

Faculté de philosophie, arts et lettres

Drowning in plastic
Noyés sous le plastique

Sous-titrage commenté

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Année académique 2019-2020
Master en traduction à finalité spécialisée

UNIVERSITÉ CATHOLIQUE DE LOUVAIN

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DROWNING IN PLASTIC

NOYÉS SOUS LE PLASTIQUE

Avant toute chose, je tiens à remercier chaleureusement mon promoteur, M. Thierry Lepage, d'avoir accepté de superviser mon mémoire, mais aussi pour ses encouragements, son infinie patience et sa disponibilité, et plus encore pour les précieuses informations et pistes de recherche, ainsi que les conseils avisés qu'il a accepté de partager avec moi durant la rédaction de ce travail.

Je souhaite évidemment remercier la production de la BBC de m'avoir autorisée à sous-titrer ce documentaire passionnant dans le cadre de mes études, mais aussi Liz Bonnin pour son engagement auprès de la faune et la flore sauvage, ainsi que l'équipe de support du logiciel EZTitles, et plus particulièrement Dimcho Daskalov, Antony Georgiev et Peter Madanski pour m'avoir accordé leur temps et leur aide en prolongeant ma licence d'accès gratuite.

Je remercie l'ensemble du corps enseignant et académique de m'avoir épaulée durant ces longues années, qui pourtant paraissent si courtes aujourd'hui – on dit que le temps passe vite lorsqu'on s'amuse. Merci à mes professeurs de traduction et de sous-titrage d'avoir partagé avec nous leur passion et leur amour des langues durant ces deux cursus universitaires, mais également à tous les professeurs de cours transversaux.

Enfin – et surtout – je remercie mes proches pour leur soutien sans égal, pour m'avoir supportée durant cette période difficile qui deviendra, j'en suis sûre, une expérience enrichissante comme les précédentes. Merci tout particulièrement à mon Papa et à Vincent pour leurs relectures, et à tous les nombreux et précieux amis que j'ai rencontré à nos débuts ou sur le tard.

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Abstract

Together, our oceans cover some 70% of the globe and provide half of the oxygen supplied on Earth, the rest being produced by forests, and over a billion people rely on them as their primary source of food or income, whether it be from fishing, tourism or even coastal protection – indeed, if they were a country, they would be the world's 7th largest economic power (WWF, 2018¹). The UN Food and Agriculture Organization (FAO) revealed in its report on the *State of the World Fisheries and Aquaculture 2018* that around half of the world's population lives on the shorelines or within 100km of it, and a billion people in poor direct coastal areas: fish is therefore the main diet and livelihood for many humans, since around the globe, 3.2 billion people rely on it for food (it provides them 20% of their animal protein intake on average), while almost 60 million work in or depend on fisheries and aquaculture for their income, 85% of which in low-income and developing Asian countries.

Furthermore, though they host thousands of precious species and ecosystems, over half of our seas are outside national jurisdiction, and thus left without protection. As reminded by WWF, we always took the oceans for granted and thought we could plunder and litter them at the same time, as if they were indestructible and inexhaustible. We must regard our seas for what they truly are: a wondrous, precious and fragile global resource that must be cared for and protected. Besides overfishing, bycatches, seabed mining, environmental destruction, agrochemical run-off, untreated sewage and oil spills, but also ocean acidification and climate change – with rising sea level and temperatures namely due to deforestation, the burning of fossil fuels and other human activities, and which results in oceans acidification – that kill together millions of marine creatures each year, resulting in some marine species changing habitat and some areas being declared as “dead zones”, plastic pollution adds further pressure on our oceans.

¹ To ensure easy navigation within this document and quick access to bibliographic references, simply hover the mouse pointer over the author's name - or the year of publication if several works of the same author are quoted - in order to display the complete source of the in-text citation, and hold down the CTRL key while clicking on it to jump directly to the referenced bibliographic entry, just as you can do with the

Humans started producing synthetic polymers at a very large scale in the mid-20th century, or less than 60 years ago, and yet, we are already drowning in it: virtually every single piece of plastic ever tossed in the environment is still there. In fact, even if the thousands of tonnes of plastics dumped in nature stopped entering the ocean each day, they would remain in the environment for hundreds or even thousands of years before completely disappearing, because of their increased lifetime. Indeed, plastics durability and ubiquity have terrible consequences on marine ecosystems, and because of their buoyancy, currents, wind and storms could easily transport them throughout the oceans. Humans have become addicted to this material because it is cheap, versatile, and has incredible properties, such as resistance – in fact, it is nearly indestructible. But we realised that plastic is not so fantastic after all, since these are the very same properties that make it such a dangerous material.

Created at first as an alternative to non-sustainable and scarce materials (e.g. animal bones, tortoiseshell, ivory), plastics have been the emblematic material that shaped our modern society for over a hundred years, contributing to human health, hygiene, safety, as well as comfort and well-being, and they are now found everywhere: from our phones and computers to the medical field, this ubiquitous material has almost become irreplaceable (UNESCO, 2017; PlasticsEurope, 2019). Plastics have changed the world: modern society, inventions, devices and developments would not have been possible without them, and in its 2019 report, PlasticsEurope was still calling them the material of choice for the 21st century. It will clearly shape our future too, since it mitigates climate change by saving resources (water, energy, food) and by helping reduce CO₂ emissions through the manufacturing of light cars and packaging or the improvement of insulation, which can thus largely contribute to lower our carbon footprint, and thereby enabling the move towards a more circular economy (UNESCO, 2017; PlasticsEurope, 2019).

Nevertheless, if not appropriately disposed of and when instead discarded at sea, they can cause physical injuries and physiological damage to wildlife and the environment. From the tiniest marine invertebrates (i.e. plankton) to the world's largest animal (the blue whale), from the Arctic Circle to the Coral Triangle, from

big polluted cities to deserts and remote islands, from the top of the world to the bottom of the ocean, from pristine rainforests to frozen lands, North to South, West to East, plastic pollution is now clearly visible everywhere and not a single species or inhospitable location on Earth is left unaffected by the plastic crisis. Indeed, plastics account for most of marine litter, a now global challenge and one of the most widespread type of pollution, also referred to as “marine debris” and defined by the UNEP in its 2009 report entitled *Marine litter: A Global Challenge* as “any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine coastal environment” (p.13).

And it does not stop at the destruction of the landscape or at a marine animal simply encountering marine debris: hundreds of marine species have been found to get trapped in plastic debris, often resulting in deadly injuries. What is more, not all plastic threats are clearly visible: scientists revealed that marine species are in fact eating microplastics, i.e. tiny plastic fragments, which may cause serious health disorders. Moreover, in addition to the dangers posed by mismanaged plastic waste to marine life, the researchers made an even more startling discovery: plastics might as well be harmful to humans who would ingest microparticles that worked their way up the food chain, and we would even breathe in and drink toxic substances contained in or absorbed by these synthetic polymers.

While some may think that the plastic crisis can be solved through better waste management, recycling and disposal only, the only way to stop the flood of plastic from entering our oceans is to turn off its tap: we must prefer alternative materials, but more importantly, we must change our use-and-toss habits by stopping the massive production of single-use plastics like bottles, disposable cutlery, packaging and carrier bags. Whether caused by businesses’ and countries’ poor waste management practices, by consumers’ misbehaviour or because of the fishing industry losing and dumping gear in the open ocean, the leakage of plastic waste in the environment is unacceptable, for ecological reasons, but also economical: plastic debris are valuable resources that can be recycled to provide sustainable and circular solutions to many economic sectors and that should not be wasted. These materials do not belong in our environment,

much less in our oceans, and let alone in our stomachs. Yet, our waterways, already overflowing with paper, textiles and metals, are now filled with huge amounts of plastic trash, mainly end-of-use plastics due to waste mismanagement or consumers' misbehaviour, but also to the fishing industry lose and dump plastic gear in the open ocean.

The following paper will briefly define what plastics are and further explains how they are produced before introducing the reader to the issue of plastic pollution in our oceans, its multiple causes and terrible consequences, and finally it will shine a light on a few solutions that could be part of our way out of this crisis, that we must start tackling as a global emergency right now if we want to turn the tide on plastic before it is too late. Most of the points discussed in this brief are not only mentioned, but also brilliantly explained in the following commented subtitling of the *BBC One* documentary entitled *Drowning in Plastic*, broadcasted in 2018 as a follow-up to the documentaries *Blue Planet* and *Blue Planet II*, and led by Liz Bonnin, a wildlife biologist who also became a successful TV anchor-woman. In the 90-minute-long video, the presenter explains, step by step and clear as day, how this once-praised and considered fantastic a material has become the new emerging threat for our blue planet. The BBC programme clearly aims at sounding the alarm on this global issue, but more importantly, at raising awareness on the many solutions that are already available to us.

Introduction: an overview of plastic pollution

1. Definition and terminological considerations

1.1. Plastics are synthetic polymers

Long before mankind manufactured the very first synthetic polymers (i.e. plastics) as we all know, the term *plastic*, borrowed from the French adjective *plastique* (from Latin *plasticus*, from Greek *plastikos*, “able to be moulded, relating to moulding”), first appeared in 1624 under the definition of “capable of shaping/moulding or being shaped/moulded” or *formative/creative* (this meaning later formed a common noun meaning *physique* in French), but also in the artistic sense of *sculptural*, and to describe an easily shaped substance or material.

According to dictionaries, the first use of this term as a common noun is attested in 1803, to refer to any material that is malleable – or *plastic* – enough, by nature or as a result of a manufacturing process (whether it be by heating it or using a solvent), to be moulded or pressed into a final form, such as ceramic clay. Plastics are now defined as synthetic or semi-synthetic polymeric materials that can be moulded into shape while soft, and then set into a rigid or slightly elastic form (PlasticsEurope, 2019).

As explained by the United Nations Environment Programme (UNEP) in its 2015 report entitled *Biodegradable Plastics & Marine Litter: Misconceptions, concerns, and impacts on marine environments*, there is a great confusion surrounding the term “plastic”: actually, when we talk about plastics, we are most of the time commonly referring to thermoplastics, a specific family of synthetic polymers, although the term “plastics” also covers other types of synthetic polymers, such as thermosets and elastomers, which we shall all define later on.

Thus, plastics are synthetic polymers, and this brings us to the definition of “polymer”. A polymer is a large molecule formed by chains of organic monomers (i.e. repeating units of a carbon-based molecule) that occurs naturally or can be synthesised – artificially created by humans (UNEP, 2015a).

1.2. Biopolymers

There are also naturally occurring polymers, called biopolymers or natural polymers – as opposed to synthetic polymers (artificial man-made polymers) – which are derived from biomass (i.e. produced by living organisms) and thus form the building blocks of vegetal and animal tissues, and which include polysaccharides (polymers made of carbohydrate monomers, i.e. biomolecules consisting of carbon, hydrogen and oxygen, and form long chains of sugars) such as cellulose (denoted $C_6H_{10}O_5$ and said to be the most abundant biopolymer on Earth, found in wood, paper, cotton, but also in corn, wheat or seaweed, for instance), starch (including wheat, tapioca, corn, potatoes, or maize) or chitin (second most abundant natural polymer namely found in fungi, yeast, insects, algae, crustaceans or molluscs) but also polyamides (polymers made of chains of amino acids) such as proteins, gelatine, wool (cashmere, mohair, or any type of fur, for instance) or silk fibres, and finally polynucleotides (polymers made of chains of nucleic acids) like DNA or RNA, although we could continue listing many examples of biopolymers such as honey, bee wax and sugarcane, along with gum rubber, which comes from the latex of rubber trees (UNEP, 2015a; Benabid & Zouai, 2016; Blaettler, 2018; El Sayed Hassan, Bai, & Dou, 2019). However, the confusing term “biopolymer”, which we will further develop under the point on alternative materials, is sometimes also used to talk about bioplastics, which are either biodegradable plastics or synthetic polymers derived from biomass (UNEP, 2015a).

2. Brief history: a toxic love story

Plastics as we know them nowadays – modern synthetic or semi-synthetic polymers – were first developed over a hundred years ago, even if humankind started to use natural raw materials that showed plastic properties thousands of years ago, such as chewing gum or shellac, for instance (PlasticsEurope, 2019). Then, we started to chemically modify natural plastics such as rubber, collagen, galalite or nitrocellulose, to finally completely synthesize plastic materials (PlasticsEurope, 2019).

One of the first examples of modern synthetic plastic was parkesine, today known as celluloid, a material created by Alexander Parkes in 1855, then PVC

(polyvinyl chloride) was polymerised for the first time between 1838 and 1872 (PlasticsEurope, 2019), but the key date in the plastics development is 1907, when bakelite, the first real synthetic plastic material to further be mass-produced, was invented by Belgian-American chemist Leo Baekeland, who named it after him (PlasticsEurope, 2019).

Since then, many other types of plastic have been polymerised and created, offering so many attractive properties that they were introduced in almost every home and industry on earth. Because we can create almost any type of plastic material that can accommodate virtually any environment, even the harshest one, plastics have been the material of choice since the 19th century. They are used in a wide range of applications, such as packaging, building and construction, and mobility and transport – those are the three biggest plastics end-markets –, but they are also obviously used in electronics, healthcare, energy, agriculture, and sport or other type of leisure (PlasticsEurope, 2019).

Plastics are now everywhere. If we are so dependent on plastics, it is first because plastics are extremely resistant, but also because it is cheap to produce and light to transport. Because of their solidity, they are used in construction, in vehicles or to manufacture products that need to resist extreme forces wind turbine panels. These materials have incredible properties, such as resistance – in fact, some are nearly indestructible.

For over a hundred years, plastics have been the emblematic material that shaped our modern society: they contribute to human health, hygiene, safety, as well as comfort and well-being. Plastics were created as an alternative to non-sustainable and scarce materials like animal bones, tortoiseshell or ivory (PlasticsEurope, 2019). According to PlasticsEurope (2019), they will clearly shape our future too, since they mitigate climate change by helping reduce CO₂ emissions and save resources (water, energy, food), and by enabling the move towards a more circular economy.

3. Plastics manufacturing

Plastics are thus synthetic polymers made from carbon-based materials, and though they only account for 4 to 6% of the overall crude oil and gas

consumption, most of the plastics produced (90%) are derived from these fossil fuels, but they can also be made from other natural materials (biomass) such as cellulose, coal, salt, wool or corn starch, for instance (Alessi & Di Carlo, 2018; PlasticsEurope, 2019). After being extruded, heavy crude oil is distilled in an oil refinery in order to separate it into “fractions” (lighter components consisting of hydrocarbon chains, i.e. chemical compounds made of hydrogen and carbon atoms), one of which is the raw material called “naphtha”, the crucial compound that will further be cracked to generate the various desired monomers such as styrene, butadiene, ethylene, propylene, and so on (Millet et al., 2018; PlasticsEurope, 2019).

These monomers, or repeating units – the molecules that form polymers, i.e. long chains, when linked together – are the building blocks used to produce plastic in catalysts (i.e. reactors) through a process called “polymerisation”, or polymer synthesis (PlasticsEurope, 2019). There are two main types of polymerization: polyaddition, a process sometimes referred to as “chain-reaction” or “chain-growth polymerisation” in which monomers are joined with double or triple carbon-carbon bonds to form long polymer chains, and polycondensation, also referred to as “step-growth polymerisation” and which consists in the chemical removal of a small molecule, such as water (PlasticsEurope, 2019).. In fact, these repeating carbon-based units (the organic monomers) are linked together in chains to form large molecules with high molecule weight and strong bonds, called polymers.

Most of the time, additives are incorporated into plastics during their production in order to give them specific desired properties, such as pigments for colour, antioxidants if the material needs to resist water and chemicals, flame-retardants if it has to resist to fire or electrical misconduct, but also plasticizers (which account for approximately half of the plastics additives), antistatic agents, solvents and stabilizers (World Economic Forum, 2016). However, they only make up 4 to 7% of the polymer mass on average, the remaining 97% being the resin itself (Jambeck, Geyer, & Lavender Law, 2017)

After being produced as raw materials, plastics are sent further on the supply chain to converters that transform it into different forms (pellets, sheets, finished products) or mix it with other materials to obtain a composite end-product

– used in cars parts, electronics, etc., where synthetic polymers are mixed with metal or any other material – before selling it to plastics manufacturers in order to either create a finished plastic product (PlasticsEurope, 2019). The converters and manufacturers also import plastics, whether as raw primary or secondary (recycled) raw materials. They are further sold to consumers, who generate plastic waste once their product has come at the end of its service life.

Synthetic polymers, and particularly thermoplastics, have become the material of choice in many applications mainly due to their durability and resistance, enabling them to replace metal, stone, timber, or concrete. Indeed, the very same properties which make them so attractive also confer them their ubiquity. If deliberately dumped, poorly managed or incidentally lost, plastic waste can end up in our oceans and cause significant harm not only to wildlife, but also to humans. Because they degrade so slowly, the volume of plastic debris present in our oceans is increasing at a startling rate. Depending on their chemical composition and their biodegradation rate, synthetic polymers can be physically and chemically hazardous.

4. Types of plastic

Plastics can be divided into two main groups, or polymer families: on the one hand, thermoplastics, which melt when heated and harden when cooled and can thus be reshaped repeatedly (this quality also makes them mechanically recyclable) and on the other hand, thermosets, which cannot be melted again to be reformed once shaped after heating, and which undergo a chemical transformation into a three-dimensional network (Millet et al., 2018).

Thermoplastics account for almost 80% of the global plastics demand – hence the fact that the term “plastics” is most commonly used to refer to thermoplastics – and can be categorised either according to their properties or to their chemical structure (Millet et al., 2018). Chemically speaking, there are amorphous and semi-crystalline thermoplastics, and in terms of uses (and thus, according to their properties standards), three types of thermoplastics can be distinguished: standard plastics (they cover 85% of the global demand), engineering plastics, and high-performance polymers (Millet et al., 2018).

Engineering plastics are more performant than standard ones, while high-performance thermoplastics are those that require high-quality properties, as the name suggests.

4.1. Thermoplastics

4.1.1. STANDARD PLASTICS

Standard plastics, also called “commodity plastics” can be classified into seven categories that represent the recycling numbers: the first is PETE, then HDPE, PVC, LDPE, PP, PS, and finally, other types of plastic, referred to as “others” (abbreviated by the letter “O”) and listed under number seven in resins identification codes for recycling. In Europe, the most popular and thus most produced synthetic polymers, covering together almost half of the demand, are PP, HDPE and LDPE and PVC (Plastic Europe, 2018).

a) Polyolefins (PP, PE, LDPE, LLDPE, HDPE)

The largest family of thermoplastics are polyolefins (they represent 55% of the thermoplastics production and 65% of the global demand for standard plastics), which includes polypropylene (PP) and the three different types of polyethylene (PE) – LDPE (low-density polyethylene), LLDPE (linear low-density polyethylene) and HDPE (high-density polyethylene) – and whose highly versatile properties allow their use in a wide range of applications such as in the automotive industry, in packaging, building and construction, but also in the scientific and medical field, in the sports industry and to manufacture consumer goods (Millet et al., 2018). They are mainly derived from crude oil and natural gas through the polymerisation of ethylene or propylene (Millet et al., 2018).

b) Polyvinyl chloride (PVC)

One of the earliest plastics and the third most widely used thermoplastic after PP and PE is polyvinyl chloride (PVC), which comes either as rigid (e.g. when used to manufacture pipes or window frames) or soft (e.g. when used in cable applications) and is mainly produced from salt, crude oil or natural gas (Millet et al., 2018).

c) Polystyrene (PS) and expanded polystyrene (EPS)

Another commodity plastic produced on a large scale is polystyrene (PS), made from the polymerisation of styrene and which can be foamed or rigid (Millet et al., 2018). They are used in a wide range of applications, including packaging and toys (Millet et al., 2018). Polystyrene is either extruded or can come in an expanded form, as a solid foam made of expanded polystyrene beads (EPS) that give the material excellent insulating properties, durability and lightweight, hence its extensive use in packaging – including food packaging – or cushioning, but also in thermal insulation (Millet et al., 2018).

d) Polyethylene terephthalate (PET)

One of the most popular thermoplastics is polyethylene terephthalate (PET), namely used in the manufacture of plastic bottles and other food and beverage containers, but also in synthetic fibres for clothing, is made of the polymerisation of the ethylene terephthalate monomer (Millet et al., 2018).

4.1.2. ENGINEERING PLASTICS

As mentioned earlier, engineering thermoplastics, which account for 10% of the thermoplastics demand, are used in fields that require high-performance materials which exhibit properties like chemical, thermal or impact resistance, but also mechanical strength or flame retardancy (Millet et al., 2018).

a) Acrylonitrile butadiene styrene (ABS)

The most widely produced is acrylonitrile butadiene styrene (it represents almost a third of all engineering plastics produced), most commonly known as ABS (Millet et al., 2018). Most of the engineering plastics production goes to electronic and electrical applications, but it is also widely used in transportation and to manufacture consumer goods (Millet et al., 2018). Other examples are polyamide (PA), polycarbonate (PC), PET injection (PET), polybutylene terephthalate (PBT), polyoxymethylene (POM), and polymethylmethacrylate, better known as PMMA (Millet et al., 2018).

4.1.3. HIGH-PERFORMANCE PLASTICS

These thermoplastics exhibit outstanding chemical and mechanical properties, which enables their use in very specific applications that require high-performance materials (Millet et al., 2018).

a) Fluoropolymers

Fluoropolymers are the most common high-performance plastics, and one of the toughest, with polytetrafluoroethylene as the most well-known (Millet et al., 2018). Other examples of high-performance thermoplastics are polyetherimide (PEI), polyetheretherketon (PEEK), polyimide (PI), polyamide imide (PAI), polysulfone (PSU), polyphenylenesulfide (PPS), polyphthaalamide (PPA) and LCP, which stands for liquid crystalline polymer (Millet et al., 2018).

4.2. Thermosets

4.2.1. EPOXY RESINS

Thermosets, sometimes referred to as thermosetting plastics, epoxy resins or simply as epoxies, whose state can be changed from a high-melting point solid to a low-viscosity liquid (they can stretch, bend and then go back to their previous shape, hence their name which is a portmanteau for “elastic polymers”), thus allowing to produce a wide variety of unique materials, are mainly used as a protective coating and lining for food and beverage containers and cans or for packaging (Millet et al., 2018). Indeed, their excellent resistance to corrosion enables their use in many packed products, but also as a protective paint or coat for ships, wind turbines, oil rigs, or even outdoor furniture (Millet et al., 2018). However, as we already said, unlike thermoplastics, once formed, they cannot be melted or softened again upon heating. Other examples of thermosets are polyurethane, phenolics, vinyl-ester resins, acrylics or unsaturated polyester.

4.2.1. POLYURETHANE (PUR)

Most of the time, polyurethane (PUR) is a thermoset made of carbon units linked by urethane atoms, however, there are also thermoplastic polyurethanes. The main applications for PUR are insulation (in building and construction as well as to manufacture freezers and refrigerators), but also cushioning, stuffing and

upholstery – they serve to manufacture mattresses, footwear, car seats, sofas, cushions, and so on (Millet et al., 2018).

5. Plastic production

Humans have made a staggering 8.3 billion tonnes of plastic since 1950 (it weighs as much as the entire human population, almost 50 million blue whales or a billion elephants) and more during the last decade than during the whole 20th century, since half of all plastics ever produced were manufactured during the 21st century (Lusher, Hollman, & Mendoza-Hill, 2017; Plastic Oceans, 2019). Worldwide plastic production has even increased by around 150% since 2010, China, fuelled by a huge, historical economic boom, has doubled its production and became the world's top plastic producer (Lusher, Hollman, & Mendoza-Hill, 2017; Plastic Oceans, 2019).

Since their invention, their production has literally skyrocketed with an average 9% increase, going from 1.5 in the early 1950s to a whopping 360 million tonnes in 2018, and while the European plastics industry initially produced a scarce volume of 0.35 million tonnes half a century ago, in 2018, it was close to 60 million tonnes (PlasticsEurope, 2009, 2018). And guess what, it does not even include synthetic fibres—used instead of cellulose fibres (cotton) in rope, in over 60% of our clothing, etc. – which accounted for over 66 million tonnes in 2018 (Garside, 2019). These figures will continue to increase for the foreseeable future and are even expected to double by 2025 and will probably have quadrupled by 2050 (World Economic Forum, 2016). Indeed, at this rate, by 2050, our planet will hold 33 billion tonnes of plastic— this could fill almost 3 billion garbage trucks, and if the debris were lined up, we could circle the Earth 800 times with it (Rochman et al., 2013).

6. Plastic waste management

6.1. Disposal and recycling of plastic waste

Rubbish can be divided in two categories: municipal (household) and industrial waste. When collected, plastics have three possible end-of-lives: they are either recycled to be reused, recovered as energy (i.e. incinerated in order to

generate heat, power, or alternative combustibles to fossil fuels, namely methane), or amassed in landfills, and in this case, they can be buried underground or put in open dumps (PlasticsEurope, 2019). Landfilled and littered plastics are therefore lost valuable resources that could otherwise serve as energy or secondary raw materials, but landfilling is easy and relatively low-cost, which explains why it is many times the first option to dispose of plastics (Antelava et al., 2019).

There are two types of recycling: mechanical recycling and feedstock recycling (i.e. chemical recycling to recover energy). The former consists in a biological treatment such as composting or anaerobic digestion, in which microbes biodegrade the organic wastes, producing biogas, and is still the major recycling option – it represents over 90% of plastics recycling – while the latter is a technique in which the chemical structure of polymers is changed through thermo-chemical processes (gasification, pyrolysis, hydrogenation) or depolymerisation – which converts polymers into monomers again (Department for Environment, Food & Rural Affairs [DEFRA], 2014; PlasticsEurope, 2018 & 2019; Antelava et al., 2019; New South Wales [NSW] Environment Protection Authority, 2019).

When collected through official management streams, plastic is sent to recovery facilities that sort out the trash, then sell the sorted waste to recycling facilities that later reprocess it as secondary raw material. Plastic is sometimes autoclaved, a mechanical heat pre-treatment that cleans household waste (e.g. food packaging) with high-pressure steam before sorting it and sending it to a recycling or energy recovery facility – this adds a process in the recycling chain but helps recover more plastic and thus reduces landfilling (DEFRA, 2014). Pyrolysis is considered the best technique in terms of environmental benefits, whereas mechanical recycling, though preferable to landfilling since it helps reduce greenhouse gases and our carbon footprint, requires the use of fossil fuels in the process – unlike pyrolysis – and is thus not the best option (Antelava et al., 2019).

6.2. Global figures

Between 1950 and 2015, we generated 6.3 billion tonnes of plastic waste, of which less than 10% has been recycled, 12% has been incinerated, while almost 80% has ended up in landfills or in the environment (Geyer, Jambeck, & Lavender Law, 2017). China's recycling and incineration rate reach respectively 25% and 30%, while most of the other producers (such as the United States) recycle less than 10% of their plastic waste and recover around 16% of it, meaning they discarded the rest – approximately 75% (Geyer, Jambeck, & Lavender Law, 2017). In 2016 only, almost 310 million tonnes of plastic waste was generated, the equivalent of more than 2,200 plastic bottles per human, and yet, over a third (37%) of it – or 100 million tonnes – ended up in nature instead of controlled waste stream (Geyer, Jambeck, & Lavender Law, 2017; WWF, 2019b).

6.3. European figures

Of the annual 30 million tonnes of plastic waste generated by the old continent, less than a third is recycled, 20% is sent for recycling outside the EU, over 40% is recovered for energy, while over a quarter is landfilled – though it really improved its amount of plastic sent to recovery in the last decade (PlasticsEurope, 2018). However, for a third of all European countries (among them Italy, Spain and France, but also in Eastern and Balkan countries), landfilling is still the first option to dispose of plastic trash (PlasticsEurope, 2018). By landfilling between 25 and over half of its plastic waste, Europe has still a long way to go in terms of plastic waste management, since it is the main reason why plastic pollution has become a major issue.

Best countries in terms of plastic waste treatment are Switzerland, Austria and the Netherlands, with zero landfilling and between 60 and 70% of plastics sent to energy recovery, followed by Germany, Luxemburg, Sweden, Finland, Belgium, Denmark and Norway – all of them have enforced landfill bans (PlasticsEurope, 2019). Malta is Europe's worst-in-class recycler – it does not recover plastic for energy and more than 75% of its plastic waste is diverted to landfills (PlasticsEurope, 2019). It is followed by Greece, Cyprus, Bulgaria and Croatia,

who landfill more than two thirds of their plastics, but recover plastics for energy – though at less than 10% (PlasticsEurope, 2019).

Countries that implemented a landfill restriction increased their recycling rates: less than 10% of their plastic waste is diverted to landfills and they transform most of it into energy (PlasticsEurope, 2019). The Netherlands were the first country to ban landfilling (1996), followed by Denmark in 1997, then Belgium (1999 and 2006), Austria (2004), Germany and Sweden (2005), Switzerland (2006) Norway (2009), Scotland (whose parliament passed the *Waste Regulation Act* enforced in 2014), and finally, Finland and Poland, that implemented landfill restrictions in 2016 (PlasticsEurope, 2019). Belgium recycles over a quarter of its plastics and transforms almost a third of it, landfilling therefore less than 2% of its plastic waste (PlasticsEurope, 2019). The main reasons why Europe's best-in-class recyclers achieve such great rates, apart from their landfill bans, are their earlier and bigger investment in promoting recycling and energy recovery, their sorting and recycling systems.

6.4. Waste exportation

Many countries traditionally exported lots of rubbish to Asian and African countries, which causes two problems: on the one hand, it is an economic loss, and on the other, such countries importing used plastics often have poor waste management systems and enough to deal with their own rubbish. What is more, it is a way of offloading one's trash problem to another country, which is a neither sustainable nor fair solution, and in fact, not a solution at all. In 2016, China imported nearly half of the world's used plastics, but as of 2017, it banned this plastic waste import, as well as other types of household waste, fed up with treating the planet's plastic while being accused of being the top polluter. Since it has stopped buying foreign countries' rubbish, these latter are thus forced to landfill most of it, creating an unprecedented global crisis (McNaughton & Nowakowski, 2019).

7. Oceans of plastic

Each year, a staggering 8 to 20 million tonnes of plastic debris are dumped at sea, killing over 100 million marine creatures, while Europe dumps between 150,000 and 500,000 tonnes of macroplastics (the equivalent of almost 20,000 to 66,000 truckloads full of trash), and 70,000 to 130,000 tonnes of microplastics in our oceans, much of them accumulate in oceanic gyres, but also in the Mediterranean Sea (UNEP, 2014; World Economic Forum, 2016; United Nations, 2017; Alessi & Di Carlo, 2018; WWF, 2019c). It is as if every minute, we dumped 1.4 million 50cl plastic bottles or an entire truckload full of plastic in our seas (World Economic Forum, 2016; WWF, 2019c).

Researchers currently estimate that the ocean contains around 150 million tonnes of plastic, a figure that could nearly double by 2025, and that plastic items account for 60 to 95% of all marine litter, i.e. marine debris present on the seabed (in the sediments) in the water column or on our beaches (Derraik, 2002; Barnes, Galgani, Thompson, & Barlaz, 2009; Ocean Conservancy, 2015; Jambeck et al., 2015). In terms of weight, there are 36 times more plastic in the ocean than plankton and by 2025, it is likely that for every three tonnes of fish in our oceans, there will be one tonne of plastic, so if our plastic consumption continues at this rate, by 2050, plastics might outweigh fish in our seas – i.e. there will be more plastic debris than fish (Ocean Conservancy, 2015; Ellen McArthur Foundation & New Plastic Economy, 2017; Plastic Pollution Coalition, 2019).

In the Mediterranean Sea alone, over half a million tonnes of plastic is leaked each year: for comparison, it is as if every minute, almost 34,000 plastic bottles were dumped in it (WWF, 2019c). If nothing is done to stop this flood of plastic, the number of end-of-use plastics – the trash – could well quadruple by 2050 (Jambeck et al., 2015).

7.1. Macroplastics: a big issue

According to various studies relayed by journalists in many newspapers and magazines, such as *National Geographic* in its *Planet or Plastic?* pledge, it is estimated that over 5.2 trillion pieces of plastic float at the surface of the oceans,

together weighing almost 270,000 tonnes, meaning there would be between 100,000 and pieces of plastic floating on every square kilometre of our oceans (Eriksen et al., 2014; Parker, 2015). To give you an idea, if we lined up all those pieces, we could circle the Earth more than 400 times (Bullock, 2018).

7.2. Microplastics: not a tiny problem

Much of these floating debris – 60 to 92% – are macroplastics, i.e. plastic pieces measuring over 5 millimetres, while the remaining – weighing approximately 35,000 tonnes – are smaller fragments of less than 5 millimetres, called microplastics – some even smaller fragments called nanoplastics also flow into our oceans, though they are considered as microplastics and a clear definition of their size is still needed, ranging from 100 to 1000 nanometres (Eriksen et al., 2014; Gigault et. al, 2018; Lusher, Hollman, & Mendoza-Hill, 2017).

There are different types of microplastics: primary microplastics, i.e. items that were manufactured within a microplastic size range, such as pellets used by plastic converters or microbeads used in various products (in cosmetic and personal care products like toothpaste, scrubs, but also in detergents or textiles such as fleece or polyester fluorescent fabrics like those used in safety vest...), and secondary microplastics, i.e. resulting from the fragmentation of larger pieces of plastic (the so-called macroplastics), either due to physical abrasion by the waves and other weathering processes like the wind and deep currents that could wash them up on our shores, to photodegradation (i.e. degradation through UV radiation) or even to thermal degradation – oxidation due to high temperatures (Barnes, Galgani, Thompson, & Barlaz, 2009; Andrady, 2011; Eriksen et al., 2014; Cózar et al., 2014; Lusher, Hollman, & Mendoza-Hill, 2017).

According to scientists' predictions, following these degradation processes and the increasing amount of trash we dump each year at sea, floating macroplastics weigh 100 times less than the estimates from half a century ago, but researchers found over twice as many buoyant macroplastics as expected compared to the number of microplastic fragments (Cózar et al., 2014; Eriksen et al., 2014; Jambeck et al., 2015). Of course, many microplastics are too small to be caught in the scientists' nets, but there is more to that: these figures suggest not

only that microplastics disappear from the water surface, but also that macroplastics deteriorate very slowly and that they enter the ocean in large amounts. So where are the remaining thousands of tonnes of plastic waste we already dumped in the ocean?

Well, while macroplastics mainly float on the water surface, microplastics are found in all marine environments – on the surface, in the water column, on beaches, and in seafloor sediments (Lusher, Hollman, & Mendoza-Hill, 2017). Researchers suggest that 94% of all marine litter sinks, while only 5% ends up on our beaches and 1% floats throughout the water column, suggesting that macroplastics are much like the tip of the iceberg, while microplastics are the hidden part – a metaphor actually used by the *National Geographic* magazine on the cover of its *Planet or Plastic?* pledge (2018) to illustrate this issue, in which we can see an iceberg which turns out to be a plastic bag (Derraik, 2002; Sherrington, 2016). And it is not the size that matters: these tiny and almost invisible particles have huge consequences. Indeed, because of their small – and sometimes microscopic – size, these plastic particles, less visible, are even more insidious than macroplastics and cause much greater harm to marine life.

In fact, microplastics may be removed from the ocean surface by many other natural processes than sinking due to their fast fragmentation into nanoparticles. Indeed, they can be ingested by organisms and enter the food web – it's then considered predation - and may even be ballasted down in the water column because they are biofouled – biofouling being the fact that plastic debris host many organisms that colonise the material by forming biofilms on it (Engler, 2012; Eriksen et al., 2014; Cózar et al., 2014). The final destination of microplastics would therefore not be the surface of the oceans, but their deep sediments, which logically implies a vertical transport of the plastic particles down to the seabed (Cózar et al., 2014).

8. Plastics durability in our oceans

8.1. Plastics lifecycle

In order to fit in a circular economy, the main challenge facing plastics is their lifespan. Indeed, the very same property that turned this material into the most broadly used – i.e. its durability – constitutes the main reason why plastics are not so fantastic. As a matter of fact, plastics are non-biodegradable: while some take between one year to half a century to deteriorate, others only degrade hundreds of years later – sometimes up to 450 years (WWF Australia, 2018a; National Geographic, 2018). While most of them have a four-year lifespan, many are single-use plastics: plastic packaging is particularly problematic, since it has an increased lifetime but serves only once. We will come back to it later.

