5 - 7 Septembre

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September 5 - 7

17ème Réunion des Présidents d'assemblée du G7
17th G7 Speakers' meeting

Parliaments committed for the oceans.
Which regulations for sustainable development?

Table of contents

Introduction

The sea is a large-scale version of the land: it covers 70% of the surface of the globe. It is, first of all, a human reality: 60% of the inhabitants of the planet live at less than 100 kilometers from a seashore [(1)]. It is also a trade reality: 80% of the world movement of goods takes place using maritime transport [(2)]. It is also, finally, essential to the survival of humanity, with more than 500 million people depending on fishing and aquaculture for their livelihood [(3)].

These figures speak for themselves, it is essential that humanity becomes aware of the extraordinary opportunities which the seas and oceans offer us. They represent a precious but fragile wealth which must be protected. The issues that are at stake are so critical and concrete that everyone must feel involved.

WHAT THE SEA OFFERS US

Every one of us, whilst contemplating the sea, has felt the energy which it transmits. Far from being a simple poetic image, the potential of blue energy is huge. Offshore wind turbines, in particular, which are a very promising energy source, come up against comparable obstacles from one country to another. In order to better harness their potential, it would be beneficial to share the experiences of the countries which are most advanced in this innovation, in the perspective of the energy transition which is taking place.

However, the principle resource of the seas and oceans is obviously, fish, which are essential to the diet of three billion people and represent a precious, but often, overexploited, capital. For the future, the development of an aquaculture which respects the environment is a necessity and the use of marine resources for medicinal purposes, still at an embroyonic stage, must be fostered. The question of the resources of the ocean must clearly be asked – the nurturing mother of humanity becoming its healer tomorrow? This question provides the opportunity of addressing the policies of the European Union, which encourage a growth in productivity that remains compatible with the preservation of the resources, particularly thanks to a system of quotas.

(1) French National Strategy for the Sea and the Coastline.
(2) Memorandum « La terre est bleue » ("The Sea is Blue") of the CESM – Center for Higher Marine Studies, November 2013.
(3) United Nations Food and Agriculture Organization (FAO).

PROTECTION OF THE OCEANS AND THE FIGHT AGAINST POLLUTION

Using the wealth and opportunities offered by the marine environment, in a sustainable way, should not be a question that is taken for granted. A fragile balance must be found so as to protect the seas and oceans, in particular, against pollution.

Certain images come immediately to mind: the atmospheric and marine discharge of large vessels, oil pollution, sea turtles found with plastic debris in their stomachs. Since this phenomenon is tangible, the commitment of developed countries in the field is forward-looking, but it must be speeded up and be better coordinated. Steps must be taken to better combat pollution in order to protect our oceans more successfully. The preservation of marine flora and fauna also implies that small-scale and industrial-scale fishermen take into account the real value of the respect of the environment. People who work with the sea, better than anyone else, see how the natural environment in which they work has deteriorated. It is also in such a context that the environmental, social and economic issues of fishing methods are raised. Although, in order to avoid over-burdening the dossier, this issue is not the subject of specific development, states must, nonetheless, act using pedagogy and determination. A telling example is the prohibition, at a European level, of electric fishing. This is a subject to which the French National Assembly is strongly committed.

Finally, no one can ignore the pollution of the seas by plastic waste, one of the "*greatest plagues of our times"* (4). At the current rate, by 2050, there will be in the ocean, as many tons of plastic as of fish (5).

THE IMPACT OF GLOBAL WARMING ON THE SEAS AND ON THE OCEANS

In addition to pollution, climate change has a considerable impact on the seas and oceans: this includes melting sea ice, rising sealevels, acidification and the rise in water temperature as well as changes in currents.

The rise in the level of the sea and the increase in the intensity and the frequency of storms require action to preserve the coasts against climate change.

LEGAL AND REGULATORY ISSUES

The need for global action has finally been recognized.

The analysis of the international governance of the oceans and the changes which it is beginning to undergo, first of all underline the dilemma of protecting free navigation and yet necessarily preserving biological diversity.

(4) UNO environment, June 2018.
(5) Study by the Ellen Macarthur Foundation.

The Artic and the routes which cross it represent, in themselves, a major geopolitical challenge. The melting of the summer ice floe has accelerated there and the season when the ocean is partly navigeable has been extended. The more and more frequent use of these routes opens up great economic opportunities, which already are leading to certain tensions. This usage will therefore be as much an issue of governance as of the preservation of the environment.

The choice of subjects for this meeting was made in order to deal with the most glaring current issues: those concerning resources and the environment.

" La mer, la mer, toujours recommencée !" [(6)]: on such a theme total comprehensiveness would be illusory. The questions, often thousands of years old, constantly continue to be asked. Our main purpose here is to open a debate which is essential to the future of humanity.

(6) "The sea, the sea, ever renewed!" Paul Valéry, Charmes.

Blue Energy for a Greener Planet

I. THE ECOSYSTEM OF BLUE ENERGIES

A. THE OFFSHORE WIND TURBINE : A STRATEGIC SECTOR

Blue energies are renewable energies which harness the resources of the marine environment. There is generally a distinction between offshore wind turbines – turbines in the sea either with a fixed bottom or floating [(7)] – and other forms of renewable marine energy (renewable energy sources or RES) : marine turbines, wave energy converters, tidal energy or ocean thermal energy.

The offshore wind turbine is, in the short term, the blue energy which seems most likely to be developed. This RES enables the production on average of twice as much energy as a land-based turbine. The production capacities of the offshore farms are 50 times that of the land farms (500 megawatts (MW) on average for an offshore farm, as opposed to 10 for a land farm) [(8)].

In 2018, offshore turbines represented 4% of the world turbine total. The sector is in full growth, with an increase of 10% of capacity over 2018 [(9)]. Led by the United Kingdom, which has one third of all the offshore turbines in the world, and by Germany, European offshore wind turbine production capacity increased by 18% in 2018, i.e. 2.6 gigawatts (GW) of extra production [(10)].

(7) These two types of turbines use different technologies. Floating turbines may be installed further from the shore than fixed-bottom turbines and are capable of capturing stronger and more regular winds.
(8) According to the French Multi-annual Energy Program Project.
(9) According to a study by HSBC, published in the press : "Offshore Wind Turbines Leave European Territory", Les Echos, February 13, 2019.
(10) According to the statistics published by Windeurope in the specialized press : https://www.enerzine.com/europe-la-capacite-eolienne-en-mer-a-augmente-de-18-en-2018/26501-2019-02.

B. THE DEVELOPMENT OF OFFSHORE WIND TURBINES SOMETIMES COMES UP AGAINST ECONOMIC, ECOLOGICAL OR SOCIETAL RESISTANCE

- The cost: the setting-up of offshore wind turbine farms requires heavy investment in the construction, the deployment and the connection of the farms and this means that, for the moment, such a form of energy is not very competitive. The natural environment can increase the costs: this is particularly the case for the nature of the seabed (rough and deep underwater terrain) and the relatively low intensity of the wind;
- The installation of offshore wind turbines closer to the coastlines, so as to limit the cost of connections, leads to the hostility of locals, of certain environmental associations and of tourist professionals. Litigation increases the already long administrative procedures which are associated with this;
- The environmental impact: the construction phase, especially for fixed-bottom turbines, may have an impact on marine bio-diversity (mammals and the seafloor) whilst the operational phase may have negative effects on birdlife and the preservation of the landscape;
- Conciliation with the other uses of the seas (conflicts with professional fishing, maritime transport and pleasure navigation).

II. IN FRANCE: HIGH POTENTIAL STILL TO BE FULLY USED

A. THE EMERGENCE OF A FRENCH SECTOR FOR OFFSHORE WIND TURBINES

Although with its 11 million km² of coastal areas and its four sea facades, making it the second largest maritime space in the world after the United States, France does not yet have a single offshore wind turbine in service off its coastline.

France was, first of all, a pioneer in the field of tidal energy with the Rance factory which was set up in 1966 and which produces annually the equivalent of the energy needed to supply a town of 225,000 inhabitants [(11)]. But this energy is not identified as a priority on account of the environmental impact that the creation of new sites might lead to.

Public authorities have been attempting for a decade to develop offshore wind turbines within the framework of French industrial and energy policy: this represents an important factor for France to reach its objectives in terms of energy mix and also constitutes an opportunity for a new industrial sector which could, in the long term, becoming an exporting field. All of these current projects taken together could, according to the ADEME (France's environmental agency), generate up to 15,000 jobs, directly or indirectly, thousands of which have already been created.

(11) *https://www.edf.fr/groupe-edf/producteur-industriel/energies-renouvelables/hydraulique/edf-hydraulique-bretagne-normandie/l-usine-maremotrice-de-la-rance/decouvrir-et-comprendre.*

In addition to the fixed turbine projects, floating turbine projects are also underway, although their level of technological progress is not as advanced and their cost is higher. In the long term, floating turbines could offer important prospects for the development of the sector: access to more remote sites with more wind as well as a reduction in the visual impact of the installations. France today has four pilot floating offshore wind turbine farms (three in the Mediterranean and one in Brittany, off the coast of Groix), with a capacity of 24 MW each. The first French prototype, Floatgen, was set up off the coast of Le Croisic. The first sites will start operating in 2021. The French "start-up" Ideol, associated to the group Bouygues Travaux Publics, is the leader in the field: it is, in particular, at the origin of the conception of the Floatgen floating system.

Source: Ministry for Ecological and Inclusive Transition.

B. THE OBJECTIVES SET DOWN IN THE FRAMEWORK OF THE MULTI-ANNUAL ENERGY PROGRAMMING PROJECT

The French Multi-annual Energy Programming Project (PPE) originally made provision for increasing the capacity of offshore wind turbines to 2.4 GW by 2023 and to around 5 GW by 2028 (out of a total electricity production in France of around 525 TWh). Capitalizing upon the industrial sector so-created, three tenders for fixed farms and three tenders for floating farms, amounting to a total of 3.25 GW, will be launched during the first period of the PPE. For future tenders, provision has been made for the state to make a reference, before their launching, to the National Commission for Public Debate (CNDP) to organize consultation with the general public.

Several voices have been raised to ask for more forward-looking objectives in the field. *France Énergie Éolienne* has thus put forward a claim for 1 GW per year from offshore turbines for the 2019-2023 period. Certain parliamentarians have addressed a letter to the Prime Minister so as to raise the objectives for the development of offshore turbines. Last June, the French Government noted these requests and announced the raising of the goals by fixing an objective of 1 GW of offshore turbine energy.

As regards the other types of marine RES, their development is not really set down as a priority in the framework of the PPE. The tidal turbine sector has a technically useable potential, without taking into account the limits of its usage, of 2 to 3 GW, at the most.

As regards wave energy, the sector is still at the demonstration stage. As for thermal sea energy, potential has been identified in overseas territories, on account of the scale of the gradient of temperatures between the hot waters of the surface and the cold waters of the depths.

III. THE G7 COUNTRIES: SHARED AMBITIONS BUT VARIOUS LEVELS OF DEVELOPMENT

Germany ranks second in the world as regards the development of offshore turbines which are totally integrated into the German energy strategy (exit from nuclear energy in 2022, progressive exit from coal). German offshore farms represent 10.7% of the total turbine power of the country and 27.6% of the world offshore turbine total [(12)]. The German branch is distinguished by its maturity and its competitiveness: of the four projects accepted during the last round of tenders launched in 2017, three function without subvention [(13)]. On April 16, 2019, the Government officialized the full commissioning, off the German island of Rügen, of *Arkona*, the largest offshore wind turbine farm in the Baltic Sea (60 turbines, capacity of 385 MW) [(14)].

(12) Global Wind Report 2018 – Global Wind Energy Council (GWEC), April 2019.
(13) "Offshore wind turbines: subventionless farms, a world first" - Les Échos – April 14, 2017.
(14) https://www.connaissancedesenergies.org/allemagne-le-parc-eolien-offshore-darkona-en-images-190425.

Canada has tidal turbine farms in the great lakes region. It is also developing a strategy for offshore turbines, with several farms already in operation. According to the data provided by the ADEME, Canada has great potential for the development of tidal turbines. Public incentives have been introduced to encourage the development of such technology, with financial support for the feasibility studies and aid programs for the commercialization. One of the main current programs is the Cape Sharp Project: a new tidal turbine was installed during the summer of 2018 and it is connected to the electricity network in Fundy Bay in Nova Scotia. In this bay, Canada has the ambition of setting-up a tidal turbine farm of 300 MW between 2030-2040.

