of the "Tour de France" in which 93,500 bags were used throughout the course in 2016.

The national campaign "Clean Actions - Self-Employed Vacations" is implemented in partnership with the Association of Mayors of France, the support of the Ministry of the Environment, Energy and the Sea and thanks to the voluntary commitment Companies involved in their social responsibility. ♦



For more information:
www.vacancespropres.com

A campaign sponsored in 2016 by Jean-Michel Cousteau



WaterTrek *A fun citizen mobilization*

3000 liters of waste, this is what was collected by about ten stand-up paddlers on the island of La Tradelière in the archipelago of Lérins on the 7 of may 2016 in a few hours : plastic, packaging, bottles, polystyrene and objects of all kind sprinkling the coast of these paradise islands a few meters away from La Croisette.

The case is not isolated: the landscapes of garbage has become common. In the majority of the cases, the pollution is of continental origin. 80% of macro-wastes noticed in the seas and the oceans are of ground origin, results from the human activity in town and on the ground and are transmitted by rivers.

This report and her love for paddling encouraged the actress Severine Vasselin to act : for three years, the association Watertrek has used aquatic sports and mainly stand-up paddling to raise awareness among littoral, continental and urban populations. Stand-up paddling quickly stood out as the essential tool to reconnect people with the marine environment and make them measure the importance of its conservation.

Cleaning operation, SUP-eco-trails to discover the littoral heritage in Brittany, Waterklass for children from Parisian suburbs who will paddle in the middle of swans, educational games with the orphans of Cambodia, SUP expeditions for climate in the mangroves: the projects of the association multiply everywhere in Europe and Asia, all articulated around the need to protect our waterways. ♦

For more information: <http://www.watertrek.org/>

The Plastic Sphere in the Mediterranean, a disturbing new ecosystem

"Born from plastic, the Plastic Sphere threatens the seas and oceans"

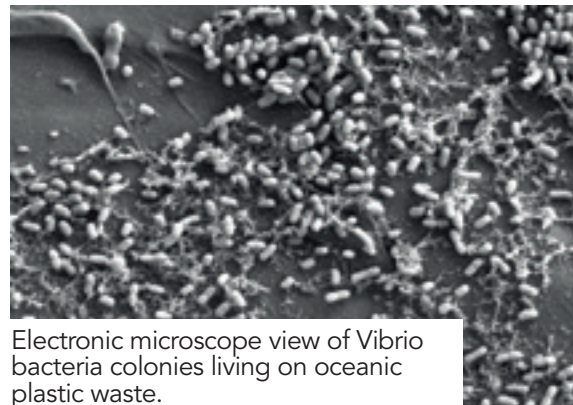
The scientific campaign of Expedition MED 2017, aboard the sailboat "le Ainez", will take off from the port of Fiumicino, near Rome in Italy, on June 22nd 2017 to cross the Southern and Central Mediterranean Sea for two months. An interdisciplinary team of scientists, sailors and eco-volunteers will sail on nearly 2000 nautical miles with the objective of studying the Plastic Sphere.

Biologists Linda Amaral-Zettler and Erik Zettler (Massachusetts Institute of Technology / Woods Hole Oceanographic Institution, USA / NIOZ Royal Netherlands Institute for Sea Research & Utrecht University) are the main scientific partners in the forthcoming Expedition MED in the Mediterranean Sea. These two researchers have discovered that a whole fauna of microorganisms live directly on and feed on plastic floating wastes. They are the origin of the term "Plastic Sphere", which is transformed into "microbial reefs" distinct from other surrounding biological communities. According to Erik Zettler, thirty minutes after his arrival at sea, a plastic waste is colonized, and composed of macro-waste and microplastics (fragments of a size <5 mm) and colonized by the microbial communities living on them. This new habitat plays a key role in the aggregation and transport of toxic chemicals and potentially invasive microorganisms in marine and human pathogen ecosystems.

The concern is to understand how far the contamination of plastic waste can enter the food chain. The most worrying bacterium is one of the genus "vibrio" which is already present in the ocean and including the one that is a vector of cholera and other gastro-intestinal diseases for humans. What the researchers have found is that this bacterium has the potential to reproduce in large quantities and also attack the fish digestive system.

THE MEDITERRANEAN SEA : A PLASTIC SOUP

Although it is one of the seas with the highest concentration of microplastics in the world, the communities of microorganisms (bacteria, viruses, microalgae, larvae of shellfish and microscopic



Electronic microscope view of Vibrio bacteria colonies living on oceanic plastic waste.