Every plastic material has its own lifecycle, it is therefore logical that the amount of plastic waste does not reflect the amount of plastic produced, since not all plastics manufactured the same year reach the end of their lifecycle at the same time. According to Ocean Conservancy (2014), it takes five years for a cigarette filter to degrade, 20 years for a plastic bag, and disposable cups need 10 to 440 more years to disappear – for coffee cups and plastic cups respectively – while it takes two centuries for a plastic straw to degrade, and 450 years for a PET plastic bottle. Other examples are plastic toothbrushes, coffee pods or disposable diapers, which require at least half a thousand years to decompose, and fishing lines, which will remain in the environment for 600 years (WWF Australia, 2018a). Even if plastic bags do not make up the majority of marine litter, it is one of the most devastating forms of plastic waste, since it breaks up easily and quickly in tiny particles – their service life is supposed to last 15 minutes or so (Plastic Oceans, 2019). Some plastics even have a longevity of thousands of years (Barnes, Galgani, Thompson, & Barlaz, 2009).

8.2. Plastics are nonbiodegradable

Most plastics are non-biodegradable and could remain in the environment for hundreds or even thousands of years (Geyer, Jambeck, & Lavender Law, 2017). In fact, it does not mean that they will never completely degrade, only that they will

do so at an extremely slow rate: photodegradation and oxidation will occur faster if the debris is floating on the surface and if it ended up on land or on the shoreline, and even more if it is exposed to high temperatures (such as in a sub-tropical or tropical climates) or physical abrasion by waves, but the fragmentation rate will dramatically decrease once the plastic is buried in sediment, if it becomes covered by inorganic or organic coating or when it enters the water column and ends up at depth where there is little or no light and very low concentrations of oxygen (Barnes, Galgani, Thompson, & Barlaz, 2009; UNEP, 2015a). What is more, biodegradability of polymers – their ability to be broken down into carbon, hydrogen and oxygen by microbial activity – is highly influenced not only by the environment in which they are, but also by their type: the higher their molecular weight, melting temperature and crystallinity, the lower their biodegradation rate – PE has one of the slowest rate of degradation (UNEP, 2015a). Most plastics ever manufactured were made from fossil fuels, but the additives that we add during their production slow down their degradation process (Barnes, Galgani, Thompson, & Barlaz, 2009; Cole, Lindeque, Halsband, & Galloway, 2011; Lithner, Larsson, & Dave, 2011).

This degradation starts when plastics weather (when they fragment due to weathering process that are abiotic, i.e. not due to biological factors) and eventually get mineralised – when these organic compounds are completely biodegraded (or broken down) and converted into carbon dioxide (CO₂), water (H₂O), methane (CH₄), ammonia (NH₃, not to be confused with ammonium hydroxide, denoted NH₄OH), hydrogen (H), new biomass or energy by microbial action – by the activity of microorganisms such as bacteria and fungi (Joint Group of Experts on the Scientific Aspects of Marine Environmental Pollution [GESAMP], 2015; UNEP, 2015a). This process highly depends on temperatures, and many plastics are said to biodegrade naturally when they only really do under temperatures higher than 50°C – as it occurs in industrial composters, but certainly not in the ocean (UNEP, 2015a). Though microorganisms such as fungi, bacteria and other microbiota are known to colonise and deteriorate plastic, there is no evidence that occurs at the same rate in the open ocean than in an industrial composter (Zettler, Mincer, & Amaral-Zettler, 2013).

Most common nonbiodegradable plastics are polyethylene (PE) and polypropylene (PP), and a metallic additive is sometimes added to the plastic in order to break it down faster: the plastics are then said to be oxo-degradable (UNEP, 2015a). However, though the metal accelerates their fragmentation, there is no proof that it actually helps complete their biodegradation (UNEP, 2015a).

9. Sources of marine plastic pollution

Depending on the area, plastics account for 60 to 95% of all marine litter, in weight (Derraik, 2002). There are various sources for plastic marine litter: mismanaged plastic waste, but also consumers misbehaviour, lost or abandoned fishing gear, microbeads in cosmetics, microfibers released from our synthetic clothes during laundry wash cycles, and so on. The most frequent macroplastic items found on surface waters are made of foam polystyrene or polyethylene, such as grocery bags, food packaging and containers like bottles (Eriksen et al., 2014; Cózar et al., 2014).

Globally, it is estimated that 80% of all marine pollution comes from land-based sources and activities (toxic chemicals like pesticides, fertilizers or oil spills, untreated sewage and other waste, including plastics), the rest of which is marine-based (mainly due to the fishing industry), while 10% of all the waste we produced on land yearly ends up in the ocean (Andrady, 2011; Jambeck et al., 2015; Ocean Conservancy, 2015; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2017).

However, ocean plastics also come from other significant sources, such as polluted beaches, but also from the fishing and shipping industries which discharge plastic gear, but also from rivers, which are a major source for marine plastic pollution (Lebreton et al., 2017; Lebreton & Andrady, 2019).

9.1. Land-based sources

9.1.1. MISMANAGED PLASTIC WASTE

Only five countries are responsible for 55 to 60% of all plastic marine litter, all located in Asia: the biggest polluter is China, with over three quarters of its plastic waste being mismanaged, resulting in between 1.3 and 3.5 million tonnes

of plastics ending up in the ocean, followed by Indonesia, the Philippines, Vietnam, Sri Lanka and Thailand (Jambeck et al., 2015; Ocean Conservancy, 2015). Indeed, countries with middle-income populations that lack proper waste management infrastructures, sometimes also experiencing a huge economic boom, are said to be the worst polluters. In fact, people living in these developing countries in which authorities do not provide any – or enough – waste treatment infrastructures or facilities are forced to get rid of their rubbish by disposing it on the streets, river banks, beaches, or in the ocean, which logically leads to greater contamination of marine, estuarine and freshwater environments (Jambeck et al., 2015).

However, many low- or middle-income Asian countries with some of the worst waste management systems also have a huge coastal population, as explained in *Drowning in Plastic* (Jambeck et al., 2015). Around half of the world's population lives on the shorelines or within 100km of it and a billion people in poor direct coastal areas, making them the most densely populated regions in the world, hence more affected by plastic pollution. It is no wonder why some Western nations such as the United States also form part of the top 20 worst polluters, due to their large coastal population and the consequent large amount of waste generated per capita (Jambeck et al., 2015). In 2010, coastal regions generated an estimated 100 million tonnes of plastic waste, of which over 30 million tonnes were mismanaged and some 8 million tonnes were poured into our oceans, and if this figure could well double by 2025, it is namely due to the stunning population and economic growth in these developing countries (Jambeck et al., 2015).

9.1.2. CONSUMERS MISBEHAVIOUR

Most of marine litter is either household waste or generated by tourism activities, in other words, due to illegal dumping and improper disposal. For instance, in the Baltic sea, marine litter is mainly due to bad behaviour and habits: each year, around 130 tonnes of plastic microbeads – those used in hygiene products (e.g. toothpaste, scrubs) and cosmetics (e.g. eye shadow), but also in cleaning agents – are flushed down the Baltic drains. We must impose bans on additives and microbeads in these household products, avoid using plastic bags or packaging and get rid of the bad habit of using disposable items. We must ensure we dump our waste where we owe to.

During the 2018 International Coastal Cleanup, the world's largest cleaning effort, in which more than a million volunteers from around the globe participated, almost 100 million trash items were collected, together weighing over 10,500 tonnes (Ocean Conservancy, 2019). As of 2017, all of the 10 most common types of waste found on our beaches are made of plastic, whereas in previous years, glass bottles, paper bags or metal caps were still in this ranking (Ocean Conservancy, 2019).

The report following the 2018 clean-up revealed that the number one trash item picked up by volunteers were cigarette butts (5.7 million), followed by food packaging (3.7 million) and straws (3.6 million). People of course gathered disposable items such as plastic cutlery, cups or plates (over 2.6 million put together), but also plastic bottles (more than 1.7 million), lids and caps (respectively over 700,000 and almost 1.4 million) and plastic bags (close to a million).

This report compared the amount of trash collected to 1,557 trucks fully loaded (we could almost circle the Earth with it if lined up) and revealed that volunteers found over 230km of fishing line and rope – enough to climb up and down Mount Everest 13 times.

9.1.3. SINGLE-USE PLASTICS

Half of all the synthetic polymers we produced yearly is single-use plastic – in other words, only 50% of all the plastic created each year is recycled – and in Europe, almost 40% of the plastics produced are used for packaging, which generates 16 million tonnes of waste yearly (PlasticsEurope, 2018; Plastic Oceans, 2019).

Every minute, we produce a million plastic bottles (that represents 525.6 billion bottles produced annually) – and the greatest irony is that to produce one bottle only, it requires six times as much water as it contains – and plastic beverage containers make up around 14% of all litter, labels and caps excluded (Bullock, 2018; Plastic Oceans, 2019). Each year, we use 500 billion plastic bags – i.e. more than a million per minute (Plastic Oceans, 2019). Takeaway cups are

also among the most common single-use plastics, and Starbucks, for instance, produces around 4 billion coffee cups a year (Starbucks, 2015).

Single-use plastic products like straws, shopping bags, bottles, cups and cutlery pose a serious threat to the environment because they are not properly disposed of. They are cheap and convenient materials, which is why we are so dependent on them, and even more on plastic packaging. Single-use plastics may only serve once, yet their lifespan is a few hundred years.

9.1.4. WATERWAYS AS PATHWAYS FOR PLASTIC TO THE OCEAN

Besides deliberate plastic trash dumping, the main other source of marine plastic pollution is the waste running off through our rivers and drains. All this plastic trash also pollutes our coasts and beaches when they come back to shore.

Creatures living in or near any kind of waterway – whether it be lakes, rivers, seas or oceans – are the worst affected, since it is where much of our plastic waste ends up. In fact, a study carried out by Christian Schmidt (2017) and his colleagues of the Helmholtz Centre for Environmental Research revealed that between 0.41 and 4 million tonnes of all marine litter entering the ocean come from our rivers, that turn into major transport pathways for plastics, and 88 to 95% of these riverine debris – of all sizes – are carried by ten rivers only, eight of which are located in Asia and flow through China (four of them only run across this specific country), the other two are African rivers.

According to this study, the most polluted river on Earth is the Yangtze river, followed by the Indus (flowing across China, India and Pakistan), the Yellow river (the second longest in China), the Hai (another Chinese river), the Nile; then, grouped under the Bengali Ganges delta, the Meghna, Brahmaputra and Ganges rivers, and finally the Pearl (China), the Amur (China), the Niger and the Mekong rivers (Schmidt, Krauth, & Wagner, 2017).

A misleading post has been shared last summer and since 2018 on social networks, published on the Facebook page of *National Geographic* and corrected since then, originally claiming 90% of all ocean plastics come from those rivers,

whereas in fact, the percentage only refers to the river-borne debris that end up in the sea, based on 1,350 rivers, as the AFP highlighted.

As explained in the following subtitled documentary, the waste management system of developing countries is either poor or inexistent, particularly in the remote countryside, where landfills are piling up. The Yangtze, the world's third longest river and Asia's longest river, is connected to the Yellow and Hai rivers by the Grand Canal, the world's oldest, which begins in the capital city of Beijing and passes through Tianjin and other cities before flowing into the East China Sea. The Hai river starts in Tianjin, where it is connected to the Yellow river through the Grand Canal, before flowing into the East China Sea.

The Hai river has many tributaries: almost all the northern rivers drain in the Hai river estuary. This canal, the world's oldest, begins in the capital city of Beijing, and passes through Tianjin and other cities the whose last significant tributary runs through many cities before that of Shanghai before flowing into the East China sea). China has been facing a drought in the last ten years, and the situation of water scarcity has also been worsened by water pollution.

The Nile is Africa's longest river and the second longest in the world: it begins its course in Lake Victoria with its two major tributaries, the White Nile and the Blue Nile, and runs through eleven countries before it empties in the Nile delta, in Egypt.

9.1.5. SEWAGE TREATMENT

Around the globe, many countries have a poor or even zero sewage treatment system: in the Mediterranean Sea only, 80% of the sewage discharged is untreated, and in developing countries, 70% of industrial waste and up to 90% of waste water are not treated before being discarded in the ocean (Cicin-Sain, Bernal, Vandeweerd, Belfiore, & Goldstein, 2002; UNEP, 2015a; Alessi & Di Carlo, 2018). What is more, thousands of synthetic microfibres are released in each wash cycle we launch, but we will come back to it later, under the point which treats the "Microplastics in our clothes".

9.2. Marine-based sources

9.2.1. DERELICT FISHING GEAR

Fisheries and aquacultures mainly pollute the environment with abandoned, lost or otherwise discarded fishing gears (abbreviated ALDFG) including rope, lines, nets gillnets, traps and pots, trawls, and buoys (Lusher, Hollman, & Mendoza-Hill, 2017). Many ships dump their waste into the ocean, either legally or incidentally, leading the fishing industry to account for 10 to 18% of all marine debris (Andrady, 2011; World Animal Protection, 2018a). By weight, fishing buoys make up almost 60% of all macroplastics drifting through the currents, and 70% of floating macroplastics are fishing related (Eriksen et al., 2014; Cózar et al., 2014). If the world's entire fishing fleet now uses plastic gear (usually made of PE and PP, two highly resistant polyolefins, or of synthetic fibres – sometimes called nylons), it is mainly because of its ultra-resistant properties and its cheap cost (Andrady, 2011).

Around ten years ago, it was estimated that globally, 640,000 tonnes of plastic fishing gear were abandoned, lost or discarded at sea each year, while in 2018, it was estimated to an annual 800,000 tonnes (World Animal Protection, 2018b).

In the Gulf of Maine only, where is located Cape Cod (New England), mentioned in *Drowning in Plastic* when Liz Bonnin meets Paul Fischer, 175,000 lobster pots are lost annually, according the Gulf of Maine Lobster Foundation (GOMLF, 2019), whose partnership with ocean conservancy organisations and local fishermen and divers, called *Gear Grab*, helped recover ghost gear that had been gathered together into masses of deadly plastic traps to animals. Around 25,000 would be lost or discarded in European seas, and in the Baltic Sea alone, it is estimated that around 5,000 to 10,000 gillnets are lost each year (Werner et al., 2016).

10. Plastic kills: impacts on wildlife

Plastic affects many marine species, 17% of which are already threatened or critically endangered, according to the IUCN Red List (Gall & Thompson, 2015).

The consequences can even be more disastrous if multiple factors threaten an area at the same time. Scientist Kara Lavender Law (2017) reported that the main threats plastic debris pose to the marine life were entanglement (i.e. entrapment), ingestion, contamination, habitat destruction and transport of so-called “alien species” – invasive animals that are not supposed to be where they belong, i.e. whose establishment can affect habitats, species or ecosystems.

Marine litter is a major threat to biodiversity. According to scientists, whose observations were republished and reposted by various organizations and magazines – like WWF, Greenpeace or *National Geographic* reports on oceans and seas – plastics are involved in 92% of animals encounters with marine debris, and 85% of these incidents were reported as ingestion or entanglement (Gall & Thompson, 2015; Kühn, Bravo Rebolledo, & van Franeker, 2015; Lavender Law, 2017).

Each year, plastic waste kills an estimated 100 million marine animals: they cause the death of a million seabirds, 100,000 marine mammals and 1,000 sea turtles each year, and these are only those we find (UNESCO, 2017; WWF Australia, 2018b & 2018c; Alessi & Di Carlo, 2018). Since 1997, fatal encounters of marine species with marine debris would have increased by 61%, and by 21% since 2012, with a total of 663 species affected by marine debris, 344 of which are known to have been trapped at least once in plastics and 233 of them having ingested plastic (Secretariat of the Convention on Biological Diversity [CBD], 2012 & 2016; Lavender Law, 2017). Indeed, plastics now affect two thirds of marine mammals, all sea turtle species, and around half of all seabirds are badly threatened.

10.1. Entanglement and physical dangers

10.1.1. CAUSES

Most entanglements (71%) – a phenomenon also known as entrapment or “ghost fishing” – involve derelict plastic fishing gear, such as rope, lines, nets (commonly referred to as “ghost nets”), gills, trawls, traps and pots, though an increasing number of animals are found trapped in other types of plastic debris including old frisbees, six-pack rings (drink holders), or plastic containers (Gall & Thompson, 2015; Kühn, Bravo Rebolledo, & van Franeker, 2015; Macfadyen,

Huntington, & Cappell, 2009). Indeed, when abandoned, lost or discarded at sea, plastic fishing gear, which is meant to be extremely resistant if not impossible to break – poses a huge threat to many marine species that get trapped – or “entangled” – into these plastic debris, commonly known as “ghost gear”. The fishing gears may keep on ghost-fishing animals for years or even decades, as their retaining capacity (i.e. their ability to catch fish) still ranges from 6% to 20% in the following couple of months (Macfadyen, Huntington, & Cappell, 2009; Werner et al., 2016). Gillnets, due to their holes, as well as traps and pots (which are attached to buoys on the surface, resulting in vertical cables stretching in the water column) account for most of ghost-fishing (Werner et al., 2016).

10.1.2. CONSEQUENCES

Entanglement can cause physical – and sometimes irreparable – injuries to marine species by cutting into their skin or constraining parts of their bodies (e.g; neck, fins, muzzles), lead to deformities (especially if the animal is trapped when very young and grows stuck in it) or even losing body parts and keep them from moving, swimming, feeding or growing correctly, but also from escaping predators, almost inevitably leading to death from hunger or because they turn into easy preys (Lavender Law, 2017). For instance, adhesive tape, which is harmful to dolphins, seals, walruses and most marine mammals known for their curiosity, since these sharp and resistant bands can cut their necks, fins and skin in general (Alessi & Di Carlo, 2018). To add insult to injury, animals can even drown because the plastic weights them down, or get strangled by or choke on garbage such as plastic bags, six-pack holders, and any other plastic trash that has holes in which the animal can put its neck, fins or limbs (Lavender Law, 2017).

10.1.1. FIGURES

According to the charity waterway cleaning organisation Ocean Crusaders (2018), at least 100,000 marine animals die from entanglement in plastic debris, and one in three marine mammal species will get entangled at least once in their life. One in three marine mammal species have been found entangled in plastic gear or products (Plastic Oceans, 2019). Though excellent swimmers, all of the world's species of sea turtles are now affected by entanglement, 67% of all seals,

around a third of whale species, a quarter of the world's seabirds, and respectively 90 species of fish and invertebrates (Kühn, Bravo Rebolledo, & van Franeker, 2015). In the Mediterranean Sea, 65% of entanglements are caused by fishing lines, and the most badly affected marine species are seabirds and fish, followed by invertebrates, mammals and sea turtles (UNEP, 2015b; Alessi & Di Carlo, 2018).

10.2. Plastic ingestion

Many plastic items, especially plastic bags, have been found in various species' stomach, including puffins, as shown in the BBC documentary. Indeed, not only zooplankton, i.e. microorganisms found at the bottom of the food web, but also small marine invertebrates (crustaceans such as crabs, krill, lobsters, crayfish, shrimps or prawns, and molluscs including sea cucumbers, barnacles or bivalves such as mussels, clams, scallops, oysters...), fish and large marine mammals higher up the food chain (seabirds, sea turtles, sharks, narwhals, dolphins, whales and many more) are found to ingest microplastics and other chemicals which accumulate into their bodies, either by eating them directly or by feeding on contaminated preys (Thompson et al., 2004; National Oceanic and Atmospheric Administration [NOAA], 2014; European Food Safety Authority [EFSA], 2016; Seltenrich, 2015). However, there are fortunately some good news worth to mention: according to a recent study, Arctic seals would not be as badly affected by plastic ingestion as other species (Bourdages et al., 2020).

10.2.1. CAUSES

This led scientists to wonder why marine species would eat plastic debris. Indeed, they seem to act as real junk food for animals: active feeders (animals that hunt mobile preys like turtles or sea birds) either ingest it intentionally by mistaking it for food, but also indirectly, for instance by feeding on preys that had previously ingested plastic, while passive feeders (mainly invertebrates and zooplankton, but also walruses that feed by foraging the sediments present on the sea bottom, called deposit feeders, or by eating suspended plankton and other fauna on the surface and column water, then called suspension feeders) tend to ingest debris –

mainly microplastics – either intentionally if selective feeders or incidentally if “filter feeders” – i.e. nonselective feeders that eat food randomly (NOAA, 2014).

In fact, seabirds, which are attracted by the smell of their food, mistake plastics such as Styrofoam for preys: the microorganisms – bacteria and algae – thriving on it emit a strong sulphide smell that act as a deceiving olfactory trap (Kiessling, Gutow, & Thiel, 2015; Kühn, Bravo Rebolledo, & van Franeker, 2015; Savoca, Wohfeil, Ebeler, & Nevitt, 2016). For some fish such as anchovies, which are not especially attracted by macroplastics, appear to be highly interested in microplastics that smell like krill, their source food. Cetaceans and turtles are especially at risk of plastic bags ingestion, since they mistake it for jellyfish, their main source of food (NOAA, 2014; Seltenrich, 2015).

Some species tend to eat more macro- or microplastics, for various reasons. Take the example of sea turtles: if they eat more macroplastics than microplastics, it is mainly because young turtles spend their time floating at the surface, in the great currents, where many dangerous big pieces of plastics float too, eating as much as possible in order to be strong enough to go back to the coast (Schuyler, Hardesty, Wilcox, & Townsend, 2012 & 2014). They seem to mistake mainly plastic bags, but also balloons for jellyfish, and fishing nets for seaweed, their main food sources, and to prefer white plastic (NOAA, 2014; Schuyler, Hardesty, Wilcox, & Townsend, 2012 & 2014; Alessi & Di Carlo, 2018). Therefore, we understand that sea turtle eat plastic while thinking they eat their staple food because they choose their prey by sight (Alessi & Di Carlo 2018). Moreover, pelagic sea turtles (those venturing into the open ocean) are twice more likely to ingest pieces of plastic than benthic ones – i.e. those that feed near the coast (Schuyler, Hardesty, Wilcox, & Townsend, 2012 & 2014).

10.2.1. CONSEQUENCES

The ingestion of pieces of plastic has both direct (physical) and indirect (physiological) devastating consequences on marine animals, with plastic bags and sharp fragments being the most dangerous to larger animals. Animals may look fine on the outside, perhaps a bit scrawnier than usual, while in fact, they are seriously ill because of plastic – mainly microplastic – ingestion. For instance, if

animals strand on beaches or are washed up dead on the shores for no clearly visible reason – like obvious fishing gear entangled on an animal – they are probably dying – or dead – from eating too much plastic.

a) Direct

Direct impacts on the animals' health are respiratory or gastrointestinal obstruction, open wounds like perforations or lacerations, and ulcers, sometimes even resulting in necrosis (NOAA, 2014; UNEP, 2015a). What is more, they give them a false feeling of satiation and lead to reduced stomach capacity, which could in turn lead to malnutrition or starvation and prevent the animals from accumulating enough fat and essential nutrients to withstand a long migration, especially in seabirds (Derraik, 2002; NOAA, 2014; UNEP, 2015a). Plastics may also increase their body burden and weigh them down, resulting in drowning, as seen on flesh-footed shearwater chicks in the documentary (Engler, 2012).

b) Indirect

It can also have serious impacts that are invisible at first glance. Because of their durability and buoyancy, plastics travel through our oceans and can last a very long time, and they are not only physically harmful to marine life – entanglement, ingestion, suffocation, open wounds – but also chemically (Hutton, 2008; Lavers, Bond, & Hutton, 2014 & 2019). Indeed, some synthetic polymers are considered potentially toxic themselves: several of their main components – chemicals derived from crude oil, cellulose, carbon or natural gas – are hazardous and could enter in the animal's organism. A study in which researchers compared the health and environmental hazard levels of 55 massively produced polymers revealed that 31 of them were made from monomers and chemicals either considered as carcinogenic (which can potentially cause cancer) and/or mutagenic (having the ability to change genes), as toxic for reproduction and hazardous to the marine environment, but also as endocrine disruptors – substances that interfere with hormones – and that 16 of them were highly hazardous (Lithner, Larsson, & Dave, 2011). The worst ranked plastics belonged to the polymer families of PVC, polyurethanes, epoxies, polystyrenes and acrylics. What is more, though plastics are essentially biologically inert, they contain toxic additives that

could be released in the environment at any point of their lifecycle (EFSA, 2016; Mathieu-Denoncourt, Wallace, de Solla, & Langlois, 2015).

Another problem is that some polymers, by moving into the marine environment, absorb other toxicants and pollutants found in the environment, hence the growing number of scientists urging governments to update their plastic waste management policies and to officially start regarding plastics as hazardous waste, by phasing out or substituting the most dangerous polymers whenever possible, and otherwise taking appropriate measures to reduce the risk of exposure to harmful chemicals (Rochman et al., 2013; EFSA, 2016). Because of their hydrophobic surface, synthetic polymers act as a vector for bacteria and man-made pollutants present in our oceans, namely heavy metals, pesticides, plasticizers, some of which are considered POP – i.e. persistent organic pollutant (NOAA, 2014; Teuten, Rowland, Galloway, & Thompson, 2007; Teuten et al., 2009). In fact, pollutants and pathogens colonise plastics because of their high surface-to-volume ratio – their large surface – which increases as fragments break into smaller pieces due to weathering, thus making microplastics a perfect environment to thrive on (NOAA, 2014; Rochman, 2015). Indeed, as plastic debris photodegrade, they gain surface area, which creates flocs and oxygen, thus increasing their porosity and roughness and allowing them to accumulate increasingly higher amounts of contaminants (Rochman, 2015). As a result, the longer the plastics remain in the seawater, the greater their concentrations of toxic pollutants will be and the more hazardous they will become for animals that ingest them (Rochman, 2015). A total of 78% of the substances that adhere to plastics and contaminate them are considered persistent toxicants – hazardous to health and that do not degrade for a long time (Lavender Law, 2017). Microplastics such as PP pellets can contain much greater concentrations of contaminants like PCBs than those of surrounding water column – sometimes up to a million times higher, and the PE resin, widely used to manufacture plastic bags and bottles, seems to accumulate more toxic pollutants than the other plastics (Mato, Isobe, Takada, Kanehiro, Ohtake, & Kaminuma, 2001; Teuten, Rowland, Galloway, & Thompson, 2007; Rochman, 2015).

Among the most toxic substances likely to be released by plastics are phthalates (esters used as plasticizers mainly for PVC, like benzyl butyl phthalate, denoted BPP), but also the infamous bisphenol A (BPA, a monomer widely used in food packaging and beverage containers due to its strength and resistance), alkylphenols (used in PVC and PS, but also in cleaning agents, for instance), polycyclic aromatic hydrocarbons (denoted PAHs and mainly produced by the combustion of organic materials such as oil, petrol, wood and coal, generated for instance by incinerators or deforestation), organochlorinated compounds including solvents used in PVC, organochlorine pesticides, insecticides and fungicides such as dichlorodiphenyltrichloroethane (DDTs) and polychlorinated biphenyls known as PCBs (they were banned decades ago but were widely used between the 1930s and the 1970s), but also halogenated compounds and finally monomers like styrene that are used as solvents or flame-retardants such as polybrominated diphenyl ethers, also known as PBDEs (Teuten, Rowland, Galloway, & Thompson, 2007; Teuten et al., 2009; Cole, Lindeque, Halsband, & Galloway, 2011; Lithner, Larsson, & Dave, 2011; Schug, Janesick, Blumberg, & Heindel, 2011; Rochman et al., 2013; NOAA, 2014; Mathieu-Denoncourt, Wallace, de Solla, & Langlois, 2015).

Another issue posed by plastic ingestion is its retention in the animals' body: in fact, tiny animals such as bivalves are unable to clear the plastic microfibers present in their organism, and the longer it stays in the digestive tract, the more damage it can cause to the animal (NOAA, 2014). Indeed, some species are able to expel the plastic debris before it fully passes beyond the guts and into their organism, but others are not, and will therefore accumulate plastic debris that will later enter the circulatory or immune system (NOAA, 2014; Browne, Dissanayake, Galloway, Lowe, & Thompson, 2008).

10.2.2. FIGURES

At least 10% of marine species that encountered plastic have ingested it, and the ingestion of plastic debris is now affecting all seven species of marine turtles, over a third of all seal species, respectively 59% of whales and seabirds, 92 different fish and 6 types of invertebrates (Wilcox, Van Sebille, & Hardesty, 2015; Baulch & Perry, 2014; Gall & Thompson, 2015; Kühn, Bravo Rebolledo, & van Franeker, 2015; Lavender Law, 2017). In the Mediterranean, 134 species are

found to be affected by plastic ingestion (including all three species of sea turtles), and half of the world's sea turtles have already ingested plastic at least once in their life (Deudero & Alomar, 2015; UNEP, 2015b; Alessi & Di Carlo, 2018). In the North Pacific only, fish are found to ingest 12 and 14,000 tons of plastic yearly.

a) Seabirds

Seabirds are the worst affected group of animals: plastic fragments have been found in the stomachs of 90% of all the world's seabird species, up 85% from 1960, and this percentage could rise to 99% by 2050 if we do not reduce the flow of plastic waste entering the oceans (Wilcox, Van Seville, & Hardesty, 2015). As explained by researchers such as Dr Jennifer Lavers and her colleagues Alex Bond and Ian Hutton in *Drowning in Plastic*, birds are therefore considered a bioindicator to study plastic debris ingestion. If it is the most studied marine species regarding the issue, it is mostly because they are badly impacted – various species with different feeding behaviours and reproduction or migration areas have been reported to ingest plastic – but also because they are easier to capture than other animals and can have their stomach content regurgitated (NOAA, 2014).

In fact, seabirds tend to eat as much plastic as other species, but seem to retain it longer, since the plastic fragments often remain stuck in the gizzard (their throat) and thus cause direct health impacts like open wounds or blockage of the digestive tract, but more important, they prevent them from eating real food instead of debris – and thus take proper care of their offspring, since they not only collect debris to build their nests, but they also feed their chicks with it (Hutton, 2008; NOAA, 2014; Lavers, Bond, & Hutton, 2014 & 2019; Provencher, Bond, & Mallory, 2014). Nevertheless, it has been found that seabirds which catch their prey on the water surface (the so-called surface plungers or surface-feeding species) are more likely to ingest plastic than those using foraging strategies, since most plastics aggregate above the waves where they float – and look like fish to seabirds – rather than in deep waters (Provencher et al., 2014; Provencher, Bond, & Mallory, 2014).

For instance, on Lord Howe Island, which hosts the largest population of flesh-footed shearwaters (*Puffinus Carneipes*) on Earth and where Liz Bonnín went to help Lavers, Hutton and Bond in their rescue and study of contaminated fledglings, the population of puffins has been declining for over 20 years due to multiple threats, including entanglement and plastic ingestion (Hutton, 2008; Lavers, Bond, & Hutton, 2014 & 2019). Indeed, Hutton even found that 79% of flesh-footed shearwater chicks contained huge amounts of plastic debris, and that 6% to 22% of these fragments remained in the digestive tract of the fledglings after proceeding to a stomach lavage (Hutton, 2008; Lavers, Bond, & Hutton, 2014).

b) Marine mammals

Marine mammals are also badly affected by plastic ingestion, though the related data are scarcer and thus harder to study than for other marine animals, since most of them are collected from dead or stranded mammals, or captive individuals (NOAA, 2014). Researchers of Plymouth University found the presence of plastics in the digestive tract of larger animals such as shearwaters, gulls, loons, seals, porpoises, whales, fulmars, and sea turtles (Thompson, 2017). Whales, for instance, feed by filtering huge volumes of water, thereby incidentally consuming plastic debris, while seals tend to ingest plastic directly by selecting contaminated preys or by mistaking it for food when younger (NOAA, 2014).

c) Sea turtles

Over 50% of all sea turtles in the world may have plastic in their bellies and one in three species have been reported to have ingested large quantities, but loggerhead turtles are especially threatened by plastic ingestion: sometimes, a single plastic item entering a sea turtle stomach is enough to kill it – by blocking or piercing its guts, choking it, or creating pockets of air in its guts that make diving and thus feeding difficult (Schuyler, Hardesty, Wilcox, & Townsend, 2014; Alessi & Di Carlo, 2018; WWF Australia, 2018c).

d) Seafood

Seafood is obviously badly impacted. In smaller animals such as molluscs or shellfish, and especially bivalves – oysters, mussels, lobsters, crabs, sole and so on – but also in the microscopic zooplankton, ingestion of microplastics and

synthetic fibres smaller than 1mm was found to be recurrent: 80% of invertebrate species eat plastic fragments (Thompson et al., 2004; Browne, Dissanayake, Galloway, Lowe, & Thompson, 2008; Cole et al., 2013; Van Cauwenberghe & Janssen, 2014). In fact, tiny animals such as bivalves feed on the seabed by dwelling the sediments, and accumulate lots of microplastics (Teuten, Rowland, Galloway, & Thompson, 2007; UNEP, 2015b). Both wild and farmed organisms were found to ingest microplastic, since the latter also feed on algae naturally present in the ocean instead of being fed by their producer, and therefore absorb as much pollutants as their unfarmed counterparts, though some researchers found higher concentrations of microplastics in farmed mussels than in wild ones (Van Cauwenberghe & Janssen, 2014; Mathalon and Hill, 2014). Moreover, tiny marine animals such as crustacean, molluscs or amphibians tend to be more affected by plastic additives (NOAA, 2014). In pelagic fish – those living far from the shorelines, in the open ocean – the most common pieces of plastic litter ingested turned out to be large macroplastics like cigarette buds.

10.3. Ecosystems imbalance

As mentioned before, by acting as some sort of vehicle, in addition to pollutants, plastic can transport microorganisms and thus bring alien species (i.e. invasive plants, animals, bacteria that are not usually found in the habitat) into precious ecosystems including coral reefs, mangroves, seagrass meadows, mussel beds or marine sponges, that normally provide real nurseries for many marine species, thereby unsettling their balance (Pham et al., 2014). These benthic ecosystems (i.e. those living on the bottom on the ocean) are already threatened by plastic debris that can cause physical harm by cutting into them if sharp, or cover them if soft like plastic bags, therefore preventing animal populations from colonising the marine flora and depriving the ecosystems of proper oxygen transfer, but their biggest threat is the microorganisms that thrive on it.

Indeed, plastics debris, and more specifically fishing lines or those with large cavities like plastic bottles and bags made of PP, PE and PS, have been found to be a great substrate for microbial and bacterial colonisation: they would

be colonised by 1,000 different species of microorganisms distributed in 335 “communities”, sometimes referred to as the “plastisphere” and which include seaweeds (algae, sponges) and invertebrates (crustaceans, insects, molluscs), but also dangerous bacteria that are known to be human and animal pathogens, such as strains of the genus *Vibrio* (*Vibris Crassostreae*), a bacteria mentioned in *Drowning in Plastic* that may cause cholera in humans (Pham, Jung, Lumsden, Dixon, & Bols, 2012; Carson, Nerheim, Carroll, & Eriksen, 2013; Zettler, Mincer, & Amaral-Zettler, 2013; Kiessling, Gutow, & Thiel, 2015; Foulon et al., 2016). As mentioned earlier, these microorganisms are known to form biofilms on plastics (they attach to them) which act like rafts that can transport and disperse them, and this could encourage their degradation process (Bonhomme et al., 2003; Webb, Crawford, Sawabe, & Ivanova, 2009). *Vibrio* tends to thrive especially well on PS (Pham, Jung, Lumsden, Dixon, & Bols, 2012). The Pacific and North Atlantic carry the highest concentrations of microorganism communities living on floating plastic on Earth, followed by the Mediterranean where half of all plastics found on the seabed were colonised by microorganisms, and 12% of them were totally covered by biofilms (Sánchez et al., 2013; Kiessling, Gutow, & Thiel, 2015).

Moreover, plastics may also impact the distribution of pelagic species (i.e. those living in the open sea), since marine species such as fish, sea turtles and dolphins, are known to aggregate below those plastic rafts to find refuge or food, therefore crossing long distances and sometimes even entering other ecosystems and crossing oceanic barriers (Kiessling, Gutow, & Thiel, 2015).