In the United States, the first offshore wind turbine farm, situated off the state of Rhode Island, with a 30 MW capacity, came into operation in August 2016. It has five turbines which were built in the General Electric factory in Saint-Nazaire (Loire-Atlantique Department, in France). In September 2016, the Energy Ministry and the Interior Ministry published a National Strategy on Offshore Wind Turbines, so as to facilitate the development of this form of energy production. Twenty-eight projects for offshore turbine farms are now being developed, and this amounts to a total production capacity of around 25,000 MW [(15)]. About 2,000 MW could already be operational by 2023. In this context, EDF and Shell came together in December 2018, in order to develop common projects [(16)].

The plans of the United States in the field of offshore wind turbines are very ambitious: the American Department of Energy has just selected, last May, four projects to conceive the next generation turbines, which will be 50% smaller and lighter, whilst at the same time being 10-25% cheaper to produce.

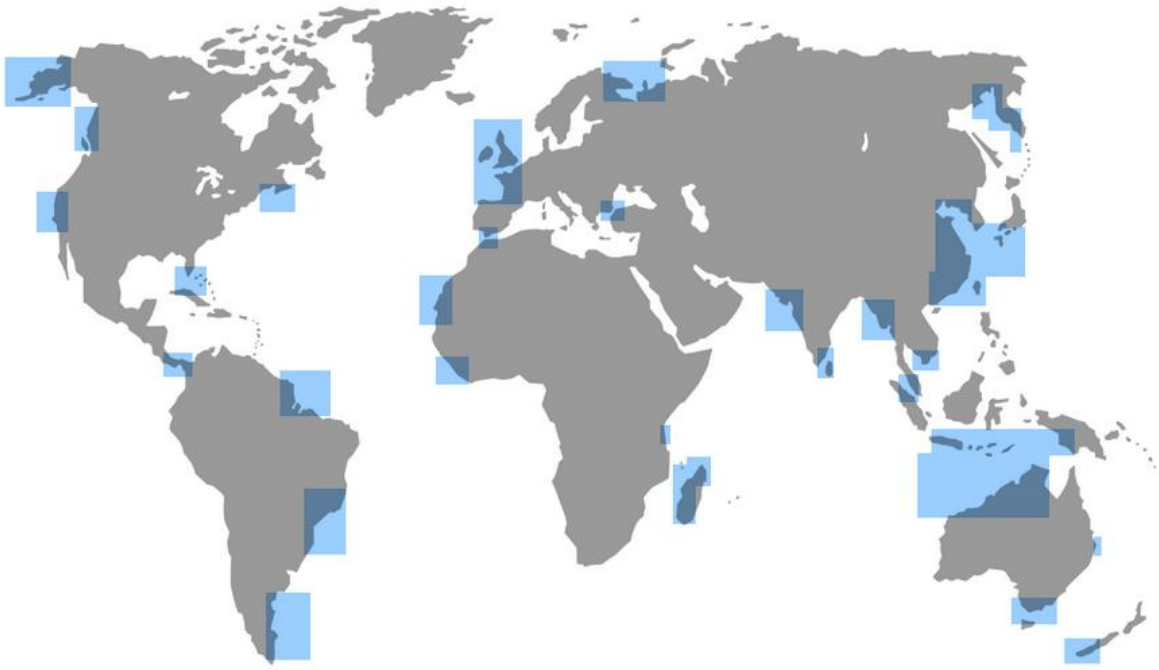
In Italy, the financing of the first offshore wind turbine farm was announced at the beginning of 2019 (ten fixed turbines for a production of 30 MW) [(17)].

Although **Japan** has a great maritime facade, the offshore wind turbine is, for the moment, not very developed there. The Government, nonetheless, displays ambitious development objectives, and plans the installation of 10 GW of turbine capacity (onshore and offshore) by 2030 [(18)]. A law was passed on November 30, 2018, to promote the construction of offshore farms, and the first tenders should be published between the end of 2019 and the beginning of 2020 [(19)]. Several experiments concerning floating offshore turbines have been launched.

(15) https://www.weamec.fr/blog/record_synthesis/synthese-marche-us-de-leolien-offshore/.
(16)"EDF and Shell form alliance to develop offshore wind turbines in the United States"- Les Échos – December 19 2018.
(17) "Italy: the first wind turbine farm gets its financing" - Le Marin – February 27, 2019.
(18) https://www.tresor.economie.gouv.fr/Articles/2017/12/18/l-energie-eolienne-au-japon-etat-des-lieux-et-politique-de-developpement.
(19) https://www.ccifj.or.jp/actus/n/news/vent-favorable-pour-leolien-offshore.html.

With the first offshore wind farm set up in 2000, the **United Kingdom** has become the world leader in offshore turbines and British production represented, in 2018, 44.5% of the total offshore turbine production in European seas [(20)] and 8% of the British electric mix [(21)]. The United Kingdom has the first floating offshore turbine farm in the world. In March 2019, the British Government set an objective of 30% of energy from offshore turbine farms [(21)], which represents 27,000 jobs. With a potential, with all capacities taken together, of 10 GW, the United Kingdom should keep its number one position in the years to come.

Zones with high potential for marine energy



Source : World Energy Council.

(20) EurObserv'ER – Baromètre éolien 2018.
(21) "The United Kingdom - European Crossroads of the Offshore Wind Turbine"- Le Monde – June 14, 2019.

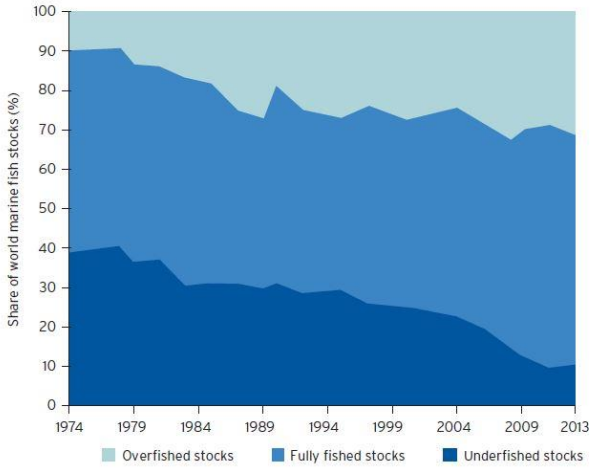
The resources of the ocean: today the nurturing mother of humanity and tomorrow its healer?

I. MARINE FISHING: WORLD AWARENESS OF THE NEED TO PRESERVE THE WEALTH OF THE OCEANS

A. WORLD STOCKS OVERFISHED, A SLIGHTLY MORE SUSTAINABLE SITUATION IN EUROPE

According to the Food and Agriculture Organization (FAO) [(22)], in 2018, around 30% of world stocks are overfished [(23)]. This world trend has been growing since the 1970s when 10% of the stocks were overfished. A 2006 study pointed out that if the global fishing model did not change, overall fishing stocks could collapse by 2048 [(24)].

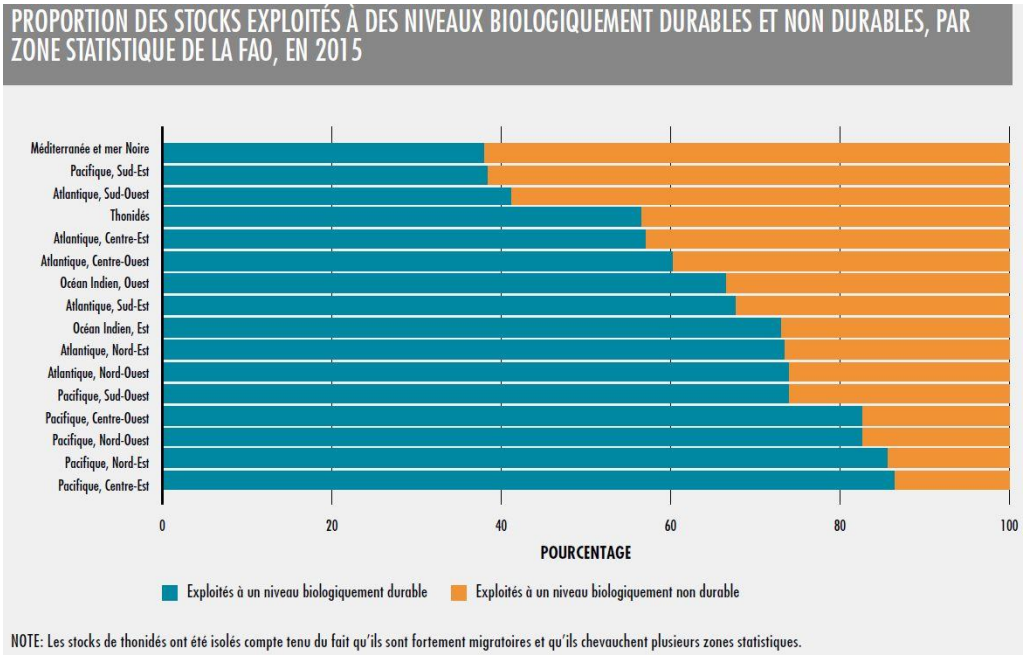
FIGURE 0.1
State of global marine fish stocks, 1974-2013



Source : World Bank, 2018

(22) FAO, "The world situation of fishing and aquaculture. How to reach sustainable development objectives", 2018.
(23) A stock is considered overfished when its biomass is lower than the biomass reference compared with the maximal sustainable yield.
(24) Worm Boris, "Impacts of biodiversity loss on ocean ecosystem services", Science, 34, 2006, pp. 787-790.

The proportions of overfished stocks vary greatly according to the regions of the world (more than 60% in the Mediterranean as opposed to 15% in the Center-east Pacific). Overall the European situation is slightly more favorable, with around 37% of known fishing stocks which are sustainably fished [(25)]. France, in this particular field, is a good student, with 48% of the volume fished coming from stocks which are sustainably fished [(26)].



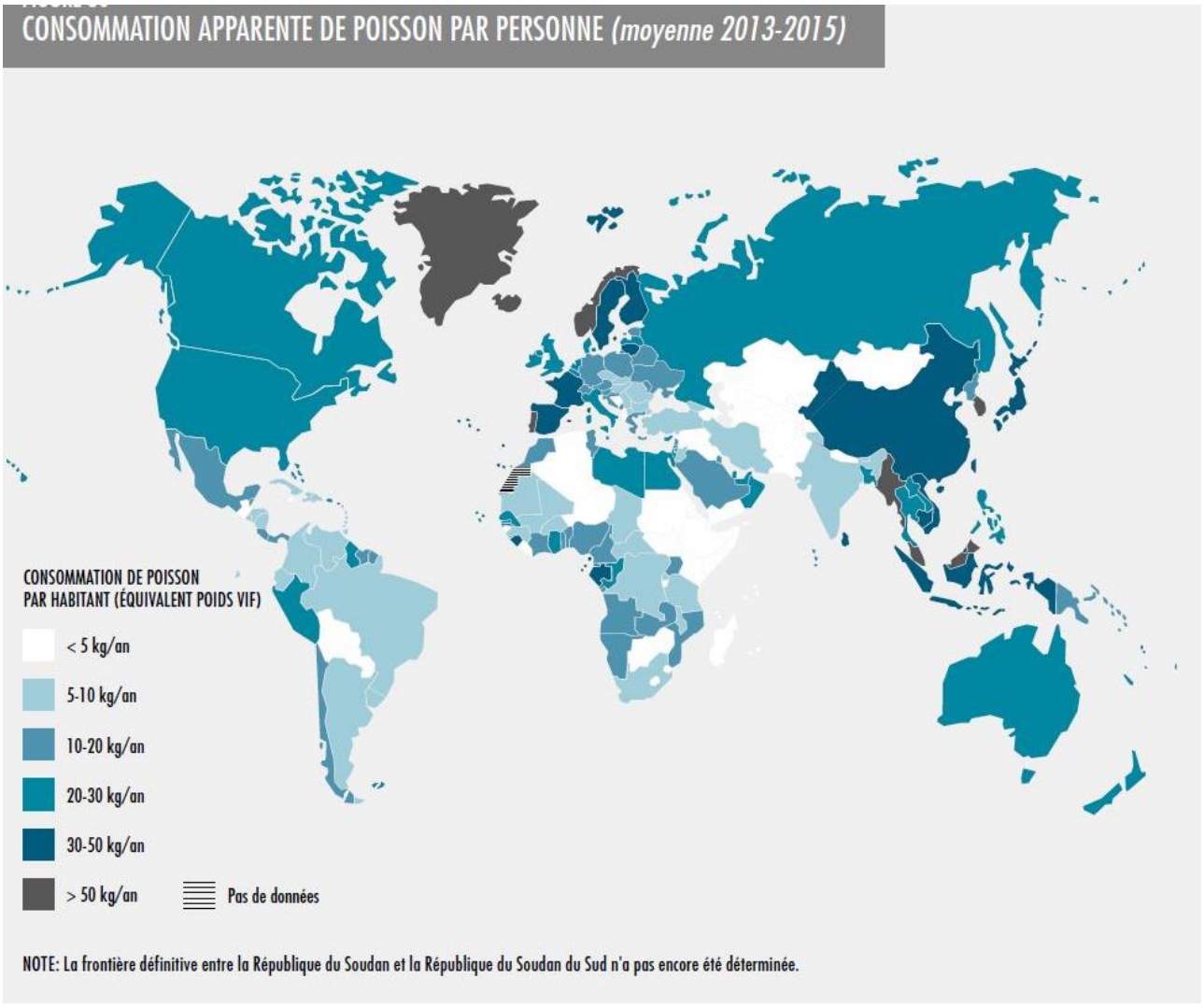
Source : FAO, 2018

B. RISING CONSUMPTION OF FISH AND SEAFOOD, DECREASING RETURN ON CATCH

The world consumption of fish has greatly increased since the 1950s, rising from 40 million tons to almost 140 million tons, thus rising much faster than the world population.