© ERIK ZETTLER



crustaceans, etc.) that live on plastics in the Mediterranean Sea are still little studied and their effects on marine ecosystems and human health unknown.

After 8 scientific campaigns dedicated to the quantification and identification of the several types of microplastics in the North-West Mediterranean Sea, Expedition MED expands its field of research in 2017 to include the study of the microbial communities of the Plastic Sphere. The 2017 campaign will take place in the southern Tyrrhenian Sea, the southern Mediterranean Sea (especially around the island of Lampedusa, a region scarcely explored but where current models indicate the high probability of areas of marine waste's accumulation), the Ionian Sea and finally the Adriatic Sea (an area with a very high density of marine waste).

One of the main objectives of Expedition MED 2017 is the identification of microorganisms species that live on fragments of plastic waste in the Mediterranean Sea and the understanding of the role of microplastics in their capacities for aggregation and transport of species. A 2003 study of the Plastic Sphere in the Atlantic Ocean by Erik Zettler and Linda Amaral-Zettler showed the ability of microplastics to aggregate on their surface the many individuals of different species that normally live in open waters and never reach high concentrations. Among them, bacteria of the genus *Vibrio* (the same genus as the cholera vector), which require a minimum of cells number to infect a host and express their pathogenic genes.

To study the Plastic Sphere standardized protocols will be used for the sampling of microplastics and sea water masses. Macroplastic samples will help characterize communities of microorganisms that make up biofilms on the surface of plastic fragments and for the quantitative and chemical study of microplastics. This work involves the extraction of DNA and RNA, as well as analyzes under the scanning electron microscope. These samples will also allow comparison with the microbial communities studied in other basins and will contribute to a better understanding of the structure and functioning of the Plastic Sphere communities.

In 2010, following the first Expedition MED campaign, we estimated that about 250 billion

bacteria were floating as microplastics in the Mediterranean Sea and were potential boats for bacteria. These bacteria can be hooked to these microplastics and can travel long distances and remain at sea much longer than other natural and biodegradable wastes that float on the surface such as wood, seashells, algae and feathers.

"These tiny plastic wastes that invade the world's oceans and seas are a major challenge for research and there is an urgent need to investigate the damage they can cause to the marine ecosystem and to humans." ♦

**Bruno Dumontet Expedition MED
(Mediterranean Sea in Danger)**

From left to right

- 2017 Expedition MED campaign
- Microplastics in water samples
- Samples taken at sea using Manta net

"MICROPLASTICS AND COASTAL PROXIMITY"

A new scientific publication has just been published as part of the MED Expedition campaigns on variations of floating plastic pollution in relation to their distance to land in the Mediterranean Sea.

All treated samples contained microplastics ranging from 13,000 to more than 578,000 debris per km² that drifted on the surface of the water with higher concentrations in the Nice coastal area. Floating plastic debris and surface plankton were sampled as part of the Expedition MED scientific surveys. The sampling was carried out on a panel of 33 sites across the Mediterranean Sea, with distances to land from 0.3 to 46 km. 54% of the sampling sites were in the 1 km strip of water adjacent to the coast.

The highest plastic concentrations were found in areas far from land, as well as in the first kilometer near the coast. In this nearshore water strip, plastic concentrations were significantly correlated with proximity to a coastal human population, with local areas close to large human settlements showing hundreds of thousands of plastic pieces per km².

Polyethylene, polypropylene and polyamides are the predominant plastic polymers at all distances from the coast (86 to 97% of the total articles), although the diversity of polymers was higher in the 1 km coastal strip because of a higher frequency of polystyrene or polyacrylic fibers.

Nevertheless, the relative abundance of small fragments (<2 mm) was higher within the 1 km coastal water strip, suggesting rapid fragmentation down the shoreline.

The presence of a high concentration of plastic, including tiny plastic fragments could be significant on the environment, health and economic impacts. There is an urgent need to react.

Download the publication: <http://bit.ly/ExpeMED2017>

Poles and glaciers: these sentinels of the climate that are still unknown

"In the pursuit of Endurance": an expedition that offers a fresh perspective on the understanding of Antarctic ocean currents



Luc Hardy: Explorer, Founder of Pax Arctica and board member of Green Cross France et Territories

Luc Hardy, board member of Green Cross France and Territories, and his team, made an expedition to Antarctica, reproducing part of the journey undertaken 100 years earlier by one of the figureheads of Polar Exploration: Sir Ernest Shackleton. This expedition highlighted the major role of polar ocean currents in maintaining the climate balance and the strategic nature of these areas as carbon sinks ⁽¹⁾.