10.3.1. CORAL REEFS

Coral reefs are real nurseries and fisheries for other organisms: they host 25% of all marine species on Earth – it represents millions of species – though they make up only 0.1% of the ocean floor (WWF, 2019a). As reminded by WWF, the biodiversity provided by coral reefs is in fact similar, in numbers of species, to that of the Amazon or New Guinea rainforests. Indeed, coral reefs are to the ocean as tropical forests are to the land. Moreover, millions of people rely on them for their primary food, and since they grow in shallow water, they also serve as a barrier against many wavy storms and protect the coastlines from erosion – and therefore, plastics too (WWF, 2019a). They are already put under considerable pressure and

eroded with overfishing or destructive fishing techniques such as bottom trawling, but also climate change, tourism, and sedimentation due to construction, mining etc., so plastic pollution adds another stress with poisoning toxins dumped in the ocean. Indeed, half of the world's mangrove and coral reefs already died, and 90% of those remaining are predicted to suffer from 'bleaching' by 2055 (Hooidek, Maynard, Manzello & Planes, 2013). This process, caused by ocean acidification, pollution and rising temperatures, threatens corals by removing the algae present in their tissue, which is their major source of food and gives them their colours (UNEP & NOAA, 2012; NOAA, 2019; WWF, 2019a). The corals then turn very pale or even completely white, are more prone to disease and if the stress continues, they eventually die (NOAA, 2019; WWF, 2019a).

The largest coral reef is the Great Barrier Reef, stretching for around 2,300 kilometres in the Coral Sea, off the east coast of Australia. Part of it extends in the Coral Triangle, a region considered as the world's centre of marine biodiversity, which stretches across six countries, namely including Indonesia, Malaysia and the Philippines, covers over 6 million km², sustains over 130 million people, and hosts more than three quarters of the world's different coral species, over 6,000 different species of fish, almost all species of marine turtle and some 30 different species of cetaceans (WWF, 2019a). Therefore, even greater attention must be paid to these precious organisms.

11. Plastic is not so fantastic: impacts of plastic pollution on humans

For a long time, people assumed that the pollutants littered in our seas would dilute and eventually disappear. Not only is this utterly false, but the issue is even worse than previously thought. In fact, as a result of our careless attitude towards marine pollution, plastics and the toxic substances they contain entered the food chain up to humans, who ingest these toxicants either through contaminated food and water or directly from consumer products which release contaminants (World Health Organization [WHO], 2002).

11.1. Microplastics in our food: the biter bit

We know now that microplastics are ingested by a wide variety of species, from the tiniest to the largest. The animals which feed on preys that have ingested microplastics are in turn eaten by larger creatures, and so on and so forth. In addition to the toxic substances that plastics could release, researchers warned that these debris may well attract toxins present in the environment and have dangerous consequences once released in the organism. Each year, millions of tons finfish and shellfish, either fresh, dried, salted or smoked, are produced for human consumption, and as said in the introduction to this paper, it is the main source of animal protein for millions of people across the globe, especially in Asia (Fisheries and Aquaculture Organization [FAO], 2018). These microplastics could therefore enter the food chain.

A Belgian study revealed that the average European consumer may well eat up to 11,000 pieces of microplastics each year, and though we would only absorb less than 1% of it, they still accumulate in our organism (Van Cauwenberghe & Janssen, 2014). This study also revealed that microplastics were as much frequent in cultured bivalves like mussels and oysters than in their wild counterparts. Another study from Plymouth University researcher Richard Thompson (2017) stated that microplastics had been found in a third of 10 fish species caught and eaten up in the United Kingdom, including lobsters, herrings, haddocks, cods, shellfish and mackerels.

According to a French-Malaysian review, in Eastern Asian developing countries, dried fish and shellfish (mackerels, mullets, croakers and anchovies) is a popular and low-cost source of proteins, since the drying process increases their lifetime, and it has been found that a third of these species contained microplastics fragments – mainly PP and PE, but also PS, PET and nylon (Karami, Golieskardi, Bin Ho, Larat, & Salamatina, 2017). Dried, smoked or salted fish are often processed and eaten as a whole without being first cleaned, which may lead us to think that by removing the guts, we would remove microplastics, but the very same paper revealed that eviscerating them before consumption would not reduce the uptake of toxicants, since they transfer from the digestive tract into the edible

tissues. Indeed, not only microplastics, but also toxins and additives would either way enter the food chain by penetrating their fat tissue. The results of a 2018 survey showed that a quarter of all fish species consumed in South Pacific remote islands contained plastic, such as those catch on Lord Howe Island or Henderson Island, mentioned in *Drowning in Plastic* (Forrest & Hindell, 2018).

As mentioned earlier, if ingested at high doses, the toxicants contained in and released by plastics are endocrine disruptors not only in animals but also in humans (they could unsettle the hormone system by mimicking oestrogens when released through UV exposition or when exposed to microwaving or boiling water in the case of food packaging), and they may as well cause cancer such as breast and prostate cancers, disrupt the immune, neurological, cardiovascular and reproductive systems (it could lead to infertility, endometriosis, ovary diseases such as polycystic ovary syndrome, or even hypospermia – a decreased production of sperm), lead to malnutrition and create diseases and conditions such as diabetes or behavioural problems, and impair the development of genes, though more research is needed (Teuten et al., 2009; Barnes, Galgani, Thompson, & Barlaz, 2009; Cole, Lindeque, Halsband, & Galloway, 2011; Schug, Janesick, Blumberg, & Heindel, 2011; Lithner, Larsson, & Dave, 2011; Bang et al., 2012; Rochman et al., 2013; NOAA, 2014).

The problem is that the concentration of chemicals rises between each link in the food chain, resulting in contamination levels sometimes millions of times higher in larger marine animals found at the end of the food chain (whales, sharks, seals, and even seabirds) than in the environment they live in (NOAA, 2014; EFSA, 2016). For instance, higher up on the food chain is the polar bear that feeds on seals and can have amounts of contamination up to 3 billion times higher than the surrounding soil or seawater (WWF, 2004). Just imagine the results for the species at the top of the food chain, the Earth's unique 'super predator': human beings. I let you do the math.

What is more, is that microplastics fibres are not only found in seafood: they would also contaminate table sea salt and honey, so maybe you would not want to add a pinch of salt on your dishes nor a teaspoon of honey in your infusion

(Karami, Golieskardi, Choo, Larat, Galloway, & Salamatinia, 2017; Kosuth, Mason, & Wattenberg, 2018).

As a matter of fact, whether you prefer fish and chips, dried mackerels or *moules-frites*, you might think twice next time you want to eat seafood. Nevertheless, though concerned as to the widespread microplastic pollution, Thompson (2017) reassures and emphasizes that there is *not enough* clear evidence yet that the consumption of contaminated fish effectively causes harm to the human health, and states that we are probably exposed to much greater quantities of plastic at home or work than by eating or drinking, unless you eat thousands of mussels and tons of salt per year. However, as WWF UK and Greenpeace recalled in their respective 2003 survey, though we are not yet sure of *how* or *how much* toxic chemicals contained in plastic materials affect human health due to a lack of data and substantial proof, evidence is mounting that they are linked to a range of health problems in both humans and animals, and that their presence in food could potentially increase direct exposure of synthetic chemicals to humans and represent a risk to public health (WWF UK, 2003; Santillo et al., 2003; Werner et al., 2016). Phasing out their use would therefore be the safest option, since there is no such thing as ‘zero risk’ when it comes to our health. Put another way, there is no room for doubts: we cannot play the lottery or the Russian roulette with this.

11.2. Microplastics in our drinks

Various German studies revealed the presence of all sorts of microplastics in both bottled and tap water (even that derived from groundwater wells), coming either as fragments or as microbeads, much of them smaller than 100 µm and made of PET, but also PP, PE, PA, PS, PVC, PTFE and PES (Oßmann et al, 2018; Kniggendorf, Wetzel, & Roth, 2019; Mintenig, Löder, Primpke, & Gerdt, 2019; Schymanski, Goldbeck, Humpf, & Fürst 2019).

A broader study, conducted in the United States and which screened 11 famous brands of commercial packaged water sold across nine different countries around the globe, including Evian and San Pellegrino, indicated that 93% of the

bottles tested were contaminated by microplastic particles (Mason, Welch, & Neratko, 2018).

Microplastic fragments and fibres are released from the tubes used in our piping systems and from the plastics used to manufacture water and beverage packaging – even those made of glass or carton, since the cap or the coating are made of synthetic polymers. Some have even been found in other bottled drinks like beers (Kosuth, Mason, & Wattenberg, 2018). However, due to the current lack of data available on the consequences of the consumption of contaminated food and beverage, further research is needed before definitely raising the alarm as to the concentration levels of microplastics entering the human body.

11.3. Microplastics in consumer goods

We would thus ingest plastic particles, and to add insult to injury, as mentioned earlier, they are not the only threat: though data on human exposure is limited, a growing body of evidence shows that anthropogenic toxic chemicals absorbed or released by plastics could cause cancers and reduce fertility, but it could also affect the immune and neurological system – by developing behavioural disorders, for instance – or muscle coordination and birth weight, and they probably pose many other health risks as yet unknown to humans and/or wildlife (WWF UK, 2003).

A WWF UK biomonitoring survey (2003) tested the blood of over 150 volunteers and identified highly toxic substances in every one of them. These were well-known dangerous chemicals such as organochlorine pesticides and brominated flame retardants: PCBs (polychlorinated biphenyls), DDTs (dichlorodiphenyltrichloroethane) and PBDEs (polybrominated diphenyl ethers). They found a total of 90% of all the chemicals they were looking for, ten of them were found in more than 95% of samples, and a person's blood even contained two thirds of them. The survey also revealed that older people and men had lower levels of PCBs – the latter could be explained by the fact that women, when breast-feeding, transmit some of the chemicals to their child.

11.4. Microplastics in the air

As explained in *Drowning in Plastic*, tyre wear creates microplastic particles, as small as a dust. Another study led by scientists from Greenpeace Research Laboratories (Santillo et al., 2003) revealed that house dust may represent a significant source of exposure to these hazardous chemicals, since they are used to manufacture a wide range of common household products. Researchers actually discovered that their concentration levels were much higher than those found in blood samples, and they pointed out their presence in personal care products like cosmetics, but also in PVC, electronic goods, paints, rubbers and many other products and objects containing plastic, such as our children's teething rings and toys.

What is more, as revealed in the subtitled documentary, poor people living near plastic production facilities are more exposed to rubbish, owing to a mismanagement of plastic waste (improper plastic disposal), and due to toxins generated by burnt plastics during incineration, and thus face even greater health problems (Lusher, Hollman, & Mendoza-Hill, 2017; Gaia, 2017).

11.5. Microplastics in our clothes

As Liz Bonnin mentioned it, synthetic fibres used in clothing could be released in the drains during a wash cycle. Indeed, according to a study led at Plymouth University, in which the team of researchers washed clothes made of various fabrics at 30 °C and 40 °C, acrylic fibres would be five times more likely to end up in the waste water than fabrics made of polyester or polyester-cotton blend, since they would release nearly 730,000 microfibrils per wash (Napper & Thompson, 2016).

12. Plastic world: worst affected areas

Not a single marine area on Earth has been left unaffected by human pressures, and over 40% of our oceans is said to be strongly affected (Halpern et al., 2008). The ocean is one of the most unexplored places on Earth – we only explored 5% of the oceans bottom, with many undiscovered phenomena and species, and yet, even at the very bottom of the ocean, where no humans go

dump their rubbish, startling amounts of plastic debris have been pictured during deep submersible dives. At the Mariana Trench, the ocean's deepest point, virtually intact plastic bags have been filmed, and we discovered that crustaceans and other benthic species living near the deep seabed were also ingesting plastic.

12.1. Oceanic gyres: the Great Pacific Garbage Patch

A zone in which the accumulation and concentrations of macro- and microplastics are huge is called an oceanic or subtropical gyre – sometimes also referred to as a 'plastic island' – and there are five of them across the globe: three are located in the Southern Hemisphere (one in the South Pacific Ocean, another in the South Atlantic Ocean and a third in the Indian Ocean), while the remaining two are found in the Northern Hemisphere – the most infamous one, also known as the Great Pacific Garbage Patch, located in the North Pacific, covers an estimated 1.6 to 3.43 million square kilometres (i.e. three to five times the size of France, or between half and a third of Europe's surface area, according to clean-ups expedition such as the Ocean Cleanup or the 7th Continent Expedition), and the other in the North Atlantic (Moore, C. J., Moore, S. L., Leecaster, & Weisberg 2001; Lavender Law et al., 2010; Lebreton, Greer, Borrero, 2012; 7th Continent Expedition, 2012; Eriksen et al., 2013; Cózar et al. 2014 & 2015; Lebreton et al., 2018; The Ocean Cleanup, 2019). Much of macroplastics present on the surface of the ocean will accumulate in these subtropical gyres, gathered by a global network of oceanic currents that together form huge vortexes, while tiny little microplastics float in the pelagic environment – all along the water column (Eriksen et al., 2014). A third of all the world's plastics is concentrated in the North Pacific, the most plastic-polluted ocean on Earth, followed by the Indian Ocean, with around 12 to 21,000 tonnes of debris forming this so-called 'plastic island' (Eriksen et al., 2014).

12.1. Europe: the Mediterranean

Each year, 150,000 to 500,000 tonnes of macroplastic debris and between 70,000 and 130,000 tonnes of tiny microplastics end up in European seas, primarily in the Mediterranean Sea (European Commission, 2018). Scientists estimate that plastics account for 45 to 95% of the waste found on European

beaches and seas, including on the deep-sea floor, and could reach up to 100% on the ocean surface, with up to 890,000 pieces of plastic per square kilometre (Galgani et al., 2000; Eriksen et al., 2014; Galgani et al., 2014; UNEP, 2015b). The five-top sea-polluting countries in the region are – in decreasing order – Turkey, Spain, Italy, Egypt, and France (Alessi & Di Carlo, 2018).

The Mediterranean Sea is considered as the cradle of civilization and many precious ecosystems used to thrive in its waters. Nevertheless, according to the report entitled *Out of the plastic trap: saving the Mediterranean from plastic pollution* (2018) published by the World Wildlife Fund (WWF), it is nowadays considered one of the most polluted seas in the world – with one of the highest concentrations of plastic waste, actually four times higher than that of the Great Pacific Garbage Patch (Alessi & Di Carlo, 2018). Indeed, in terms of plastic accumulation, it is said to be the world's 6th worst polluted marine area (it contains 7% of all ocean microplastics), though it barely holds 1% of the Earth's water (Lebreton, Greer, Borrero, 2012; Eriksen et al., 2014; Cózar et al., 2015; Suaria et al., 2016). Even the Pelagos Sanctuary, which is the largest European marine protected area (MPA), has a concentration of microplastics comparable to those in subtropical gyres (Reuchlin-Hugenholtz & McKenzie, 2015; Alessi & Di Carlo, 2018).

Various factors may explain this figure. First, the region generates one of the largest quantities of solid household waste, between 200 and 700kg per capita each year (UNEP, 2014; UNEP, 2015b). This huge figure is mostly due to the fact that during the peak season, the region attracts 200 million tourists in addition to the 150 million permanent residents, increasing marine litter by 40% and generating 75% of the annual waste (Galgani et al., 2014). Another reason for such alarming figures on plastic pollution is that, as anywhere in the world, marine litter mainly originates from in-land activities, and the Mediterranean, a semi-enclosed sea, borders three different continents, causing a long-term accumulation of plastic waste. It also comes from rivers that carry the trash generated by densely populated areas through which it passes – essentially the Nile, the Ebro, the Rhone, the Po, and the Turkish Seyhan and Ceyhan rivers (Galgani et al., 2014; Alessi & Di Carlo, 2018).

12.2. Arctic Circle

Longyearbyen, located in the Norwegian archipelago of Svalbard, in the Arctic Circle, is the northernmost town on Earth and one of the world's most remote islands. As explained by Liz Bonnin, Longyearbyen is quite unique: it has 24 hours of sunshine a day during three months of the year, followed by 24 hours of darkness. In other words, it has no nights for over ninety days in summer and no days for ninety more in winter.

According to various Canadian studies, plastics even affect the North Atlantic and the High Arctic regions: researchers found microplastics in the guano (i.e. the poo) of up to 71% of Arctic marine birds (the great shearwaters and Northern fulmars are the most badly impacted species), and 87% of all fulmars in the Canadian Arctic have already ingested plastic (Provencher, Gaston, & Mallory, 2009; Provencher et al., 2014; Provencher, Bond, & Mallory, 2014). Moreover, microplastics have been found to be ingested by plankton and tiny invertebrates such as mussels, but also in the faeces of walruses and other apex predators.

12.3. Remote islands

Many remote islands that, apart from experts, are otherwise inhabited by humans because of the harsh and inhospitable environments are also badly affected by plastic waste, even though no one directly dumps it there.

12.3.1. LORD HOWE ISLAND

For instance, Lord Howe Island, where Liz Bonnin takes part in rescue mission to try and save as much flesh-footed shearwaters as possible, where Dr Jennifer Lavers, a marine biologist who has been studying the impacts of plastic waste on the island for more than 10 years, and her team analyse the stomach of shearwaters puffins and take samples.

12.3.1. HENDERSON ISLAND

Another example worth to mention is Henderson Island, considered by scientists as the most plastic-polluted island to date, though it is lost in the middle of the South Pacific Ocean, with no other island at 200km around (Forrest & Hindell, 2018). It is only visited for purposes of research once every ten years or

so, but being isolated from all human life did not prevent it to be filled with plastic, since it is located near the centre of the South Pacific gyre ocean current, therefore also receiving debris from South America or the fishing industry. A study led by Dr Lavers and Dr Bond (2017) estimated to around 38 million the number of plastics debris present on this island, weighing 17 tonnes. This UNESCO World Heritage Site is far from being a pristine remote island, since it is not so as much deserted by plastics as it is by humans: over 3700 pieces of plastic are being washed up each day on just one of its beaches. These figures would even be greater, since only a certain size of plastics was sampled in this study that focused on the beaches rather than on cliffs. Dr Lavers added that now 55% of all seabird species, including two found on Henderson Island, are threatened by plastic waste.

The remote places aforementioned only represent a few of the many examples that show how much plastic is affecting wildlife and the environment at a global and horrific scale, even in the middle of nowhere, as reminded by Liz Bonnini, and that there is no way for us to escape it. The increase of debris found stranding on such remote places mirrors the increased number of debris abounding in our oceans, as well as it reflects the fact that plastic has long-term devastating consequences when they accumulate in our seas (Eriksen et al., 2014; Ryan, Moore, van Franeker, & Moloney, 2009).

13. Solutions to turn the tide on plastic

Since plastic marine litter is mainly due to the lack of an effective waste management system and an excessive production and consumption, it would require a change in our habits, but we can tackle it. However, as reminded by the GESAMP (2015), the measures taken and the efforts made today may take years before they pay off and show benefits, so we might as well get started right away to achieve the zero-waste goal and if we want to witness any kind of improvement in our lifetime.

Zero waste is has become a trend last years, perhaps one of the only sensible fashion to follow, even if large corporations of all sectors are increasingly surfing on this wave by greenwashing their image. Zero waste supermarkets,

shops, items and alternatives are popping all around the globe, and multiple brands made public pledges by committing to going plastic-free.

Numerous cities, regions and countries banned single-use plastics or planned to do so in the coming years. Currently, around 30 countries in the world implemented national or regional bans on plastic shopping bags. Speaking about fashion, many clothing brands are going back to natural basics, creating 100% cotton fabrics, tote bags made from old jeans and even recently, shoes reusing old plastic have recently been spotted on lots of podiums. Alternative materials to plastic or reusable solutions are either created or brought up to date even in the intimacy of our bathrooms, with bamboo toothbrushes, cleaning cotton pads, natural cosmetics and make-up – or brands trying to greenwash their products – menstrual cups and other feminine protection products like washable pants or pads. Periods can seem taboo, but not when it comes to the billions of tampon applicators ending up in landfills – at best – knowing that a woman will on average use 11,000 disposable feminine hygiene protections in her lifetime, that 45 billion menstrual products are used each year, and taken into account that 1.4 million period products are daily flushed down British loos, and that a pad is 90% plastic-made, according to the plastic-free brand Natracare (Bodywise, 2019).

13.1. Authorities

In May 2018, the European Commission proposed new rules to target marine litter, and more precisely abandoned or lost fishing gear at sea, as well as the 10 most common single-use plastic products found in European seas or on the beaches. In fact, those items make up 70% of all marine litter.

Building on the momentum gained through its campaign for voluntary pledges, the European Commission proposed its *Declaration of the Circular Plastics Alliance*,

13.1.1. AT AN INTERNATIONAL LEVEL

Countries around the globe must create a legally binding joint agreement to eliminate any leakage or littering of plastic materials in the environment, in order to prevent land-based plastic pollution from entering the sea. To achieve this, authorities must provide to their citizens well-organized collection and deposit

schemes designed for plastic waste recycling. We must reach a 100% waste collection rate.

a) Promote the importance of marine ecosystems

In order to avoid jeopardizing marine ecosystems with harmful fishing techniques, we must support small-scale producers. People need to understand that their own health is at stake if the marine environment is threatened: if our oceans are unhealthy, it is not only bad for human health too, but also for economic or social development.

One of the many associations aiming to prevent and fight plastic pollution and marine litter that formed during last years is the Global Plastics Alliance (GPA), a group of now 75 plastics associations, including PlasticsEurope, coming from 40 countries worldwide and established at the 5th International Marine Debris Conference (IMDC) in 2011. As of December 2017, the GPA planned or launched a total of 355 projects around the globe to address the plastic pollution issue. This alliance is based on the global *Declaration of the Global Plastics Associations for Solutions on Marine Litter*, a commitment document whose signatories include PlasticsEurope.

During its last annual meeting in December 2018, the main topics discussed were the 4th session of the UNEA (the United Nations Environment Assembly) and the implementation of Operation Clean Sweep (OCS), a project launched by the plastics industry aiming to prevent the loss of plastic raw materials – like plastic pellets, powders or flakes – across their entire value chain and to which PlasticsEurope and many other plastic producers, manufacturers and associations are participating.

The IMDC is a collaborative initiative from the NOAA (National Oceanic and Atmospheric Administration), the UNEP (the United Nations Environment Program) and other organisations and aims to debate over various subjects related to marine litter, such as prevention or community-led coastal and beach clean-ups, but more important, it was held to create a document known as the *Honolulu Strategy*. This strategy is a framework for a global and collaborative effort to prevent and reduce the negative and cascading impacts of marine debris

on the environment, especially on our oceans' biodiversity and ecosystems, but also on our economy and health, and even on our navigation safety; and a planning and monitoring tool on local, national, regional and global levels (UNEP & NOAA, 2012).

b) Protect our seas by implementing MPAs (marine protected areas)

In 2002, the World Summit on Sustainable Development (WSSD), which was held in Johannesburg, set up a goal for 2012: declaring parts of the ocean as conserved, or as 'marine protected areas' – or MPAs (United Nations, 2002).

In fact, though they make up around 70% of the Earth's surface – they are the world's biggest living space – less than 6.5% of our oceans were declared marine protected areas (or MPAs) – which does not necessarily imply that such areas actually benefit from an effective and complete protection, since only 1.89% of our oceans is totally protected, and called 'no-take MPAs' (IUCN, 2017). There is therefore still much work for us to do. According to WWF, by protecting marine ecosystems, MPAs not only allow fish stocks to recover, but they also enable job-creation and tourism promotion.

In 2010, the UN Convention on Biological Diversity established a rescue plan aiming to ensure that MPAs would cover at least 10% of our oceans by 2020, and in 2015, the UN General Assembly adopted a resolution to establish a legally-binding treaty to conserve the high seas, i.e. marine areas beyond national jurisdiction known as 'ABNJ', that belong to everyone, or shall we rather say to no one, and that account for 62% of the ocean's surface and 95% of its volume (UN, 2015; Lusher, Hollman, & Mendoza-Hill, 2017). They were supposed to meet for the fourth and last time in March 2020 – the meeting was obviously postponed because of the sanitary crisis. This 'global ocean treaty' could help protect up to 30% of our oceans, a number recommended to achieve by scientists at the IUCN World Parks Congress in 2014 (IUCN, 2017). Implementing MPAs could benefit not only the marine environment and people depending on it, but also the economy, by creating jobs in a sustainable blue economy, by protecting our oceans for future generations and creating ecological policies towards the oceans' recovery.

c) 2030 goal: all new plastics are reusable and recyclable

Plastics must be 100% recyclable, since today, the issue is that recycling facilities do not accept any type of plastics, because some are too difficult, if not impossible to reconvert. Those that are considered unrecyclable are dumped in landfills.

The issue of increased lifetime in plastic packaging still needs to be addressed: we must design these ubiquitous materials so that their increased longevity, durability and resistance will not be harmful to wildlife and nature, and in such a way that enables their reusing and recycling, as well as increase our recycling rates and improve our recyclates – these recycling facilities that process plastic waste. This would boost the market for recycled plastics and make the plastics industry more competitive.

In January 2018, the European Commission adopted its *European Strategy for Plastics in a Circular Economy*, presented as a priority in its *Circular Economy Action Plan*. This strategy, the first-ever of its kind in Europe, forms part of the European transition towards a circular economy and aims to protect the environment and to make a safer and more sustainable use of plastics by transforming the way we design and produce them, but more importantly, by improving their recycling within the EU. It also aims to reach the EU's climate commitments and its *Sustainable Development Goals* by reducing GHGs emissions, marine litter and our dependence on fossil fuels – mainly those imported. The ambitious goals envisioned by the European Commission in this declaration are for all plastics newly produced to be 100% recyclable by 2030, and for half of all the plastic waste to be recycled by 2025, then to increase plastics waste recycling rate by one percent a year in order to reach 55% by 2030.

Moreover, the European Commission wants the demand for recycled plastics to grow four-fold. Indeed, though the plastic demand keeps on growing in Europe, the demand for recycled plastics is still too weak – representing only 6% of the total demand – and needs to be boosted (European Commission, 2018). Consumers must learn to use plastic materials in a more sustainable way, to reuse or repair them before buying new ones, and to recycle them properly once their

service life has come to an end, businesses must commit to prevent plastic leakage in the environment across all the links in the supply chain, from raw material resources to end markets, and authorities must ensure to prompt people to move from a single-use, throw- and takeaway lifestyle and go-go-go culture to a sustainable, eco-friendly and non-polluting society, by enforcing laws on proper disposal and recycling of used plastics, but also by reducing the number of single-use plastics.

In September 2017, a conference called *Reinventing Plastics – Closing the Circle* and, a UN initiative, aiming to present problematics linked to plastic pollution and explore potential solutions that would be proposed in the *European Strategy for Plastics in a Circular Economy*, took place in Brussels. The European Commission then launched a campaign to urge stakeholders to make voluntary pledges in order to promote the uptake of recycled plastics.

13.1.2. AT A NATIONAL LEVEL

At national levels, the current plastic recycling rate target of 30% should be increased to 100% by 2030, all plastics should be produced as reusable, single-use plastics and microbeads in cosmetics and detergents should be banned by 2025, and incentives or taxes must be implemented.

To make the plastics industry and the plastic life cycle more circular, zero landfilling is clearly the first objective we need to achieve. Nevertheless, official landfilling is still better than illegal dumping or littering, even if it is by far the least preferable option among the various waste management streams. Indeed, leaving plastics in underground or open dumps is also polluting – yet much less than tossing our trash elsewhere than in bins or plastic collection and processing facilities provided for the purpose. They contaminate our soils, and when dumped in open landfills, plastics can be blown away by the wind.

d) Proper waste management systems

The key to avoiding landfilling or marine litter is to promote recycling to citizens, but more importantly, authorities must create infrastructures that collect, sort and reprocess – recycle – commercial and household waste, especially plastic packaging, through a national scheme. Yet, landfilling is still better than

incineration, which basically consists in the burning of plastics and is by far the least preferable false solution, since the toxins it generates are even more polluting, and it does not address the problem of plastic overproduction at its root (Gaia, 2017).

Even if the European Commission, in its *Waste Framework Directive* – in force since late 2010 – mentions that the preferred collection method are separate streams, other solutions are possible, such as one bag for all packaging materials (e.g. blue bags in Belgium), provided the system is based on complementarity and meets the quality standards required in the directive.

There are many solutions or waste management systems: sorting centres either directly recycle the plastic to sell it as secondary raw materials or sell it to recyclers through an invitation to tender. In some countries, a system of agreements and financial support is in place, where there is no purchase or sale of waste.

In Belgium, the uniform national waste management system for plastic waste consists in the implementation of 'blue bags' that are provided for plastic bottles, metal packaging and drink cartons (also known as PMD for short) that have the 'green dot' symbol. Therefore, Belgium focused on a simple national scheme for household packaging, in which individuals simply have to sort their plastic waste before leaving the bag on the kerbside. The bags are later collected and transported to material recovery facilities (MRFs) for sorting. Belgium also implemented the 'VAL-I-PAC' system that enables the uptake of industrial and commercial plastic packaging waste and promotes the recycling and unpacking with incentives. In 1999 and 2006, Belgian national bans were established on landfilling to help promote better sorting and recycling.

In Germany, there are nine green dot schemes for plastic packaging. Household plastic waste is mainly collected through a kerbside scheme, and includes all types of plastics – from bottles, to films and rigid packaging. Commercial packaging is a bit trickier, since packers – packaging manufacturers – can adhere to a recycling system or not: if they do, their clients can return their

plastic waste for free and leave it in the same collection points as for consumers' waste.

In Sweden, commercial and domestic solid waste are collected in bring stations, though there are some kerbside collection schemes for household packaging – that later go to bring stations too, called plastic recovery facilities or PRF, in order to be sorted. The commercial stream is self-sufficient in recycling: there is no national collection system for commercial waste, and no green dot fee to pay if a company wants to add the symbol on their product, and yet, Sweden reaches higher recycling rates than in some countries where industrial and commercial streams are much more regulated. In Germany and Sweden, new competing plastic waste streams are now challenging the original national systems.

e) Bans on plastics and incentives

Governments must ban or restrict plastic products or activities that are unnecessary and harmful. Governments and companies must invest in new models to produce products that use less or no packaging or that reuse old plastics. Corporates and consumers need to phase out of production or use of single-use plastics. Our mindset needs to change and focus more on a circular, sustainable and healthy lifestyle.

In Italy, single-use plastic bags are banned in supermarkets, and as of 2020, plastic cotton swabs and microplastics in cosmetics are banned. Spain has no landfill ban but is discussing a ban on single-use plastic in the Balearics. In France, there is a ban on single-use plastic bags in the supermarket, and plastic cotton swabs are to be banned in 2020. The country has committed to achieving a 100% recycling rate for plastics by the year 2025, since it only recycles 22% of its plastic waste, one of Europe's lowest plastic recycling rate. Greece had established a roadmap for 2020, targeting a 65% recycling rate for plastics, but the country is far from reaching it. Turkey has pledged to improve its plastic recycling rate and to discourage the population from using plastic bags by imposing a tax on them (since 2019, customers have been paying for plastic bags at the checkout of supermarkets). Croatia has developed several strategies to address marine litter, such as cleaning operations, improved waste management and laws that require

plastic producers to manufacture reusable, recovered or recycled packaging. The authorities have set up a goal for 2022: to create a marine waste management system.

During her expeditions, Liz Bonnin went to meet marine scientist Jamal Jompa on an Indonesian island to discover more about the “Garbage bank”, a community enterprise waste management system that encourages villagers to sort out their trash and to properly dispose of it by paying them by weight for the household waste they hand over. This bank is the first link in the valuation chain of end-of-life plastics, before it is sent out to sorting facilities and finally bought by plastic resellers who compact and shred them up to be sold again to manufacturers that will turn them into lower-grade plastic products (i.e. of a lower quality), such as carpet backing.

13.2. Industries

Industries, including plastic converters and manufactures, must invest in innovative alternatives, adopt a zero waste policy, redesign their infrastructure in order to promote alternatives to plastic, and develop solutions to prevent the release of synthetic fibres in the production and supply chains, reduce their plastic use starting with packaging and other plastic products that are not absolutely necessary.

13.2.1. THE FISHING INDUSTRY

The fishing industry must promote sustainable fisheries and aquaculture by developing and using alternative fishing techniques that do not require plastic gear, and when not possible (for financial or practical reasons), they must ensure their fishing gear is properly disposed of and a monitoring system must be put in place in order to detect ghost nets and derelict fishing gear.

Plastics can be manufactured so as to degrade faster in seawater, which could help reduce the impacts of derelict plastic fishing gear on marine wildlife, but the fishing industry relies on highly resistant gear and alternative ropes and traps are much more expensive, hence the reluctance of most fishermen across the world to opt for alternative materials (UNEP, 2015a). In this sense, authorities must offer them incentives to encourage them in changing their fishing techniques.

13.3. Citizens

According to a Eurobarometer survey (2017), 74% of European worry about the impact of plastic on their health, 87% are concerned about its environmental consequences, and 94% agree that industries must reduce packaging and should design plastic products so that they are recyclable.

13.3.1. **USE OF ALTERNATIVE MATERIALS**

Citizens must avoid buying plastic products and turn towards recycled, biodegradable or environmentally friendlier materials, but also opt for reusable items instead of disposable ones. Eco-friendlier alternatives to single-use plastics could be a good start to reduce plastic marine litter, but again, replacing a throwaway product by another won't make us change our bad habits of littering the environment, even if it has fewer devastating impacts than plastics. We have to focus more addressing the issue at its root on the and less on the middle or end of the lifecycle of plastics. Seeking less-polluting alternatives is a good idea, but we definitely must tackle the problem of our throw-away-culture, because improving our systems of recycling and disposal won't stem the tide of plastics if we do not stop throwing it in the environment. Remember that not all plastics have the same lifespan, as a result, it is illusory to think that stopping plastic production overnight would solve crisis or that not a single plastic item ever produced would be tossed in nature again (Geyer, Jambeck, & Lavender Law, 2017). Sure, we should continue cleaning the plastics that are already out there, but more importantly, in order to try and perhaps eventually get out of the plastic crisis, we have to change our mindset and lifestyle, which is no easy feat in our consumer society.

a) In the bathroom

For instance, in the bathroom, one can replace plastic combs and brush by wooden items with natural hairs and nylon dental floss by a biodegradable one, but also avoid using plastic cotton swabs or single-use cotton pads and substitute them with bamboo swabs and reusable pads, prefer razors with replaceable heads and bamboo toothbrush, use an activated charcoal toothpaste and make a natural homemade scrub with coffee grounds to exfoliate one's skin instead of using those containing microbeads, or at least buy cosmetic products that are microplastic-free

if you do not feel like create your own cosmetics – then check for PE, PVC or PP in the ingredients to know if the item contains plastic.

b) In the kitchen

In the kitchen, use ceramic dishes and crockery, glass bottles and jars to store food, but more importantly, avoid plastic packaged food and prefer buying by it loose, by weight or in carton or glass containers, and finally, do not use plastic straws, bottles, cutlery, or shopping bags when going out.

c) In the utility room

In the utility room, use eco-friendly detergents that are plastic-free, on-tap detergents or create your own cleaning products – most of the time, as for cosmetics, you will only need a few ingredients such as vinegar, bicarbonate of soda (baking soda), lemon juice, African black soap, salt, and Marseille soap. Not only are these products safe for the environment, but your wallet will thank you, since you can create cleaning products for a few cents. Many do-it-yourself recipes are available on the Internet, and do not worry, no chemical or specific skill is required, but many find it off-putting because it is a little more time-consuming, but it is not so difficult, it is only a matter of changing our habits. To avoid the leakage of plastic fibre when making the laundry, prefer 100% cotton or natural fibre clothes.

d) Proper disposal, sorting and recycling

Of course, follow the recycling and waste management rules and procedures in force in your town, city and country, dispose of your trash properly and improve your waste management if you own a business, go plastic-free and promote sustainable alternative to this ubiquitous material. We must also promote sustainable coastal tourism and learn how to travel in a more responsible way, without damaging the environment and our coasts.

e) Biodegradable plastics

Among the solutions that seems great at first glance are biodegradable plastics, sometimes called bioplastics, which can be either be degraded into carbon dioxide, biomass (mainly methane) or water by microorganisms or by the

process of hydrolysis – in which the addition of water breaks down the chemical bonds, catalysed (sped up) by enzymes (GESAMP, 2015; Millet et al., 2018).

The most well-known example of bioplastic is PLA, which stands for polylactic acid, produced namely from corn starch, but also sugar cane (UNEP, 2015a; Millet et al., 2018). Another is PGA (polyglycolic acid), widely used in medical applications such as temporary stitches, but also as pill capsules, for instance (UNEP, 2015a).

There is no real consensus on the definition of bioplastics, sometimes wrongly simply referred to as biopolymers, since they can either refer to bio-based plastics (made from renewable resources) or to biodegradable plastics (UNEP, 2015a). Bio-based plastics are synthetic polymers either derived directly from biomass through the process of biosynthesis (which implies a fermentation by microorganisms), they are then called biosynthetic biopolymers or bioplastics, or by a chemical polymerization of the natural monomers (through an *in vitro* process which implies an enzymatic action), and in this case, we call them synthetic biopolymers or bio-based polymers (UNEP, 2015a).