(25) Scientific, Technical and Economic Committee for Fisheries (STECF), "Monitoring the Performance of the Common Fisheries Policy" (STECF-Adhoc-19-01).

(26) IFREMER, "French Fishing Resources: 2018 situation", February 1, 2019.



Source : FAO, 2018

At the same time, the volume of catches has continued to decrease over the last twenty years. The FAO considers that world fishing reached its peak in terms of landing sizes in 1996, with 86.4 million tons fished [(27)] (as opposed to 20 million tons in 1950) [(28)]. The quantities of fish landed have decreased since then. The average catch per fisherman has dropped from 5 tons per year in 1970 to less than 2.5 tons in 2012 [(29)].

According to the World Bank, the economic losses linked to overfishing of stocks were estimated at 83 billion euros in 2012. This study shows that, if world fisheries reduced their fishing to a sustainable level, the unitary price of fish would rise, on average, by 24%.

(27) This figure does not include volumes produced by aquaculture.
(28) FAO, "The World Situation of Fishing and Aquaculture. How to contribute to food safety and the nutrition of all"; 2016 (page 39).
(29) World Bank.

C. AN INTERNATIONAL WILL TO IMPLEMENT SUSTAINABLE DEVELOPMENT FOR FISHING RESOURCES

This threatened collapse required the implementation of a more sustainable management of fishing resources. Thus, the European Union, which set up a common fisheries policy in 1983, annually fixes the total admissible catches (TACs) on the basis of scientific advice concerning the state of the stocks provided by consultative bodies such as the International Council for the Exploration of the Sea (ICES) and the Scientific, Technical and Economic Committee for Fisheries (STECF). These TACs are then divided between the member states in the form of national quotas.

The will to preserve fishing stocks has also been made clear through the banning of certain particularly destructive fishing vessels: on April 16, 2019, the European Parliament adopted the prohibition of electric fishing in European waters as of July 1, 2021. This fishing technique, which was authorized provisionally and monitored within the European Union, had already been prohibited in the majority of countries in the world.

Nonetheless, there are contrasting situations within the European Union: the worrying situation of the Mediterranean has justified the adoption, in February 2019, of a management plan for the western Mediterranean. The prospect of the United Kingdom leaving the European Union without an agreement has also, indeed, introduced serious uncertainty in the French, German, Belgian, Danish, Spanish, Irish, Dutch, Polish and Swedish fishing sectors, which fish a third of their catch in the British Exclusive Economic Zone (EEZ).

In **Canada**, fishing law was modified in 2012, so as to establish rules enabling the management of threats which weighed upon the sustainability and the conservation of Canadian fishing productivity. Of the 155 known stocks, 74 are fished sustainably, 41 are in the "prudence zone" and 16 are in a critical state [(30)].

In the **United States**, the Sustainable Fisheries Act of 1996 introduced new obligations aiming at returning over-fished stocks to sustainable levels. In 2013, 64% of the 44 overfished stocks covered by the provisions of this law had been reconstituted or were on their way to being so, and they produced revenue which was 92% higher than that recorded at the beginning of the process.

Japan set up total admissible catches in 1996 as well as a regime of "total authorized fishing efforts" in 2003. Japan, however, has experienced a reduction in the dynamism of the overall sector, particularly in the field of consumption. To attempt to remedy this situation, Japan launched the project "Delicacies of a Country Rich in Fish" in 2012 which called on all the actors of the sector to promote the consumption of fish and aquaculture products. Japan, which was traditionally the first world importer of tuna, was overtaken for the first time, in 2015, by the United States.

In December 2018, Japan announced its withdrawal from the International Whaling Commission (IWC). Although the country had officially put an end to whaling since the 1980s, a certain amount of whaling for scientific reasons was, nonetheless, authorized.

(30) "Examination by the OECD on fisheries. Basic policies and statistics", 2015.

Whaling now would, according to the authorities, be "limited to Japan's territorial waters and to its exclusive economic zone, in accordance with the quotas for catches calculated according to the IWC's method, so as not to exhaust stocks". Nonetheless, the consumption of whale meat seems to have slowed down in recent years and has not reached 100 grammes per person per annum since 1987 [(31)], which could lessen the economic impact of this decision. 1,380 whales were caught in the world in 2017, of which 596 were caught by Japan and 432 by Norway.

Germany, Italy, the United Kingdom and France share the position of all the member states of the European Union which aims at restoring all stocks to a sustainable level by 2020, by means of the tools of the common fisheries policy. This objective was formalized by the "Marine Strategy Framework Directive" of June 17, 2008, but will not be reached on account of the state of European fishing stocks and notably those in the Mediterranean area. The prospect of an upcoming exit of the United Kingdom from the European Union should lead to reflection on the future of the management of common stocks.

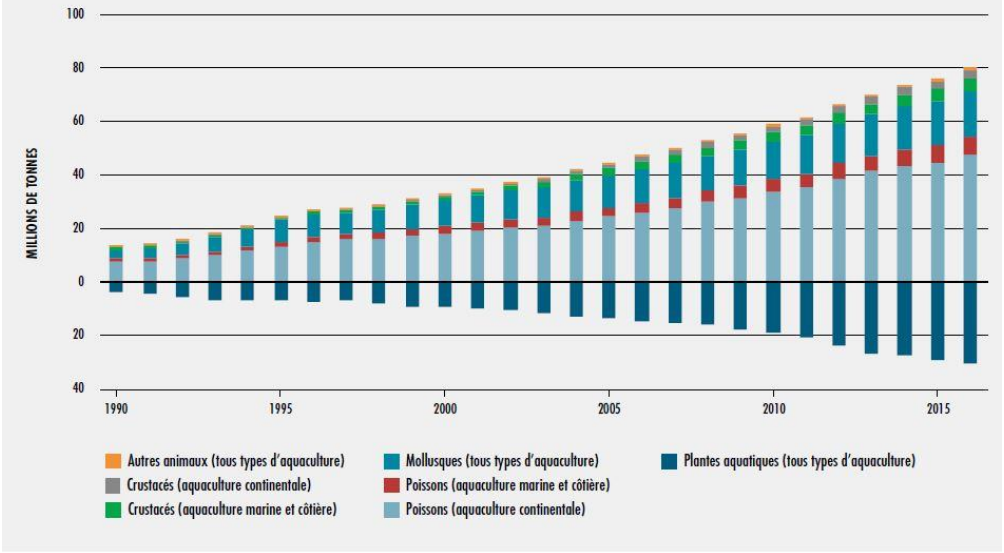
II. AQUACULTURE : AN ECONOMIC OPPORTUNITY TO BE REGULATED

A. WORLD AQUACULTURE PRODUCTION HAS GREATLY INCREASED OVER THE LAST TWENTY YEARS

According to the FAO, in 2016, world aquaculture production was 80 million tons, as opposed to scarcely 15 million in 1990. Thus aquaculture, which was almost non-existant in the 1950s and just about represented 10% of the overall fish production in 1991, had reached a little more than 47% in 2016. As the production of capture fisheries has remained relatively stable since the end of the 1980s, it is, in fact, due to aquaculture that there has been a continual growth in the supply of fish for human consumption.

(31) Report of the Japanese Minister for Agriculture, Forests and Fisheries quoted by the newspaper Asahi Shimbun.

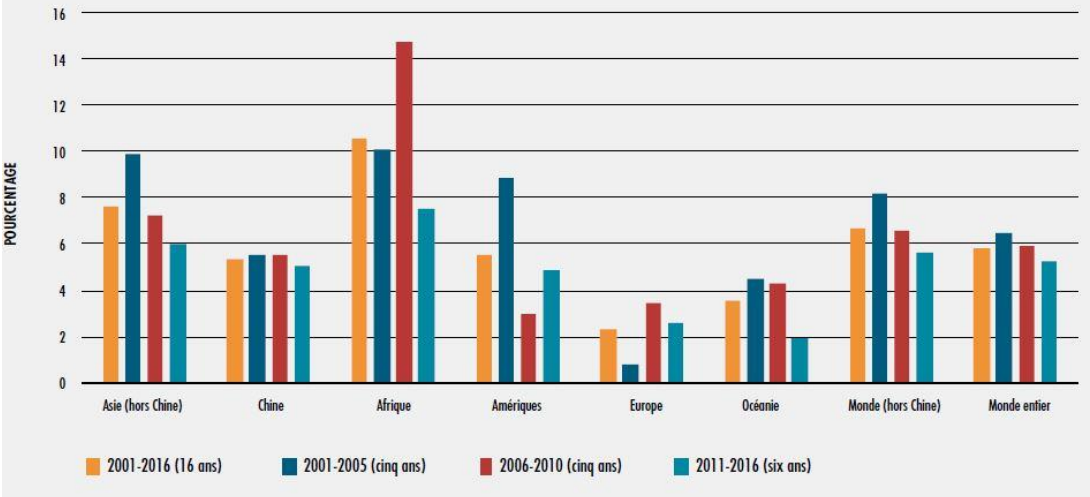
FIGURE 5
PRODUCTION MONDIALE DE POISSON D'ÉLEVAGE DESTINÉ À LA CONSOMMATION ET DE PLANTES AQUATIQUES CULTIVÉES, 1990-2016



Source : FAO, 2018

The European Union is at the origin of 1.3 million tons of aquaculture products [(32)], whilst China produces 61.5 million, Indonesia 15.6 million and India 5.2 million. The main aquaculture-producing countries in Europe are Spain (22.4% of European production), the United Kingdom (16.2%), France (15.8%) and Italy (11.4%).

FIGURE 6
TAUX DE CROISSANCE ANNUEL MOYEN DE LA PRODUCTION AQUACOLE, EN VOLUME (hors plantes aquatiques)



Source : FAO, 2018

(32) European Commission, "The Common Fisheries Policy, in Figures", 2018 edition (page 22).

On a world scale, the aquaculture sector continues to grow more quickly than the other large sectors of food production, even if it no longer has annual growth rates such as those recorded in the 1980s and 1990s (around 10%). The annual average growth of the sector has decreased and was steady at 5.8% over the period 2000-2016. A 2017 study shows that 13 million km² could potentially be used for aquaculture [(33)].

B. A DYNAMIC ECONOMIC SECTOR, WHICH MUST BETTER RESPECT ENVIRONMENTAL CRITERIA

In the world, 19.3 million people live from aquaculture. The main problem stems from the fact that 70% of the world production comes from species which are fed by artificial feedstuffs (oil or fishmeal) [(34)]. Today, 20% of world captured fish are destined for aquaculture.

In addition, aquaculture turns out to be a polluting activity, on account of its use of pesticides, anti-biotics and on a massive scale, oxygen.

Biological aquaculture must therefore be developed. So as to regulate aquaculture production, notably from an environmental point of view, the FAO published a code of conduct for responsible fishing [(35)], which brings together all the requirements needed to frame this activity.