HERE IS THEIR ADVENTURE :

"The main objective of our expedition was to provide the United Nations World Climate Research Program with a more precise sampling of the area from Elephant Island to the South

Sandwich Islands through South Georgia. Our plan was to launch seven drifting buoys and four profilers - which was done successfully.

Thanks to the water wings and profilers launched by our team and to the many others (more than 3,000) deployed by researchers in 30 countries and distributed across the oceans, scientists can remotely monitor the physical, chemical and even biological changes in the water. The real-time position of the floats is used to measure and understand the speed of currents, vortex systems and other movements. The trajectories of the floats show all directions of currents that are going through the Drake passage.

Another mission of our expedition was to



collect a variety of snow samples in order to provide specialized scientists with data that could improve knowledge on these rarely visited areas. The aim of the study is to assess the impact of atmospheric particles on the global climate. By falling into the ocean, these particles contribute to the nourishment of plankton because of the micronutrients they contain. When they are polluted by humans, they interfere via the plankton throughout the food chain.

Phytoplankton consists of algae that produce photosynthesis by transforming atmospheric carbon dioxide into organic matter and thus contribute to the reduction of the greenhouse effect. On back, the samples must be treated. Encouraging preliminary analyzes have been carried out but it will take longer to ensure the reliability of the data we have measured and for Professor Losno to communicate them to the scientific community for further interpretations. These data will make it possible to estimate the flux of micronutrients falling in the ocean and to determine their potential impact on primary productivity and thus the efficiency of this ocean in absorbing carbon dioxide from the atmosphere. This part of the sub-Antarctic Ocean is considered to be a net carbon sink. " ♦

⁽¹⁾ A carbon sink is a natural or artificial reservoir that accumulates and stores carbon from the atmosphere

GLACIERS ARE VERY SENSITIVE TO HEAT AND RAINFALLS

Some glaciers enlarge, like most of the glaciers of Norway and New Zealand, like the Perito Moreno glacier in Argentina or even the Maili glacier in Russia, and others reduce. All glaciers in the Alps - France, Switzerland, Austria and Italy - have been losing their mass for a century and a half, and the phenomenon has accelerated since the 1980s.

Also affected by global warming are the Hintereisferner glacier in Austria, the Franz Josef glacier in New Zealand, and the Furtwängler glacier (Kilimanjaro), which lost 80% of its volume during the 20th century and might disappear in the next decade.

THE ARCTIC SEAS ARE VICTIMS OF CHEMICAL POLLUTIONS

We don't know it so much, but the Arctic seas are victims of longstanding chemical pollution, especially from seadumped ammunition (also named UW - UXO) and also from unexploded armaments (UXO). It is also the case in the Baltic Sea, as off the coast of Puerto Rico (Culebra Islands). Green Cross, in collaboration with the Food and Agriculture Organization of the United Nations (FAO), the United Nations Program for the Environment (UNEP), the World Tourism Organization (UNWTO) and the United Nations Industrial Development Organization (UNIDO), the Blacksmith Institute, but also with the support of some national governments, puts forward the risks of infections associated with these arms, and finds potential solutions to identify them, get them back to the land and treat them in a more satisfactory way.

A first operation to identify the stocks and appraise their volume is underway, and it will allow to suggest some measures and to seek means up to the challenges. Different site visits since October 2013, added to the openness of the U.S. national archives, have helped to better understand the nature of these arms, as well as their potential nuisance, and have been the subject of identification as part of UN resolutions, taken in 2010 and 2013. Green Cross is committed in partnership with the secretariats of the Basel and Stockholm Convention for a better consideration of these issues. Paul F. Walker, who heads the environment and security programs, regularly talks to States and International Institutions about the urgency to act. He received for his work the prestigious Right Livelihood Award (RLA) in December 2013, to "work tirelessly to rid the world of chemical weapons".

For further information : <http://millennium-project.org/millennium/ES-2005.pdf>

Tools and links

ESEC REPORT: "WHAT MEANS AND GOVERNANCE FOR A SUSTAINABLE MANAGEMENT OF THE OCEANS? "

Offshore economic activities are developing, some offering new prospects such as renewable marine energies or biotechnologies. For all, the question of their impacts arises. However, the oceans governance framework is complex and incomplete, particularly in the open seas, where no laws protect biodiversity in a specific way. In its report, the ESEC seeks to illustrate what has been learned, but also what is lacking. It makes recommendations to promote a new governance and a new framework for human activities, ensuring sustainable use of the oceans, based on an ecosystem-based and concerted approach.