Bioplastics can thus either be biodegradable or nonbiodegradable, depending on the raw material used: indeed, the irony is that some plastics labelled as biodegradable are actually petro-based (derived from fossil fuels), while others are in fact nonbiodegradable though derived from renewable materials (UNEP, 2015a). Typical examples of bioplastics are proteins and polysaccharides, and include natural rubber, while bio-based plastics include polyphosphoester (PPE) and aliphatic aromatic polyesters.

Bioplastics can be sugar-based like PLA (polylactic acid), which is produced by extracting the lactose (milk sugar) from potatoes, wheat, sugar beet or maize, but also starch-based (e.g. dextran) if derived from tapioca, potatoes, wheat and maize by extracting the glucose from the vegetable, or cellulose-based if obtained from wood, cotton, corn, wheat and other plants.

While the idea may sound great, it is definitely not. In fact, as explained earlier in the lifecycle of plastics, bioplastics are not necessarily easily biodegradable in the natural environment. Indeed, a plastic bag marketed as

biodegradable may only biodegrade in specific environmental conditions which are highly unlikely to occur naturally in the ocean, but rather in an industrial composter, hence the confusion – and even the increase in misbehaviour – for most consumers who think biodegradable shopping bags may degrade if dumped in the environment or in their domestic composting (UNEP, 2015a).

What is more, there is currently no proof that it would significantly decrease the amount of plastics entering our oceans or their impacts on wildlife, and it does not solve the problem of microplastics, nor will it change our use-and-toss habits. Nevertheless, if we are to continue our massive production of single-use plastics, they might as well be biodegradable.

f) Oxo-degradable plastics

Oxo-degradable plastics, sometimes referred to as oxy-biodegradable polymers, are synthetic polymers in which a metal compound was added in order to increase the oxidation and fragmentation rates. Again, this does not solve the microplastics issue and is not eco-friendlier, since there is no evidence that they will degrade completely if not industrially composted, which means they will also end in incinerators or landfills, and even if they did, they would only start to disappear after two or five years and thus remain as visible litter (UNEP, 2015a). Moreover, plastics containing pro-oxidants (the metal compound, such as manganese) are not easily recyclable (UNEP, 2015a).

g) Seaweed plastics

Indonesian entrepreneur David Christian, mentioned by Liz Bonnin, has been developing edible and soluble plastics made of seaweed that could replace plastic packaging, and especially sachets, produced in billions and widely used in poor or low-income Asian countries to pack just about anything and everything, from toothpaste to washing powder, cereal bars, soap or even tea or coffee. Simply by dunking it into hot water and stirring it, the algae sachet will naturally dilute, and Christian designed two even better inventions: soaps without plastic packaging, that are ready to use in our bathroom sink, and edible food wrappers and disposable cups. This brilliant idea could solve the single-use plastics problem, which accounts for a big part of ocean plastics.

13.4. Clean-ups initiatives and solutions

Clean-up initiatives to clean the environment from all the rubbish that destroys the beautiful sceneries Earth has got to offer us, like beaches, islands and watersheds, is one way to reduce plastic waste, but it does not help to get rid of microplastics, the infamous unseen pollution, nor does it prevent littering.

In addition to the many existing coastal clean-up initiatives (the aforementioned 2018 International Coastal Cleanup as the largest one), engineers and designers are inventing solutions that could clean up the ocean trash. For instance, Dutch designer Boyan Slat was only 16 when he came up with the idea of the 'Ocean Cleanup', a floating barrier roughly looking like a tube that is 600 metres long and that stretches over three meters beneath the waves, meant to clean the ocean surface from 90% of plastic pollution (and especially the Great Pacific Garbage Patch) by moving through the currents and collecting buoyant debris on its path thanks to its 'skirt' – the curtain hanging down in the water (The Ocean Cleanup, 2019). While the idea sounded great and even raised millions of dollars in funds, after months of testing the device out in the open sea, it finally turned to be a fail, though not a total one, since Slat indicated that modifications and adjustments still needed to be made to ensure optimal efficiency of the cleaning system. If it had worked out exactly as planned, Slat was thinking of deploying 60 other cleaning systems of this kind in the Pacific Ocean, which he expected would have enabled the removal of around half of this plastic island every five years (The Ocean Cleanup, 2019). However, this solution is not a perfect one, since it only addresses floating macroplastics, not the sinking debris nor the microplastics issue.

Knowing that rivers are a major source for plastic into our oceans, Australian Pete Ceglinski designed a system known as 'the Seabin, that collects the riverine trash before it ends up in the ocean by pumping water and filtering debris (Seabin Project, 2020). However, as reminded to Liz Bonnin by its designer, this solution would only work for small waterways or harbours, since the cleaning up of larger rivers like the Citarum would require a more powerful device such as 'Mr Trash Wheel', a sort of mill designed by Australian inventors John Kellet and

Adam Lindquist that already helped collecting thousands of tonnes of plastic debris since its launch in 2014 (it has already pulled out some 11 million cigarette butts, a million plastic bottles and 500,000 plastic bags), fed in energy by the flow of the river as well as solar panels, hence its expensive cost – around 500,000 dollars – which would make this technology unaffordable to poor communities (Lindquist, 2016; McIlwraith et al, 2019). Dutch engineers are currently developing a prototype system based on a tube pierced with holes and which, once placed at the bottom of the river, releases air bubbles that are dredged to the water surface, thereby forcing plastic debris to the riverbanks so they only need to be picked up. Boyan Slat team of Ocean Cleanup recently developed “the Interceptor”, a solar-powered technology that extracts plastic from polluted rivers (The Ocean Cleanup, 2020).

14. Conclusion

We know now that microplastics literally go down our drains and that macroplastics end up in our oceans instead of official waste streams, that it kills millions of marine creatures each year and that it ends up in our plate.

Though we understood that cleaning the ocean from all the plastic waste that is already in it is almost impossible, we can stop the flood of plastic trash going into our oceans – or at least stem its flow – by addressing the problem at its source: as Liz Bonnin put it, we must ‘turn off the plastic tap’. However, we can still tackle the plastic crisis by cleaning our oceans, but it won’t solve the issue if we keep on producing millions of tonnes of plastic.

Citizens must do their part at their own level, by taking part in beach clean-ups, avoiding plastic products and packaging, but also by giving up on single-use plastics and changing their habits. If we try and go ‘green’ or ‘zero-waste’ at home by using alternative products and materials and by carefully dumping and recycling our waste, that is already a good start.

More importantly, authorities must now take action at national and international levels, by banning the use of certain additives and materials, by establishing policies that prohibit single-use plastics and providing incentives to industries in

order to reduce their use of plastic packaging, and finally, they must promote and invest in eco-friendly alternatives or solutions to help clean our oceans.

It is time for everyone to make a change for the better, because if we do not turn the tide on plastic right now, if we act too late, we may eventually drown in plastic for real.

Sous-titrage

1. Mode d'emploi pour un visionnage optimal

1.1. EZTitles

Afin de visionner le documentaire sous-titré sur le logiciel EZTitles, il suffit de procéder comme suit :



- 1) Télécharger et décompressez le dossier .zip afin d'en extraire les fichiers ;
- 2) Faire un double clic sur le fichier EZT ;
- 3) Préciser de commencer le time-code de la vidéo à 00:00:00 lorsque la fenêtre prévue à cet effet s'ouvre automatiquement ;
- 4) Importer la vidéo dans le logiciel (via l'onglet Video > Import > sélectionner la vidéo intitulée « *Drowning in Plastic* » dans le dossier .zip) ;
- 5) Afficher le mode plein écran en appuyant sur la touche F10.

1.2. VLC

Afin de visionner la vidéo et ses sous-titres sans utiliser le logiciel officiellement utilisé à l'UCL, vous pouvez également choisir de lire le fichier via le logiciel VLC. Deux possibilités s'offrent à vous il faut :



- 1) Une fois les fichiers extraits du dossier .zip, suffit d'effectuer un clic droit sur le fichier MP4 intitulé « *Drowning in Plastic_hardsub* », situé dans le dossier « *Drowning in Plastic_HardSub* » et de sélectionner « Lire avec VLC ». Les sous-titres ont été brûlés sur cette vidéo ;

- 2) Ou bien vous pouvez décider d'ouvrir le fichier vidéo intitulé « *Drowning in Plastic* » dans le dossier principal, et de procéder comme expliqué au point précédent (clic droit > « Lire avec VLC » dans le menu contextuel). Les sous-titres seront logiquement intégrés automatiquement à la vidéo sans devoir les ajouter manuellement. Si ce n'était pas le cas, sachez qu'il suffit alors de cliquer sur l'onglet « Sous-titres » de VLC, puis sur « Ajouter une piste de sous titres » en la sélectionnant dans le même dossier. Vous avez la possibilité entre des sous-titres au format SubRip (disponibles dans le dossier « Version SubRip_.srt », portant l'extension : .srt) ou Advances SubStation Alpha (extension de fichier : .ass). Cependant, VLC lira automatiquement la piste de sous-titres .ass, pour la simple raison que j'ai décidé de placer les sous-titres .srt dans un autre dossier, car ceux-ci ne permettent pas un visionnage optimal du sous-titrage. En effet, les quelques *stripe boxes* utilisées dans VLC pour masquer les sous-titres anglais de la version originale ne sont pas compatibles avec les version .srt, ce qui gêne le visionnage. Je vous conseille donc d'utiliser les sous-titres portant l'extension .ass et situés dans le dossier principal de la clé USB.

Bonne visualisation.

1.1. Paramètres utilisés dans EZTitles

Les points ci-après reprennent les paramètres utilisés lors du repérage des sous-titres dans le logiciel EZT :



- ✓ *Nombre de caractères par seconde* : 13
- ✓ *Nombre de caractères par ligne* : 36
- ✓ *Intervalle minimum entre les sous-titres* : 5 images
- ✓ *Durée maximale d'un sous-titre* : 6 secondes
- ✓ *Durée minimale d'un sous-titre* : 1 seconde

Traduction : Sous-titres



N° ST	Timecode IN	Timecode OUT	Version originale	Version traduite
1	00:00:11:01	00:00:13:19	Our Blue Planet is facing one the biggest threats	Notre planète fait face à l'une des pires menaces
2	00:00:13:24	00:00:15:04	in human history.	de l'histoire.
3	00:00:19:13	00:00:24:15	Trillions of pieces of plastic are choking the very lifeblood of our Earth.	D'innombrables plastiques détruisent l'élément vital de notre Terre.
4	00:00:27:01	00:00:28:15	And every marine animal,	Toute la faune marine,
5	00:00:28:23	00:00:30:02	from the smallest plankton	du plancton
6	00:00:30:13	00:00:32:06	to the planet's largest creatures,	au plus grand animal du monde,
7	00:00:32:11	00:00:35:05	is facing this new and growing threat.	est confrontée à cette menace croissante.
8	00:00:37:13	00:00:40:23	But how much do we really know about this plastic tide?	Mais que sait-on au juste de cette crise du plastique ?
9	00:00:41:06	00:00:42:13	Nick, very nice to meet you.	Nick ! Enchantée.
10	00:00:42:18	00:00:44:12	Nice to meet you. –Permission to come aboard?	Enchanté ! – Je monte à bord ?
11	00:00:44:24	00:00:47:13	I'm Liz Bonnin, a wildlife biologist.	Je suis Liz Bonnin, biologiste de la faune.
12	00:00:48:09	00:00:51:05	Last year, Blue Planet II made the plastic crisis	Depuis la sortie de Planète bleue l'an dernier,
13	00:00:51:14	00:00:53:04	impossible to ignore,	elle est impossible à nier.
14	00:00:53:14	00:00:54:15	and your response	Et votre réaction
15	00:00:54:20	00:00:56:04	has been extraordinary.	est sans précédent.
16	00:00:59:01	00:01:01:06	Since then, scientists have made	Depuis, les experts ont fait
17	00:01:01:11	00:01:02:22	startling new discoveries.	de troublants constats.
18	00:01:03:06	00:01:04:06	Is that vibrio? Is that...? –Yes.	Du Vibrio ? – Oui.
19	00:01:04:11	00:01:05:22	Oh, my God.	Nom de Dieu !
20	00:01:08:15	00:01:11:24	I'll be joining expeditions across the globe	Je vais prendre part à des expéditions dans des régions
21	00:01:12:04	00:01:14:14	in some of the most remote	parmi les plus isolées et hostiles

			and inhospitable places	
22	00:01:16:22	00:01:19:20	to discover what's happening in our oceans right now.	pour comprendre ce qu'il se passe dans nos océans,
23	00:01:21:08	00:01:22:13	My God!	Nom de Dieu !
24	00:01:22:23	00:01:23:24	Look at it!	Regardez-moi ça !
25	00:01:26:14	00:01:28:18	I'll work with rescue missions attempting to save	suivre des missions visant à sauver
26	00:01:28:23	00:01:30:24	some of the worst affected animals,	les espèces les plus menacées,
27	00:01:33:02	00:01:35:04	Oh, God, the damage is unbelievable.	La blessure est impressionnante.
28	00:01:37:15	00:01:41:11	And meet the engineers racing to design radical solutions.	et rencontrer les ingénieurs en quête de solutions radicales.
29	00:01:43:20	00:01:46:21	The world has been shaken by the plastic crisis...	La crise du plastique a bouleversé le monde entier,
30	00:01:48:07	00:01:51:13	but can we turn the tide before it's too late?	mais peut-on encore inverser la tendance ?
31	00:01:51:23	00:01:55:23	This is the story of plastic in our oceans.	Voici l'histoire du plastique dans nos océans.
32	00:01:58:12	00:02:02:24	DROWNING IN PLASTIC	NOYÉS SOUS LE PLASTIQUE
33	00:02:06:05	00:02:08:09	I'm beginning my mission with a group of animals	Ma mission commence par des animaux
34	00:02:08:14	00:02:10:12	that scientists believe	considérés par les experts comme
35	00:02:10:17	00:02:13:04	are the key indicators for the health of our oceans:	les indicateurs clé de la santé des océans :
36	00:02:15:00	00:02:16:04	sea birds.	les oiseaux marins.
37	00:02:19:11	00:02:22:20	Sea birds spend much of their life around plastic.	Ils sont bien souvent cernés de plastique.
38	00:02:23:20	00:02:27:05	They fly across the world, living on both the open ocean	Ils volent à travers le monde et vivent à la fois en haute mer
39	00:02:28:01	00:02:29:03	and the shorelines	et sur les côtes.
40	00:02:30:24	00:02:32:16	They hunt on the surface of the sea, where some plastic floats,	Ils chassent à la surface,
41	00:02:32:21	00:02:34:10		où du plastique flotte,
42	00:02:35:06	00:02:37:13	and beneath the waves, where smaller fragments	et sous l'eau, où de petites particules

43	00:02:37:18	00:02:39:09	are suspended in the water.	sont en suspension.
44	00:02:40:19	00:02:42:07	And many eat almost anything they can find – including plastic.	Ils mangent à peu près tout
45	00:02:42:12	00:02:43:16		ce qu'ils trouvent,
46	00:02:44:03	00:02:45:14		notamment du plastique.
47	00:02:50:19	00:02:54:10	And one sea bird has recently been discovered to eat more	On a récemment découvert qu'une espèce en ingérait plus,
48	00:02:54:15	00:02:58:03	plastic relative to their size than any other animal in the ocean:	proportionnellement à sa taille, que tout animal marin :
49	00:02:59:12	00:03:01:10	the flesh-footed shearwater.	les puffins à pieds pâles.
50	00:03:05:20	00:03:08:09	400 miles off the coast of Australia, in the Tasman Sea,	À 640 km au large des côtes australiennes,
51	00:03:08:18	00:03:10:00		dans la mer de Tasman,
52	00:03:10:07	00:03:11:24	is Lord Howe Island.	se trouve l'île de Lord Howe.
53	00:03:19:13	00:03:21:09	This six-mile stretch of rock	Cette étendue rocheuse de 10 km
54	00:03:21:14	00:03:23:07	is home to the largest colony of flesh-footed shearwaters on the planet.	abrite la plus grande colonie de puffins à pieds pâles au monde.
55	00:03:23:12	00:03:26:00	40,000 of them migrate here every autumn	Chaque automne, 40 000 d'entre eux migrent ici
56	00:03:29:08	00:03:32:04	to the safety of the island's pristine rainforests	pour se réfugier dans les forêts vierges tropicales
57	00:03:32:22	00:03:35:23	where they lay their eggs in burrows.	et pondre leurs œufs dans des terriers.
58	00:03:36:24	00:03:39:06	It's just gone eight o'clock here on Lord Howe Island, in the middle of the Tasman Sea, and I'm about to join a team of scientists and volunteers who have been gathering here every single year for the past 12 years.	Il est tout juste 20 h
59	00:03:48:11	00:03:49:24		sur l'île de Lord Howe, au milieu de la mer de Tasman.
60	00:03:50:04	00:03:53:21		Je vais rejoindre
61	00:03:54:07	00:03:55:09	who have been gathering here every single year for the past 12 years.	des scientifiques et des volontaires
62	00:03:55:14	00:03:57:22		qui se retrouvent ici chaque année depuis 12 ans.
63	00:03:58:02	00:04:01:19	Hello!	Coucou, toi !
64	00:04:08:05	00:04:09:06	Aw, look at you.	Oh, mais regarde-toi !
65	00:04:11:15	00:04:13:06	Off he goes, waddling down the path	Il s'en va en se dandinant
66	00:04:16:24	00:04:19:16		

67	00:04:20:12	00:04:22:17	towards the sound of the sea.	en direction du bruit de la mer.
68	00:04:25:18	00:04:29:17	The team is led by marine biologist Dr Jennifer Lavers.	La docteure Jennifer Lavers, biologiste marine, dirige l'équipe.
69	00:04:30:12	00:04:31:15	For over a decade, she's been investigating how plastic	Depuis 10 ans,
70	00:04:31:20	00:04:33:01		elle étudie
71	00:04:33:06	00:04:35:21	is affecting the shearwaters.	l'impact du plastique sur les puffins.
72	00:04:36:24	00:04:38:23	She believes that these birds hold the key to understanding	Elle pense qu'ils sont la clé
73	00:04:39:03	00:04:42:23	how plastic could be harming all marine life.	pour comprendre en quoi il menace l'ensemble de la faune marine.
74	00:04:43:22	00:04:45:10	All right, these are for self-protection.	C'est pour te protéger.
75	00:04:45:22	00:04:47:19	OK. –The birds have quite sharp beaks, and also very sharp claws,	OK. – Ils ont un bec tranchant
76	00:04:47:24	00:04:50:23	so those will come in very handy.	et des griffes acérées. Ces gants sont très utiles.
77	00:04:51:03	00:04:53:22	OK, OK, perfect. They're everywhere they're scurrying everywhere,	OK, pas de souci. Ils courent dans tous les sens
78	00:04:54:02	00:04:56:18	and they're so dark, they just sort of appear out of nowhere	et sont si sombres ! Ils sortent de nulle part !
79	00:04:56:23	00:04:58:21	a little bit too late for comfort for me.	Ça ne me rassure pas trop, si tard.
80	00:04:59:03	00:05:00:11	OK, off we go.	Allez, c'est parti.
81	00:05:06:15	00:05:08:08	Tonight, for the first time in their young lives,	Ce soir, pour la première fois
82	00:05:08:13	00:05:09:15		de toute leur vie,
83	00:05:09:21	00:05:12:17	the shearwater chicks emerge from their burrows.	les poussins sortent de leur terrier.
84	00:05:15:14	00:05:16:22	From the moment they were born,	Dès leur naissance,
85	00:05:17:02	00:05:20:12	they should have been fed a nutritious diet of fish and squid.	ils sont normalement gavés de poisson et de calamar,

86	00:05:22:23	00:05:25:16	But when their parents go hunting, they often mistake plastic for food.	mais en chassant, leurs parents confondent
87	00:05:25:21	00:05:27:09		plastique et nourriture.
88	00:05:30:08	00:05:33:19	We hand over the chicks to Lord Howe Islander Ian Hutton	On confie les poussins à un habitant de l'île, Ian Hutton,
89	00:05:33:24	00:05:35:09	and Dr Alex Bond, who carry out a delicate procedure.	et au docteur Alex Bond,
90	00:05:35:14	00:05:37:23		qui vont se livrer à un exercice délicat.
91	00:05:39:18	00:05:42:13	OK, so what exactly are you doing now?	Alors, qu'allez-vous faire, au juste ?
92	00:05:42:18	00:05:44:01	Well, we've measured this one and weighed him, and now we're doing	Eh bien,
93	00:05:44:06	00:05:48:05		après l'avoir mesuré et pesé, on procède au lavage gastrique,
94	00:05:48:10	00:05:51:19	the final step, which is lavaging, which is basically gently pumping	qui consiste à lui injecter de l'eau dans l'estomac
95	00:05:52:12	00:05:54:18	a bit of water into the stomach and getting him to vomit into the basin.	pour le faire vomir dans la bassine.
96	00:05:55:14	00:05:57:06	So, if you'd like to hold him open, Alex,	Tu peux ouvrir son bec, Alex ?
97	00:05:57:11	00:05:59:15	we'll see if we can get this down the throat.	Voyons si ça s'enfonce dans sa gorge.
98	00:06:01:21	00:06:03:02	Easy, fella.	Tout doux, mon petit.
99	00:06:05:13	00:06:08:18	OK, so that's gone into the stomach there.	C'est dans son estomac. – Bien joué, tout en douceur !
			Very nicely done, very smooth	
100	00:06:09:02	00:06:10:08	Right, pumping.	OK, on injecte.
101	00:06:14:24	00:06:16:13	Oh, jeepers!	Bon sang ! – Il y en a plein.
			– And look at that... stomach's full of plastic.	
102	00:06:16:18	00:06:19:03	One, two, three, four, five, six...	Un, deux, trois, quatre, cinq, six !
103	00:06:19:13	00:06:22:08	Oh, look at that! Yeah... Look at the size of that piece.	Ça alors ! Regardez la taille de ce morceau !
104	00:06:23:06	00:06:25:02	Sharp, too.	Il est tranchant !

			–Oh, my God.	– Bon Dieu...
105	00:06:25:07	00:06:28:01	So, the parent's had to vomit that up to feed the chick	Ses parents l'ont régurgité pour le nourrir,
106	00:06:28:06	00:06:31:07	and then the chick's had that in the stomach, and now just coughed it up.	il l'a ingéré et là, il le recrache. –Seigneur.
107	00:06:31:16	00:06:35:01	So they're gradually, with all the best intentions,	Donc peu à peu, malgré leurs bonnes intentions,
108	00:06:35:12	00:06:38:14	feeding their chicks to death, potentially,	ils risquent de tuer leurs poussins
109	00:06:38:24	00:06:42:15	filling their stomachs with big pieces of plastic... –Like, pure rubbish.	en les gavant de plastique. – Oui, en leur donnant des déchets.
110	00:06:43:03	00:06:45:10	...that are... –I felt plastic on the way down there.	Ils sont... – Il y a encore du plastique.
111	00:06:45:15	00:06:47:00	This time? –Just now I can feel it.	Ah bon ? –Oui, je le sens.
112	00:06:47:05	00:06:50:15	As the tube was going in, I could feel plastic. –I can't believe how much is coming out.	J'en ai senti en insérant le tube. – La quantité est énorme !
113	00:06:53:24	00:06:55:15	Oh, look at that.	Eh bien, dites donc !
114	00:06:55:21	00:06:57:23	Oh, my gosh, this is ridiculous.	Bon sang, mais quelle horreur !
115	00:06:58:05	00:07:01:10	I think that was blocking the throat, so he's having trouble getting it all out,	Ce morceau obstruait sa gorge et l'empêchait de vomir.
116	00:07:01:17	00:07:05:02	and now that we've got rid of that big bit, we might be able to remove it all.	Maintenant qu'il l'a régurgité, le reste devrait sortir.
117	00:07:08:15	00:07:09:15	Amazing, isn't it?	C'est fou, non ?
118	00:07:11:16	00:07:12:21	I can't believe just...	J'en reviens pas.
119	00:07:13:24	00:07:16:06	Is this, on average, what	Vous en trouvez autant en moyenne ? Vingt morceaux ?
120	00:07:16:11	00:07:17:13	you find, about 20 pieces?	
121	00:07:17:18	00:07:21:14	How much do you normally find? – I think the record's about 260.	Vous en trouvez combien d'habitude ? – Le record s'élève à 260.
122	00:07:21:19	00:07:23:02	That's a really bad bird.	Il était mal en point.
123	00:07:23:07	00:07:25:06	In a chick?	Dans un seul poussin ?

			–In a chick, yeah.	– Oui.
124	00:07:25:16	00:07:28:08	Eurgh... I'm in shock. I mean, I knew there was a plastic problem,	Je suis choquée. Je connaissais le problème,
125	00:07:28:13	00:07:29:18	it's just when you see...	mais là, le voir...
126	00:07:29:23	00:07:31:12	When you see it first hand, yeah. – Yeah.	... en vrai ? – Oui.
127	00:07:33:02	00:07:35:01	My head's spinning already, and this is our first chick. –Yeah...?	Je suis à bout après le premier.
128	00:07:35:06	00:07:36:06		C'est vrai ?
129	00:07:38:13	00:07:39:15	OK...	Bien.
130	00:07:40:12	00:07:43:08	That's just mad, when... It's just... Yeah. Oh, my God.	C'est complètement dingue. C'est vraiment fou.
131	00:07:51:12	00:07:52:18	It's really, really hard	C'est très difficile
132	00:07:52:23	00:07:56:08	to watch this poor little thing regurgitating plastic	de voir cette pauvre petite bête régurgiter du plastique,
133	00:07:56:13	00:07:57:17	after plastic, after plastic.	encore et encore.
134	00:07:57:22	00:08:01:17	And that wasn't even a bad one – that was 19 pieces of plastic.	Il y en a dans de pires états. Il y avait quoi... 19 morceaux ?
135	00:08:03:07	00:08:06:16	So, yeah, I feel angry and emotional	Alors, oui, je suis furieuse et bouleversée,
136	00:08:08:07	00:08:11:14	and...full of feelings I didn't quite expect	et je ne m'attendais pas à ressentir de telles émotions.
			would be so strong right now.	
137	00:08:14:16	00:08:16:03	Yeah, that's about it, really.	Voilà, c'est tout.
138	00:08:26:19	00:08:28:11	38.2.	Ça fait 38,2.
139	00:08:30:00	00:08:31:00	Yeah, not much.	C'est peu.
140	00:08:31:05	00:08:33:11	For the next three hours, we measure them,	Pendant 3 h, on les mesure,
141	00:08:33:23	00:08:35:20	take feather and blood samples...	on prélève des plumes et du sang,
142	00:08:37:15	00:08:41:10	..and empty their stomachs to increase their chances of survival.	et on leur vide l'estomac pour augmenter leurs chances de survie.

143	00:08:42:04	00:08:45:00	So, in the 12 years that you've been doing this in this location,	Selon vous, qui travaillez depuis 12 ans
144	00:08:45:11	00:08:46:19		sur cette île,
145	00:08:47:12	00:08:50:24	what's changed? What have you seen happening to this breeding colony?	qu'est-ce qui a changé dans cette colonie de nidification ?
146	00:08:52:08	00:08:54:16	The numbers have definitely	Les chiffres ont sûrement varié,
147	00:08:55:06	00:08:56:13	fluctuated, but definitely more	mais en tout cas,
148	00:08:56:18	00:09:00:14	and more of the birds have plastic in them,	de plus en plus d'oiseaux ingèrent du plastique,
149	00:09:00:20	00:09:05:21	and we are finding an increasing number of birds that seem to be more heavily affected.	et on constate qu'ils semblent de plus en plus gravement touchés.
150	00:09:06:12	00:09:08:22	So, quite a number of years ago, you know, the average number of pieces	Il y a quelques années,
151	00:09:09:09	00:09:13:06	of plastic per bird might have been closer to,	la quantité moyenne de plastique dans l'estomac d'un oiseau était
152	00:09:14:06	00:09:17:00	perhaps, 5 or 10 pieces per bird, and now,	de 5 ou 10 morceaux, alors qu'aujourd'hui,
153	00:09:17:05	00:09:19:22	it's much closer to 30 or 40 pieces per bird,	on parle plutôt de 30 à 40 morceaux.
154	00:09:20:02	00:09:22:09	so things are shifting.	Donc oui, les choses changent.
155	00:09:25:20	00:09:29:06	By 11 pm, the birds have stopped emerging from their burrows	À 23 h, les oiseaux ne sortent déjà plus de leur terrier,
156	00:09:29:15	00:09:31:11	and it's time to call it a night.	et il commence à se faire tard.
157	00:09:33:17	00:09:36:01	I am absolutely shattered.	Je suis carrément épuisée.
158	00:09:36:15	00:09:40:04	Not only are they long, emotionally draining nights,	Les soirées sont longues et émotionnellement éprouvantes,
159	00:09:40:16	00:09:42:11	but it's a relentless job.	et c'est un travail incessant.
160	00:09:43:07	00:09:45:11	I'm only doing it for one or two more nights –	Je reste qu'un ou deux soirs de plus,
161	00:09:45:16	00:09:47:20	these guys are here for 60 nights,	alors qu'eux sont ici pour deux mois.
162	00:09:49:14	00:09:50:22	I don't know how they do it.	Comment font-ils ?

163	00:09:51:23	00:09:53:03	Right, to bed.	Bon, au lit.
164	00:10:00:11	00:10:04:01	The three-month-old shearwater chicks that left their burrows	Les poussins de 3 mois qui ont quitté leur terrier ce soir
165	00:10:04:08	00:10:07:03	tonight are beginning one of the most astounding journeys	vont entreprendre l'un des plus beaux voyages
166	00:10:07:08	00:10:08:14	in the natural world.	du règne animal.
167	00:10:10:06	00:10:11:16	They can't fly yet,	Ils ne savent pas voler.
168	00:10:11:21	00:10:14:02	their parents have left them to fend for themselves	Leurs parents les livrent à eux-mêmes
169	00:10:14:13	00:10:16:16	and they've never even seen the sea.	alors qu'ils n'ont jamais vu la mer.
170	00:10:19:03	00:10:23:08	And yet, instinct drives them to begin	Mais leur instinct les pousse à entamer un incroyable périple :
			an extraordinary endeavour,	
171	00:10:24:01	00:10:26:22	waddling through the dense rainforest in the dark,	Traverser l'épaisse et sombre forêt tropicale,
172	00:10:27:04	00:10:28:11	across the beaches and	et ensuite la plage,
173	00:10:28:16	00:10:30:16	out through the pounding surf.	jusqu'aux vagues déferlantes.
174	00:10:32:19	00:10:36:16	Once there, they must teach themselves to fly and hunt.	Ensuite, ils doivent apprendre à voler et à chasser par eux-mêmes.
175	00:10:37:16	00:10:41:06	And for those who manage to take off, they won't touch land again	Ceux qui parviennent à prendre leur envol ne toucheront terre
176	00:10:41:11	00:10:44:14	for 5 years – when they'll return to breed.	que dans 5 ans, lorsqu'ils viendront se reproduire.
177	00:10:47:10	00:10:51:15	But the shearwaters who have been fed plastic	Mais les puffins gavés de plastique sont souvent trop lourds
178	00:10:51:20	00:10:53:02	are often so weighed down they can't fly	pour réussir à voler,
179	00:10:53:12	00:10:56:09	and so weak they can't get past the surf.	et trop faibles pour franchir les vagues.
180	00:10:58:01	00:11:00:07	Many simply won't make it.	Beaucoup ne s'en sortiront pas.
181	00:11:02:18	00:11:05:00	Oh no! –He's really, really bad.	Mince ! – Il est dans un sale état.
182	00:11:07:01	00:11:08:06	Oh, my gosh.	C'est pas vrai...

183	00:11:11:03	00:11:14:01	This is what happens when they leave the colony in poor condition.	Voilà ce qui arrive quand ils quittent la colonie
184	00:11:14:06	00:11:15:16		en piteux état.
185	00:11:15:21	00:11:18:13	They can't get up off the surface of the water,	Ils n'arrivent pas à sortir de l'eau,
186	00:11:18:18	00:11:20:02	and they get tumbled in the waves, and it exhausts them,	et se font emporter.
187	00:11:20:12	00:11:23:06	and this is how they wash up on the beach.	Ça les épuise, et ils s'échouent sur la plage.
188	00:11:24:00	00:11:27:13	This one looks so nutritionally compromised I can't imagine that he'd ever...	Il souffre de malnutrition, je vois mal comment il pourrait
189	00:11:28:00	00:11:29:13	he'd ever make it. –Yeah.	s'en sortir. – C'est vrai.
190	00:11:29:18	00:11:32:19	The key for these guys, in the long term is,	La solution à long terme, pour ces animaux,
191	00:11:33:00	00:11:38:05	in the absence of issues like plastic or other human pressures,	serait l'absence de plastique ou de toute autre menace humaine.
192	00:11:38:23	00:11:42:09	is the species can deal with a little bit of loss like this.	Les espèces peuvent supporter la présence humaine,
193	00:11:42:14	00:11:46:04	It's when we start to put other pressures, like plastic, into the environment that...	mais avec la pollution plastique, on voit que la nature...
194	00:11:46:09	00:11:49:04	It's when you start seeing too many of these chicks on this beach	On voit énormément de poussins qui s'échouent
195	00:11:49:09	00:11:51:13	in this condition or worse. – Exactly.	dans cet état, ou pire encore. – Oui.
196	00:11:51:19	00:11:54:14	So, we'll put him in a bag, and we'll put him in a warm spot	On va l'installer dans le sac, au chaud,
197	00:11:54:22	00:11:57:08	and we'll have a look for any others.	puis on va regarder s'il y en d'autres.
198	00:12:07:15	00:12:09:07	Gosh, yeah, he's on death's door.	Il est sur le point de mourir.