III. TOMORROW : THE HEALING SEA?

The potential impact of the sea on human health is real but remains a challenge for world research. Although the majority of biodiversity comes from the sea, only 10% of the substances used in medicine are of marine origin [(36)]. The discovery in 1969, in the organism of a jellyfish, of substantial quantities of a molecule which scientists had difficulty in synthesizing, led to the birth of the concept of "medicines of the sea". In particular, micro-algae constitute a promising, if under-explored, source of unusual molecules for various applications in the fields of health, of human and animal food supply, of cosmetics and of energy. Their chemodiversity provides the opportunity for developing the pharmacopoeia of tomorrow.

Today it is in cancer treatment that the greatest number of molecules of marine origin are used, notably thanks to the work of the National Cancer Institute in the United States, in cooperation with pharmaceutical companies. Japan has marketed an effective anti-cancer drug which is made up of an extract from a sponge and is used in the treatment of mammary carcinoma. The use of sea products in the formulation of hydrogels for bone reconstruction and the vectorization of osteoinductive material is also possible.

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(33) Rebecca R. Gentry, Halley E. Froehlich, Dietmar Grimm, Peter Kareiva, Michael Parke, Michael Rust, Steven D. Gaines & Benjamin S. Halpern, "Mapping the global potential for marine aquaculture", Nature Ecology & Evolution, 1, pp. 1317–1324, 2017.

(34) Gascuel, Didier, "Fishing and aquaculture : what challenges for the food supply?", in : "The ocean : what are the stakes?", 2016.

(35) http://www.fao.org/fishery/code/fr.

(36) Banaigs, Bernard, "Marine molecules for health and medical research", Institut Océanographique, 2013.

The sea could provide part of the solution to two problems faced by the pharmaceutical industry: the decrease in the number of discoveries of new medicines and the expiry of numerous lucrative patents.

A French company in the process of revolutionizing transplantation techniques

In October 2018, **the Breton company "Hamarina"** received the prize for "start-up" of the year, thanks to the discovery of a hemoglobin in a sea worm, called "arenicola marina", whose properties make it forty times more "oxygenating" than human hemoglobin and which is compatible with the human organism. The potential of this discovery for transplant techniques is huge, as are the many applications it could have on the health market.

How to better fight against pollution so as to better protect our oceans

The state of the planet's oceans is deteriorating. Climate change has already had a considerable effect upon the ocean ecosystems: rise in the temperature of the oceans, melting of sea ice, rise in the sealevel, disruption of meteorological conditions, changes in the ocean currents and the effects of the acidification of the oceans. Such effects are worsened by the pressure linked to human activity, such as over-fishing, the destruction of dwellings and the multifaceted pollution of various origins, which is, mostly, generated upstream of the coastline.

I. MAN-MADE POLLUTION: A GROWING THREAT FOR OUR OCEANS

The contamination of the seas by waste created by humans is present everywhere today, in particular on account of plastic, which makes up 70% to 90% of the waste found in the oceans and on the coasts [(37)].

According to the United Nations Environment Program (UNEP):

- more than 80% of sea pollution comes from the land via rivers or via runoff and discharge along the coastal zones. This can be of diffuse sources (mainly coming from agricultural activities) or of local origin (industrial waste water plants – from refineries, petrochemical and metalwork industries) or urban water treatment plants) [(38)] ;
- thus more than 20% of marine pollutions have their source in sea activities. The most publicized of these are the accidental or deliberate oil spills from ships (degassing, discharge of oil and fuel residue) or the discharge of ballast water. Such discharges may be lawful [(39)], but their volume is proportionate to the

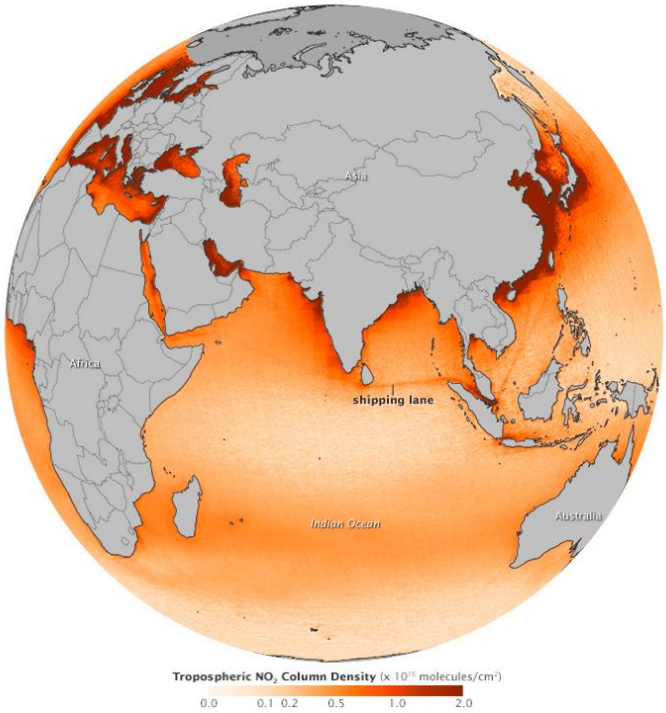
(37) See the file on plastics ("Plastic, the plague of the oceans").

(38) UNEP quoted by the French General Commissariat for Sustainable Development, RéférenceS, May 2011, "Coastal and Marine Environment, Chapter V: pollution and quality of the marine environment", p.105.

(39) International law prohibits the discharge of tank-bottom sludge or of waste oils near the coasts. However, it allows the discharge of low concentrated oily waters (less than 15 parts per million) whatever their quantity. The only limit is that such discharges must be carried out outside of specially defined areas in the framework of the Marpol Convention.

traffic. According to the UNEP, around 3,000 major discharges take place every year in European waters through which a substantial amount of world maritime transport transits [(40)]. The loss of cargoes, nets, ropes and lines, as well as the dumping of waste, are also large sources of pollution. On top of this must be added airborne emissions: combustion of engines (lead, sulphur) and of incinerators (aromatic compounds).

A satellite view of shipping pollution [(41)] (2005-2012)



Given the diversity of their sources, pollutants come, themselves, in a variety of forms:

- aquatic waste (bags or microparticles coming from plastic waste, containers fallen from a ship etc.);
- oil slicks, organic material, nitrates, heavy metals (cadmium, brass, lead, mercury, nickel, zinc);
- residues of medicinal products, pesticides etc.

(40) UNEP quoted by the French General Commissariat for Sustainable Development, ibidem, p. 109.

(41) The data of the Ozone Monitoring Tool (OMT) built by the Netherlands and Finland on the NASA satellite Aura, indicate long traces of high levels of nitrogen dioxide (NO2) along certain shipping lines. NO2 is part of a group of oxides which are highly reactive, known as NOx, which can lead to the production of fine particules and ozone which damage the cardiovascular and respiratory systems of human beings. Combustion engines, such as those which drive ships and motor vehicules,are a major source of NO2 pollution. The above map is based on the measurements of the OMT between 2005 and 2012. Earth Observatory, NASA (https://earthobservatory.nasa.gov/images/80375/a-satellites-view-of-ship-pollution)

The French Marine Science Research Institute (IFREMER) recalls that 60,000 synthetic chemical substances have been dispersed into the environment purposefully, by accident or by negligence, some of these end up, directly or by river, in the oceans thus threatening the lives of living organisms [(42)].

On a world scale, oceanographic studies have led to locating substantial concentrations of waste (gyres) in the North Pacific covering several hundred thousands of km² and, more recently, in the Atlantic, off the North American coast. The *Sea Education Association* estimates the average density at 200,000 fragments per km² in the Atlantic gyre, and 300,000 in the Pacific where one can find, on average, 5kgs of waste per km²; waste which can be found even in the deepest oceanic waters [(43)].

The effect of such waste is unequivocal: threats to the biodiversity of the oceans, to the humans whose livehood depends on this and, in the end, to the oceans themselves. The impact of pollution linked to oil usage, is, in itself, substantial and complex, and needs to be imagined over the long term. The quickest consequences, and the most visible ones, are the deaths of birds and of mammels covered in the oil which washes up on the coasts [(44)]. The oil can have long term ecotoxicological effects on the whole food chain starting with the phytoplankton and going as far as the end consumers.

With a lifespan, especially in the sea, which can be very long [(45)], aquatic waste has substantial impact on the fauna, depending on the nature of the waste (size, composition, shape etc.) and the habits of animals (feeding behavior, habits, interest etc.). Nets, fishing lines, ropes and certain plastic packaging are the main causes of the strangulation and the suffocation of sea turtles, birds and marine mammals. Studies show that this concerns annually between 0.2% and 1.3% of the world populations of fur seals and sea lions [(46)]. However, ingestion causes the greatest damage to the largest number of species. Studies carried out on stranded sea turtles in the western Mediterranean basin have shown that nearly 80% of them have debris in their stomachs [(47)].

Micropolluants disrupt the physiology of the species and become concentrated in the sediment and along the food chain right up to human beings. The suspended matter can suffocate ecosystems of great significance: the nutrients lead to the proliferation of macroalgae, such as sargassum, and of phytoplankton. When added to the effects of climate change, the eutrophication of the waters, which results from the intensification of human activities affecting the coastal zones, leads to a large-scale deoxygenation of our oceans.

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(42) Lecture by G. Bocquené, Ifremer, 2012.

(43) F. Galgani et al, A Clean Sea – Mission Impossible, 70 keys to understanding sea waste, Éditions Quae, 2013.

(44) The oil slick of the Erika, for example, could possibly have caused the death of between 200,000 and 300,000 birds, according to the French Bird Protection League (LPO). An article by L. Laubier, published in "Natures Sciences et Sociétés 12" in 2004, quotes the results of several toxicological studies carried out on the consequences of the catastrophe: between 64,000 and 125,000 common guillemots were, in particular, killed.

(45) The NOAA (National Oceanic and Atmospheric Administration, United States) estimates that of aliminium cans to be 200 years and that of plastic bottles to be more than 44 years.

(46) Bolan et Donohue, 2003, quoted by the French General Commissariat for Sustainable Development, ibidem, p. 116.

(47) P. Casale et al, Biases and best approaches for assessing debris ingestion in sea turtles, with a case study in the Mediterranean, Marine pollution bulletin, volume 110, September 15, 2016.

Whilst the deoxygenation of the oceans was indeed discussed in the 2014 report of the Intergovernmental Panel on Climate Change (IPCC), the global nature of this emerging threat has not yet been fully recognized and has not been included on the agenda of political figures nor of stakeholders, at a world level.

Finally, oil spills have a direct impact upon the economy and human activities such as fishing, shellfish aquaculture or tourism, and the huge presence of waste on beaches requires periodic, sometimes daily, cleaning-up during the summer season. Over and above their cost for public finances, such clean-ups, often with mechanized equipment, lead to the disappearance of ecological niches in the zones of the high water marks (products of the accumulation of natural or human debris).

II. BETTER COORDINATION BETWEEN LOCAL SOLUTIONS AND GLOBAL ACTIONS IS NECESSARY

The member states of the G7 act at different levels against waste, notably plastic waste. In April 2018, London hosted the 72nd session of the Marine Environment Protection Committee of the International Maritime Organization, which led to the adoption of the "Initial strategy on the reduction of greenhouse gas emissions from ships" (48), which made provision, in particular, for the reduction of the total annual volume of greenhouse gases, by, at least, 50% by 2050, in comparison with 2008, whilst continuing the action being carried out in the perspective of progressively eliminating them.

In accordance with the 2008 "Marine Strategy Framework Directive" (49), the **member states of the European Union** have been led to take various measures to rediscover "*the good environmental status*" of all the Union's marine environments by 2020 (50). The new strategy against plastic waste, adopted by the European Commission in January 2018, constitutes a supplementary step in the investment of Europe in the oceans.

In February 2016, the **countries of the Mediterranean** (including France and Italy) adopted a regional strategy for the prevention of, and the fight against, marine pollution coming from ships (51). It makes provision, in particular, for the possibility of having the Mediterranean Sea recognized as an **Emission Control Area** (52), like certain areas in Canada, the United States, the Channel-North Sea and the Baltic. Stronger regulations on nitrogen oxide and sulphur oxide emissions apply there to ships (for example, in the case of sulphur oxide, the sulphur content of marine fuel is fixed at 0.1%). The creation of such a zone depends upon an impact study and France has taken the initiative to carry out such a study for the whole Mediterranean.

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(48) http://www.imo.org/fr/MediaCentre/MeetingSummaries/MEPC/Pages/MEPC-72nd-session.aspx.