<http://www.lecese.fr/travaux-publies/quels-moyens-et-quelle-gouvernance-pour-une-gestion-durable-des-oceans>

OCEAN HEALTH INDEX

The Oceans Health Index assesses how responsibly we use the resources and benefits of the oceans. It is a tool for lawmakers and businesses all over the world. It assesses 10 indicators of ocean health, where an ocean is defined as healthy if it brings a set of benefits to populations, now and for the future.

<http://www.oceanhealthindex.org/>

REVIVING THE OCEANS ECONOMY: THE CASE FOR ACTION—2015

In terms of wealth generated ("marine GDP") oceans represent the seventh sector of the world economy, with an annual output of goods and services valued at \$ 2.5 trillion. The overall value of the oceanic heritage is estimated at \$ 24 trillion. But threats to the oceans are dangerously close to the breaking point.

https://c402277.ssl.cf1.rackcdn.com/publications/790/files/original/Reviving_Ocean_Economy_REPORT_low_res.pdf?1429717323

WEB TV GREEN CROSS FRANCE & TERRITORIES

COP21 kicked off on 30 November and Green Cross France & Territoires has launched its own Web TV at the same time. This Web TV presents daily videos on an important theme related to this event, filmed at Le Bourget or in the center of Paris. It revolves around themes such as "Islands and coastal areas, climate sentinels", "Protecting the Oceans for a serene climate and a preserved humanity" or "Water, Ocean and Climate".

<https://vimeo.com/channels/cop21paris>

OCEANIA 22

The Oceania Meeting is a regional forum of governance and projects whose central stake is the mobilization for sustainable development in the face of climate disruptions. The 4th edition

of the Summit, Oceania 22, took place in New Caledonia on the theme "From Paris to Marrakech, Oceania is leading the way." The Bourail Declaration signed at the Summit by the Pacific countries and territories present urged countries to sign the Paris Agreement and to rapidly enter into a ratification process. It also reaffirmed its message to the international community of the urgency to act for the countries and territories from the region that are the first to suffer the effects of climate change.

<http://www.oceaniameetings.com/>

NDC EXPLORER

CoP21 was an essential time for the climate. This is the first time that countries have made voluntary, concrete and differentiated commitments in the fight against climate change. These commitments are now all put online by an independent structure, and everyone can see how they are applied all over the world.

<http://bit.ly/NDCcomp>

IPCC SPECIAL REPORT: OCEANS & CRYOSPHERE

The most recent scientific work shows, and this is the case of the IPCC Working Group on "Ocean and Cryosphere", that there is a formal relationship between extreme weather events and climate change, and rise of the waters accelerates, making the evolution of the ocean and the cryosphere even more critical than what was modeled only a few years ago.

<https://www.ipcc.ch/report/srocc/>

CHEMICAL POLLUTION REACHS ABYSSES

A study of British researchers published Monday, February 13 in the journal Nature Ecology & Evolution revealed that the world of the deep seabed also carries the indelible mark of human activities. Alan Jamieson and his colleagues sent an underwater robot equipped with traps into the two deepest marine pools (Mariana and Kermadec) in which they trapped amphipods. These fleas were then analyzed by researchers, and the results showed: chemical pollution, particularly from transport and agriculture, contaminates the abyss.

For more information :

- The publication in Nature, 13th 2017 : <http://www.nature.com/articles/s41559-016-0051>
- Eagle News Philippines, april 2017 : <http://www.eaglenews.ph/life/pollution-in-deep-pacific-devastating-earth-uk-study/>
- Reuters Video / Interaksion, 4th april 2017 : <http://interaksyon.com/article/138267/watch--pollution-in-deep-pacific-devastating-earth---uk-study>

Special thanks

The following people contributed to this publication: Interviewed personalities and members of the GCFT task force related to the coast and the ocean

Congratulations also to the winning photographers who illustrated this book and the exhibition "Keys to act "



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Actor



BRUNO DUMONTET
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Green Cross is an international NGO founded by Mikhail Gorbachev in 1993, following the Earth Summit in Rio de Janeiro in 1992. The French branch of Green Cross France and Territories is chaired by Jean-Michel Cousteau. In order to preserve peace and a sustainable future for everyone, Green Cross France and Territories works to preserve a healthy environment, guaranteeing a positive future. Recognized as a common interest group, it acts through advocacy and real-world projects.
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