199	00:12:10:22	00:12:12:23	What do you normally do?	Vous faites quoi dans ces cas-là ?
200	00:12:14:15	00:12:15:20	Realistically...we'll probably just let nature run its course.	Concrètement,
201	00:12:16:23	00:12:19:03		on va devoir laisser faire la nature.
202	00:12:23:01	00:12:25:20	How often do you find evidence of plastic ingestion in	Vous trouvez souvent des résidus de plastique
203	00:12:26:00	00:12:28:19	the chicks that you gather on the beach that haven't made it?	dans l'estomac des poussins qui sont morts ?
204	00:12:30:08	00:12:32:09	Virtually every one,	Pratiquement à chaque fois.
205	00:12:33:00	00:12:36:03	there's some kind of bottle cap,	Ça va du bouchon de bouteille aux petits fragments,
206	00:12:36:08	00:12:39:04	or small fragment, or maybe the lid of a pen, or something like that.	en passant par un capuchon de stylo-bille.
207	00:12:39:11	00:12:43:22	I mean, I... There are very few places left on the planet	Il reste très peu d'endroits sur Terre
208	00:12:44:14	00:12:49:04	that are so remote and pristine, seemingly,	aussi reculés et intacts en apparence
209	00:12:49:20	00:12:52:06	than Lord Howe Island – and yet, even here...	que cette île, et pourtant, même ici...
210	00:12:52:11	00:12:55:19	It shows what the rest of the world is doing impacts wildlife	Les activités humaines ont un impact sur la faune,
211	00:12:55:24	00:12:58:03	on even the remote islands. –Everywhere. Everywhere.	même sur les îles isolées. – Partout !
212	00:12:58:08	00:13:03:01	And it's a global responsibility, that much is without question.	C'est notre responsabilité à tous, c'est clair. Ça ne fait aucun doute.
213	00:13:04:18	00:13:05:18	Yeah.	C'est vrai.
214	00:13:10:19	00:13:14:09	We head back to the island lab to examine the dead chicks.	On retourne au laboratoire pour examiner les poussins morts.
215	00:13:16:00	00:13:18:17	Do we know the source of most of the plastics	Sait-on d'où viennent les bouts de plastique
216	00:13:18:22	00:13:21:04	that you find in the flesh-footed shearwaters?	Trouvés à l'intérieur de ces poussins ?
217	00:13:22:11	00:13:25:19	Unfortunately not. A lot are what	Non, car beaucoup

			we call identifiable fragments.	sont "non-identifiables",
218	00:13:26:02	00:13:29:17	But every now and then,	mais parfois, on trouve un fragment très reconnaissable.
			we encounter something that is really recognisable.	
219	00:13:29:22	00:13:33:24	So, this is a jar of plastics from the flesh-footed shearwater	C'est un bocal rempli de plastiques provenant des puffins de l'île.
			here on Lord Howe Island.	
220	00:13:34:13	00:13:37:01	How many birds contributed to this amount of plastic?	Cela représente combien d'oiseaux ?
221	00:13:37:06	00:13:40:06	Maybe 50 to 100, give or take.	Je dirais entre 50 et 100, à peu près.
222	00:13:40:21	00:13:43:22	And right away we see some top offenders.	On voit directement les déchets les plus courants.
223	00:13:44:02	00:13:45:05	So a really common one... Let's have a look here.	Jetons un œil.
224	00:13:48:03	00:13:51:13	Oh, my good Lord, that is insane. So...	Nom de Dieu... C'est fou !
225	00:13:52:02	00:13:54:11	Bottle caps. Bottle caps. Whole bottle caps!	Des bouchons de bouteilles entier !
226	00:13:54:16	00:13:58:01	How does that go down the throat of a three-month-old shearwater?	Comment un puffin de 3 mois parvient à avaler ça ?
227	00:13:58:06	00:14:00:06	I don't...	Ça me dépasse. – Bonne question.
			–Great question. –...understand.	
228	00:14:00:11	00:14:02:22	This is the top of a Tetra Pak,	Le bouchon d'une brique de lait,
229	00:14:03:02	00:14:04:06	so maybe some boxed milk or boxed juice.	ou de jus. – Oui.
			– Yeah, yeah.	
230	00:14:04:13	00:14:09:09	Anything that we've really ever made from plastic, as we know,	Chaque objet ou morceau de plastique jeté dans la nature y est encore.
			every bit of plastic ever made is still out there,	
231	00:14:09:14	00:14:12:24	and the birds are precision	Les oiseaux sont de véritables

			finding mechanisms.	détecteurs de précision.
232	00:14:13:04	00:14:16:08	They go out there in the ocean, they find it, they bring it back,	Ils trouvent du plastique en mer et le ramènent.
233	00:14:16:16	00:14:19:00	and so we're never surprised at what we find in the ocean.	Ça ne nous surprend pas de trouver ça.
234	00:14:19:05	00:14:21:11	It's the most surreal thing to see.	C'est complètement hallucinant.
235	00:14:21:16	00:14:25:05	I cannot believe all of this has come out of shearwaters' stomachs.	Je n'en reviens pas que tout ça provienne
236	00:14:25:18	00:14:27:01		de leur estomac.
237	00:14:31:12	00:14:33:00	Over the past 10 years, Jen and her team have had the disturbing task	Depuis 10 ans,
238	00:14:33:05	00:14:35:17		Jen et son équipe ont la lourde tâche
239	00:14:35:22	00:14:37:20	of recording the stomach contents	de consigner le contenu stomacal
240	00:14:38:00	00:14:40:11	of every shearwater chick they've found.	des poussins de puffins qu'ils trouvent.
241	00:14:41:14	00:14:43:20	So we've opened this chick up now, and there's quite a volume in here.	On vient d'ouvrir ce poussin,
242	00:14:44:13	00:14:45:24		et son estomac est plein.
243	00:14:47:11	00:14:49:16	Her studies reveals that, by weight,	Elle a constaté qu'en termes de poids,
244	00:14:49:21	00:14:52:03	shearwaters eat the most plastic of any marine animal.	les puffins ingèrent plus de plastique
245	00:14:52:08	00:14:54:00		que tout autre animal marin.
246	00:14:54:13	00:14:58:06	There's no doubt this bird died as a result of this plastic ingestion.	Cet oiseau est mort à cause du plastique qu'il a ingéré.
247	00:14:59:16	00:15:01:18	The contents of this bird's stomach is the equivalent of	Le contenu stomacal de cet oiseau
248	00:15:01:23	00:15:06:04	a human eating 10 kilos of plastic.	reviendrait pour un humain à ingérer 10 kg de plastique.
249	00:15:06:09	00:15:08:02	It's quite remarkable.	C'est assez impressionnant.
250	00:15:09:18	00:15:11:11	But Jen's research has revealed that the plastic may be doing	Mais d'après ses recherches,
251	00:15:11:16	00:15:15:15	even more damage than first thought.	le plastique pourrait bien faire plus de dégâts qu'on ne le pensait.

252	00:15:17:19	00:15:19:08	So, if we hold this up to the light...	Regardez à la lumière...
253	00:15:19:13	00:15:21:04	In the last few months, she's discovered evidence that	Elle a récemment découvert
254	00:15:21:09	00:15:24:04	chemicals found on plastic could be disrupting the birds' hormones.	que les produits chimiques issus du plastique
255	00:15:24:09	00:15:26:14		Perturbent les hormones des oiseaux.
256	00:15:27:06	00:15:28:20	From these studies, we know that they interfere with	D'après nos recherches,
257	00:15:29:00	00:15:32:22	hormone production and the function of hormones in the bloodstream.	ils altèrent la production et la fonction sanguine des hormones.
258	00:15:33:10	00:15:37:15	And so the bird or other animal can look completely normal	Un oiseau ou un autre animal peut donc sembler bien se porter,
259	00:15:37:20	00:15:41:06	on the outside, and yet not actually be able to reproduce	mais être incapable de se reproduire ou de se développer.
260	00:15:43:11	00:15:45:11	and grow correctly.	Il faut approfondir la recherche,
261	00:15:45:16	00:15:48:19	More research needs to be done, but Jen now believes that	mais Jen estime que le plastique, même à faible dose,
262	00:15:48:24	00:15:50:22	even small amounts of plastic may impact a bird's health.	peut être nocif pour les oiseaux.
263	00:15:52:12	00:15:55:15	We may have drastically underestimated the effect	On a sans doute largement sous-estimé l'impact
264	00:15:55:20	00:15:58:02	that plastic is having on these animals.	du plastique sur ces animaux.
265	00:15:59:09	00:16:00:13	Gosh. And all of this	Et ces produits
266	00:16:00:18	00:16:03:15	can be in the plastics that these birds are ingesting	sont dans le plastique que les oiseaux mangent ?
267	00:16:04:05	00:16:06:14	in the burrow? – Now you understand the complex challenge that scientists	Dans les terriers ? – Vous voyez le défi
268	00:16:06:19	00:16:09:20	have to try and tease it all apart to figure out.	que les chercheurs doivent relever pour comprendre

269	00:16:10:01	00:16:14:14	The world that these sea birds now live in,	comment ces oiseaux de mer vivent et les problèmes qu'ils rencontrent.
			the challenge that they face.	
270	00:16:19:12	00:16:23:04	This research into shearwaters has serious implications	Cette recherche sur les puffins est d'une importance capitale
271	00:16:23:09	00:16:25:18	for the health of all marine life.	pour la santé de tous les animaux marins.
272	00:16:28:13	00:16:30:21	Over 200 different marine species have been found to ingest plastic,	Plus de 200 espèces marines
273	00:16:31:01	00:16:33:06		ingèrent du plastique,
274	00:16:33:12	00:16:36:06	but the question that scientists are still grappling with	mais les scientifiques se demandent toujours
275	00:16:36:15	00:16:39:00	is why they're eating it in the first place.	pourquoi elles en mangent.
276	00:16:41:16	00:16:45:22	Fascinating new research suggests	De nouvelles recherches ont révélé que l'odeur y serait pour beaucoup.
			that smell might play an important part.	
277	00:16:47:02	00:16:50:08	Algae growing on ocean plastic gives off a scent	Les algues qui poussent dessus dégagent un parfum qui,
278	00:16:50:13	00:16:53:23	that acts like a beacon, attracting a whole host of species.	tel un appât, attire tout un tas d'espèces.
279	00:16:56:04	00:16:57:22	It's also thought that sea life may mistake tiny pieces of plastic	On pense aussi que les animaux
280	00:16:58:02	00:17:01:02	for fish eggs, and plastic bags for jellyfish.	prennent le plastique pour des œufs de poisson
281	00:17:01:16	00:17:04:02		et les sacs plastiques pour des méduses.
282	00:17:06:24	00:17:09:10	But while research into what makes plastic so attractive to	Alors qu'on étudie pourquoi le plastique
283	00:17:09:19	00:17:12:02	sea life continues, teams across the planet work around the clock	attire autant les espèces marines,
284	00:17:12:11	00:17:15:01		des équipes du monde entier sont à l'œuvre
285	00:17:15:06	00:17:17:14	to rescue as many animals as they can.	pour secourir un maximum d'animaux.

286	00:17:24:19	00:17:26:23	It's time to leave Lord Howe Island.	Je dois quitter l'île de Lord Howe.
287	00:17:27:16	00:17:30:19	What's really at the forefront of my mind is that,	Ce qui me préoccupe le plus,
288	00:17:31:11	00:17:34:19	if this is what's going on to a tiny bird	c'est que si cela arrive à un petit oiseau
289	00:17:35:02	00:17:38:03	on a tiny remote island in the middle of nowhere,	sur une minuscule île perdue au milieu de nulle part,
290	00:17:38:10	00:17:40:13	then this is a symptom	ça signifie
291	00:17:40:18	00:17:44:10	of something so much bigger than I could possibly have imagined.	que c'est bien plus grave que je ne pouvais l'imaginer.
292	00:17:46:19	00:17:49:23	To have any chance of stopping this plastic tide, it's vital	Pour tenter d'enrayer ce raz-de-marée plastique,
293	00:17:50:03	00:17:53:19	to understand exactly where it's coming from.	on doit impérativement comprendre quelle est sa source.
294	00:17:59:01	00:18:00:03	Around the globe,	Dans le monde,
295	00:18:00:13	00:18:01:15	every minute,	chaque minute,
296	00:18:02:01	00:18:04:22	we buy a million plastic bottles,	on achète un million de bouteilles en plastique,
297	00:18:05:12	00:18:07:10	a million disposable cups	un million de gobelets jetables,
298	00:18:07:23	00:18:10:09	and two million plastic bags.	et deux millions de sacs plastiques.
299	00:18:11:12	00:18:14:15	And every minute, an entire rubbish truck load of plastic	Chaque minute, l'équivalent d'un camion-poubelle
300	00:18:14:20	00:18:17:07	ends up in the ocean.	rempli de plastique se déverse dans la mer.
301	00:18:19:06	00:18:22:10	Over a year, this adds up to a staggering eight million tonnes.	En un an, cela représente un chiffre alarmant
302	00:18:22:15	00:18:24:13		de 8 millions de tonnes.
303	00:18:26:18	00:18:29:17	And it's estimated that half of all that plastic	On estime que la moitié des déchets plastiques
304	00:18:29:22	00:18:32:16	enters the ocean from our rivers.	qui finissent en mer provient de nos fleuves.
305	00:18:33:19	00:18:35:10	The Yangtze, the Nile, the Ganges.	Le Yangtsé, le Nil,
306	00:18:35:15	00:18:36:19		le Gange :

307	00:18:37:01	00:18:40:12	The world's rivers have been turned into plastic arteries,	les fleuves du monde sont devenus des artères de plastique
308	00:18:40:17	00:18:42:17	coursing towards the sea.	qui coulent en direction de la mer.
309	00:18:45:24	00:18:49:22	One of the worst affected rivers is the Citarum in Indonesia.	L'un des fleuves les plus touchés est le Citarum, en Indonésie.
310	00:18:52:07	00:18:53:11	In April, of this year,	En avril,
311	00:18:53:16	00:18:55:10	a giant plastic berg blocked	un énorme îlot de plastique
312	00:18:55:15	00:18:57:01	a section of the river that flows	a bloqué un bras du fleuve
313	00:18:57:06	00:19:00:03	into the capital city of Jakarta.	menant à la capitale, Jakarta.
314	00:19:02:11	00:19:03:16	I'm travelling to Indonesia to find out why rivers here and	Je vais en Indonésie
315	00:19:03:21	00:19:06:13	across the world	pour découvrir pourquoi tous nos fleuves
316	00:19:07:07	00:19:09:03	are choking with plastic.	débordent de plastique.
317	00:19:19:12	00:19:22:12	So, we've arrived on the island of Java, in Indonesia,	Nous voilà arrivés sur l'île de Java, en Indonésie,
318	00:19:22:17	00:19:26:22	and it is bucketing it down in true tropical rain style.	et il tombe des cordes, on dirait une vraie pluie tropicale.
319	00:19:28:03	00:19:30:10	We have just got a call from some villagers we were supposed	On a reçu un appel des habitants
320	00:19:30:15	00:19:32:22	to visit in a few days' time and, because of these rains,	qu'on devait voir dans quelques jours.
321	00:19:33:05	00:19:34:13		À cause de cette pluie,
322	00:19:34:18	00:19:38:08	they are sitting in the middle of something that is so disturbing,	ils sont confrontés à un phénomène tellement troublant
323	00:19:38:13	00:19:42:21	they've asked us to head out there straight away -	qu'ils nous ont dit de les rejoindre tout de suite, et on est en route.
324	00:19:45:07	00:19:47:08	so that's where we're going now.	
325	00:19:47:13	00:19:48:13	I'm meeting Indra Darmawan, a local whose village	Je vais voir Indra Darmawan, dont le village
326	00:19:48:18	00:19:50:02	plays a reluctant part	joue une grande part
327	00:19:50:07	00:19:52:07	in the nation's plastic crisis.	dans la crise du plastique du pays.
328	00:19:52:12	00:19:53:20	Indra?	Indra ?

			–Hello.	– Oui, bonjour.
329	00:19:54:00	00:19:55:14	Nice to meet you. How are you today? Good.	Enchantée. Comment ça va ?
330	00:19:56:17	00:19:58:02	Where are we heading, this way? –Yeah, this way. –OK.	C'est par ici ? – Oui.
331	00:19:59:06	00:20:01:09	He takes me down to the banks of the Citarum River. –Hello!	Il m'emmène au bord du Citarum.
332	00:20:13:20	00:20:15:17	Plastic, and everywhere plastic.	Du plastique à perte de vue.
333	00:20:16:10	00:20:17:17	Oh, my God.	C'est pas vrai !
334	00:20:21:13	00:20:23:08	There are people fishing in it. Yes.	Les gens pêchent dedans ?
335	00:20:23:22	00:20:24:23		Oui.
336	00:20:25:22	00:20:30:04	Overnight, an enormous raft of plastic waste has appeared -	Cette nuit, une gigantesque plaque de déchets plastiques est apparue,
337	00:20:30:16	00:20:32:04	over a mile long	mesurant plus de 1,5 km
338	00:20:32:09	00:20:35:08	and stretching across the entire width of the river.	et s'étendant sur toute la largeur du fleuve.
339	00:20:36:09	00:20:40:11	I've never seen anything like...	J'ai jamais vu un truc pareil.
340	00:20:42:12	00:20:43:19	..quite like this.	C'est quoi ce délire ?
341	00:20:44:18	00:20:45:22	What is going on? What is going on?	C'est quoi ce truc ?
342	00:20:48:22	00:20:50:02	20 years ago, this stretch of river was teeming with fish.	Il y a 20 ans,
343	00:20:50:07	00:20:53:05		ce tronçon du fleuve regorgeait de poissons.
344	00:20:55:02	00:20:59:07	Now it's being flooded by a deluge of plastic waste.	Il est aujourd'hui submergé par un torrent de plastique.
345	00:21:01:12	00:21:07:00	Each day, an estimated 2,000 tonnes of plastic flows down this river.	Le fleuve en charrie environ 2 000 t par jour.
346	00:21:09:16	00:21:11:18	And today, after the heavy rains,	Les fortes pluies ont laissé place
347	00:21:11:23	00:21:15:20	it's one of the worst plastics rafts locals have ever seen.	à l'un des plus grands îlots de plastique jamais observés ici.
348	00:21:20:06	00:21:21:17	Look. Oh, my God.	Oh mon Dieu.
349	00:21:22:16	00:21:24:12	Indra, this is crazy.	C'est vraiment fou.

			–Yeah.	– Je sais.
350	00:21:24:22	00:21:26:15	What are these guys...? What are they doing on the boats?	Que font-ils sur ces barques ?
351	00:21:26:20	00:21:29:24	We have 58 pickers and they collect rubbish from here every day.	Tous les jours, 58 ramasseurs repêchent les déchets.
352	00:21:30:04	00:21:32:15	They take whatever's worth anything and sell it to a plastic industry	Ils ramassent tout objet
353	00:21:32:20	00:21:36:01		susceptible d'être racheté par une usine de plastique.
354	00:21:39:15	00:21:42:18	Many of the litter pickers used to be fishermen,	De nombreux ramasseurs étaient autrefois pêcheurs,
355	00:21:42:23	00:21:45:11	but plastic waste and pollution in the river	mais à cause de la pollution plastique,
356	00:21:45:16	00:21:48:22	has reduced the number of fish species by 60%.	la population de poissons a dégringolé de 60 %.
357	00:21:50:00	00:21:52:24	And what's left is potentially dangerous to eat.	Manger les poissons du fleuve peut être dangereux.
358	00:21:55:15	00:22:01:11	I used to fish here but now I'm scared to.	Avant, je pêchais ici, mais maintenant, j'ai trop peur.
359	00:22:01:16	00:22:06:05	I won't feed my family with fish from this river.	Je ne veux pas nourrir ma famille avec les poissons de ce fleuve.
360	00:22:13:05	00:22:15:03	I just can't believe how people...	Je comprends pas comment les gens
361	00:22:16:19	00:22:18:07	..can cope with this.	arrivent à supporter ça.
362	00:22:19:23	00:22:24:19	It's this weird, weird, surreal reality	Cette situation est surréaliste, je ne m'attendais pas vraiment
363	00:22:25:12	00:22:27:12	that I never really expected to experience in my lifetime,	à voir ça un jour dans ma vie,
364	00:22:27:17	00:22:30:01	you know. But this is real. This is what's going on.	mais c'est la réalité. Voilà où on en est.
365	00:22:34:01	00:22:38:11	And there are guys on boats just getting on with their day's work,	Des hommes sur leur barque font leur boulot quotidien,
366	00:22:39:04	00:22:42:03	picking plastic out of this massive raft	ils écument le plastique de cet îlot gigantesque
367	00:22:42:08	00:22:44:20	that's now moving downstream.	qui descend maintenant le courant.

368	00:22:45:11	00:22:47:00	My God...	Nom de Dieu !
369	00:22:48:06	00:22:49:16	Look at it, like...	Regardez-moi ça !
370	00:22:51:24	00:22:53:00	Just look at it.	Regardez ça !
371	00:23:06:05	00:23:08:05	To find out how all this plastic has ended up in the river,	Pour savoir comment ce plastique
372	00:23:08:10	00:23:09:23		est arrivé dans le fleuve,
373	00:23:10:12	00:23:13:13	I travel upstream, to the region of Bandung,	je me rends en amont, dans la région de Bandung.
374	00:23:14:24	00:23:17:07	home to 165 villages,	Elle abrite 165 villages,
375	00:23:17:12	00:23:20:11	many of which are on the banks of the Citarum.	pour beaucoup situés sur les rives du Citarum.
376	00:23:23:00	00:23:25:21	I've contacted a local environmental campaigner, Deni Riswandani.	J'ai contacté un défenseur de l'environnement,
377	00:23:26:17	00:23:28:02		Deni Riswandani.
378	00:23:35:06	00:23:36:06	Wowzers.	C'est dingue.
379	00:23:39:17	00:23:44:01	So this is where all the village puts their plastic.	Voilà où les villageois déposent leur plastique.
380	00:23:44:13	00:23:49:22	They're making their own landfill site because they're getting	Ils créent leur propre déchetterie car ils ne reçoivent aucune aide.
			no help from anyone else to do this.	
381	00:23:50:05	00:23:53:21	Local government asked people to sort out their own rubbish	Les autorités locales ont demandé aux villageois
382	00:23:54:01	00:23:57:22		de trier leurs déchets,
383	00:23:58:10	00:24:02:12	but they didn't provide any facilities	mais elles ne leur ont pas fourni les infrastructures nécessaires
384	00:24:02:17	00:24:06:05	to get rid of the plastic.	pour se débarrasser du plastique.
385	00:24:07:05	00:24:09:03	Is this the same scenario	Il se passe la même chose
386	00:24:09:08	00:24:12:10	in all the villages that border the Citarum?	dans les autres villages qui bordent le Citarum ?
387	00:24:12:19	00:24:16:07	Yes, everyone has had	Oui, tous les villageois sont contraints
388	00:24:16:12	00:24:21:13	to turn the banks of the river into rubbish dumps.	de se servir des rives du fleuve comme décharge publique.
389	00:24:21:18	00:24:24:15	There is no control.	Les autorités ne contrôlent rien.

390	00:24:28:07	00:24:30:11	The villagers say that they've used the Citarum as a place	Les habitants disent que le Citarum
391	00:24:30:16	00:24:33:17	to get rid of their rubbish for centuries.	leur sert de dépotoir depuis des siècles.
392	00:24:36:18	00:24:39:19	Before plastic we only used	On n'utilisait que des matériaux écologiques
393	00:24:39:24	00:24:41:19	environmentally friendly materials.	avant l'arrivée du plastique.
394	00:24:42:08	00:24:46:22	But the rapid rise in the use of plastic has replaced many organic materials and swamped the river and its banks.	Le plastique a très vite remplacé de nombreuses matières naturelles,
395	00:24:47:09	00:24:49:24		et s'est mis à inonder le fleuve et ses rives.
396	00:24:53:01	00:24:55:23	It's crazy, absolutely crazy.	C'est insensé ! C'est complètement fou.
397	00:25:00:03	00:25:03:22	Villagers say the local government here provides no facilities	Selon les habitants, les autorités ne prévoient aucun centre
398	00:25:04:02	00:25:06:17	to collect and dispose of the rubbish.	de collecte et d'élimination des déchets.
399	00:25:08:15	00:25:11:15	Globally, it's estimated that two billion people have no access	Dans le monde, environ deux milliards de personnes
400	00:25:11:20	00:25:14:09	to proper waste management.	n'ont aucun service de gestion des déchets,
401	00:25:16:04	00:25:17:24	That's a quarter of the world's population	Un quart de la planète
402	00:25:18:04	00:25:20:23	who have no option but to throw their plastic waste	est contrainte de jeter ses déchets plastiques
403	00:25:21:03	00:25:24:06	on their own doorsteps or in a nearby waterway.	autour de sa maison ou dans un cours d'eau à proximité.
404	00:25:29:14	00:25:32:21	But governments are not the only ones being blamed for this.	Mais ce n'est pas uniquement la faute des autorités :
405	00:25:33:18	00:25:35:07	Many think that corporations play	les entreprises seraient
406	00:25:35:12	00:25:38:08	a big part in the plastic crisis, too.	en partie responsables de la crise du plastique.
407	00:25:39:22	00:25:42:06	And wealthy global brands have	De grandes marques ont été accusées

			been accused of knowingly selling products to developing countries that often have no adequate way	de vendre des produits dans des pays émergents
408	00:25:42:11	00:25:45:03		
409	00:25:45:15	00:25:49:18	of disposing of the plastic packaging. Hello.	souvent incapables de se débarrasser des emballages plastiques.
410	00:25:54:15	00:25:57:21	Much of the concern is over small plastic sachets that make	Le problème concerne surtout les petits sachets
411	00:25:58:05	00:26:02:03	everyday goods affordable to those with little or no income.	qui rendent les produits abordables pour les plus pauvres.
412	00:26:03:10	00:26:05:15	So you've bought straws, and then drinks, drinks, drinks. Sachets provide locals here with modern essentials like washing powder, toothpaste and shampoo, and they cost very little.	Donc vous avez acheté des pailles
413	00:26:06:03	00:26:07:15		et beaucoup de boissons.
414	00:26:08:09	00:26:09:24		Les sachets fournissent
415	00:26:10:04	00:26:11:22		les produits indispensables
416	00:26:12:02	00:26:14:00		comme la lessive, le dentifrice,
417	00:26:14:05	00:26:17:01	and shampoo, and they cost very little.	ou le shampoing, et ils sont très bon marché.
418	00:26:24:21	00:26:26:21	There is a huge dilemma here.	Le dilemme est de taille.
419	00:26:27:01	00:26:29:17	On the one hand, you have this new	D'un côté, il y a...
420	00:26:30:15	00:26:32:21	affordable lifestyle that everybody here is as entitled to enjoy	ce nouveau mode de vie abordable,
421	00:26:33:01	00:26:37:00		dont l'ensemble de ces personnes a le droit de jouir au même titre
422	00:26:37:05	00:26:38:17	as much as we are in the West, and the sachets give them that.	que nous, occidentaux.
423	00:26:39:01	00:26:42:00		Ces sachets leur offrent ce mode de vie.
424	00:26:43:02	00:26:44:08	But then, on the other hand, you've got rivers teeming with	Mais d'un autre côté,
425	00:26:44:24	00:26:49:06		les fleuves sont remplis de sachets.
426	00:26:50:02	00:26:51:21	the stuff, and who's responsibility is that?	Qui est responsable de ça ?
427	00:26:54:22	00:26:56:00	Around the world,	À travers le monde,
428	00:26:56:05	00:26:57:19	governments and corporations are starting to address the problem.	autorités et entreprises
429	00:26:57:24	00:27:00:04		commencent à s'attaquer au problème.
430	00:27:00:23	00:27:03:21	Some companies are making	Certaines entreprises

			very public pledges to make all	s'engagent publiquement
431	00:27:04:03	00:27:07:01	their products 100% reusable, recyclable or compostable by 2025.	à rendre tous leurs produits 100 % réutilisables,
432	00:27:07:06	00:27:10:13		recyclables, ou compostables d'ici 2025.
433	00:27:11:21	00:27:15:11	But many believe 2025 is just too late.	Mais beaucoup de personnes pensent qu'il sera déjà trop tard.
434	00:27:16:05	00:27:18:00	The figures suggest that, by then, the amount of plastic pouring	D'après les calculs, d'ici là,
435	00:27:18:05	00:27:20:19	into our oceans could have already doubled.	la quantité de plastique déversée en mer
436	00:27:20:24	00:27:23:02		pourrait déjà avoir doublé.
437	00:27:25:17	00:27:27:19	With such disturbing projections, I want to investigate what	Avec des telles prévisions,
438	00:27:27:24	00:27:29:00		je veux étudier
439	00:27:29:05	00:27:31:08	other solutions can be found.	les solutions qui s'offrent à nous.
440	00:27:32:12	00:27:34:01	Adam and John, is that right? It's good to finally talk to you.	Adam et John, c'est ça ?
441	00:27:34:10	00:27:36:00		Ravie d'enfin vous parler.
442	00:27:36:05	00:27:38:23	Inventors and engineers have been designing technology that	Des ingénieurs ont mis au point
443	00:27:39:03	00:27:42:13	collects the plastic from our rivers before it enters the sea.	un système qui récupère le plastique des fleuves
444	00:27:42:18	00:27:44:13		avant qu'il ne finisse en mer.
445	00:27:44:18	00:27:47:24	The first person I speak to is a surfer from Sydney.	Mon premier interlocuteur est un surfeur de Sydney.
446	00:27:48:05	00:27:50:14	So I was reading about your Seabin,	J'ai lu des articles sur votre Seabin,
447	00:27:51:09	00:27:53:07	and I wanted to know a little bit more about it.	et je souhaitais en savoir plus.
448	00:27:53:12	00:27:56:04	The Seabin, it's quite a simple device.	La Seabin est un dispositif plutôt simple.
449	00:27:56:15	00:28:00:04	We've basically got a rubbish bin, we have a small water pump	En gros, il s'agit d'une poubelle et d'une petite pompe à eau
450	00:28:00:09	00:28:02:16	that we filter out the debris in the middle.	avec lesquelles

				on filtre les ordures.
451	00:28:03:09	00:28:04:23	Do you ever imagine bringing some sort of sea bin out to Asia?	Avez-vous déjà pensé
452	00:28:05:10	00:28:07:14		à exporter l'une de ces poubelles
453	00:28:08:03	00:28:09:16		en Asie ?
454	00:28:09:21	00:28:14:08	We've got an order sheet with requests from about 170 countries.	Nous avons reçu des précommandes de la part d'environ 170 pays.
455	00:28:14:20	00:28:16:06	As depressing as it is, it's quite an amazing time to see the opportunity of, you know, how we can fix this.	Aussi triste que ce soit,
456	00:28:16:24	00:28:21:09	The Seabin is an effective solution for harbours and smaller rivers, but it simply couldn't withstand the huge volumes of plastic pouring down the most polluted rivers in the world.	c'est assez génial de voir comment on peut arranger ça.
457	00:28:22:17	00:28:24:19		La Seabin est une solution efficace
458	00:28:24:24	00:28:27:03		pour les ports et les petits fleuves,
459	00:28:27:08	00:28:31:00	but it simply couldn't withstand the huge volumes of plastic pouring down the most polluted rivers in the world.	mais elle ne pourrait pas gérer l'énorme quantité de plastique des fleuves les plus pollués au monde.
460	00:28:31:05	00:28:33:13	There is one solution which is called Mr Trash Wheel, and they're pulling out thousands and thousands of pounds of trash per year.	Il y a une solution appelée "Mr Trash Wheel", qui extrait des milliers de tonnes de détritiques chaque année
461	00:28:33:18	00:28:36:23	And this is something that's suited for high volumes.	et qui est adaptée aux gros volumes.
462	00:28:37:03	00:28:42:02	This wheel has been built in Baltimore harbour.	Ce moulin a été conçu dans le port de Baltimore.
463	00:28:42:14	00:28:45:24	It lifts plastic rubbish from the river and drops it into a barge.	Il extrait le plastique du fleuve, et le dépose dans un conteneur.
464	00:28:51:10	00:28:55:06	The Trash Wheel is actually a very simple machine.	Le Trash Wheel est une machine très simple.
465	00:28:56:12	00:28:59:12	The water wheel gets its energy from two different sources -	Le moulin à eau est alimenté par deux sources d'énergie :
466	00:28:59:17	00:29:03:16	one is the flow of the river	le courant du fleuve
467	00:29:03:21	00:29:06:08		

			that brings the trash,	qui amène les déchets,
469	00:29:06:17	00:29:11:03	the other is we have solar panels on the Trash Wheel.	et des panneaux solaires placés sur le Trash Wheel.
470	00:29:11:08	00:29:12:20	That sounds incredible.	Ça a l'air génial.
471	00:29:13:16	00:29:16:12	Since the Wheel started turning in 2014, it's collected almost	Depuis que ce moulin a commencé à tourner en 2014,
472	00:29:16:17	00:29:19:16	one million plastic bottles,	il a récolté un million de bouteilles en plastique,
473	00:29:19:23	00:29:21:17	half a million plastic bags,	500 000 sacs en plastique,
474	00:29:21:22	00:29:24:02	and 11 million cigarette butts	et 11 millions de mégots de cigarettes
475	00:29:24:07	00:29:27:01	that are made up of tiny plastic fibres.	Constitués de minuscules fibres de plastique.
476	00:29:29:09	00:29:32:13	We've picked up over 35 tonnes of trash in one day.	Un jour, on a ramassé plus de 35 t de détritrus.
477	00:29:32:18	00:29:33:18	Wow!	Ouah !
478	00:29:34:05	00:29:37:16	But with each Wheel costing around half a million dollars,	Mais chaque moulin coûtant 500 000 dollars,
479	00:29:37:21	00:29:40:07	this technology could be just too expensive	ce système pourrait coûter trop cher
480	00:29:40:12	00:29:44:01	for many local councils in countries like Indonesia.	pour bien des petits villages de pays comme l'Indonésie.
481	00:29:45:24	00:29:49:24	In Amsterdam, engineers have been experimenting with bubbles.	À Amsterdam, des ingénieurs tentent une solution à base de bulles.
482	00:29:50:09	00:29:53:21	A tube full of holes is placed near the bottom of a river.	Un tuyau percé de trous est placé près du fond du fleuve.
483	00:29:54:03	00:29:57:12	The air bubbles are forced to the surface, trapping the plastic	Les bulles d'air remontent, piégeant ainsi le plastique
484	00:29:57:17	00:30:00:21	and funnelling it to the river bank, ready for collection.	et l'attirant vers la berge, prêt à être ramassé.
485	00:30:01:15	00:30:03:20	This design has great potential,	Ce projet a un grand potentiel,
486	00:30:04:05	00:30:06:10	but it's still in the prototype phase.	mais ce n'est encore qu'un prototype.

487	00:30:07:20	00:30:10:20	I'm also keen to find out about solutions that are coming at	J'ai envie de découvrir les solutions qui abordent
488	00:30:11:00	00:30:14:17	the ocean plastic problem from a completely different angle.	la pollution plastique des océans sous un tout autre angle.
489	00:30:16:14	00:30:19:09	I've arranged a meeting with this young entrepreneur	J'ai rendez-vous avec un jeune entrepreneur
490	00:30:19:14	00:30:23:07	who has been developing an alternative material to plastic.	qui développe un matériau de substitution au plastique.
491	00:30:23:12	00:30:26:18	Now, if it's as good as the reports I've been reading online,	Alors, si c'est aussi bien que ce qu'on dit sur Internet,
492	00:30:26:23	00:30:30:14	it feels to me like this could be a real game changer.	j'ai bien l'impression que ça pourrait changer la donne.
493	00:30:36:03	00:30:39:00	David? Hello. – Hello. It is, yeah. – Hello, I'm Liz. Hi.	David ? Bonjour, je suis Liz. – Oui. Bonjour.
494	00:30:41:05	00:30:43:05	David Christian has been experimenting	David Christian étudie
495	00:30:43:10	00:30:45:15	with a natural resource that could	une ressource naturelle susceptible
496	00:30:45:20	00:30:47:13	replace plastic packaging.	de remplacer les emballages.
497	00:30:47:23	00:30:49:21	He's focusing on finding an alternative to the billions of plastic sachets	Il cherche un moyen de remplacer
498	00:30:50:06	00:30:51:24		les milliards de sachets
499	00:30:52:04	00:30:55:10	used in Indonesia and other developing countries	utilisés en Indonésie et dans d'autres pays émergents.
500	00:30:56:14	00:30:57:22	What is this made of?	De quoi est-ce fait ?
501	00:30:58:02	00:31:00:21	It's made of seaweed, without using any chemical process.	D'algues non traitées chimiquement
502	00:31:01:01	00:31:02:17	So, we can use it for the...	pour pouvoir emballer...
503	00:31:02:22	00:31:07:01	Cereal bar? – Yeah, like, for the bar and then the coffee sachet.	... une barre de céréales ? – Oui, ou un sachet de café.
504	00:31:07:06	00:31:10:06	So you basically just have to bung this in a...?	Il faut simplement le mettre dans...
505	00:31:10:11	00:31:11:18	In the hot water and then stir it.	Dans de l'eau chaude.
506	00:31:12:09	00:31:13:20		Ensuite, il faut remuer.

507	00:31:15:10	00:31:18:08	Right, I'm going to taste this coffee, because you promised me	Je vais goûter ce café, parce que vous m'avez juré
508	00:31:18:13	00:31:21:14	it would not taste of the sea. – Yeah, please. It's very hot.	qu'il ne goûtait pas l'eau de mer. – D'accord. Voici.
509	00:31:23:16	00:31:24:19		C'est très chaud.
510	00:31:27:01	00:31:28:13	That's great. That's a great cup of coffee.	Ce café est délicieux.
511	00:31:28:18	00:31:29:21	This is for soap.	Ça, c'est du savon.
512	00:31:30:11	00:31:33:03	So, you don't need to open the soap, we can just wash our hand.	Ça s'ouvre pas. Il suffit de se laver les mains.
513	00:31:33:15	00:31:34:20	That's it, just...? – Yeah.	C'est tout ? – Oui.
514	00:31:35:00	00:31:36:21	And start rubbing? – Start rubbing.	Il faut frotter ? – Oui.
515	00:31:38:11	00:31:41:02	That dissolves really quickly!	Ça se dissout vraiment très rapidement !
516	00:31:41:24	00:31:45:00	When I think about the amount	Quand je pense au nombre
517	00:31:45:05	00:31:48:24	of little plastic soaps in plastic packaging	de savons emballés dans du plastique
518	00:31:49:04	00:31:51:09	in all the hotels around the world,	qu'il y a dans tous les hôtels du monde,
519	00:31:51:14	00:31:54:08	wrapped in separate little small plastic bags, and how this could	chacun emballé dans un sachet différent,
520	00:31:54:13	00:31:58:23	completely change that industry for the better... That's huge.	je me dis que ça peut révolutionner le secteur. C'est formidable.
521	00:31:59:23	00:32:01:01	David and his team have also used	David et son équipe
522	00:32:01:06	00:32:02:23	their seaweed technology to	ont aussi utilisé des algues
523	00:32:03:03	00:32:05:03	design fast-food packaging.	pour créer des emballages à burger
524	00:32:05:08	00:32:09:14	I presume the only nutrition in this is in the wrapper.	Je suppose que les seuls nutriments, là-dedans, sont dans l'emballage.
525	00:32:10:17	00:32:12:05	And disposable cups.	et des gobelets jetables.
526	00:32:12:10	00:32:13:10	Take a bite!	Mordez !
527	00:32:14:22	00:32:19:07	Food packaging makes up over a third of all plastic waste in the ocean.	Plus d'un tiers du plastique présent dans l'océan provient d'emballages.