(49) Directive 2008/56/EC of the European Parliament and of the Council of June 17, 2008 setting up a framework for community action in the field of policy for the marine environment.

(50) Report of the Commission to the European Parliament and to the Council. Assessment of the measurement programs of the member states within the "Marine Strategy Framework Directive", 2018.

(51) https://web.unep.org/unepmap/fr/strat%C3%A9gies.

(52) ECA Zone.

Germany: The reply of Germany to the 2008 framework directive can be seen in the following measures: the drawing-up of protected marine areas; the management of ballast waters and the discharge of waste waters from ships; the introduction of nitrogen oxide monitoring zones. The limiting of nutrient, nitrate and other contaminant flows would be more based upon the implementation of European directives on water, nitrates, urban wastewater and of the REACH regulation (53) than upon a strategy for the reduction of pesticides.

Canada *(Oceans of Canada : Our Strategy)*: Canada has implemented several important initiatives for the reduction of plastic and marine waste as well as of plastic pollution (54). In addition to the objectives linked to plastics, the national plan for "healthier, cleaner and securer" oceans, has fixed the following aims:

- The setting-up of partnerships for the cleaning of shores;
- Combatting ghost fishing.

The United States: The "Joint Marine Pollution Contingency Plan" with Canada proposes a coordinated mechanism for planning, preparation and intervention in the event of pollution incidents affecting the two countries in the waters of their bordering coastlines and of the Great Lakes region. This would be triggered in the case of all types of marine pollution (ships, sea platforms, spillages of unknown origins etc.).

Italy: Italy has taken measures similar to those implemented by Germany in replying to the requirements of the 2018 framework directive.

Japan: The "Fundamental Law on Marine Policy", adopted in 2007, led to the drawing-up of twelve avenues for improvement – amongst them the conservation of the marine environment (55). Its implementation is carried out through a steering committee chaired by the Prime Minister, a specific secretariat and action plans over successive five-year periods. Concrete examples of action based on this law are the facilitation of access to information on marine issues, a strategy of conservation of marine biodiversity and stricter measures for the inspection of shipping.

The United Kingdom: The United Kingdom is committed to respecting the objective of a "good environmental status" of all marine environments set out in the 2008 "Marine Strategy Framework Directive".

(53) Regulation (EC) nº 1907/2006 of the European Parliament and of the Council of December 18, 2006 concerning the recording, the assessment and the authorization of chemical substances, as well as restrictions applicable to such substances (REACH).

(54) See the file on plastics ("Plastics, the plague of the oceans").

(55) The scope of this law does not cover the issue of plastics, dealt with as of 2019. See the file on plastics: ("Plastics, the plague of the oceans").

France: France has been at the origin of certain decisions taken on an international scale to reduce polluting emissions linked to shipping as well as encouraging regulation in the field [(56)]. The main action is the lowering of the sulphor level to 0.5% by 2020. This limit is today at 3.5%. Another key action is the encouragement of liquified natural gas (LNG) as fuel for ships. This would lead to the abolition of sulphor dioxide and particles and to the drastic reduction in nitrogen dioxide emissions. Actions are also being developed in maritime harbours, such as the provision of electrical connections on the quays for boats or bonuses for "virtuous" ships etc.

Nonetheless, the oceans have no physical boundaries and the individual action of states is legally limited to the waters under their jurisdiction. Broader and more concerted action seems, more than ever, a vital necessity for marine ecosystems.

(56) Ministry for Ecological and Inclusive Transition, January 2019.

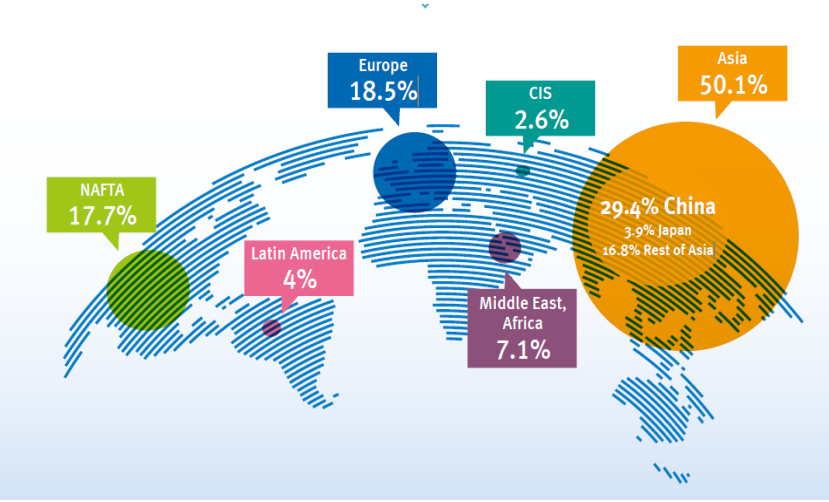
Plastic, the plague of the oceans

Plastic has, for a long time, been presented as a material with a very high potential on account of it properties: it is light, mouldable, durable and resistant. Seventy years after it was first introduced, the difficulties its usage raises are nonetheless numerous. The prevention of plastic pollution in the oceans is an extremely complex question whose solution is to be found essentially on land and involves the right coordination between global and local actions.

I. ONE OF THE "BIGGEST ENVIRONMENTAL PLAGUES OF OUR TIME" (57)

A. THE EXPONENTIAL INCREASE IN THE PRODUCTION OF PLASTIC PRODUCTS

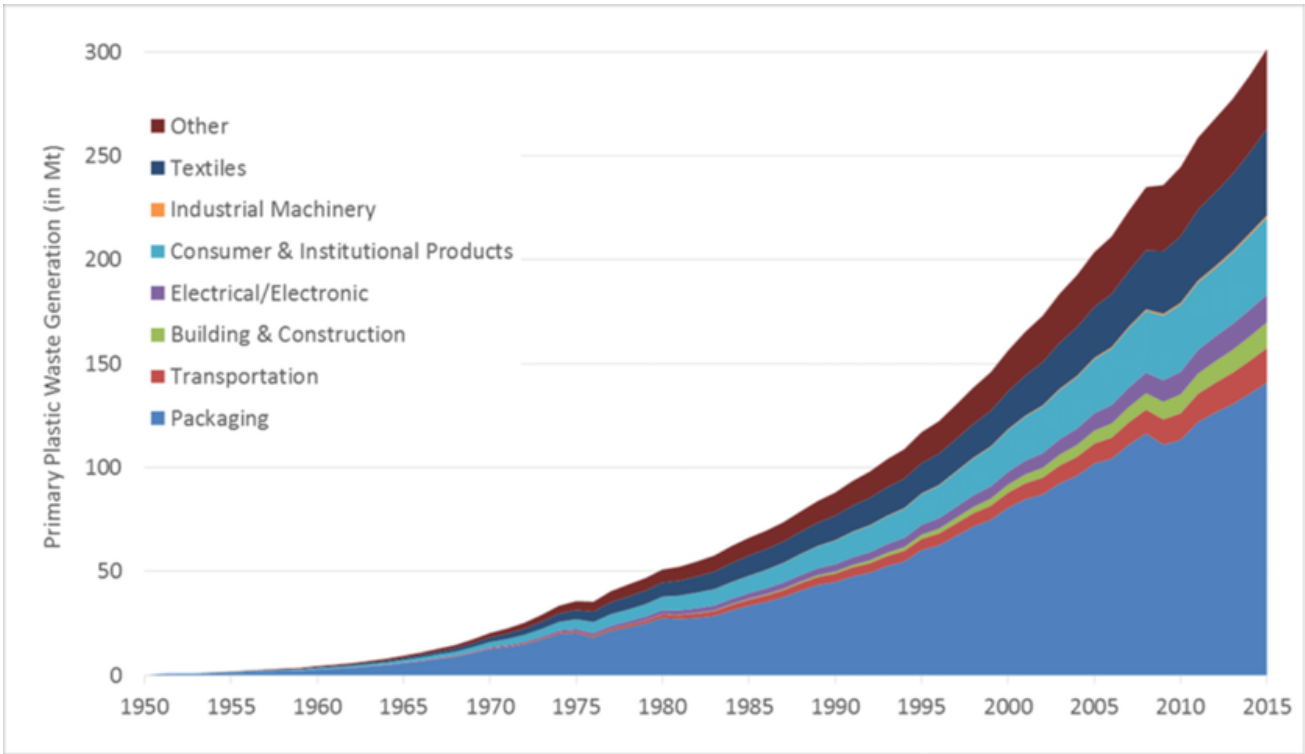
The annual production of plastics today exceeds 350 million tons (58). China is the largest producer in the world, followed by Europe and North America (the United States, Mexico and Canada).



Source : Plastics – the Facts 2018. An analysis of European plastics production, demand and waste data (PlasticsEurope market research group (PEMRG) / Conversio market & strategy GmbH).

(57) UNO Environment, June 2018.

(58) According to the study, "Plastics – the Facts 2018", this production was 335 million tons in 2016 and 348 en 2017.



Source : Production, use and fate of all plastics ever made, Roland Geyer, Jenna R. Jambeck and K.ara Lavender Law, Sciences Advances, vol 3/7, July 1, 2017 [(59)].

B. ALMOST HALF OF PLASTIC PRODUCTS ARE TRANSFORMED INTO WASTE IN LESS THAN THREE YEARS

Researchers have shown that between 4.8 and 12.7 million tons of plastic waste reached the oceans in the year 2010 alone [(60)]. Using the discharge of rivers, other researchers have demonstrated that at least 8 million tons of such waste reach our seas each year [(61)]. At this rate, by 2050, when the world population will be close to 10 billion, there will be as many tons of plastic in the oceans as tons of fish [(62)].

- *Marine macro waste : the tip of the iceberg*

The most common marine debris is made up of plastic and synthetic materials which have disastrous effects upon marine life and seabirds.

75% of marine plastic waste sinks [(63)]. The other 25% floats in the ocean currents. Some of it can wash back up on the shore a few hundred or a few thousand kilometers away, but the

(59) These researchers estimate that 8,300 million tons of plastic have been produced in the world since the 1950s and that they have generated more than 6,300 million tons of waste, of which merely 9% have been recycled, 12% incinerated, whilst the remaining 79% are either in dumps or in the environment.

(60) J. R. Jambeck, R. Geyer, C. Wilcox, T. R. Siegler, M. Perryman, A. Andrady, R. Narayan, K. L. Law, Plastic waste inputs from land into the ocean. Science 347, 768–771 (2015).

(61) Christian Schmidt, Tobias Krauth, and Stephan Wagner, Export of plastic debris by rivers into the sea, Environmental Science & Technology (2017).

(62) Jenna Jambeck and others, Plastic waste inputs from land into the ocean, Science (2015) and World Economic Forum, "The New Plastics Economy. Rethinking the future of plastics", January 2016 (page 7).

(63) The Sea Cleaners Association.

most substantial part will continue to float and break up through the force of the ocean and will be transformed into micro waste (> 5 mm) and then into nano waste.

- *Micro- and nanoplastics : what is hiding beneath the surface?*

Many plastics are very absorbant and can attract other contaminants such as heavy metals, chemical substances which disrupt the endocrine function and persistent organic pollutants through the food chain. *"The contaminants have potential and documented negative effects on marine life, our well-being and our health"* (64): these substances can have a range of harmful effects on humans and animals, especially causing congenital anomalies, difficulties with cognitive development, problems of sterility and various types of cancer.

II. TO PROTECT THE OCEANS, EVERYONE HAS THEIR ROLE TO PLAY - BUT HOW TO GET EVERYONE ON BOARD?

A. ON AN INTERNATIONAL SCALE, MORE AND MORE DECISIVE ACTION IS BEING TAKEN, BUT IT REMAINS NON-BINDING

Around 90% of the plastic waste floating in the oceans comes from ten major rivers, of which eight are in Asia (the Yangzi, Indus, Yellow River, Hai He, Ganges, Pearl River, Amur and Mekong) and two in Africa (the Niger and Nile) (65). A substantial amount of such waste is to be found in international zones. The answer must thus, first of all, be sought at this particular level.

At the meeting of the Ecology ministers of the G7 countries in Halifax, Canada, in June 2018, a non-binding Charter on plastics in the oceans was approved by five of the seven member countries (Canada, Italy, the United Kingdom, Germany and France), as well as by the European Union.