528	00:32:19:23	00:32:21:13	While there are still some concerns about how seaweed farms might affect	On ne connaît pas encore
529	00:32:21:18	00:32:24:24	coastal ecosystems,	l'impact des algues sur les écosystèmes côtiers,
530	00:32:25:07	00:32:26:22	the potential of this design is enormous.	mais cette invention
531	00:32:27:02	00:32:28:06		est prometteuse.
532	00:32:29:12	00:32:32:14	Are big companies that make all of these sachets	Les multinationales qui produisent ces sachets
533	00:32:32:19	00:32:35:15	biting your hand off at the moment? – Yes.	s'arrachent votre concept ? – Oui.
534	00:32:35:20	00:32:38:17	Until now, we already get enquiries from more than 200 companies.	Plus de 200 entreprises nous ont déjà contactés,
535	00:32:39:01	00:32:41:06	Wow. Including those big companies.	notamment ces multinationales-là.
536	00:32:41:11	00:32:44:20	I mean, the potential is huge.	Le potentiel est énorme, vraiment.
537	00:32:45:00	00:32:48:02	That much is very clear from what you've achieved so far.	C'est évident, vu le travail que vous avez réalisé.
538	00:32:48:07	00:32:51:15	I needed to meet someone like you who has their feet firmly on	Je me devais de voir quelqu'un de pragmatique comme vous,
539	00:32:51:20	00:32:56:14	the ground but who is finding an absolutely exciting and viable	qui trouve une solution innovante et durable.
			solution to all this. So I really...	
540	00:32:56:19	00:33:00:04	I wish you all the best in the future.	Je vous souhaite plein de succès. - Merci beaucoup.
			Yeah, thank you so much.	
541	00:33:02:23	00:33:05:09	That was really great. It seems to me to be to be such an exciting but,	C'était vraiment génial.
542	00:33:05:21	00:33:08:18		Ça m'a l'air innovant, mais au-delà de ça,
543	00:33:09:03	00:33:11:16	more importantly, a really concrete solution to the plastic problem,	c'est une solution concrète au plastique
544	00:33:11:21	00:33:15:16	and it's coming from a young Indonesian. He's only 25 years old.	que propose ce jeune Indonésien d'à peine 25 ans.
545	00:33:16:00	00:33:20:20	It's coming from a country that's one of the biggest plastic	Cette solution vient d'un pays parmi les plus gros pollueurs plastiques.

			polluters in the world,	
546	00:33:21:00	00:33:24:10	I cannot wait to see what this guy achieves in the next few years.	J'ai hâte de voir ce qu'il fera dans les prochaines années.
547	00:33:30:15	00:33:33:21	The staggering rise in our global consumption of plastic	Notre consommation de plastique ne cesse d'augmenter
548	00:33:34:01	00:33:36:06	is down to the fact that it's cheap to produce,	car son coût de production est faible,
549	00:33:36:11	00:33:39:12	light to transport and incredibly strong.	et car il est léger à transporter et très résistant.
550	00:33:40:06	00:33:43:07	This makes it very attractive to big industry,	Ces qualités séduisent les grandes entreprises,
551	00:33:43:14	00:33:45:16	not least those working on the ocean who need a material	surtout celles travaillant en mer,
552	00:33:45:21	00:33:48:03	that can cope with the phenomenal power of the sea.	car il leur faut un matériau qui résiste
553	00:33:48:08	00:33:50:09		à la puissance des vagues.
554	00:33:54:21	00:33:57:01	The fishing industry puts more plastic in the sea	L'industrie de la pêche est le secteur
555	00:33:57:06	00:33:59:05	than any other sector.	qui pollue le plus les océans.
556	00:34:01:12	00:34:05:06	Fishing is one of the largest and oldest industries in the world.	C'est l'un des plus grands et des plus anciens au monde :
557	00:34:05:17	00:34:07:22	It employs 200 million people.	il emploie 200 millions de personnes.
558	00:34:08:08	00:34:10:21	And nearly every net,	Presque chaque filet, cordage, et ligne
559	00:34:11:01	00:34:14:03	rope and line used in commercial fishing is made of plastic.	utilisé pour la pêche commerciale est en plastique.
560	00:34:16:04	00:34:18:20	Over a million tonnes of plastic fishing gear is lost or	Plus d'un million de tonnes d'engins de pêche
561	00:34:19:00	00:34:21:21	dumped at sea each year.	sont perdues ou abandonnées en mer chaque année.
562	00:34:24:13	00:34:27:23	And the consequences for marine life are catastrophic.	Les conséquences pour la vie marine sont dramatiques

563	00:34:35:02	00:34:38:05	I'm heading to one of the busiest fishing grounds in the world,	Je vais dans l'une des zones les plus pêchées au monde,
564	00:34:38:10	00:34:40:24	in New England, on the East Coast of America.	en Nouvelle-Angleterre, aux États-Unis.
565	00:34:44:10	00:34:46:05	I'm meeting a search-and-rescue team to better understand	Je vais voir des sauveteurs
566	00:34:46:10	00:34:49:23	how fishing gear affects sea life.	pour comprendre l'impact du matériel de pêche sur la faune.
567	00:34:51:05	00:34:55:04	They're all getting together for the morning briefing,	Ils sont en pleine réunion, je vais vite entrer.
			so I'm just going to run in.	
568	00:34:57:16	00:35:00:00	Low tide is around 2 pm today,	La mer sera à marée basse vers 14 h,
569	00:35:00:22	00:35:04:23	so we're going to be trying to work around the tide.	on va travailler à ce moment-là, et partir le plus vite possible.
			We're going to try and get out as soon as possible.	
570	00:35:05:16	00:35:09:17	So, yesterday, we did count at least 17 animals that were entangled.	Hier, on a recensé au moins 17 animaux empêtrés.
571	00:35:10:11	00:35:14:05	So, the work that we're doing today is really important.	On va avoir beaucoup à faire aujourd'hui, alors merci d'être là.
			Thank you all for being here.	
572	00:35:14:10	00:35:18:05	Let's get all of our gear ready and start getting people loaded up.	On va préparer l'équipement et monter en voiture.
573	00:35:23:08	00:35:25:04	Brian Sharp leads this team	Brian Sharp gère cette équipe
574	00:35:25:09	00:35:27:19	of highly trained experts and volunteers.	d'experts et de volontaires qualifiés.
575	00:35:28:01	00:35:31:19	I'm seeing everybody walking around with lists, lists, lists. Yeah.	Je vois tout le monde marcher tête baissée avec des listes.
576	00:35:31:24	00:35:34:21	Heads down, lists. Yes.	Oui, car il y a beaucoup d'équipement, de personnel,
			It is a massive amount of equipment, personnel...	
577	00:35:35:01	00:35:36:07		
578	00:35:36:24	00:35:38:20	Just the whole coordination of this.	et qu'il faut tout coordonner.

579	00:35:39:00	00:35:43:00	You know, it's something we only get a certain opportunity to do,	On n'a pas souvent l'occasion de faire ça, il faut rien oublier.
			so we want to make sure that nothing is forgotten.	
580	00:35:46:05	00:35:49:01	Our first call is to rescue a grey seal pup entangled in fishing net.	Nous allons d'abord secourir un bébé phoque gris enchevêtré dans un filet.
581	00:35:49:06	00:35:50:22		Presque fini.
582	00:35:51:02	00:35:52:03	It's been spotted on a sandbank two miles off the coast,	Il se trouve sur un banc de sable à plus de 3 km des côtes.
583	00:35:53:04	00:35:56:10		L'équipe doit faire vite pour tenter de le sauver.
584	00:35:56:15	00:35:59:13	and the team have to work quickly to try to save it.	Regardez son cou.
585	00:36:02:01	00:36:04:15	Look at its neck... Look at its neck.	Le bébé phoque est coincé dans un filet maillant, un filet vertical qui retient les poissons par les branchies, constitué de fils en plastique ultrarésistants et fins et dont il est impossible de se libérer.
586	00:36:07:10	00:36:10:09	The pup is entangled in part of a gill net -	
587	00:36:10:18	00:36:14:09	a vertical wall of netting that traps fish by their gills.	C'est un très jeune phoque avec une laceration très profonde. – C'est extrêmement profond.
588	00:36:15:08	00:36:18:14	It's made of incredibly strong, thin threads of plastic that are	
589	00:36:19:02	00:36:21:14	almost impossible to break free from.	Voilà l'engin de pêche dans lequel il s'est pris.
590	00:36:22:01	00:36:23:16	This is a very young animal and with a very deep laceration -	
591	00:36:23:21	00:36:27:22	you can see it there. – I can't get over how deep that is.	Vous voyez le collier mortel que ça constitue pour lui.
592	00:36:30:06	00:36:33:17	So, this is the gear that was entangling the animal.	
593	00:36:33:24	00:36:37:08	So, you see, basically, it forms this deadly necklace around the seal.	La largeur de cette plaie, je... – Je sais.
594	00:36:37:15	00:36:40:08	The width of that cut, I can't... – Yes.	

595	00:36:40:13	00:36:44:06	As the animal moves, as the animal swims, as the animal grows,	En bougeant, en nageant, en grandissant,
596	00:36:44:11	00:36:46:06	it makes that cut deeper and wider.	la plaie s'agrandit.
597	00:36:46:23	00:36:49:21	What do you think its chances are, Brian?	Vous pensez qu'il va survivre ? – Difficile à dire.
598	00:36:50:01	00:36:51:11	It's hard to say. – One, two, three, lift.	
599	00:36:53:23	00:36:58:00	So the plan now is to get that young seal	À présent, il faut emmener cette jeune femelle
600	00:36:58:05	00:37:02:06	back to IFAW headquarters and give it 24-hour care	au siège d'IFAW et lui donner des soins intensifs,
601	00:37:02:11	00:37:04:24	because she's in such a bad state.	car son état est grave.
602	00:37:06:11	00:37:09:10	Fluids, then we'll give her some antibiotics and pain meds.	On va lui donner antibiotiques et des antalgiques.
603	00:37:13:02	00:37:17:01	All right, so we'll grab all of our stuff and we'll get out of here and give her some rest.	On va prendre notre équipement, s'en aller et la laisser se reposer.
604	00:37:21:23	00:37:23:13	Look at her.	La pauvre !
605	00:37:24:22	00:37:27:02	All right, go ahead, close those doors.	Très bien, fermez les portes.
606	00:37:29:03	00:37:30:05	It's not long before	Rapidement,
607	00:37:30:10	00:37:33:07	this five-month-old pup's condition deteriorates.	l'état de cette femelle de 5 mois s'aggrave.
608	00:37:35:08	00:37:37:22	Sadly, she doesn't make it through the night.	Elle n'a malheureusement pas passé la nuit.
609	00:37:38:16	00:37:40:07	Just watch your step there. –Yeah.	Attention à la marche. –OK.
610	00:37:41:24	00:37:45:09	It's the job of biologist Misty Niemeyer to discover	La biologiste Misty Niemeyer est chargée de déterminer
611	00:37:45:14	00:37:49:03	the cause of death for all the seals brought in by the rescue team.	les causes de la mort des phoques amenés par l'équipe.
612	00:37:50:17	00:37:55:01	I join the examination of another seal who suffered	J'assiste à l'autopsie d'un autre phoque mort d'une blessure au cou.

			a fatal neck wound.	
613	00:37:56:01	00:37:58:10	We always want to... Oh, yeah, there it is.	Il faut toujours... Eh bien, voilà.
614	00:37:58:24	00:38:00:18	Hang on, though, is that what the rope did?	C'est à cause du cordage ?
615	00:38:01:03	00:38:03:14	That was all done likely from this line.	Oui, tout ça à cause de cette ligne.
616	00:38:03:19	00:38:06:22	It somehow got this around its neck. And then it started to grow,	Ça s'est retrouvé sur son cou, puis le phoque a grandi,
617	00:38:07:02	00:38:09:23	and then it started to slowly cut into around the neck.	et ça a continué à lentement lui lacérer le cou.
618	00:38:10:22	00:38:14:03	So, we'll want to do... – It's so young... How old is this...?	Donc il faut... – Il est si jeune ! Il a quel âge ?
619	00:38:14:08	00:38:19:14	It was probably born sometime in May or June, so it's only a few months old.	Il a dû naître vers mai ou juin, donc il a quelques mois à peine.
620	00:38:20:00	00:38:24:14	I mean, these are intelligent, social, sentient mammals.	Ces mammifères sont intelligents, sociables, sensibles.
621	00:38:24:24	00:38:28:16	This pup was in...how much pain?	À quel point ce phoque souffrait ?
622	00:38:28:21	00:38:31:00	Something like this, where it's around your neck,	Avec un truc pareil autour du cou,
623	00:38:31:05	00:38:33:23	where you're trying to breathe and where you're trying to eat	pour réussir à respirer ou manger,
624	00:38:34:17	00:38:39:04	and you're constantly moving and swimming, it's probably constantly painful.	en bougeant, en nageant, ça doit être constamment douloureux.
625	00:38:40:08	00:38:41:21	So we can just try to slide this off if we can.	On va le faire glisser.
626	00:38:42:01	00:38:44:12	Do you think it will? – I think so.	Ça va s'enlever ? – Je crois.
627	00:38:50:07	00:38:51:18	Oh, dearie me...	Oh, Seigneur...
628	00:38:56:20	00:39:00:06	You guys are so amazing and pragmatic. Just holding its little head...	Vous avez le cœur bien accroché. Rien que tenir sa tête,

629	00:39:00:24	00:39:02:04	just set me off.	ça me rend malade.
630	00:39:02:10	00:39:04:11	Yeah, it can be difficult sometimes. – Yeah.	C'est difficile, parfois. – Oui.
631	00:39:07:08	00:39:08:08	Oh, dear.	Bon Dieu !
632	00:39:10:14	00:39:12:07	It's such a young little thing, you know.	Il est si jeune,
633	00:39:12:12	00:39:15:20	It didn't even have a chance at life at all.	la vie ne lui a laissé aucune chance.
634	00:39:19:09	00:39:20:20	She's breaking my heart.	Elle me brise le cœur.
635	00:39:21:00	00:39:24:02	They're all breaking my heart. This whole situation is breaking my heart.	Ils me fendent tous le cœur, tout ça me bouleverse.
636	00:39:26:17	00:39:30:08	Can you believe this is what goes on when we carry on with our lives, you know?	Il se passe ça, et nous, on continue à vivre l'air de rien.
637	00:39:33:15	00:39:36:06	And then they've got to go back out there and keep going,	Ils vont devoir y retourner encore et encore.
638	00:39:36:11	00:39:37:15	and keep going, and it just never stops.	Ça s'arrête jamais.
639	00:39:38:21	00:39:40:02	It's too much.	Il y a trop à faire.
640	00:39:44:04	00:39:48:00	Entanglements are affecting animals all over the world,	Le problème de l'empêchement touche les animaux du monde entier,
641	00:39:48:05	00:39:52:08	killing an estimated 300,000 marine mammals a year...	et cause chaque année la mort d'environ 300 000 mammifères marins,
642	00:39:54:04	00:39:56:20	..and over 400,000 sea birds.	et de 400 000 oiseaux marins.
643	00:39:58:24	00:40:02:18	Many of these animals have been caught in plastic fishing gear.	Beaucoup se prennent dans des engins de pêche en plastique.
644	00:40:04:06	00:40:07:02	Whales in particular are badly affected,	Les baleines sont particulièrement touchées
645	00:40:07:14	00:40:10:19	because they migrate through some of the busiest fishing grounds.	car elles passent par les zones les plus pêchées.
646	00:40:13:03	00:40:16:01	One species of whale is so under threat, it's being pushed	Une espèce en particulier est si menacée
647	00:40:16:06	00:40:18:14	to the brink of extinction.	qu'elle est au bord

				de l'extinction :
648	00:40:21:03	00:40:23:10	The North Atlantic right whale.	la baleine noire de l'Atlantique Nord.
649	00:40:25:06	00:40:28:01	To reduce the number of right whale entanglements,	Pour limiter son enchevêtrement,
650	00:40:28:06	00:40:31:10	local authorities here have imposed strict fishing bans	les autorités imposent une interdiction de pêche
651	00:40:31:15	00:40:33:10	at the peak of their migration.	durant son pic de migration,
652	00:40:35:02	00:40:38:24	And fishermen have also made significant changes to their fishing gear.	et les pêcheurs ont radicalement modifié leur matériel de pêche.
653	00:40:41:04	00:40:43:20	But with more rules and restrictions on the horizon,	Mais ces nouvelles règles et restrictions
654	00:40:44:10	00:40:46:07	a backlash is brewing.	provoquent un véritable tollé.
655	00:40:47:14	00:40:50:01	We've got so much regulation jammed up our ass.	On a plein de normes sur le dos.
656	00:40:50:16	00:40:54:13	The lobster men, you're going to put them out of business.	Les pêcheurs de homard finiront au chômage. Aucun bateau de ce port
657	00:40:54:18	00:40:56:13	Not one of the boats in this harbour	n'a jamais attrapé de baleine.
658	00:40:56:22	00:40:57:22	has caught a right whale, ever. EVER.	Jamais !
659	00:41:01:06	00:41:03:02	I track down another fisherman.	J'ai suivi un autre pêcheur.
660	00:41:03:08	00:41:05:11	Nick, I'm Liz. – Hi, Liz.	Nick ! Je suis Liz. – Bonjour, Liz.
661	00:41:05:16	00:41:06:23	– Very nice to meet you. – Nice to meet you.	Enchantée ! – De même.
662	00:41:07:03	00:41:08:17	Permission to come aboard? – Absolutely.	Je monte à bord ? – Bien sûr !
663	00:41:09:08	00:41:13:05	Nick Muto is keen to explain the struggle the industry is facing,	Nick Muto va m'expliquer pourquoi le secteur est en difficulté,
664	00:41:14:14	00:41:17:20	and why plastic rope is so vital to their work.	et en quoi les cordages synthétiques sont essentiels.
665	00:41:18:16	00:41:21:20	Can we see one of your lobster pot	On peut voir vos casiers à homard ?

			systems here? – Yeah.	– Oui.
666	00:41:22:07	00:41:24:16	So most of our end lines are 36 metres.	Nos lignes de fond font 36 mètres.
667	00:41:26:05	00:41:30:02	Lobster fishing involves a lobster pot thrown to the bottom of the sea,	Pour pêcher le homard, il faut jeter en mer des casiers
668	00:41:30:07	00:41:32:06	attached to a buoy at the surface by	attachés à des bouées en surface
669	00:41:32:11	00:41:35:03	a very long length of plastic rope.	par un très long câble synthétique.
670	00:41:36:20	00:41:38:23	It stays in the water for several days until the fishermen	Ils y restent plusieurs jours,
671	00:41:39:03	00:41:41:08	return to collect it.	jusqu'à ce que le pêcheur les remonte.
672	00:41:42:21	00:41:45:17	Try to grab it from the ends and try to... – Oh, my God, I can't.	Prenez-le par les côtés. –J'y arrive pas !
673	00:41:45:22	00:41:47:24	It's heavy. – How heavy is that?	C'est lourd. – Combien ça pèse ?
674	00:41:48:04	00:41:51:01	It's probably 65 almost 70lbs.	Ça doit faire une trentaine de kilos.
675	00:41:52:17	00:41:54:12	The plastic rope Nick uses	Le cordage synthétique de Nick
676	00:41:54:17	00:41:56:24	can hold the weight of a family car:	peut supporter le poids d'une voiture.
677	00:41:58:06	00:42:01:23	it's twice as strong as traditional natural fibre rope.	Elle est deux fois plus solide que celles en fibres naturelles.
678	00:42:02:15	00:42:04:24	So, I actually have some of the natural fibre rope.	J'ai des cordages en fibres naturelles.
679	00:42:05:09	00:42:06:09	We've got some of it right here,	Il y en a juste là.
680	00:42:06:14	00:42:09:13	this is the old hemp rope. – Good old-fashioned hemp, OK.	C'est un cordage en chanvre. – Du bon vieux chanvre.
681	00:42:09:18	00:42:11:06	And you see, when I open the valve...	Si j'actionne la valve...
682	00:42:14:02	00:42:17:01	Whoa! how long did that take? – Not long enough.	Ça a tenu combien de temps ? – Pas assez longtemps.
683	00:42:17:17	00:42:19:20	Show me that with one of	Faites-le avec celle en plastique.

			your plastic ropes then.	
684	00:42:20:00	00:42:23:08	It's the same diameter, right?	C'est le même diamètre ? Oui, même diamètre de cordage.
685	00:42:23:21	00:42:25:02	Same diameter rope and, as you can see...	Comme on peut le voir,
686	00:42:29:08	00:42:31:10	...there's no way. –There's no way?	c'est incassable. – Vraiment ?
687	00:42:32:11	00:42:36:24	We need to make sure that we have the ability to get our gear up off the bottom of the ocean.	On doit s'assurer de pouvoir remonter nos engins hors de l'eau.
688	00:42:37:07	00:42:40:05	I have hundreds of thousands of dollars	J'ai investi des centaines de milliers de dollars
689	00:42:40:10	00:42:42:00	wrapped up in commercial fishing.	dans la pêche commerciale.
690	00:42:42:07	00:42:47:05	My wife, myself, my daughter, my three crewmen that I... and their	Ma femme, moi, ma fille, mes trois membres d'équipage,
691	00:42:47:18	00:42:51:14	families rely on me being able to make a living on the water.	et leurs familles dépendent de moi et de mes revenus.
692	00:42:56:12	00:43:01:19	It's estimated that three million miles of this virtually unbreakable	Près de 5 millions de kilomètres de cordages en plastique armé
693	00:43:01:24	00:43:04:05	plastic rope is used on this coastline alone.	sont utilisés sur ce littoral.
694	00:43:05:15	00:43:10:07	But it's this same rope that causes terrible harm to migrating whales.	Elles provoquent de terribles dégâts chez les baleines en migration.
695	00:43:13:10	00:43:17:00	Thousands of these ropes hang vertically in the water,	Des milliers de câbles verticaux sont tendus dans l'eau,
696	00:43:17:05	00:43:19:16	creating a deadly obstacle course.	Créant un parcours d'obstacles mortel.
697	00:43:21:12	00:43:24:03	Despite their incredible size and strength,	Malgré leur taille et leur force imposantes,
698	00:43:24:08	00:43:27:00	the only way to free the whales once entangled	la seule façon de libérer une baleine empêtrée
699	00:43:27:05	00:43:30:11	is to attempt an incredibly dangerous rescue mission	est de tenter un sauvetage extrêmement dangereux.

700	00:43:32:05	00:43:33:22	So, Liz, this is our team.	Liz, voici notre équipe.
701	00:43:34:15	00:43:38:09	One of the few people skilled enough and brave enough to do this	L'un des rares courageux assez qualifié pour le faire
702	00:43:38:14	00:43:39:18	is Scott Landry.	est Scott Landry.
703	00:43:40:08	00:43:42:21	He and his team are on call seven days a week,	Lui et son équipe contrôlent 7 jours sur 7
704	00:43:43:03	00:43:46:08	patrolling an area over twice the size of Britain.	une zone qui fait plus du double de la Grande-Bretagne.
705	00:43:47:01	00:43:50:00	This was on a humpback whale and we worked on Saturday	Une baleine à bosse s'est emmêlée dedans et samedi,
706	00:43:50:05	00:43:51:05	to remove this from the whale.	on l'a enlevé.
707	00:43:51:14	00:43:55:23	You've literally got the whole lobster pot gear.	On voit carrément le casier à homard avec la bouée censée être au-dessus,
			You've got the buoy at the top,	
708	00:43:56:12	00:43:59:04	the rope that extends down to the bottom of the ocean.	et le cordage qui va jusqu'au fond de l'eau.
709	00:43:59:11	00:44:02:00	It is just rope, a pot and a buoy,	Rien qu'un cordage, un casier et une bouée
710	00:44:02:22	00:44:05:06	and it can cause a really complicated problem.	peuvent causer de sérieux dégâts.
711	00:44:06:02	00:44:09:00	Scott recorded his latest mission on headcam.	Scott a filmé sa dernière mission avec une caméra.
712	00:44:09:11	00:44:10:19	There's the whale.	Voilà la baleine.
713	00:44:12:16	00:44:14:09	Right here, right here, right here...	Juste là, devant nous !
714	00:44:16:01	00:44:18:24	..and there's that buoy and the grappling hook.	Voilà la bouée et le grappin.
715	00:44:19:04	00:44:21:23	He doesn't want the buoy,	Il doit attraper la ligne sous la bouée.
			he wants the line that's underneath the buoy.	
716	00:44:22:07	00:44:26:18	A yellow rope is hooked onto the fishing gear that's wrapped	Ils accrochent une corde au matériel de pêche emmêlé autour de sa queue
717	00:44:26:23	00:44:28:14	around the whale's tail, so they can	pour pouvoir se rapprocher

			edge themselves closer to one	
718	00:44:28:19	00:44:32:07	of the largest and most powerful animals on Earth.	de l'un des animaux les plus puissants et imposants du monde.
719	00:44:33:05	00:44:34:15	So, the whale is carrying on.	Elle continue à nager.
720	00:44:34:20	00:44:36:06	Oh, I can see the other rope trailing. –Yeah, see all the rope...	Je vois le cordage. –Oui ?
721	00:44:36:11	00:44:38:24	This is all this stuff? This is all this stuff ? This is... –...that's all this stuff. That's exactly it.	C'est ce qu'il y a là ? – Le cordage, oui.
722	00:44:39:04	00:44:40:08	...crazy.	C'est fou !
723	00:44:42:03	00:44:44:17	And so, right now, they're letting the line pay out.	Ils donnent un peu de mou à la corde.
724	00:44:45:12	00:44:47:24	And the whale is dragging the boat at a fierce rate.	La baleine tire le bateau très vite.
725	00:44:48:20	00:44:49:21	You're going... – Yes. – You're going to be lead by the whale	Ça avance. – Oui.
726	00:44:50:01	00:44:52:08	and you're going to let that whale take you.	Vous laissez la baleine vous tracter.
727	00:44:52:13	00:44:54:18	Yeah, and the whale is going to react automatically.	Oui. La baleine va forcément réagir.
728	00:44:57:01	00:44:58:15	I can't get over what I'm seeing.	J'en crois pas mes yeux.
729	00:44:59:08	00:45:00:15	Alright, Paul, give me the knife.	OK, Paul, le couteau !
730	00:45:00:20	00:45:03:10	It's an incredibly dangerous procedure.	Il s'agit d'une opération très dangereuse.
731	00:45:03:17	00:45:06:14	Last year, Scott's friend and colleague died	L'an dernier, l'ami et collègue de Scott est mort
732	00:45:06:19	00:45:08:16	while trying to rescue a whale.	en tentant d'aider une baleine.
733	00:45:08:24	00:45:12:21	And so, as the whale is at the surface, we draw ourselves closer and closer to the whale.	Quand la baleine est à la surface, on s'en approche de plus en plus.
734	00:45:13:04	00:45:15:15	You can see the wound and	On peut voir la plaie

			the rope going right into it.	et le cordage dedans.
735	00:45:16:06	00:45:18:16	Oh, yeah, yeah, and the rope is plastic, it's not hemp -	Et il est synthétique, pas en chanvre,
736	00:45:19:07	00:45:21:23	which is the reason why the whales are in such a pickle. Yeah.	voilà où est le problème. – Oui.
737	00:45:24:07	00:45:26:09	So, you can see our support boat in the background.	Il y a le navire de soutien derrière.
738	00:45:26:16	00:45:30:14	Alright, so... Could you please here grab that quick?	OK, bon, tu peux attraper ça s'il te plaît ?
739	00:45:33:08	00:45:36:22	So now on the end of the long pole is a hook-shape knife	Au bout de cette perche, il y a une lame en forme de crochet
740	00:45:37:02	00:45:38:18	that is extremely sharp.	extrêmement tranchante.
741	00:45:43:24	00:45:48:15	After hours of backbreaking work, they skilfully release the buoy.	Après des heures de travail acharné, ils parviennent à dégager la bouée.
742	00:45:53:06	00:45:55:08	The plastic fishing rope is cut away...	Ils coupent le cordage synthétique
743	00:45:57:03	00:45:59:06	..finally setting the animal free.	et libèrent enfin la baleine.
744	00:46:00:15	00:46:02:19	So, it's now going to be free to swim away.	Elle peut enfin nager librement.
745	00:46:03:02	00:46:05:10	This animal has a lot of work to do on its own now. Nothing we can do for it.	Elle doit se débrouiller maintenant.
746	00:46:05:15	00:46:08:21	We cannot give it medication, no palliative care -	On peut lui donner ni médicaments, ni soins palliatifs.
747	00:46:09:21	00:46:13:00	and so I can't say that this whale, for sure, is out of the woods.	Je peux pas garantir qu'elle soit tirée d'affaire.
748	00:46:16:04	00:46:21:03	It's estimated that between half and two thirds of whales in these	Entre la moitié et les deux tiers des baleines dans ces zones de pêche
749	00:46:21:08	00:46:24:14	fishing grounds have been entangled at least once in their lifetime.	se sont enchevêtrées au moins une fois dans leur vie.
750	00:46:24:19	00:46:28:09	Whales are running from their breeding grounds	Elles nagent de zone de reproduction en zone d'alimentation,

			to their feeding grounds	
751	00:46:28:14	00:46:30:16	and they, essentially, are running a gauntlet.	et c'est très dangereux pour elles.
752	00:46:31:09	00:46:36:09	This is where it becomes extremely difficult for, say,	C'est pourquoi ça devient difficile pour un pêcheur local, par exemple,
753	00:46:36:14	00:46:38:02	a local fisherman to buy into this issue.	
754	00:46:38:09	00:46:41:02	Are you finding that the majority of entanglements	Vous pensez que la plupart des empêtements sont dus aux engins de pêche ?
755	00:46:41:07	00:46:44:00	are caused by active fishing gear?	
756	00:46:44:05	00:46:47:15	Yes.	Oui, c'est du matériel utilisé pour pêcher de quoi manger.
			This was gear that was catching food for people.	
757	00:46:48:18	00:46:54:17	Now, getting to the point of	Parvenir à pêcher quoi que ce soit dans l'océan ou au fond de celui-ci
			catching whatever it is	
			that you want on the sea floor,	
758	00:46:55:02	00:46:56:05	or anywhere in the ocean, without rope, that is...	sans cordages,
759	00:46:57:02	00:47:00:14	...that's the Holy Grail. – OK. Yeah.	c'est ça, le but ultime. – Je vois.
760	00:47:01:18	00:47:04:13	Globally, there are fewer than 30 small rescue teams like this one, and an estimated population of two million whales.	On compte moins de 30 équipes de sauvetage
761	00:47:04:18	00:47:06:04		comme celle-ci au monde,
762	00:47:06:09	00:47:07:24		et environ
763	00:47:08:04	00:47:09:19		deux millions de baleines.
764	00:47:10:07	00:47:12:16	This can never be a long term solution.	Cette solution n'est pas durable.
765	00:47:13:10	00:47:16:09	The only way to stop entanglements	La seule solution à l'empêchement est de supprimer
766	00:47:16:14	00:47:19:01	is to remove those vertical ropes from the water column.	ces câbles verticaux de la colonne d'eau.
767	00:47:19:06	00:47:23:08	That is the only way they are going really to protect whales here.	C'est la seule façon de protéger les baleines qui nagent ici.

768	00:47:28:23	00:47:33:21	Some of the fishermen here are open to finding out about alternative fishing techniques.	Certains pêcheurs sont ouverts aux nouvelles techniques de pêche.
			Dave Casoni, from the Massachusetts Lobstermen Association,	Dave Casoni, de l'Association de homardiers du Massachusetts,
769	00:47:35:16	00:47:39:09	has agreed to test a new fishing system	a accepté de tester un nouveau système
770	00:47:39:14	00:47:41:21	that doesn't rely on floating vertical ropes,	sans câbles verticaux tendus dans l'eau,
771	00:47:42:03	00:47:44:14	but he has his reservations.	mais il émet des réserves.
772	00:47:45:16	00:47:47:07	Dave, I'm Liz. – Hey, Liz.	Dave ! Je suis Liz. – Bonjour, Liz.
773	00:47:47:21	00:47:50:05	How you doing? – All right.	Ça va ? – Oui.
774	00:47:50:10	00:47:51:10	Nice to meet you finally. –Nice to meet you.	Enchantée. –Enchanté.
775	00:47:51:15	00:47:53:03	Marco, right? –Yes, right.	Marco ? – Oui.
776	00:47:53:08	00:47:54:09	Really good to meet you both.	Enchantée !
777	00:47:54:14	00:47:55:14	Marco Flag is the engineer who's designed the new fishing gear.	Marco Flag, ingénieur, a conçu le nouveau système.
778	00:47:55:19	00:47:58:23	His invention keeps the ropes attached to the Lobster pot	Il maintient le cordage fixé au casier à homard,
779	00:48:02:17	00:48:04:12	safely out of harm's way.	hors d'état de nuire.
780	00:48:02:17	00:48:04:12	It's only released when the fisherman wants to haul up his trap.	Elles ne se déroulent que si le pêcheur veut remonter sa cage.
781	00:48:04:17	00:48:08:07	Don't get in my way over here. – OK, OK, I'm out of your way.	Traînez pas dans le passage. – OK, je m'en vais !
782	00:48:10:03	00:48:12:20	Very tense, very, very tense. That's for sure.	C'est tendu, vraiment très tendu. Ça, c'est sûr.
783	00:48:17:02	00:48:20:21	First, Dave has to set up the new system.	Dave doit d'abord monter le nouveau système.
784	00:48:22:01	00:48:24:18	So, this line	Alors, il faut insérer
785	00:48:25:15	00:48:30:19		

			has to go inside here,	cette ligne là-dedans,
786	00:48:31:02	00:48:35:00	and now this has to go in these...	puis ça, ça doit passer
787	00:48:35:05	00:48:36:24	...gargantuan holes.	dans ces énormes trous.
788	00:48:37:19	00:48:39:19	I think this is very time consuming	Ça prend beaucoup de temps
789	00:48:39:24	00:48:42:19	and difficult in sea conditions.	et c'est très compliqué de faire ça en mer.
790	00:48:43:06	00:48:46:20	It's tricky, No, I can see that, with everything else you've got to do.	C'est pas facile. Vous avez déjà beaucoup à faire.
791	00:48:47:13	00:48:48:23	New technology, Dave.	L'innovation, Dave !
792	00:48:49:13	00:48:53:03	Marco has it, he's got to attach it to that trap now.	C'est à Marco, maintenant. Il doit l'attacher au casier.
793	00:48:55:11	00:48:58:08	It works by storing the rope, and surface buoys	Il faut placer le cordage et les bouées de surface
794	00:48:58:13	00:49:00:12	that would normally float in the water,	censés flotter dans l'eau
795	00:49:00:17	00:49:03:14	in a container attached to the lobster pot.	dans un panier attaché au casier.
796	00:49:03:19	00:49:06:18	You guys have got to all be away when this goes back in.	Il faudra s'éloigner quand le câble s'enroulera.
797	00:49:06:23	00:49:09:23	Right, Dave where do you need us to be? – Up in the wheelhouse.	OK, Dave. Où doit-on se mettre ? – Dans la timonerie.
798	00:49:10:14	00:49:13:15	It sort of wants to go upright. – Is it going to go upright?	Il doit couler à la verticale. – Ça va fonctionner ?
799	00:49:13:20	00:49:14:20	Yeah.	Oui.
800	00:49:15:00	00:49:16:20	Here it goes, here it goes, here it goes! – Yeah.	Ça y est, il est parti ! –Oui.
801	00:49:22:14	00:49:24:24	The pots can now sit on the seabed without any plastic ropes	Les casiers vont se poser au fond de l'eau
802	00:49:25:04	00:49:28:22	causing an obstacle to marine life.	sans que des lignes verticales ne gênent les animaux marins.
803	00:49:31:05	00:49:32:09	But with no visible buoys,	Sans bouée en vue,
804	00:49:32:22	00:49:36:09	Dave needs to use a GPS system to find his pots.	Dave doit utiliser un système GPS pour trouver ses casiers.

805	00:49:36:14	00:49:38:11	You're going to the right, or you could do a circle the other way.	Faites un cercle sur la droite.
806	00:49:38:16	00:49:40:13	We need to turn back on ourselves, basically.	Il faut qu'on se retourne.
807	00:49:41:07	00:49:45:05	I'm putting it in neutral, cos we're right over it. -OK, we're right over it Marco.	Je mets au point mort, on y est. - On est juste au-dessus, Marco !
808	00:49:45:11	00:49:46:18	Yup. - Here we go.	OK. - C'est parti !
809	00:49:46:23	00:49:49:05	Alright, we went to the buoy again. - Are we talking to it? - Yeah. - OK.	C'est la bouée. - Elle envoie un signal ?
810	00:49:50:17	00:49:54:04	A transmitter on the boat sends a signal down to the container,	Un émetteur placé sur le bateau envoie des signaux au panier
811	00:49:54:10	00:49:57:18	which should trigger the release of the rope and the buoys.	ce qui devrait relâcher le cordage et les bouées.
812	00:49:59:06	00:50:01:12	Right now, I would have expected it to already be up	Elles devraient déjà être remontées,
813	00:50:01:17	00:50:03:12	so there could well be a snag here somewhere.	il doit y avoir un pépin.
814	00:50:04:07	00:50:07:06	So, you're asking if it will work, now, no? - Well, we're trailing it.	Vous demandez pas si ça va marcher ? - On fait un test.
815	00:50:07:11	00:50:08:13	I got you.	Je vois.
816	00:50:09:22	00:50:11:22	After several failed attempts...	Après plusieurs tentatives,
817	00:50:13:21	00:50:15:17	..the system proves successful.	le système fonctionne enfin.
818	00:50:17:00	00:50:19:01	There we go, right there.	Et voilà ! Juste là !
819	00:50:20:19	00:50:22:00	Two buoys.	Deux bouées !
820	00:50:27:00	00:50:28:20	There it is.	Ah ! Le voilà !
821	00:50:29:10	00:50:32:14	The technology is there, but there are glitches.	La technologie est là, mais il y a encore des ratés.
822	00:50:32:19	00:50:36:16	So, even though you've seen this pop up, you're not confident yet.	Même si les bouées sont remontées, vous n'êtes pas convaincu ?

823	00:50:36:21	00:50:39:16	It has a lot to overcome.	Il y a plein de trucs qui vont pas. Je sais pas
824	00:50:40:08	00:50:43:16	I'm not sure that I'm thrilled with being the pioneer on this.	si j'ai vraiment envie d'être le pionnier, pour le coup.
825	00:50:43:21	00:50:46:17	Why not?	Pourquoi ?
826	00:50:46:22	00:50:50:21	– Because some pioneers are glorified, other are vilified.	– Parce que les pionniers, soit on les glorifie, soit on les calomnie.
827	00:50:51:12	00:50:56:10	My saying in any way, shape or manner that I endorse ropeless fishing	De toute façon, si je soutiens la pêche sans cordages,
828	00:50:56:15	00:51:00:10	will vilify me with the industry, because the industry is so opposed.	je vais me mettre le secteur à dos, car il s'y oppose fermement.
829	00:51:00:15	00:51:02:15	As a pop-up buoy, it will work.	La bouée sur appel fonctionne,
830	00:51:02:20	00:51:04:24	Is it practical? No. – Why?	mais c'est pas pratique. – Pourquoi ?
831	00:51:05:04	00:51:07:20	Because it is too time consuming,	Parce que ça prend trop de temps,
832	00:51:08:00	00:51:10:17	and, in our business, time is money.	et dans le métier, le temps, c'est de l'argent.
833	00:51:14:08	00:51:15:12	Dave isn't alone.	Il n'y a pas que Dave.
834	00:51:16:05	00:51:19:18	Many other lobstermen are sceptical about the new technology's design	De nombreux autres pêcheurs doutent de cette technologie,
835	00:51:20:07	00:51:21:19	and its high costs.	et de son coût élevé.
836	00:51:22:19	00:51:25:23	But approximately 340 million lobsters	Mais environ 340 millions de homards
837	00:51:26:03	00:51:28:10	are caught globally every year.	sont pêchés chaque année dans le monde.
838	00:51:28:18	00:51:30:12	That's millions of miles of rope	Des millions de câbles
839	00:51:30:17	00:51:33:18	across our oceans, potentially entrapping whales.	sont tendus en mer, risquant de piéger des baleines.
840	00:51:34:17	00:51:39:10	An effective ropeless system could not only protect whales all around the world,	Un système sans cordage protégerait les baleines du monde entier,
841	00:51:39:15	00:51:41:22	but the livelihoods of fishermen, too.	mais aussi le gagne-pain des pêcheurs.

842	00:51:46:04	00:51:48:10	I've heard about a different design,	On m'a parlé d'une autre invention,
843	00:51:48:15	00:51:51:04	the brainchild of lobsterman Mike Lane.	Imaginée par le pêcheur de homard Mike Lane.
844	00:51:53:07	00:51:55:23	Hello, hello, I'm looking for Mike. – Right here.	Bonjour, je cherche Mike. – C'est moi.
845	00:51:56:03	00:51:58:12	Hi, I'm Liz, we spoke on the phone. – Yes.	Je suis Liz. On s'est téléphoné. – Oui.
846	00:51:59:00	00:52:01:09	Rob Morris is the engineer helping him.	Rob Morris est l'ingénieur du projet.
847	00:52:02:04	00:52:04:14	We wanted to come up with, first of all, a very rugged release that is basically bulletproof	On voulait créer un casier très solide
848	00:52:04:24	00:52:07:02	that Mike can't break...	que Mike ne puisse pas casser
849	00:52:07:07	00:52:09:22	Yeah. I'll try... – ...on the back of a lobster boat or on the back of his pick-up truck.	sur le homardier ou dans le pick-up. – Oui.
850	00:52:10:02	00:52:11:17	Yeah. –So we're going to wake it up first.	OK. – Il faut le démarrer.
851	00:52:11:22	00:52:15:03	Power on. –Oh, OK, something's talking to something. –Yeah.	Marche. – Ces deux trucs communiquent.
852	00:52:15:10	00:52:18:24	This seems to be a sturdier and more feasible design.	Ce système semble plus solide et plus réalisable.
853	00:52:19:05	00:52:20:21	It takes just seconds to load and the release and collection	Le chargement est rapide,
854	00:52:21:01	00:52:22:09		et mouiller et lever
855	00:52:22:14	00:52:25:11	of the rope and buoys is much more straightforward.	les cordages et les bouées est bien plus facile.
856	00:52:25:21	00:52:27:21	It looks pretty simple and it looks like it would work.	Ça a l'air simple, ça peut marcher.
857	00:52:29:03	00:52:31:24	Why did you feel like you wanted to find a solution?	Pourquoi vouliez-vous trouver une solution ?
858	00:52:32:07	00:52:34:12	You gotta be responsible for what you do in life.	Il faut assumer ses responsabilités,

859	00:52:35:01	00:52:37:06	And I don't, you know, I don't want	et j'ai pas envie de tuer une baleine.
			to be responsible for killing a whale.	
860	00:52:37:23	00:52:41:04	They're beautiful creatures and we see them out there all the time,	C'est un animal magnifique, on en voit tout le temps ici.
861	00:52:41:09	00:52:43:01	they're amazing and I don't want my buoy wrapped around one,	Je veux pas qu'il s'empêtre,
862	00:52:43:06	00:52:46:09	and I don't want people not to buy lobsters	ni que ça freine les gens d'acheter du homard par peur.
			because they think I'm going to tangle on the whale.	
863	00:52:47:07	00:52:48:15	So I want to solve the problem.	Je veux arranger ça.
864	00:52:51:22	00:52:53:22	Perhaps this exciting collaboration	Cette collaboration prometteuse
865	00:52:54:03	00:52:56:10	between lobstermen and engineer	entre un pêcheur et un ingénieur
866	00:52:56:15	00:52:59:09	can finally put an end to the threat of whale entanglements	pourrait bien mettre fin à l'empêchement
867	00:52:59:23	00:53:03:00	and save the Northern Right Whale from extinction.	et ainsi sauver la baleine noire de l'extinction.
868	00:53:05:10	00:53:07:13	I always feel like people portray fishermen as,	Les gens pensent que les pêcheurs
869	00:53:07:18	00:53:09:09	we're just a bunch of people that hate the environment	détestent la nature
870	00:53:10:02	00:53:13:18	and we want to rape the ocean of everything its worth.	et veulent vider l'océan de toute vie, mais c'est faux.
			We're not like that.	
871	00:53:14:17	00:53:17:23	I don't have a college degree, I don't have an educa...	J'ai pas de diplôme universitaire, je sais faire que ça.
			I don't have anything else I can do.	
872	00:53:19:12	00:53:21:18	My whole life has been built around lobstering,	La pêche au homard, c'est toute ma vie,
873	00:53:21:23	00:53:24:03	and that's what I have invested in.	j'ai tout investi là-dedans.
874	00:53:25:05	00:53:27:20	So, what do you do if your job is taken away?	Je fais quoi si on m'enlève mon travail ?

875	00:53:28:03	00:53:29:21	You've got to restart your life.	Tout serait à refaire.
876	00:53:30:08	00:53:33:02	How long will the bank let me go without paying my mortgage?	Combien de temps la banque va encore me laisser ?
877	00:53:33:23	00:53:37:21	So, the sooner I get this finished and done with, the better off I'm going to be.	Plus vite je règle ça, mieux je me sentirai.
878	00:53:39:23	00:53:43:22	I am really glad I got to meet Mike today, just before leaving Cape Cod.	Je suis contente d'avoir vu Mike juste avant de quitter le cap Cod.
879	00:53:46:12	00:53:49:14	He's really struck a chord with me, and I think it is because...	Je crois qu'il m'a beaucoup touchée, car...
880	00:53:50:18	00:53:54:11	..amidst all of the contention and complex issues,	au milieu de toute cette discorde, des questions complexes,
881	00:53:54:16	00:53:57:15	and the discussions - which, of course, need to happen -	et des discussions, qui sont bien sûr nécessaires,
882	00:53:58:04	00:54:01:24	he just decided to get on with it from the start,	il a décidé de prendre le mal à sa source,
883	00:54:03:00	00:54:05:02	to take it into his own hands and be a fisherman	de prendre les choses en main,
884	00:54:06:03	00:54:11:06	that's finding a solution to a fishing industry problem.	et d'être le pêcheur qui résout ce problème de pêche industrielle.
885	00:54:18:15	00:54:21:21	I've spent the last nine months researching this plastic crisis,	Après avoir passé 9 mois à étudier la crise du plastique,
886	00:54:22:13	00:54:26:05	and what's becoming clear is that the very qualities	il s'avère que les propriétés mêmes qui font du plastique
887	00:54:26:10	00:54:30:08	that have made plastic such a central part of our lives,	un élément central de nos vies sont justement celles qui le rendent
888	00:54:30:13	00:54:32:17	are also those that make it so destructive to marine life.	si dangereux pour la vie marine.
889	00:54:34:14	00:54:38:09	Plastic is one of the most durable materials on the planet.	Le plastique est l'un des matériaux les plus résistants au monde.
890	00:54:44:08	00:54:46:13	Virtually every single piece of plastic that's ever entered	On estime que tous les plastiques
891	00:54:46:18	00:54:49:15	the ocean is still there.	qui ont fini dans l'océan

				s'y trouvent encore.
892	00:54:52:20	00:54:54:18	In fact, just last year, plastic was found at the bottom	En effet, l'an dernier,
893	00:54:54:23	00:54:58:01	of the Mariana Trench at a depth of seven miles.	on en a retrouvé
894	00:54:58:06	00:54:59:19		au fond de la fosse des Mariannes,
895	00:55:03:22	00:55:05:23	And scientists have recently discovered	à 11 km de profondeur.
896	00:55:06:03	00:55:09:16	that it's threatening one of the oceans most fragile ecosystems -	Les experts ont découvert il y a peu
897	00:55:11:11	00:55:12:21	coral reefs.	qu'il menace l'un des écosystèmes marins les plus fragiles :
898	00:55:17:22	00:55:21:17	I'm heading to a part of the world known as the Coral Triangle,	les récifs coralliens.
899	00:55:21:22	00:55:23:05	an area of coral reefs	Je me rends dans une région appelée le "Triangle de Corail",
900	00:55:23:10	00:55:28:22	that stretches over 2.3 million square miles,	une barrière de corail
901	00:55:29:02	00:55:31:19	from Indonesia to the Philippines,	de 5,2 millions de kilomètres carrés située entre Indonésie, Philippines,
902	00:55:32:11	00:55:35:03	and Papua New Guinea to the Solomon Islands.	Papouasie-Nouvelle-Guinée et Îles Salomon.
			Hi!	Bonjour, ravie de vous rencontrer !
			Hi, nice to meet you! – It's so nice to finally meet you!	
903	00:55:35:08	00:55:36:21	You made it! Yes! Great.	– Bonjour !
904	00:55:37:14	00:55:39:10	Can I help you with some stuff? – Yes.	Vous êtes enfin là ! – Oui !
905	00:55:40:19	00:55:43:08	I'm joining Assistant Professor Joleah Lamb,	Je peux vous aider ? – Oui !
906	00:55:43:13	00:55:45:13	an expert in coral ecology, who is here to study	Je me joins à la professeure Joleah Lamb,
907	00:55:46:11	00:55:50:08	why plastic is so lethal to reefs.	experte en écologie corallienne,
908	00:55:54:05	00:55:56:19	Corals are extraordinary animals,	venue étudier pourquoi le plastique est si nocif pour les récifs.
				Les coraux

				sont des animaux incroyables.
909	00:55:58:02	00:56:01:16	our oceans contain over nine million species of them,	Plus de 9 millions d'espèces de coraux peuplent nos océans.
910	00:56:01:21	00:56:05:23	and the reefs they create are the largest living structures on Earth.	Les récifs de corail sont les plus grandes bioconstructions du monde.
911	00:56:08:10	00:56:11:03	Coral reefs are the nurseries of the sea,	Ce sont les nurseries des océans.
912	00:56:11:16	00:56:14:11	providing shelter for a myriad of small fish,	Ils servent d'abri à de nombreux poissons,
913	00:56:15:22	00:56:18:23	and feeding grounds for a whole host of species.	et d'aire d'alimentation à une foule d'espèces.
914	00:56:19:09	00:56:21:02	But with these precious ecosystems already straining	Ces précieux écosystèmes,
915	00:56:21:12	00:56:24:19	under the pressures of our modern world,	déjà mis à rude épreuve par notre société moderne,
916	00:56:25:00	00:56:27:09	plastic is posing yet another threat.	sont à présent menacés par le plastique.
917	00:56:29:03	00:56:32:23	There's almost as much plastic as there is...sea squirts,	Il y a presque autant de plastique que d'ascidies,
918	00:56:33:03	00:56:34:23	isn't there? – Yeah, they're sachets. It's definitely not a clean body of water	non ? - Oui, ce sont des sachets.
919	00:56:35:03	00:56:37:19	that we're diving in today, is it? – Definitely not.	On va plonger dans une eau très sale, non ?
920	00:56:37:24	00:56:39:01		Oui, en effet.
921	00:56:51:23	00:56:53:15	As soon as I'm under the surface,	À peine sous l'eau,
922	00:56:53:20	00:56:56:11	it's clear that this reef is in trouble.	je constate que ce récif est mal en point.
923	00:56:59:17	00:57:02:00	These corals are already immensely stressed	Ces coraux sont déjà très fragilisés
924	00:57:02:13	00:57:06:07	due to rising water temperatures from global warming.	par le réchauffement des océans dû au changement climatique.
925	00:57:10:03	00:57:11:06	And all around me, plastic is now	Tout autour de moi,

926	00:57:11:11	00:57:14:08	covering these vulnerable animals.	le plastique recouvre ces fragiles créatures.
927	00:57:20:18	00:57:24:01	I help Joleah to collect samples of the plastic.	J'aide Joleah à prélever des échantillons de plastique.
928	00:57:25:11	00:57:28:22	She believes that another danger is threatening the coral.	Elle pense qu'un autre danger menace les coraux.
929	00:57:35:05	00:57:37:21	Just disgusting.	C'est dégoûtant. C'est juste répugnant.
930	00:57:38:01	00:57:39:16	That's all I can say.	Je n'ai pas d'autre mots.
931	00:57:40:08	00:57:43:08	You didn't think you'd see that much? – No. It just never ended and,	Vous pensiez en voir autant ? – Non, il y en a partout.
932	00:57:43:13	00:57:46:05	more than anything, it's these flipping things...	Mais le pire, ce sont ces fichus trucs.
933	00:57:46:10	00:57:49:16	Coffee sachet, softener sachet...	Un sachet de café, un sachet d'adouçissant...
934	00:57:50:08	00:57:52:14	What the heck is that? – I think this is a tea or a coffee.	C'est quoi ? Du café ? – Du thé ou du café.
935	00:57:52:19	00:57:54:04	A tea sachet, a soup sachet.	Un sachet de thé,
936	00:57:54:12	00:57:56:19		un sachet de soupe ou de sauce...
937	00:57:57:12	00:58:01:19	Sachet after sachet, after sachet, after sachet.	Sachet après sachet, encore et encore des sachets.
938	00:58:05:04	00:58:08:04	Did you see the little juvenile recruits on that bottle?	Vous avez vu ces juvéniles fixés sur la bouteille ?
939	00:58:08:17	00:58:11:15	Yeah, there's something really powerful	Oui. C'est saisissant de voir
940	00:58:11:20	00:58:15:15	about seeing a really old bottle with a coral	un corail pousser sur le goulot d'une vieille bouteille.
			growing out the neck of it,	
941	00:58:16:02	00:58:20:02	it's almost like nature is doing absolutely everything it can	On dirait presque que la nature se bat de toutes ses forces
942	00:58:20:07	00:58:22:21	to try and survive this mess.	pour tenter de survivre à cette crise,
943	00:58:23:08	00:58:27:00	And yet right beside that little	et pourtant, à côté de ce bout

			bit of life growing out the plastic,	de vie qui pousse sur du plastique,
944	00:58:27:08	00:58:29:17	there's a whole area that's just dead.	toute une zone est décimée.
945	00:58:30:22	00:58:35:18	And this is just one of the sites, so there are many islands out here	Ce n'est qu'un des sites coralliens, d'autres sont bien plus pollués.
			that have much more plastic than this.	
946	00:58:35:23	00:58:38:02	More than this? – There can be more plastic than this.	Plus que ça ? – Oui, c'est possible.
947	00:58:39:07	00:58:43:23	It's tragic.	C'est vraiment terrible. C'est...
			It's just, it's just...	
948	00:58:45:07	00:58:46:16	Oh, my God.	C'est pas vrai !
949	00:58:56:03	00:58:58:00	We head to a nearby island to examine what might be living	On se rend sur une île voisine
950	00:58:58:10	00:59:00:03		pour examiner les organismes
951	00:59:00:08	00:59:02:02	on the surface of the plastic we've collected.	sur le plastique ramassé.
952	00:59:13:18	00:59:16:23	When we were coming up on the boat,	En arrivant par bateau, ça semblait paradisiaque,
			it looked like a little piece of paradise.	
953	00:59:17:04	00:59:18:14	Didn't it? And now... – It's just covered.	et là... – C'est pollué.
954	00:59:18:19	00:59:21:18	Look at all the fishing lines at the bottom of the pier.	Regardez tous ces fils de pêche sous le ponton !
955	00:59:23:23	00:59:25:23	Shall we off-load everything on the side? – Yeah,	On décharge tout sur le côté ? – Oui,
956	00:59:26:03	00:59:27:04	we'll put this here.	on va mettre ça là.
957	00:59:27:18	00:59:29:16	Joleah's new research has led her to believe	Joleah a récemment découvert
958	00:59:30:00	00:59:34:09	that lethal doses of bacteria are being transported on the plastic.	que le plastique transportait des quantités mortelles de bactéries.
959	00:59:35:10	00:59:38:12	Plastics, like this one here.	Les plastiques comme celui-ci sont remplis
960	00:59:38:17	00:59:40:23	It's just full of these	de petits trous et pores.

			little pits and pores	
961	00:59:41:03	00:59:42:10	and, even on a bottle, if you look up very closely,	Et sur une bouteille,
962	00:59:42:16	00:59:46:10	you can see all these nooks and crannies.	si on regarde de très près, on peut voir ces renforcements.
963	00:59:46:15	00:59:48:24	So, it's about the texture of plastic? – Yes.	C'est dû à la texture du plastique ? – Oui.
964	00:59:49:11	00:59:53:17	The surface of plastic provides the perfect home for bacteria to thrive.	Sa surface est l'endroit rêvé pour qu'une bactérie se développe.
965	00:59:54:13	00:59:56:18	One of the most dangerous bacteria for coral is found in a group	L'une des plus nocives pour les coraux
966	00:59:57:01	00:59:58:23	called vibrio, one strain of which causes cholera in humans.	fait partie du genre Vibrio,
967	00:59:59:03	01:00:02:06		dont l'une des souches cause le choléra chez l'Homme.
968	01:00:03:12	01:00:04:13	What we are going to do is,	Ce qu'on va faire,
969	01:00:04:18	01:00:07:23	do a scraping of what's on this plastic	c'est gratter ce qu'il y a à la surface du plastique,
970	01:00:08:05	01:00:10:23	and we're going to test whether or not it has vibrio.	puis tester s'il est contaminé par le Vibrio.
971	01:00:11:14	01:00:14:14	And vibrio is a pathogen,	Le Vibrio est un agent pathogène,
972	01:00:14:19	01:00:16:09	which means it can cause disease in corals, and shrimp and oysters.	donc vecteur de maladies
973	01:00:16:14	01:00:19:11		chez les coraux, les crevettes, et les huîtres.
974	01:00:19:20	01:00:21:22	OK, so which sample would you like to start with?	OK. On commence par quel plastique ?
975	01:00:22:02	01:00:23:22	Let's start with the rice sack.	Commençons par le sac de riz.
976	01:00:24:12	01:00:26:02	What's the liquid that's in here?	C'est quoi ce liquide ?
977	01:00:26:07	01:00:30:02	So, this is just filtered sterile sea water. – OK.	De l'eau de mer stérile filtrée. – D'accord.
978	01:00:31:03	01:00:33:24	You just want to turn it into a nice green pea soup.	Ça doit avoir la consistance d'une soupe de pois.
979	01:00:34:05	01:00:35:06	That's brown soup,	Bon, elle est...
980	01:00:35:22	01:00:38:20	but it's definitely soupy.	plutôt marron,

				mais c'est une soupe !
981	01:00:39:00	01:00:41:12	And you just put four drops here and four drops here.	Vous en versez quatre gouttes ici et là.
982	01:00:43:21	01:00:45:06	Perfect.	Voilà.
983	01:00:45:11	01:00:47:04	Joleah uses a bacteria testing kit.	– Joleah utilise un kit de test de bactéries.
984	01:00:47:14	01:00:50:22	If a particular toxin produced by vibrio is present,	Si une toxine produite par le Vibrio est présente,
985	01:00:51:02	01:00:54:00	a red line will appear in the small window.	un trait rouge apparaîtra dans la fenêtre de test.
986	01:00:56:22	01:00:58:07	Oh. What? – Look.	Quoi ? – Regardez !
987	01:00:58:12	01:00:59:20	Is that Vibrio? – Yes!	C'est du Vibrio ? – Oui.
988	01:01:01:01	01:01:02:09	Oh, my God.	Nom de Dieu !
989	01:01:03:13	01:01:05:16	That's from the sack.	Ça vient du sac.
			That's the sack, yeah.	– Exact.
990	01:01:06:18	01:01:08:06	This one is light, too.	Celui-là aussi.
991	01:01:10:01	01:01:11:22	So, what does this mean for this reef?	Ça signifie quoi pour ce récif ?
992	01:01:12:04	01:01:16:08	It's essentially a whole new way to transport diseases	C'est une toute nouvelle façon de transporter des maladies
993	01:01:16:13	01:01:19:18	that we never even thought about until this year.	qu'on ne connaissait pas jusqu'à cette année.
994	01:01:20:00	01:01:21:10	Until this year? – This year.	Cette année ? – Oui.
995	01:01:27:09	01:01:28:17	why potentially lethal doses of bacteria thrives on plastic...	On ne sait pas pourquoi
996	01:01:28:22	01:01:32:22		des bactéries potentiellement mortelles colonisent le plastique,
997	01:01:34:21	01:01:37:16	but the result is that plastic floating in our oceans	mais à cause d'elles, le plastique océanique
998	01:01:39:00	01:01:41:21	is turning into disease-carrying rafts.	se transforme en radeau vecteur de maladies.

999	01:01:44:04	01:01:48:01	Once this plastic sinks and becomes entangled in the coral,	Lorsque le plastique coule et se coince dans les coraux,
1000	01:01:48:10	01:01:51:08	it cuts into it, like an infected knife...	il les tranche tel un couteau souillé,
1001	01:01:52:20	01:01:55:20	..delivering bacteria into it, like an open wound.	propageant les bactéries dans les plaies béantes.
1002	01:01:57:15	01:01:59:24	Coral tissue is slowly destroyed as the bacteria moves across it,	Le tissu corallien se détériore peu à peu
1003	01:02:00:04	01:02:02:07		à mesure que la bactérie se propage,
1004	01:02:02:23	01:02:06:04	in the same way that gangrene spreads across human flesh.	comme la gangrène se répand dans la chair humaine.
1005	01:02:07:14	01:02:08:22	This newly discovered threat paints a harrowing picture	Cette nouvelle menace
1006	01:02:09:09	01:02:12:23	for the future of our reefs.	laisse présager un sombre avenir pour nos récifs.
1007	01:02:15:01	01:02:17:21	So, we looked at 124,000 corals with and without plastic	Nous avons observé 124 000 coraux,
1008	01:02:18:02	01:02:19:12		avec et sans plastique.
1009	01:02:20:01	01:02:22:17	and, when we see the plastic on the coral,	Lorsqu'il y a du plastique sur les coraux,
1010	01:02:22:24	01:02:24:11	the likelihood of disease goes up to 89%.	leur risque de maladie
1011	01:02:24:16	01:02:26:03		grimpe à 89 %.
1012	01:02:26:08	01:02:28:01	89%? – Likelihood yes.	À 89 % ? – C'est la probabilité.
1013	01:02:28:15	01:02:29:19	Mind-blowing.	C'est hallucinant.
1014	01:02:29:24	01:02:31:09	I'm absolutely gobsmacked.	Ça me sidère.
1015	01:02:31:14	01:02:35:04	I thought I knew how much plastic was affecting marine life.	Je croyais connaître l'impact du plastique sur la vie marine,
1016	01:02:35:09	01:02:36:22	I didn't for a second think it could also be a carrier of disease.	mais je ne pensais pas
1017	01:02:37:02	01:02:39:17		qu'il pouvait être vecteur de maladies.
1018	01:02:44:10	01:02:46:10	But there is a glimmer of hope.	Mais il y a une lueur d'espoir :
1019	01:02:46:24	01:02:50:00	Some reefs are showing fewer signs of disease.	certains récifs sont moins touchés par la maladie.

1020	01:02:51:10	01:02:53:24	We swim out to one of them to investigate.	On nage vers l'un d'eux pour en savoir plus.
1021	01:02:57:00	01:02:59:18	Here, the coral seems to be fairing better,	Ici, le corail semble mieux se porter.
1022	01:03:00:07	01:03:03:03	and it's even supporting an array of sea life.	Il abrite même une grande biodiversité marine.
1023	01:03:07:02	01:03:10:10	Joleah has been investigating possible reasons for this.	Joleah a cherché à comprendre pourquoi.
1024	01:03:11:19	01:03:13:04	As we head back to the coast,	Près de la côte,
1025	01:03:13:09	01:03:16:17	a meadow of sea grass is growing in the shallows.	une prairie sous-marine pousse dans les petits fonds.
1026	01:03:19:22	01:03:21:16	Joleah thinks that this seagrass	Joleah pense que cet herbier
1027	01:03:21:21	01:03:24:15	could be contributing to the health of the reef.	Contribuerait à la bonne santé du récif.
1028	01:03:30:20	01:03:33:13	So, look at it, look what happens.	Regardez : ici,
1029	01:03:33:18	01:03:35:06	There's, like, no plastic and then it traps it.	il n'y a pas de plastique, et là, il est pris au piège.
1030	01:03:35:21	01:03:38:07	So, essentially, this is the first line of defence,	Donc en gros, il forme un premier rempart.
1031	01:03:38:12	01:03:41:17	when you have sea grass before a coral reef,	S'il y a un herbier marin avant le récif corallien,
1032	01:03:41:22	01:03:44:03	it physically traps the plastic.	il retient le plastique ?
1033	01:03:44:08	01:03:47:08	Yeah, you can see it physically slowing the water down	Oui, comme vous voyez, il ralentit le courant
1034	01:03:47:09	01:03:48:22	and also trapping it like fingers.	et attrape le plastique.
1035	01:03:50:10	01:03:55:02	But seagrass may be doing much more than simply acting as a physical barrier.	Mais les herbiers ne font pas seulement office de barrière.
1036	01:03:58:02	01:04:00:10	What we've found recently is that the sea grass	On a découvert que les herbiers marins
1037	01:04:00:15	01:04:03:19	reduces harmful bacteria by 50%.	réduisent de moitié le nombre de bactéries nocives.
1038	01:04:04:07	01:04:05:19	50%? – 50%.	De moitié ? – Oui.

1039	01:04:06:01	01:04:07:20	That's extraordinary. – It is.	C'est incroyable ! – En effet.
1040	01:04:08:07	01:04:12:00	Sea grass can actually kill bacteria	Les herbiers peuvent tuer les bactéries nocives pour l'Homme
1041	01:04:12:05	01:04:13:18	that's harmful to people and also marine organisms.	et les organismes marins.
1042	01:04:14:09	01:04:17:01	So, this is really, seriously important stuff.	Ils sont donc indispensables.
1043	01:04:19:18	01:04:23:00	Seagrass meadows are not only trapping the plastic,	Les herbiers marins font plus que piéger le plastique :
1044	01:04:23:08	01:04:24:24	they are also disinfecting it.	ils le désinfectent.
1045	01:04:25:14	01:04:29:01	It's thought that the grass could contain antibiotic properties	Les herbes marines auraient des propriétés antibiotiques
1046	01:04:29:06	01:04:30:23	that kills off the bacteria.	qui tuent les bactéries.
1047	01:04:32:00	01:04:35:24	More research needs to be done, but this is a promising discovery.	Il faut poursuivre les recherches, mais c'est très encourageant.
1048	01:04:36:11	01:04:40:00	It may be that nature will provide some solutions of its own	Il se pourrait qu'à elle seule, la nature offre une solution
1049	01:04:40:05	01:04:41:15	to the plastic crisis.	à la crise du plastique.
 1050	01:04:43:16	01:04:46:00	Seagrass is on every continental shelf except for Antarctica.	Il y en a sur chaque plateau continental,
1051	01:04:46:05	01:04:47:11		sauf en Antarctique.
1052	01:04:47:18	01:04:49:22	It is one of the most important ecosystems,	Ce sont des écosystèmes essentiels.
1053	01:04:50:02	01:04:53:22	so if we could start showing that it's important for small	Sensibiliser les gens à l'importance des herbiers pour ces îles,
1054	01:04:54:04	01:04:55:23	islands like this, but also where I come from and where you come from...	mais aussi pour mon pays
1055	01:04:56:03	01:04:59:18	Yeah. ..then that's the best way we can move forward.	ou le vôtre, c'est la meilleure façon d'avancer.
1056	01:05:06:03	01:05:07:22	When it comes to other global crises,	D'autres crises mondiales,
1057	01:05:08:02	01:05:11:16	when it comes to climate change,	tel le changement climatique,

			we have been studying that for decades now.	ont longtemps été étudiées,
1058	01:05:12:01	01:05:13:19	We are only just beginning to really pay proper attention	mais on commence à peine
1059	01:05:13:24	01:05:18:17	to plastic pollution in our oceans.	à vraiment s'intéresser à la pollution plastique des océans.
1060	01:05:19:04	01:05:23:00	And as much as there is hope with the seagrass,	Et, même si les herbiers marins sont une source d'espoir,
1061	01:05:23:10	01:05:26:08	that can't be the only solution, it won't be.	ça ne peut pas être la seule solution. Impossible.
			It won't be the only solution.	
1062	01:05:26:22	01:05:30:02	We have to find other answers	On doit en trouver d'autres,
1063	01:05:30:07	01:05:33:07	and we have to find them very, very quickly.	et il faut les trouver au plus vite.
1064	01:05:35:13	01:05:39:09	So, what else can be done to solve a problem of this magnitude?	Que faire de plus pour résoudre un problème de cette ampleur ?
1065	01:05:41:05	01:05:43:03	Predictions make for grim reading.	Les prévisions sont alarmantes.
1066	01:05:43:24	01:05:45:00	Reports say the amount of plastic we use and throw away	Selon les études,
1067	01:05:45:05	01:05:49:10		nous utilisons et jetons chaque année plus de plastique.
1068	01:05:49:18	01:05:52:05	is growing year on year, and some have suggested that by 2050,	Certaines ont déclaré que d'ici 2050,
1069	01:05:52:19	01:05:56:05	there will be more pieces of plastic in the ocean than fish.	il y aura plus de plastique que de poissons dans les océans.
1070	01:05:57:07	01:05:59:23	I've read about valiant, but small-scale, efforts	J'ai entendu parler d'initiatives locales
1071	01:06:00:03	01:06:02:02	to clean-up the ocean plastic.	pour ramasser le plastique :
1072	01:06:02:09	01:06:05:03	Beach cleans, boat trawls and diving projects -	nettoyage des plages, chalutage, plongée.
1073	01:06:06:02	01:06:09:17	and yet, with an estimated	Mais avec 51 000 milliards de particules de plastique
1074	01:06:09:22	01:06:12:11	51 trillion pieces of plastic in the ocean, they simply won't be enough.	
				dans l'océan, ça ne suffira pas.