The United Nations Organization organized, for 2019, a world campaign against plastic pollution. Last March, a resolution calling for the abolition of single-use plastics was adopted during the fourth United Nations Environment Assembly (UNEA-4):

"*We will address the damage to our ecosystems caused by the unsustainable use and disposal of plastic products, including by significantly reducing single-use plastic products by 2030, and we will work with the private sector to find affordable and environmentally friendly products".*

(64) European Environment Agency, 2019.

(65) Christian Schmidt, Tobias Krauth, and Stephan Wagner, Export of plastic debris by rivers into the sea, Environmental Science & Technology (2017).

B. ON A NATIONAL SCALE : ACTING ON THE GROUND IN A MORE EFFICIENT WAY USING GLOBAL STRATEGIES

Significant results are beginning to appear: according to the data published by the United Nations for World Environment Day in 2018 [(66)], 127 countries had by then passed legislation regulating the use of plastic bags. 27 of them had done so through the introduction of a tax on the production of such bags and 30 by making consumers pay for them. 27 states also introduced legislation prohibiting certain products, materials or types of plastic production and 8 specifically banned microplastics. In addition, 63 states introduced a system of enlarged responsibility for the producer which was aimed at single-use plastic products. [(67)]

So that waste does not get into the oceans, the priority is to reduce its production and to improve its collection on land. Every actor has a role to play:

- Scientists work specifically on packaging made of biodegradeable polymers, often natural in origin: starch, cellulose, polylactic acid;
- The committment of politicians is necessary to reach the objectives for waste management (collection, sorting and disposal) more quickly;
- Industrialists, producers and users of plastics must develop "good practices" which can be stimulated by legislation, by participating in collective actions of prevention and of waste disposal;
- Finally, the education and the raising of the awareness of the general public are, of course, essential.

In order to harmonize such actions, the most forward-looking states are adopting global strategies which combine regulation and consultation with companies. They have in common the prohibition of certain products and obligations for recycling.

III. THE COUNTRIES OF THE G7 AND THE FIGHT AGAINST MARINE PLASTIC WASTE: BROADLY SHARED OBJECTIVES, RECENT POLICIES

The European states of the G7, Canada and, more recently, Japan have made the reduction of plastic waste a priority.

● **Germany,** which is the first producer and consumer of plastic in Europe, has the highest plastic waste recycling rate in the European Union in tons [(68)] (twice as high as the French rate, even though the countries generate, more or less, the same quantity of plastic waste): over close on thirty years, with the modernization of its separation and recycling centers, this rate has progressively reached 50%.

(66) UNO, "The State of Plastics", World Environment Day Perspectives, 2018 (1st part : "governements").
(67) https://wedocs.unep.org/bitstream/handle/20.500.11822/27113/plastics_limits.pdf.
(68) http://www.europarl.europa.eu/news/fr/headlines/society/20181212STO21610/dechets-plastiques-et-recyclage-dans-l-ue-faits-et-chiffres .

● **Canada** has undertaken substantial efforts on both an international and a national scale:

- The Canadian presidency of the G7 in 2018 was very active on this subject;
- The first world conference on the sustainable blue economy;
- The joint ministerial session of the G7 on the "Health of the oceans, the seas and resilient communities";
- A national plan for "Healthier, cleaner and safer" oceans [(69)] which aims at allowing Canada to progress towards a national strategy of zero plastic waste, at joining the United Nations "Clean Seas" campaign to eliminate single-use plastic objects (in particular the prohibition of single-use plastic objects as of 2021), at investing 100 million dollars so as to prevent plastic from making its way into the oceans and at establishing partnerships for the cleaning-up of the shores.

● The **United States** has adopted a different policy which aims at sub-contracting its plastic waste management massively to China (4 000 containers of recyclable plastic leave the Unites States daily on their way to China [(70)]) and is opposed to measures which would restrict this practice. In particular, in May 2019 it opposed the reinforcement of certain provisions of the Basel Convention on the strengthening of the reduction of cross-border movements of waste [(71)]. The Trump administration, nonetheless, committed itself at the beginning of June, 2019, before the American Senate, to not oppose international efforts aimed at reducing the plastic pollution of the oceans [(72)].

● In **Italy**, the "Save the Sea" bill, approved by the Italian Council of Ministers on April 4, 2019, constitutes an interesting experiment in finding ways for close cooperation with fishermen in the preservation of maritime areas. Italy had been particularly struck by the discovery in Sardinia, at the beginning of the month of April, 2019, of a pregnant whale which had died because its stomach was filled with 22kgs of plastic [(73)]. The Italian bill would oblige fishermen to bring back to dry land any plastic caught up in their nets. Until now, on the contrary, they were obliged to throw such waste back into the sea, on account of the existence of a criminal offence for "the illegal transport of waste". Italy has made it clear that this bill will be definitively passed when the definitive implementation of the European directive aimed at prohibiting single-use plastic products takes place. The management of the waste collected at sea would thus be covered by a part of the tax on waste collection, whereas it was previously paid for not only by the port authorities but by the trawlers themselves. In addition, Italy launched an experiment in the Adriatic during the summer.

(69) https://pm.gc.ca/fra/nouvelles/2018/12/31/canada-conclut-presidence-du-g7-reussie.
(70) https://eu.usatoday.com/story/news/nation-now/2018/06/21/china-ban-plastic-waste-recycling/721879002/.
(71) https://www.ecologique-solidaire.gouv.fr/transferts-transfrontaliers-dechets.
(72) Hearing of Mike Pompeo June 1, 2019 before the Senate.
(73) https://www.nationalgeographic.fr/animaux/une-baleine-enceinte-ete-retrouvee-morte-lestomac-rempli-de-plastique.

● **Japan**, which is the second world producer of plastic waste per capita after the United States, has, up until the moment, taken few measures specifically dealing with the reduction of single-use plastic. Nonetheless, at the end of May 2019, Japan unveiled a program for the reduction of plastic waste which pollutes the oceans [(74)]. Japan's objective is to recycle 100% of new plastic before 2035 and to develop biodegradeable replacement solutions. There will be a charge for plastic bags, although neither the date for the implementation of such a measure is mentioned, nor whether all retail outlets will be concerned.

The final declaration of the G20 of Osaka makes direct reference to the issue of plastic and, in particular, its impact upon the oceans [(75)], calling the states of the world to share the "Osaka Blue Ocean Vision" aimed at reducing "*additional pollution by marine plastic litter to zero by 2050 through a comprehensive life-cycle approach that includes reducing the discharge of mismanaged plastic litter by improved waste management and innovative solutions while recognizing the important role of plastics for society"* [(76)].

● The **United Kingdom** announced at the beginning of January 2018 the implementation of a plan, very similar to the French one, for the global struggle against plastic waste [(77)], aiming to eliminate all "avoidable" plastics before 2025. After the general implementation of charging for plastic bags in all stores throughout the country in January 2018, a series of other provisions were being discussed last summer: the implementation of a deposit system for plastic bottles (only 43% of the 13 billion plastic bottles used every year in the country carry a deposit); the general prohibition of single-use plastics such as cotton buds, tea/coffee stirrers and straws.

In addition, around forty of the big producers and suppliers wished to demonstrate their commitment by signing the "UK Plastics Pact" [(78)], launched by the sustainable development group called Waste and Resources Action Programme (WRAP). The signatories commit themselves to having 100% of their plastic packaging reusable, recyclable or compostable before 2025 and that by then, 70% of their packaging should be, in reality, recycled. In the future, packaging must contain, at least, 30% recycled material. Finally, the large companies which have signed this pact have committed themselves to eliminating the use of plastic "in cases which pose a problem or in which it is useless", such as over-packaging.

(74) Memorandum of the Regional Economic Department of the General Direction of the Treasury, "A new strategy to fight against plastic waste in Japan", June 2019: https://www.tresor.economie.gouv.fr/Articles/2019/06/18/une-nouvelle-strategie-de-lutte-contre-les-dechets-plastiques-au-japon.

(75) Point 39 of the final declaration. : "We reiterate that measures to address marine litter, especially marine plastic litter and microplastics, need to be taken nationally and internationally by all countries in partnership with relevant stakeholders".

(76) Point 39 of the final declaration.

(77) https://www.livingcircular.veolia.com/fr/industrie/au-royaume-uni-la-lutte-contre-la-pollution-plastique-sintensifie.

(78) http://www.wrap.org.uk/content/the-uk-plastics-pact.

● **France** has been committed for nearly ten years, since the environmental agreement referred to as the "Grenelle de l'Environnement", to this particular policy, by regularly toughening its laws, notably:

- Law n° 2015-992 of August 17, 2015 on energy transition towards green growth prohibiting the use of single-use plastics and certain containers;
- Law n° 2016-1087 of August 8, 2016 on the "reconquest" of biodiversity, of nature and of the countryside which prohibits plastic microbeads in certain cosmetics and extends the prohibition of containers;
- The "Roadmap for a circular economy" dating from 2018 (79) which speeds up this trend and whose legislative measures are included in the bill on wastage and for the circular economy which will soon be examined by the French Parliament. This roadmap makes provision, in particular, for the objective of 100% recyclable packaging by 2025, for the acceleration of the collection of plastic bottles and of cans (the new generation of "solidarity deposits"), for the limiting of the use of expanded polystyrene for food and drinks containers, for the installation of filters to recover plastic particles and for the extension of the polluter pays principle to professional packaging.

(79) *https://www.ecologique-solidaire.gouv.fr/feuille-route-economie-circulaire-frec.*

The coasts and climate change

Our coastlines are, by definition, shifting. Their outline and their characteristics are subject to the considerable strength of the sea, the wind and telluric movements: a shoreline in a specific place may gain or lose in size due to marine erosion or coastal flooding. Nature but also Man can be at the origin of such movements. Our shorelines are places for contact and for exchange: almost 2.4 billion people (around 40% of the world population) live less than 100 kms from the coast and more than 600 million people live in coastal zones less than 10 meters above sealevel [(80)]. But, coastal regions are also home to some of the planet's richest natural environments.

The rise in the level of the seas, accelerated by climate change, has been the subject of great attention at an international level since the 1990s. However, it is difficult to project into the future and attempt to understand the magnitude of the upcoming phenomenon. Protection measures, scientific oversight and alert mechanisms all, naturally, have a cost. However, preparing to adapt to climate change is necessary.

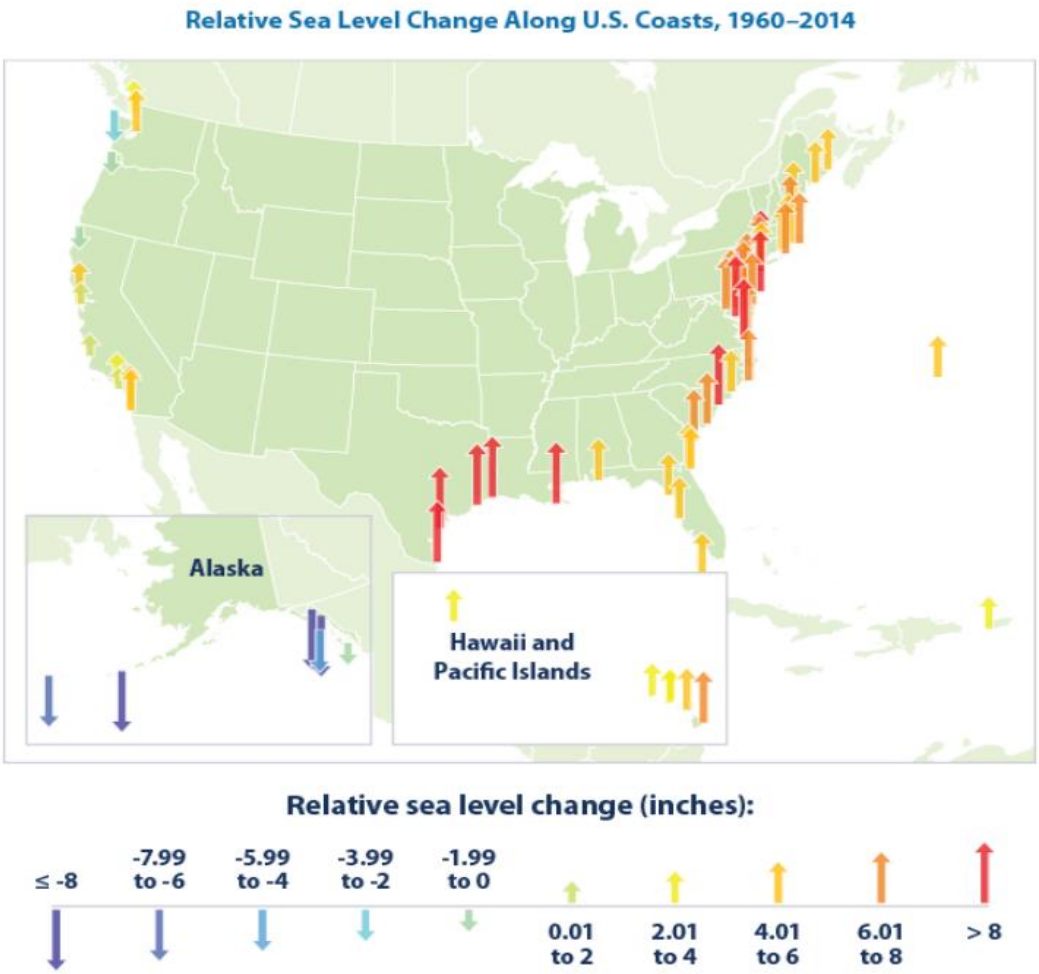
In this field, scientific knowledge is for the moment insufficient and it therefore is a major challenge, as its development is a prior condition for efficient, global, public policies.

I. DO WE UNDERGO OR DO WE ADAPT?

With the announcement of the rise in the level of the seas and the increase in the frequency and the intensity of storms, the retreat of the coastline is a phenomenon which citizens and public authorities, throughout the world, must deal with more and more often. Every type of coastline is liable to modification on account of climate change, whether they be coastlines in their natural state (sandy coasts, rocky coasts, mangroves etc.) or populated coastlines.

The human, material, economic and environmental consequences of climate change on coastal regions are already being felt. The island nations of the Pacific, of the Caribbean and of the Indian Ocean have already been affected, but so also has, for example, the United States, by the variation in the level of the seas in various coastal areas. The following map was drawn up in 2015 by the American Federal Environment Protection Agency (EPA):

(80) United Nations Ocean Conference (June 2017), "Factsheet : people and ocean" : https://www.un.org/sustainabledevelopment/wp-content/uploads/2017/05/Ocean-fact-sheet-package.pdf.



A change in physicochemical balances in the oceans has also been observed, in particular a warming and an acidification of the waters. The rise in the level of the seas could bring about the worsening of two forms of erosion: one-off erosion due to flooding and definitive erosion which leads to a lasting retreat of the coastline. Continuous coastal retreat affects numerous countries. For example, according to the cartographic studies of the French Institute for the Environment (IFEN) published in October 2007, erosion affects, to varying degrees, the majority of stretches of coastline in Europe; 22.8% of the Italian coastline, 17.3% of the British coastline and 12.8% of the German coastline are receding on account of erosion. This phenomenon leads to three types of risk: the loss of land with an economic, social or ecological importance; the rupture of natural coastal defences (cliffs, sand dunes etc.) leading to the flooding of retreating lands; the undermining of protection structures which leads to the same phenomenon of flooding.

The rise in atmospheric temperatures and in the temperatures of the seas and of the oceans has effects which can already be seen on the biodiversity of the coastlines, as is shown by the studies of the IPBES [(81)].

(81) Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES); this scientific forum brings together 127 states.

The works of the sixth assessment cycle of the International Panel on Climate Change (IPCC) [(82)] drew up projections for 2100 according to the different scenarii of CO^2 emissions. The temperatures could rise from 1.1°C to 4.8°C by 2100 and the level of the seas from 26 to 82 cms (with substantial regional variations). This rise in sealevel would bring about serious changes to ecosystems and to the conditions of agricultural production, particularly on account of the salinization of soils, as well as a probable increase in the number of extreme weather events which would lead to an accentuation of the phenomena of coastal erosion and of marine flooding. As of 2040, a rise in the ocean levels of 30 centimeters is expected in South-East Asia.

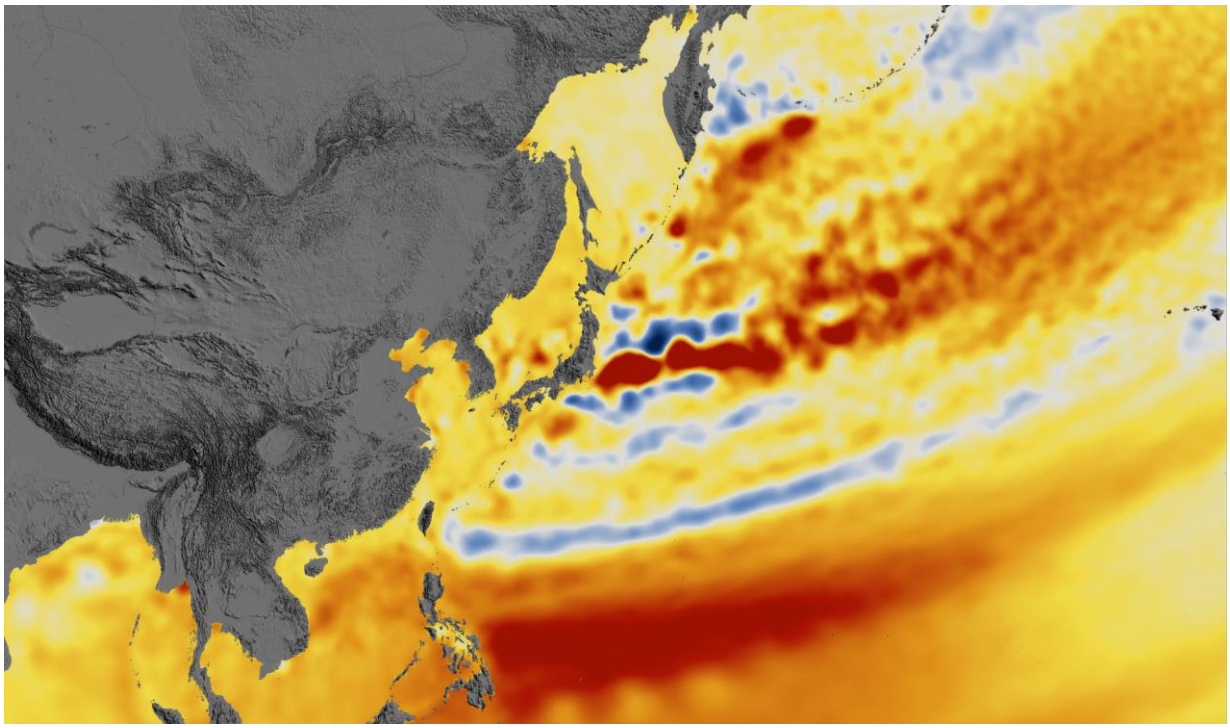
In this respect, the situation of Bangladesh is a prime example. The number and the intensity of the cyclones which strike the country, situated at sealevel, continue to increase: in the period from 1947-2016, there were as many recorded cyclones as during the previous four centuries. This comes on top of the rise in the level of the ocean which puts agricultural production supporting 70% of the population, under pressure. The growing lack of food and health safety, as well as of financial security, have led to fears of large population movements on an Indian sub-continent which is already subject to extremely high demographic pressure. These fears create immense tension between Bangladesh and its direct neighbor, India.

II. ACTIONS UNDERTAKEN

Scientific understanding of the developments on our coastlines, the size of such developments and the assessment of the associated risks are far from being comprehensive, but numerous organizations are working on these subjects. From the beginning of the 1990s, the level of the seas has been measured in a precise way using elevation images from satellites, thanks, in particular, to close cooperation between the United States, the European Union, China and India. The images gathered by these satellites enables the drawing-up of maps such as the following one, which illustrates the elevation of the sea over the period 1992-2014, along the Chinese and Japanese coasts (source : NASA [(83)]) :

(82) Special report of the Intergovernmental Panel on Climate Change (IPCC) on the impact of a global warming of 1.5° above the pre-industrial level (October 2018).

(83) https://earthobservatory.nasa.gov/images/91746/sea-level-rise-is-accelerating.



The international charter "Space and Major Disasters", created in 2000, organizes cooperation between 17 national agencies which possess satellite data on catastrophes of either natural or man-made origin.

The regulating of urbanization and of economic activities along the seashore is a crucial element which falls within the remit of national legislators.

Information on the climate risks and the raising of the awareness of the populations is also of extreme importance in order to better anticipate the consequences of climate change.

As regards marine ecosystems, the IPBES recommends, in particular, an ecosystem-approach to fishing and the development of protected marine areas.

Traditional protection against erosion uses levees, polders or other such structures whose aim is to protect coastal housing and agricultural zones. In France, for example, 18% of the coastline is protected by harbor areas, dykes, embankments or rockfill. The City of Saint Petersburg (Russia) strengthened, in 2012, its dam-protection structures [(84)]. The City of Shanghai (China) built more than 500 kms of protective barriers against the rise in sealevel [(85)].

(84) "St Petersburg dam is holding back the floods, for now", in The Moscow Times (February 21, 2019): https://www.themoscowtimes.com/2019/02/21/st-petersburgs-dam-is-holding-back-floods-for-now-a64066.

(85) "Shanghai takes measures against rising sea levels", in GBTimes, December 7, 2015 : https://gbtimes.com/shanghai-takes-measures-against-rising-sea-levels.

There are other techniques to mitigate the fragilization of the coastlines, without, nonetheless, completely stopping erosion or flooding: the replenishment of beaches with sand, planting in order to stabilize the dunes, the creation of "buffer" zones between the shore and the area given over to economic activities, etc.

Certain coastal areas are the subject of fruitful international cooperation. This is the case, for example, of the Wadden Sea, a coastal wetland ecosystem whose integrated management and conservation are carried out through cooperation between three states (**Germany**, The Netherlands and Denmark) which supplements the protection measures taken by each state individually.

In **Canada**, all the provinces and all the territories of the coastal regions have drawn up strategies or adaptation plans which explicitly include reference to coastal issues [(86)]. For example, Nunavut, the North-Western Territories and the Yukon have all adopted an adaptation strategy which underlines the importance of taking into account coastal erosion in planning and which includes a mechanism for the exchange of knowledge.

In the **United States**, the *Coastal Zone Management Act (CZMA)*, dating from 1972, was strengthened in 1990. After Hurricane Katrina, innovative practices were implemented to strengthen the security of the coasts. Parts of the fragile levees were, first of all, consolidated or rebuilt. But, in particular, large-scale works were undertaken with notably, the adoption, in 2012, of "*Louisiana's Comprehensive Master Plan for a Sustainable Coast"* (updated in 2017). The cost of its implementation is estimated at 50 billion dollars. By bringing together the know-how of engineers and scientists, this program makes provision for innovative investments spread out over several years. In addition to the protection of levees, more structural measures have been undertaken such as the stabilization of banks, the creation of barriers and reefs, the restoring of island barriers and the construction of infrastructures.

The role of regional initiatives is also crucial in **Italy** [(87)], particularly in Liguria (the territorial coastal coordination plan was adopted in 2000) and in Emilia-Romagna (guidelines for the integrated management of coastal zones, adopted in 2005).

In **Japan**, following the 2011 tsunami, the construction of 450 kms of concrete dykes began along the coast to raise or to replace the previous seawalls.

France, with its exclusive economic zone of more than 10 million km², and 19,200 kms of coastline, has the second largest maritime area in the world (after the United States but before Australia). It is particularly concerned by these developments, especially in its overseas territories. French coastal communities saw their resident population increase by 41% on the continental French coastlines and by 89% in the overseas departments, between 1961 and 2010. Around 30% of the coastline is artificialized. Erosion has a significant effect on 27% of the continental French Coast (and in all 20% of the European coastline), according to the studies of the French Goelogical and Mining Research Bureau (BRGM).

(86) Government of Canada, report: "Canada's Coastline and Climate Change"(2016) : https://www.rncan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/files/pdf/NRCAN_fullBook_f_WEB-72dpi.pdf.

(87) "State-regional Relations in Italian Coastline Policy" (J. Rochette), in "Revue géographique des pays méditerranéens", n° 115 (2010) : https://journals.openedition.org/mediterranee/4982#tocto2n4.

In February 2017, the state adopted a national strategy for the sea and for the shoreline, setting down several long-term objectives, notably concerning the ecological transition for the sea and for the coastline, the development of a sustainable “blue economy”, the good ecological state of the marine environment and the preservation of the attractiveness of the French coastline.

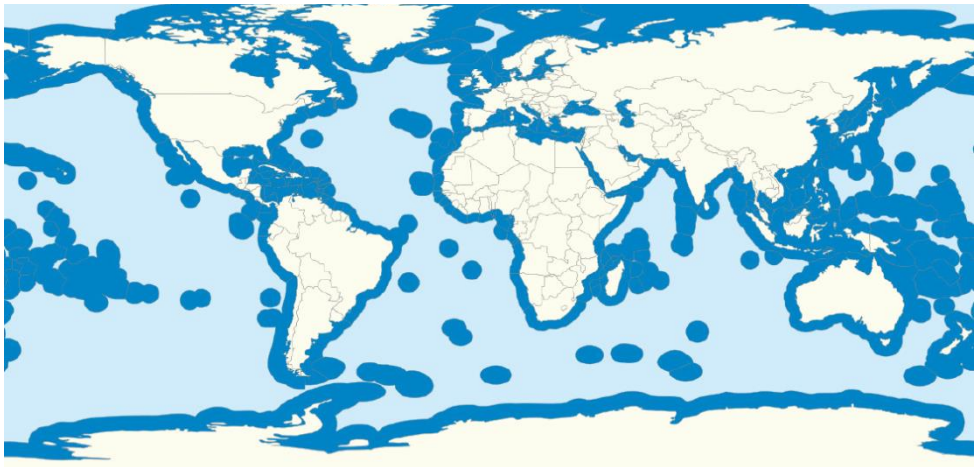
The International Governance of the Oceans and the Freedom of the Seas

I. MANAGING THE FREEDOM OF THE SEAS SO AS TO PRESERVE THE OCEANS?

International maritime law is based on the freedom of navigation which includes, at least, two principles: that of free passage in straits, even if they are covered by territorial waters, and that of innocent and free passage in territorial waters.

International waters (the high seas), which cover 64% [(88)] of the world's oceans and which are a home to a substantial part of marine biodiversity, are assigned to the free use of all (free movement on the seas, freedom to lay underwater cables and pipelines, freedom of fishing, freedom of scientific research etc.). However, the principle of the free use of the high seas creates for these zones, which for a long time were inaccessible on account of their distance from the shores, a growing pressure which is more and more worrying. Their exploration and their exploitation have recently increased in a significant way on account of technological and scientific progress which has been accompanied by an expanding worldwide demand. For example, 10 million tons of fish [(89)] are caught every year in international waters. The following map shows in light blue the zone covering the high seas:

The high seas



Source : Seas Around Us.

(88) United Nations press communiqué at the beginning of the second round of negotiations on the future treaty for the protection and future sustainable use of the marine biodiversity of the high seas– 25 March 2019.
(89) Report of the Global Ocean Commission – From decline to recovery : a rescue package for the ocean (2014).

A strengthened regulation of human activities on the high seas now appears necessary so as to preserve the marine environment. This question is now the subject of international negotiations under the auspices of the United Nations (see below).

II. INTERNATIONAL MARITIME LAW HAS PROGRESSIVELY EXTENDED THE INFLUENCE AND STRENGTHENED THE RESPONSIBILITY OF COASTAL STATES

The United Nations Convention on the Law of the Sea (UNCLOS), dating from December 10, 1982 [(90)], referred to as the Montego Bay Convention, represents the current basis of maritime law. It has been widely accepted and all the large countries have ratified it, with the exception of the United States. UNCLOS divides the oceans into six big maritime zones:

- the territorial waters which constitute a maritime area over which the coastal state has sovereign authority;
- the zone contiguous to the territorial waters in which the coastal state may intervene in order to prevent offenses to its national law, in the customs, fiscal, health and immigration fields, from being carried out;
- the exclusive economic zone (EEZ) in which each coastal state possesses sovereign rights over the natural resources in the water column, the seafloor and the sub-seabed;
- the continental shelf over which each neighbouring state has sovereign and exclusive rights concerning the use of natural resources [(91)].

Two other important segments of the law of the sea correspond to the maritime zones beyond national jurisdictions:

- the high seas which are open to all;
- international seafloors which are situated beyond the continental shelf of coastal states and which have the status of "the common heritage of humanity".

III. THE CURRENT NEGOTIATIONS OPPOSE THE DEFENDERS OF THE "FREEDOM OF THE SEAS" AND THE SUPPORTERS OF THE "COMMON HERITAGE OF HUMANITY"

In 2017, an intergovernmental conference was set up under the auspices of the United Nations, so as to work towards the drawing-up of a binding legal instrument which would ensure the preservation, even the "reconquest", of biological diversity in the high seas. This is the negotiation process known as "BBNJ" (*biological diversity in areas beyond national jurisdiction*), which should reach a conclusion, after four negotiation sessions, during the year 2020.

(90) Entered into force in 1994.
(91) Only for the seafloor and the sub-seabed and not for the overlying water column.

Concerning the high seas, an ideological divide opposes the supporters of the concept of “the common heritage of humanity” and the defenders of the notion of “freedom of the high seas”. On the one hand, the coalition of developing countries, the Group of 77 (G77) notably including China, is in favour of the sharing of resources between all countries. On the other hand, countries such as the United States or Japan, both members of the G7, argue that the use of, and access to, such resources should be governed by the “freedom of the high seas”.

The negotiations concerning the high seas are based, for the four countries of the G7 which are also members of the European Union (Germany, Italy, the United Kingdom, France), on European community competences. Thus the positions of the European Union are decided upon, together, before the meetings of the intergovernmental conference. All the countries of the European Union share, on the question of the high seas, a single ambition which aims to ensure the optimal protection of marine biodiversity, whilst allowing a sustainable and responsible use of the oceans’ resources for the benefit of all states and of all their populations.

Such an instrument should, in particular, allow the creation of protected maritime zones in the high seas as well as the carrying-out of impact studies on human activities in these areas. The equitable and transparent use of genetic marine resources is also a major issue in these negotiations. At the moment, it is the rule of “first come, first served” which applies.

It is important, however, to note that fishing is not included in the framework of these negotiations, although that particular sector is one of those most responsible for the impact upon marine biodiversity. Certain states, such as Norway, or Russia, are firmly opposed to its inclusion, considering that it is up to regional fishery management organizations (RFMOs) to deal with this issue.

The shipping routes of the Arctic, new maritime highways?

The Arctic Ocean, which has a total surface area of 14 million km², is predominantly covered by ice during the winter and a substantial part of it remains frozen during the summer. However, the area which remains covered by ice all year round has significantly decreased since the beginning of the 1970s. On account of global climate change, the melting of the summer pack ice is accelerating and its renewal is becoming, from year to year, more and more difficult, both from a depth and breadth point of view. According to the fifth report of the Intergovernmental Panel on Climate Change (IPCC) dating from 2013, the probability of seeing the Artic Ocean almost totally free of ice in the middle of the month of September for five consecutive years could become a reality by the middle of the XXIst century.

Such a development should also lead to a progressive extension of the season during which the Artic Ocean could be considered as navigable. This would open up substantial economic prospects, especially for the transport of goods and for the transport of people (cruises). Such activities already exist in the Artic but, nowadays, they are difficult to carry out, even during the summer.

Three shipping routes could then be used to link Asia and Europe without passing through the Panama or the Suez canal:

- the "North-East passage", also called the "Northern Sea Route", which goes from Norway, through the Bering Strait along the coasts of the Russian Federation;
- the central route crossing the international waters of the Artic Ocean and passing close to the North Pole;
- and the "North-West passage", which crosses the Canadian archipelago. Using this route a journey between London and Tokyo is only 15,700 kms long, as opposed to 23,000 kms by Panama and 21,200 kms by Suez.

Traffic is still extremely light on these routes and the scale of their development is yet uncertain: this growth will not happen unless the necessary safety, reliability and profitability conditions apply. According to the International Maritime Organization, 1,869 vessels navigated in the application zone of the "Polar Code" [(92)] during 2017, taking into account all categories of ship (fishing boats, cruise ships, container-carriers etc.). 774 of these were Russian vessels, 228 American, 179 Norwegian and 71 Canadian.

By comparison with the 18,000 to 20,000 vessels which use the Suez canal each year, the volume of intercontinental trade navigation which takes the Artic routes will remain marginal for a long time. However, the development of projects for using the natural resources of the Artic will necessarily lead to an increase in the maritime traffic (local and regional sailings).

Nonetheless, at the current time, the artic regions are without sufficient infrastructures to allow any significant traffic to be envisaged (harbour facilities, means of communication, sea rescue capabilities etc.) and only ice-strengthened vessels or those accompanied by ice-breakers, can navigate there; such ships remain very costly and their heavy weight increases the cost of the journey in terms of fuel.

I. MAIN ISSUES AND CHALLENGES

The shipping routes of the Artic will probably not become real "maritime highways", given the seasonal nature of their navigability, and the risks which the journeys will present for a long time to come. However, their growing use, foreseeable in the mid and long term, is liable to create tension between the desire to use the resources of this ocean and the will to preserve them. Two main questions must thus be dealt with:

(92) The "International Code for Ships Operating in Polar Waters", or so-called "Polar Code", was adopted in 2015 by the International Maritime Organization so as to strengthen the security of the operation of ships and to lessen their impact upon the populations and the environment of polar waters.

A. WHAT FORM SHOULD THE GOVERNANCE OF THE ARTIC TAKE, AND, IN PARTICULAR, CONCERNING INTERNATIONAL COOPERATION FOR SEA RESCUE OPERATIONS?

The intergovernmental governance of the Artic (the Artic Council) is embryonic. Sovereignty claims by several neighbouring states are still pending. It should be noted that, as regards the navigation of vessels, the "Polar Code" of the International Maritime Organization came into force on January 1, 2017.

B. HOW TO RECONCILE THE EXPANSION OF ECONOMIC ACTIVITIES (MARITIME TRANSPORT BEING ONLY ONE OF THESE ACTIVITIES) AND THE PRESERVATION OF THE ENVIRONMENT IN THESE REGIONS, WHICH ARE, ALREADY, AMONGST THOSE MOST DEEPLY AFFECTED BY CLIMATE CHANGE?

A significant increase in maritime transport is liable to have a considerable environmental impact: pollution of the waters by the fuel used and oil spills, adverse noise impact on marine mammals, introduction of invasive species via ballast water, the calling into question of protected marine areas etc.

It should be noted that nine countries of the European Union signed, in October 2018, an agreement aimed at prohibiting fishing in the Artic Ocean for sixteen years. This agreement was also signed by Canada, the United States, China, Iceland, Japan, South Korea, Norway and Russia. It will only be enforced when all the parties have ratified it (by the end of May 2019, only Canada, the European Union and Russia had done so).

II. THE POSITIONS OF THREE MEMBERS OF THE G7 : CANADA, JAPAN AND FRANCE

- Canada : more than 30% of the Artic (excluding the high seas) is in Canada and 40% of Canadian territory is in the Artic. The three northern Canadian territories – the Yukon, the North-West Territories and Nunavut – have almost the same area as the European Union. The environmental changes observed in the Artic are thus of central importance for the Federal Government of Canada. Two of the components of the "Canadian Strategy for the North", presented in 2009, are the protection of natural heritage and the demonstration of Canadian sovereignty (there is still a dispute between Canada and the United States over the Beaufort Sea and the North-West Passage).

On the contrary of the clear desire on the part of Russian authorities to organize passage by means of the Artic shipping routes (notwithstanding the questions of maritime security to be resolved), for different reasons, Canada does not wish a commercial maritime passage to be developed in the North-West.

- Japan : Japan wishes to play a prominent role in the definition and in the distribution of the resources of this space. In 2013, it became a permanent observer of the Artic Council, and it presented the "Japanese Policy for the Artic" which underlines the principle issues for Japan in this region: the environment, indigenous populations, sciences, international relations, resources and maritime transport. For the Japanese authorities, the economic profitability of the use of the North-East passage remains to be proved.

- The European Union, which numbers three countries of the Artic Council among its members, adopted, in April 2016, an “Integrated Policy for the Artic zone”, and France adopted a “Roadmap for the Artic” (June, 2016), which defines the Artic as an “ecologically sensitive zone, in which economic opporunities and environmental and climate challenges are inextricably mixed”, and in which European and national interests must be expressed in terms of a lasting and general interest. The uncertain economic profitability, the issues linked to the safety of ships and the imperatives of protection of the environment, particularly difficult to implement, mean, as far as France is concerned, that it cannot be imagined that the shipping routes of the Artic, in the short or medium term, could be in serious competition with the other maritime routes.