1075	01:06:14:07	01:06:16:23	But it's been reported that one pioneering project	Il paraît toutefois qu'un projet innovant
1076	01:06:17:11	01:06:20:20	could remove hundreds	permettrait de vider des milliers de tonnes de plastique
1077	01:06:21:00	01:06:22:03	and even thousands of tonnes of plastic from the ocean.	de l'océan.
1078	01:06:23:08	01:06:26:08	The project was devised by a 16-year-old boy.	Le projet a été élaboré par un garçon de 16 ans.
1079	01:06:27:04	01:06:30:09	He's now 24 and is realising his dream.	Aujourd'hui, il a 24 ans, et il réalise son rêve.
1080	01:06:33:06	01:06:35:11	Boyan, hi! – Hi there.	Salut Boyan ! Je suis Liz. – Bonjour !
			– Liz.	
1081	01:06:36:02	01:06:37:11	Nice to finally meet you.	Ravie de vous voir !
1082	01:06:38:00	01:06:39:06	I meet him in the Netherlands.	On est aux Pays-Bas.
1083	01:06:39:24	01:06:42:18	So, when I was 16, I went scuba diving in Greece	À 16 ans, j'ai fait de la plongée en Grèce,
1084	01:06:42:23	01:06:45:22	and I looked around me, and I saw more plastic bags than fish,	et j'ai vu plus de sacs plastiques que de poissons.
1085	01:06:46:07	01:06:48:24	and I just wondered, 'Why can't we clean this up?'	Je me demandais pourquoi on ne nettoyait pas.
1086	01:06:49:04	01:06:52:23	And now we have a team close to 100 people, who raise tens of millions of dollars.	À présent, on est 100 dans l'équipe et des millions ont été levés.
1087	01:06:53:19	01:06:58:15	Boyan Slat and his team have designed a floating 600-metre tube	Boyan Slat et son équipe ont conçu un tube flottant de 600 m de long.
1088	01:06:59:00	01:07:01:10	with a three-meter curtain hanging beneath it.	attaché à un rideau de 3 m de profondeur.
1089	01:07:02:10	01:07:05:00	Pushed by the waves, it will travel across the seas,	Grâce au courant, il voyagera en mer
1090	01:07:05:05	01:07:07:12	collecting plastic as it goes.	et ramassera le plastique sur sa route.
1091	01:07:08:05	01:07:10:11	Talk me through it, because	Expliquez-moi.

			it looks fairly simple	Ça a l'air simple,
1092	01:07:10:21	01:07:12:07	but, obviously, so much thought and brainpower,	Oui. – mais ça a demandé
1093	01:07:12:12	01:07:15:13	and collaboration, has got into this.	beaucoup de réflexion et de collaboration.
1094	01:07:15:23	01:07:18:18	It has been extremely complicated to get to something simple, I must say.	Ça a été difficile d'arriver à un projet simple,
1095	01:07:18:23	01:07:19:23		je l'admets.
1096	01:07:20:11	01:07:23:20	So, it's a very long, floating barrier. The plastic just gets pushed around by the current.	C'est une longue barrière flottante. Le plastique
1097	01:07:24:00	01:07:25:16		est déplacé par le courant.
1098	01:07:26:04	01:07:28:01	Like a giant Pacman,	C'est comme un énorme Pacman :
1099	01:07:28:06	01:07:31:07	the system roams the ocean and collects the plastic.	le système parcourt la mer et ramasse le plastique.
1100	01:07:33:12	01:07:35:02	Scientists have identified five colossal areas	Des experts ont identifié
1101	01:07:35:07	01:07:38:01	of plastic waste floating in our oceans.	cinq immenses masses de déchets plastiques
1102	01:07:38:06	01:07:39:20	of plastic waste floating in our oceans.	flottant dans nos océans.
1103	01:07:40:09	01:07:44:12	The plastic is gathered by enormous swirling vortexes	Le plastique s'accumule dans de gigantesques vortex
1104	01:07:44:20	01:07:48:01	fed by a global network of ocean currents.	alimentés par un réseau mondial de courants marins.
1105	01:07:49:13	01:07:51:20	Boyan is concentrating his efforts	Boyan consacre ses efforts
1106	01:07:52:00	01:07:54:24	on collecting the plastic from the largest of these,	à dépolluer le plus grand d'entre eux :
1107	01:07:55:04	01:07:56:22	the Great Pacific Garbage Patch,	le '7e continent',
1108	01:07:57:08	01:07:59:13	between Hawaii and California,	situé entre Hawaï et la Californie,
1109	01:07:59:19	01:08:03:02	which is now over three times the size of France.	et qui fait aujourd'hui trois fois la taille de la France.
1110	01:08:04:05	01:08:08:24	Pretty soon, I discovered that everyone in the field was saying,	J'ai vite compris que le secteur pensait que je n'y arriverais pas,

1111	01:08:04:05 01:08:09:04	01:08:08:24 01:08:11:18	'Well, no way you can do that,	J'ai vite compris que le secteur pensait que je n'y arriverais pas, que l'océan est trop vaste et trop violent,
			'the ocean is too big, the ocean is too violent, just forget about it.	
1112	01:08:12:21	01:08:16:06	'The only thing we can do is not make it worse.'	qu'il faut laisser tomber et juste éviter que ça n'empire.
1113	01:08:16:11	01:08:18:15	Which, first of all, I think is a very depressing message.	Je pense que c'est un triste message.
1114	01:08:20:10	01:08:23:20	Just a few weeks ago, after years of research and development,	Il y a peu, après des années de recherche et développement,
1115	01:08:24:15	01:08:28:10	Boyan launched his Ocean Cleanup system in San Francisco.	Boyan a déployé son système Ocean Cleanup à San Francisco.
1116	01:08:29:17	01:08:33:05	Am I allowed to jump the gun here already	C'est peut-être précipité, mais je voulais vous demander
1117	01:08:33:10	01:08:35:08	and ask you what the ambition is for Ocean Cleanup?	quelles sont vos ambitions,
1118	01:08:35:13	01:08:39:05	How many of these systems do you envisage	combien de dispositifs de ce genre allez-vous placer en mer ?
1119	01:08:35:13 01:08:39:10	01:08:39:05 01:08:40:23	being out there doing their job?	combien de dispositifs de ce genre allez-vous placer en mer ? Si le premier fonctionne,
			Once the first system is working,	
1120	01:08:41:03	01:08:47:02	we'll then start the scale up	on en déploiera une soixantaine dans l'océan Pacifique.
1121	01:08:41:03 01:08:47:13	01:08:47:02 01:08:51:21	from one to around 60 of these systems	on en déploiera une soixantaine dans l'océan Pacifique. Si on y parvient, on devrait pouvoir nettoyer
			roaming the Pacific Ocean and,	
			if we manage to do that – well, then we should be able to clean up	
1122	01:08:52:01	01:08:55:00	half this Great Pacific Garbage Patch every 5 years.	la moitié du 7e continent tous les 5 ans.
1123	01:08:56:02	01:08:58:13	The sooner we get it out, the better it is for the ocean.	Plus vite on règle ça, mieux ce sera.
1124	01:08:59:07	01:09:03:03	Just a few weeks ago, Boyan launched his Ocean Cleanup system	Il y a quelques semaines, Boyan a lancé l'Ocean Cleanup

1125	01:09:03:08	01:09:04:13	in San Francisco.	à San Francisco.
1126	01:09:05:05	01:09:08:23	It's making its way to the Great Pacific Garbage Patch to begin its work.	Il fait cap vers le 7e continent où il entamera sa mission.
1127	01:09:10:06	01:09:13:10	There will be many months of testing out in the open sea.	Il sera testé en haute mer pendant plusieurs mois.
1128	01:09:14:11	01:09:18:07	This plastic crisis is only going to be solved	Cette crise du plastique ne pourra être résolue
1129	01:09:18:16	01:09:21:23	through a whole host of different collaborations,	que par une vaste synergie et des solutions concrètes
1130	01:09:18:16 01:09:22:03	01:09:21:23 01:09:24:05	and practical solutions,	que par une vaste synergie et des solutions concrètes Proposées par des gens comme Boyan.
			from more people like Boyan.	
1131	01:09:24:10	01:09:26:10	But projects like Ocean Cleanup	Mais un projet comme le sien
1132	01:09:26:15	01:09:28:20	don't stop the millions of tonnes of plastic	n'empêche pas des tonnes de plastique
1133	01:09:29:00	01:09:31:16	from pouring into the oceans every year.	d'être déversées en mer chaque année.
1134	01:09:31:21	01:09:35:07	And many scientists think that efforts should focus more on	De nombreux scientifiques pensent qu'il faut avant tout
1135	01:09:35:12	01:09:39:02	stopping that plastic from getting into the sea in the first place.	éviter que le plastique ne finisse dans les océans.
1136	01:09:43:02	01:09:44:13	As the world wakes up to the scale of this crisis,	Le monde entier constate
1137	01:09:44:18	01:09:46:08	As the world wakes up to the scale of this crisis,	l'ampleur de cette crise, et tous les jours, des actions sont mises en place.
1138	01:09:46:13	01:09:49:11	new endeavours are cropping up all the time.	
1139	01:09:58:19	01:10:01:11	A project on a remote Indonesian island	Sur une île reculée d'Indonésie,
1140	01:10:01:16	01:10:05:09	is experimenting with a system they're calling the garbage bank.	on teste un système appelé "la banque de déchets".
1141	01:10:09:08	01:10:11:19	Here, the problem is easy to see:	Ici, le problème

				est clairement visible :
1142	01:10:12:15	01:10:16:04	the ocean is the waste bin for hundreds of households.	l'océan sert de poubelle à des centaines de ménages.
1143	01:10:18:09	01:10:19:20	In the last 25 years,	Depuis 25 ans,
1144	01:10:20:09	01:10:23:17	to dispose of the plastic, people here are just dumping it into the ocean? –Yes.	ils jettent le plastique en mer ? – Oui.
1145	01:10:24:17	01:10:27:24	I meet Professor Jamal Jompa, a marine scientist	Je vais voir le professeur Jamal Jompa, océanographe,
1146	01:10:28:04	01:10:30:13	who's going to show me how the system works.	qui va me montrer comment ça fonctionne.
1147	01:10:30:21	01:10:34:06	The sea is a solution, a simple solution for them	Pour eux, c'est la solution de facilité
1148	01:10:34:11	01:10:35:22	to get away from this garbage.	d'y jeter leurs déchets.
1149	01:10:36:06	01:10:40:02	And they have no other option. They haven't had any assistance	Ils n'ont pas d'autre choix. Ils n'ont reçu aucune aide
1150	01:10:40:07	01:10:43:06	from the government or anyone else about where to put it,	pour s'en débarrasser, pas même des autorités.
1151	01:10:43:11	01:10:44:24	so where else would they put it?	Comment faire autrement ?
1152	01:10:45:12	01:10:47:12	You're right but, for them, it is not a problem	Pour eux, ce n'est pas un souci,
1153	01:10:47:17	01:10:51:02	because they don't see it yet as a disaster.	car ils ne perçoivent pas encore tout ça comme un désastre.
1154	01:10:51:07	01:10:52:20	They don't see this as going to reduce or affect their livelihood.	Ils ne voient pas
1155	01:10:53:00	01:10:55:18	They don't see this as going to reduce or affect their livelihood.	que ça va affecter leur quotidien.
1156	01:10:55:23	01:10:56:23	Yeah.	Je vois.
1157	01:10:58:02	01:11:01:10	The villagers here are taking things into their own hands.	Ici, les villageois prennent les choses en main.
1158	01:11:02:18	01:11:04:08	A community enterprise project has begun to make it worthwhile	Un projet communautaire
1159	01:11:04:13	01:11:09:14	for locals to be more	les incite à faire plus attention

			careful with their plastic.	à leurs déchets plastiques.
1160	01:11:10:14	01:11:11:14	Hello, hello.	Bonjour !
1161	01:11:12:07	01:11:14:10	So, what is this place?	À quoi sert cet endroit ?
1162	01:11:15:00	01:11:17:05	This is called...kind of garbage bank.	On appelle ça une "banque de déchets".
1163	01:11:18:04	01:11:21:03	The bank collects used plastic from the neighbourhood,	Elle collecte le plastique usagé des habitants
1164	01:11:21:08	01:11:23:08	paying people by the weight they hand over.	et les paie au poids.
1165	01:11:23:22	01:11:26:00	The people in the village get credit for the plastic they bring	On les paie en échange du plastique,
1166	01:11:26:05	01:11:30:14	but then what happens to this plastic? – OK, so then they bring it to the city	mais qu'en fait-on ensuite ? – Il est amené en ville,
1167	01:11:30:19	01:11:32:11	of Makassar. – And then do they get money for it?	à Makassar. – Ils sont payés ?
1168	01:11:32:16	01:11:34:09	Yeah, so they get cash.	Oui, en liquide.
1169	01:11:34:21	01:11:36:22	So, in Makassar, there is a centre of collection.	Il y a un centre de collecte là-bas.
1170	01:11:38:21	01:11:40:18	This garbage bank is the first link in a chain	La banque est le premier maillon
1171	01:11:40:23	01:11:44:03	that's making plastic waste valuable.	de la filière de valorisation des déchets plastiques.
1172	01:11:47:00	01:11:48:18	Thank you, bye-bye.	Merci ! Au revoir.
1173	01:11:53:00	01:11:55:05	To find out if this system is effective, I follow the chain	Pour voir si ce système est efficace,
1174	01:11:55:10	01:11:59:01	to Makassar City, the provincial capital.	je me rends à Makassar, la capitale provinciale.
1175	01:12:00:18	01:12:02:14	Where is Nasrun? I'm looking for Nasrun...?	Nasrun ? Je cherche Nasrun.
1176	01:12:02:19	01:12:04:04	– Yes. – Nasrun ? – Yeah. – Hello.	Nasrun ? Bonjour. – Oui.

1177	01:12:04:19	01:12:08:16	Nasrun runs the facility here, sorting the plastic that arrives	Nasrun gère le centre qui trie le plastique provenant
1178	01:12:08:21	01:12:10:24	from 600 small garbage banks.	de 600 petites banques de déchets.
1179	01:12:11:04	01:12:16:10	I usually get 5 tonnes of plastic every day from my two warehouses.	Mes deux entrepôts m'envoient 5 t de plastique par jour.
1180	01:12:17:02	01:12:19:11	Five tonnes a day? A day?	Cinq tonnes par jour ? Par jour !
1181	01:12:20:02	01:12:24:11	So, that makes me think two things. There is so much plastic to collect,	Je me dis deux choses : il y a tant de plastique à ramasser,
1182	01:12:24:18	01:12:26:02	but people are doing it -	mais les gens le font,
1183	01:12:26:07	01:12:28:15	people are collecting it for you and bringing it to you.	ils le ramassent et vous l'apportent.
1184	01:12:29:07	01:12:30:07	Ah, cups, I saw them preparing this on the island.	Des gobelets !
1185	01:12:30:12	01:12:32:13	Ah, cups, I saw them preparing this on the island.	Je les ai vu les emballer sur l'île.
1186	01:12:32:23	01:12:35:03	Once the plastic is sorted by type...	Une fois le plastique trié par type,
1187	01:12:35:15	01:12:37:07	Wrapping. Wrapping, wrapping, wrapping.	C'est plein d'emballages.
1188	01:12:37:14	01:12:39:02	This is all bottles? – Yeah.	Des bouteilles ? – Oui.
1189	01:12:39:15	01:12:41:24	Various companies arrive to buy it.	Des entreprises viennent en acheter.
1190	01:12:42:13	01:12:45:02	Nasrun, where are these bottles going now?	Que vont devenir ces bouteilles ?
1191	01:12:45:07	01:12:50:02	This plastic has been bought by a vendor that specialises in bottles.	Un vendeur spécialisé dans le domaine les a achetées.
1192	01:12:50:07	01:12:54:07	They will take them to their warehouse and repack them again.	Il va les emporter et les restocker dans son entrepôt.
1193	01:12:55:17	01:12:58:11	So, I've just spoken to the guy who's buying these bottles	Je viens de parler avec cet acheteur.
1194	01:12:58:16	01:13:00:18	and he is allowing me to follow them to his establishment	Il m'invite à visiter son entrepôt,

1195	01:13:00:23	01:13:02:20	the next link in the chain.	le second maillon de la filière.
1196	01:13:05:08	01:13:07:11	We travel to a much bigger warehouse on the outskirts of the city.	C'est un entrepôt bien plus grand,
1197	01:13:07:16	01:13:09:04	We travel to a much bigger warehouse on the outskirts of the city. So, this is it, this is your operation.	en périphérie de la ville.
1198	01:13:09:09	01:13:12:14		Voilà, donc ça, c'est votre entreprise.
1199	01:13:13:16	01:13:15:14	The owner, Marwan Hassan,	Le propriétaire, Marwan Hassan,
1200	01:13:15:19	01:13:18:16	has been buying and selling used plastic bottles	revend des bouteilles en plastique usagées
1201	01:13:18:21	01:13:19:21	for nine years.	depuis 9 ans.
1202	01:13:20:20	01:13:23:23	Marwan's team are processing thousands of bottles a day...	Ses employés en traitent des milliers par jour.
1203	01:13:25:06	01:13:28:08	How big is this warehouse?	L'entrepôt est grand ? Combien de sacs de bouteilles
1204	01:13:25:06	01:13:28:08	How many sacks of plastic bottles	L'entrepôt est grand ? Combien de sacs de bouteilles stockez-vous dedans ?
	01:13:29:06	01:13:31:12	do you have inside that warehouse right now?	
1205	01:13:31:17	01:13:38:10	Right now we have around 30 tons.	Là, maintenant, on doit en avoir 30 t.
1206	01:13:39:14	01:13:41:06	30 tonnes, you've got a full house.	Trente tonnes ? Il est plein !
1207	01:13:41:11	01:13:42:11	Full.	En effet.
1208	01:13:43:10	01:13:46:13	All bottles? – Yeah, special bottles. Just bottles.	Rien que des bouteilles ? – Oui, seulement certaines.
1209	01:13:51:08	01:13:53:07	Here, the bottles are compacted	Les bouteilles sont compactées,
1210	01:13:56:17	01:13:59:09	before they're sold to a much bigger company in Jakarta,	puis vendues à une grande société à Jakarta,
1211	01:14:00:15	01:14:02:12	who shreds them up to be sold again and turned into lower-grade plastic products like carpet backing.	qui les broie et les revend
1212	01:14:02:17	01:14:06:21		pour créer des objets en plastique recyclé comme des dossiers de tapis.
1213	01:14:08:00	01:14:09:00	But you know what? This mass of plastic is being dealt with.	Vous savez quoi ?

1214	01:14:09:22	01:14:13:14	But you know what? This mass of plastic is being dealt with.	Cette immense quantité de plastique est prise en charge.
1215	01:14:14:00	01:14:17:24	30 tonnes of plastic bottles are not in the oceans because of this guy.	Ça fait 30 t de bouteilles en plastique en moins dans l'océan,
1216	01:14:18:04	01:14:19:07	30 tonnes of plastic bottles are not in the oceans because of this guy.	grâce à cet homme.
1217	01:14:27:11	01:14:29:03	Having grown up in Makassar and seeing the change with the plastic,	Vous avez grandi à Makassar.
1218	01:14:29:11	01:14:32:18	Having grown up in Makassar and seeing the change with the plastic,	Vu comment les choses évoluent, pensez-vous
1219	01:14:32:23	01:14:37:19	do you think that your business, and other businesses like yours, are making a difference?	que les entreprises comme la vôtre font la différence ?
1220	01:14:32:23 01:14:38:13	01:14:37:19 01:14:42:23	It never reduces. In fact, the amount of plastic is increasing.	que les entreprises comme la vôtre font la différence ? Non, la quantité de plastique ne cesse d'augmenter.
1221	01:14:43:09	01:14:48:01	Year on year, the amount	Chaque année, la quantité de déchets
1222	01:14:48:06	01:14:55:01	we are shipping to Jakarta is increasing. This means the amount of plastic is also increasing.	expédiée à Jakarta augmente, donc la quantité de plastique aussi.
1223	01:14:56:08	01:15:00:24	So even...warehouses like this and the amount of plastic you take in,	Même les entrepôts qui traitent autant de plastique que le vôtre
1224	01:15:02:02	01:15:04:06	is not making a difference, you don't think?	ne règlent pas le souci, selon vous ?
1225	01:15:04:11	01:15:12:10	Compared to other plastic warehouses, my warehouse is small.	Mon entrepôt est petit comparé à d'autres.
1226	01:15:19:10	01:15:22:20	I'm feeling a little bit stupid right now, and...painfully naive.	Pour le coup, je me sens un peu bête et...
1227	01:15:23:13	01:15:24:22	I'm feeling a little bit stupid right now, and...painfully naive.	terriblement naïve.
1228	01:15:26:08	01:15:29:13	Like, when I met Nasrun, I was so elated...	Quand j'ai rencontré Nasrun, j'étais si enthousiaste

1229	01:15:32:03	01:15:36:08	...when I thought that, 'Oh, gosh, OK, there's a solution here, there's an answer.'	à l'idée de me dire : "Super, donc il y a une solution."
1230	01:15:36:13	01:15:39:14	And of course, they're doing something, it's better than doing nothing,	Bien sûr, c'est toujours mieux que rien.
1231	01:15:40:13	01:15:42:10	but what I've just learnt in here is that	Mais je viens de comprendre
1232	01:15:42:24	01:15:45:20	it's not breaking the back of the plastics problem...	que ça ne règle pas le problème du plastique.
1233	01:15:49:15	01:15:53:07	..and this isn't making a difference.	Et si ça, ça ne fait pas la différence,
1234	01:15:54:20	01:15:58:04	Like, what does that mean about how bad this is?	on se demande à quel point la situation est critique.
1235	01:15:59:19	01:16:03:02	The reality is there simply aren't enough facilities here	Le problème est que la région manque d'infrastructures
1236	01:16:03:07	01:16:06:09	to keep up with this relentless deluge of plastic.	pour contenir ce flux incessant de plastique.
1237	01:16:09:02	01:16:11:14	But this isn't just Indonesia's problem.	Le problème ne se limite pas à l'Indonésie :
1238	01:16:12:01	01:16:13:04	Across the world, only 11% of plastic is recycled.	à travers le monde,
1239	01:16:13:09	01:16:16:06	Across the world, only 11% of plastic is recycled.	seuls 11 % des déchets plastiques sont recyclés.
1240	01:16:18:24	01:16:20:17	Currently, the focus is still on producing new plastic	On continue aujourd'hui
1241	01:16:20:22	01:16:24:04	rather than recycling it.	à produire du plastique plutôt que de le recycler.
1242	01:16:25:18	01:16:27:04	If something doesn't change,	Si l'on ne fait rien,
1243	01:16:27:09	01:16:31:03	it's estimated that annual plastic production, in 2050,	d'ici 2050, la production annuelle de plastique
1244	01:16:31:08	01:16:34:07	will have increased by 500%.	aura augmenté d'environ 500 %.
1245	01:16:40:13	01:16:42:16	As scientists work tirelessly to better understand this crisis,	Alors que les experts tentent

1246	01:16:42:21	01:16:46:04	a new plastic threat – possibly the most serious yet – is emerging.	de comprendre cette crise, une autre menace plastique,
1247	01:16:46:09	01:16:48:09	a new plastic threat – possibly the most serious yet – is emerging.	peut-être la pire jamais connue,
1248	01:16:48:14	01:16:49:14		plane sur nous.
1249	01:16:52:11	01:16:56:17	Trillions of micro-plastics.	Une myriade de microplastiques, minuscules fragments de plastique,
1250	01:16:57:00	01:16:58:21	Tiny pieces of plastic, some no bigger than a speck of dust...	parfois microscopiques,
1251	01:17:01:24	01:17:03:06	..floating in our oceans.	flotte en mer.
1252	01:17:07:03	01:17:11:04	These micro-plastics are even transported to the top of the world...	On en retrouve jusque dans le cercle polaire arctique,
1253	01:17:07:03	01:17:11:04	..where I'm heading on my final expedition.	On en retrouve jusque dans le cercle polaire arctique,
	01:17:12:24	01:17:15:11		où je me rends pour ma dernière expédition.
1254	01:17:16:15	01:17:19:09	We're in Longyearbyen – the northernmost town in the world,	Longyearbyen, la ville la plus au nord du monde,
1255	01:17:19:24	01:17:22:20	on the Norwegian Archipelago of Svalbard.	se situe dans l'archipel norvégien du Svalbard.
1256	01:17:23:02	01:17:26:03	1,300 kilometres that way is the North Pole.	Là-bas, à 1 300 km, c'est le pôle Nord.
1257	01:17:27:23	01:17:30:00	We're heading deeper inside the Arctic Circle.	On s'enfonce dans l'Arctique,
1258	01:17:30:05	01:17:32:11	It's as untouched and remote a place as I think I've ever been	l'endroit le plus sauvage et reculé
1259	01:17:32:16	01:17:33:19	It's as untouched and remote a place as I think I've ever been	que j'ai jamais vu,
1260	01:17:33:24	01:17:38:13	and yet we're here to investigate a plastic threat	pour étudier l'impact du plastique, pourtant visible jusqu'ici.
1261	01:17:33:24	01:17:38:13	that's reached even here.	pour étudier l'impact du plastique, pourtant visible jusqu'ici. On est au milieu de l'été,
	01:17:40:23	01:17:42:09	It's the middle of summer, so you get 24 hours of daylight here,	
1262	01:17:42:14	01:17:45:09	It's the middle of summer, so you	donc on bénéficie

			get 24 hours of daylight here, which is why, at 2:30, in the morning it looks like this,	de 24 h d'ensoleillement, c'est pourquoi à 2 h 30,
1263	01:17:45:14	01:17:47:07		
1264	01:17:48:02	01:17:50:23	and it might be a little bit hard to get to sleep on the journey up.	il fait clair. Ça va être difficile de s'endormir
1265	01:17:51:06	01:17:52:08	and it might be a little bit hard to get to sleep on the journey up.	sur le trajet.
1266	01:17:52:22	01:17:57:03	I'm joining Dr Amy Lusher, a leading expert on microplastics,	Je pars avec la docteure Amy Lusher, experte en microplastiques,
1267	01:17:57:14	01:17:58:21	on a three-day journey to one of the most extraordinary places on Earth.	passer trois jours
1268	01:17:59:01	01:18:02:06	on a three-day journey to one of the most extraordinary places on Earth.	dans l'une des plus incroyables régions de la planète.
1269	01:18:11:14	01:18:15:04	The Arctic is home to some of our most astounding wildlife.	Elle abrite certains des plus beaux animaux du monde.
1270	01:18:18:06	01:18:20:23	Magnificent polar bears roam the ice...	De superbes ours blancs traversent la glace,
1271	01:18:22:15	01:18:24:22	..walruses haul out on the beaches...	des morses se rassemblent sur la plage,
1272	01:18:26:13	01:18:28:19	..and majestic narwhals and belugas hunt in the freezing waters.	et de majestueux narvals et bélugas
1273	01:18:28:24	01:18:31:03	..and majestic narwhals and belugas hunt in the freezing waters.	chassent dans les eaux glacées.
1274	01:18:36:15	01:18:38:07	We sail for nine hours to a remote Arctic beach...	On a navigué durant 9 h,
1275	01:18:38:12	01:18:40:04	We sail for nine hours to a remote Arctic beach...	vers une plage déserte,
1276	01:18:44:02	01:18:46:09	..miles from any human habitation.	loin de toute civilisation.
1277	01:18:47:24	01:18:49:00	Wow.	Eh bien !
1278	01:18:50:07	01:18:51:10	Even here.	Il y en a même ici ?
1279	01:18:51:24	01:18:55:17	We are in a very remote part of the planet	On se trouve dans une région extrêmement reculée de la planète,
1280	01:18:57:00	01:18:58:05	and yet the plastic reaches even here.	et pourtant...

1281	01:18:59:08	01:19:02:02	and yet the plastic reaches even here.	le plastique parvient à arriver jusqu'ici.
1282	01:19:02:18	01:19:05:19	Tomato ketchup – good Lord!	Du ketchup, sérieusement ? – Oui, du ketchup avec...
1283	01:19:02:18 01:19:07:00	01:19:05:19 01:19:10:24	Yep, that's a tomato ketchup.	Du ketchup, sérieusement ? – Oui, du ketchup avec... C'est fou que le bouchon doseur se soit détaché du flacon.
			I mean, I can't believe the nozzle and the bottle separated	
1284	01:19:11:17	01:19:12:19	at whatever stage. It's obscene.	C'est choquant.
1285	01:19:13:08	01:19:16:21	Up here, in the Arctic, the plastic becomes really,	Ici, le plastique devient vite particulièrement cassant,
1286	01:19:17:01	01:19:18:13	really brittle quite quickly and they just start to break down.	et il se décompose.
1287	01:19:18:18	01:19:20:14	It just snaps in your hand.	Oui, il se casse directement.
1288	01:19:21:18	01:19:25:14	Finding big pieces of plastic	Trouver de gros débris plastiques dans une région si isolée,
1289	01:19:21:18 01:19:25:19	01:19:25:14 01:19:27:00	in one of the most remote places on Earth	Trouver de gros débris plastiques dans une région si isolée, c'est déjà alarmant.
			is alarming enough.	
1290	01:19:27:20	01:19:30:04	You take this and fill it up with some nice clean water...	Tenez, remplissez ça d'eau claire.
1291	01:19:30:13	01:19:34:03	..but Amy is much more concerned with the smaller fragments.	Mais ce qui inquiète le plus Amy, ce sont les petits fragments.
1292	01:19:35:02	01:19:37:04	We take a closer look at the sand.	On examine le sable de plus près.
1293	01:19:38:14	01:19:41:22	We're just going to take a scoop of the top layer of sand.	Maintenant, on va prendre une couche de sable.
1294	01:19:38:14 01:19:42:02	01:19:41:22 01:19:44:14	We're just going to take a scoop of the top layer of sand.	Maintenant, on va prendre une couche de sable. D'accord. – On va le verser doucement.
			OK. – We put the sand in carefully... and if we tip it so it comes out of this corner,	
1295	01:19:46:23	01:19:49:22	it will be a lot easier for us.	Ce sera plus facile en le penchant de ce côté.

1296	01:19:50:24	01:19:53:15	There's loads of bits of plastic floating on the top.	Il y a plein de bouts de plastique à la surface !
1297	01:19:54:01	01:19:56:13	We call them microplastics.	Oui, des microplastiques. En général,
1298	01:19:56:18	01:20:00:16	Normally, it's anything less than 1mm in size is a microplastic.	ces fragments mesurent moins de 1 mm.
1299	01:20:02:05	01:20:03:13	Microplastic.	Les microplastiques.
1300	01:20:03:24	01:20:07:19	Much of it is a result of larger pieces breaking up at sea,	La plupart viennent de gros morceaux qui se sont cassés en mer.
1301	01:20:08:02	01:20:10:13	but it's also coming from some more surprising sources.	D'autres ont une origine surprenante.
1302	01:20:12:16	01:20:16:19	Microscopic fibres are being washed out of our synthetic clothing.	De minuscules fibres se détachent de nos vêtements synthétiques.
1303	01:20:18:04	01:20:21:02	Last month, a UK university revealed that, in each synthetic wash cycle,	Une université britannique a révélé le mois passé
1304	01:20:21:07	01:20:23:05	Last month, a UK university revealed that, in each synthetic wash cycle, more than 700,000 microplastic fibres	qu'à chaque cycle de lavage,
1305	01:20:23:10	01:20:26:20		plus de 700 000 fibres microplastiques
1306	01:20:27:00	01:20:28:24	are released into the environment.	sont rejetées dans la nature.
1307	01:20:30:11	01:20:34:17	Microbeads in toothpaste and face scrubs	Les microbilles de nos dentifrices et gommages partent dans le siphon.
1308	01:20:35:11	01:20:36:13	are being washed down the sink,	Lorsqu'il pleut,
1309	01:20:36:18	01:20:39:15	and rain is flushing tiny plastic fragments	des microparticules de pneus sont évacuées
1310	01:20:39:20	01:20:40:23	from our car tyres into drains.	par les eaux usées.
1311	01:20:42:11	01:20:44:14	It just keeps getting more and more complex.	C'est de plus en plus complexe.
1312	01:20:44:19	01:20:46:02	I've been focusing on the big bits of plastic	Je me suis penchée
1313	01:20:46:07	01:20:49:08	and how they're affecting wildlife.	sur les macroplastiques et leur impact sur la faune,
1314	01:20:49:13	01:20:50:21	This is...almost...	mais là, c'est...

1315	01:20:51:16	01:20:52:20	This is...almost...	C'est presque...
1316	01:20:53:23	01:20:57:00	..overwhelming to think about all of this stuff.	c'est bouleversant, quand on y pense.
1317	01:20:57:12	01:21:00:01	It's a little bit scary when you think about it.	Oui, c'est assez effrayant de se dire
1318	01:21:00:13	01:21:03:16	Originally, they used to say that the only places	qu'on pensait qu'il n'y avait pas de microplastiques
1319	01:21:03:21	01:21:05:17	we hadn't found microplastics were the Arctic and Antarctic,	en Arctique et en Antarctique,
1320	01:21:05:22	01:21:07:22	but...it's in front of us here.	mais on peut en voir juste là.
1321	01:21:16:12	01:21:19:06	Scientists now believe that the Arctic has some of the highest	Les experts croient que l'Arctique concentre
1322	01:21:19:11	01:21:22:10	levels of microplastics in the world.	un des plus hauts taux de microplastiques au monde.
1323	01:21:24:10	01:21:27:02	And it's found its way into the food chain.	On en trouve même dans la chaîne alimentaire.
1324	01:21:29:18	01:21:31:13	In a recent study, scientists injected microplastics	Récemment, des chercheurs
1325	01:21:31:18	01:21:35:01	with a florescent marker.	ont teinté le microplastique avec un agent fluorescent.
1326	01:21:36:11	01:21:40:16	They discovered that tiny plankton are ingesting them.	Ils se sont aperçus que le plancton en ingérait.
1327	01:21:42:05	01:21:46:02	They then focused their research up the food chain -	Ils ont examiné les animaux qui s'en nourrissent : les poissons,
1328	01:21:46:07	01:21:48:18	to small fish, mussels, clams and oysters -	les moules, les palourdes et les huîtres,
1329	01:21:49:05	01:21:52:08	and discovered that they were ingesting microplastics, too.	et découvert qu'ils en ingéraient également.
1330	01:21:54:09	01:21:55:09	The concern now is that microplastics are heading	Le souci,
1331	01:21:55:14	01:21:58:14	The concern now is that microplastics are heading	c'est qu'ils remontent la chaîne alimentaire
1332	01:22:00:03	01:22:02:08	further up the food chain to some of the biggest ocean predators.	jusqu'aux grands prédateurs marins.

1333	01:22:06:12	01:22:08:20	This island is home to a colony of walruses...	Cette île abrite une colonie de morses.
1334	01:22:09:14	01:22:11:08	This one's rolling into the water.	Il se roule dans l'eau !
1335	01:22:12:12	01:22:16:21	..and Amy wants to find out if microplastics	Amy veut découvrir s'ils ingèrent des microplastiques.
1336	01:22:12:12	01:22:16:21	have made their way into their diet.	Amy veut découvrir s'ils ingèrent des microplastiques. Quel spectacle pour les yeux !
	01:22:18:16	01:22:20:09	What a sight for sore eyes.	
1337	01:22:22:07	01:22:25:06	This is the first time anyone has investigated this.	Personne ne s'est penché sur le sujet auparavant.
1338	01:22:25:20	01:22:29:13	I'm just watching these stunning juveniles just...	Je regarde ces jeunes morses imposants
1339	01:22:29:18	01:22:30:22	..frolicking is the only word I can think of. I mean, look at them. They're joyful here.	batifoler.
1340	01:22:31:02	01:22:34:12	..frolicking is the only word I can think of. I mean, look at them. They're joyful here.	C'est le seul mot qui me vient. Ils sont heureux comme tout !
1341	01:22:39:15	01:22:42:05	Despite weighing over a tonne, walruses	Bien que le morse pèse plus d'une tonne,
1342	01:22:42:10	01:22:45:23	walruses mostly feed on small mussels and clams	il se nourrit de moules et palourdes vivant sur le fond marin.
1343	01:22:42:10	01:22:45:23	living on the ocean floor.	il se nourrit de moules et palourdes vivant sur le fond marin. Pour ce faire, Il plonge au fond de l'eau et creuse les sédiments avec son museau.
	01:22:48:12	01:22:50:19	They dive and forage along the seabed,	
1344	01:22:50:24	01:22:53:08	rooting through the sediment with their snouts.	
1345	01:22:54:05	01:22:57:18	They can eat up to 6,000 mussels and clams in a day.	Il peut manger jusqu'à 6 000 moules et palourdes par jour.
1346	01:23:01:09	01:23:02:19	And they've noticed us.	Ils nous ont remarqués,

1347	01:23:03:09	01:23:07:04	They don't seem tense or nervous about our presence.	mais notre présence ne semble pas les perturber ou les stresser.
1348	01:23:08:03	01:23:11:19	It's just...such a beautiful sight.	C'est tout simplement magnifique à voir.
1349	01:23:17:10	01:23:20:18	To discover if walruses are ingesting microplastics,	Pour savoir si les morses ingèrent des microplastiques,
1350	01:23:20:23	01:23:23:02	Amy needs to analyse their faeces.	Amy doit analyser leurs déjections.
1351	01:23:24:20	01:23:26:05	Poo, they just found poo!	Ils en ont trouvé !
1352	01:23:28:12	01:23:29:20	Ooh, I can smell it from here.	Je sens l'odeur d'ici.
1353	01:23:33:07	01:23:34:15	This is a huge one.	Quelle grosse crotte !
1354	01:23:37:06	01:23:39:21	That must be the dominant male. It's got to be!	C'est forcément celle du mâle dominant.
1355	01:23:43:05	01:23:44:22	This has got a little fibre in it.	Il y a une fibre dedans.
1356	01:23:45:05	01:23:46:24	A microfibre? – Yeah.	Une microfibre ? – Oui.
1357	01:23:47:09	01:23:49:13	Already, there are signs of microplastics.	On trouve déjà des microplastiques.
1358	01:23:56:06	01:23:57:22	Back in the lab, it doesn't take long	Très vite, au laboratoire,
1359	01:23:58:02	01:24:00:05	to confirm what Amy has suspected.	l'intuition d'Amy se confirme.
1360	01:24:00:20	01:24:02:21	So, I found a fibre.	J'ai trouvé une fibre.
1361	01:24:03:02	01:24:04:06	I can see it, I can see it.	Oui, je la vois !
1362	01:24:04:11	01:24:05:15	So, if you look down here, you'll see a lot clearer. – OK	Regardez dedans,
1363	01:24:05:22	01:24:07:14	So, if you look down here, you'll see a lot clearer. – OK	vous verrez bien mieux. –OK.
1364	01:24:08:02	01:24:12:06	So, that is a fragment of plastic	C'est un fragment de plastique. On voit à sa forme qu'il...
1365	01:24:08:02 01:24:12:11	01:24:12:06 01:24:13:22	and, from the shape of it, you can see that it's...	C'est un fragment de plastique. On voit à sa forme qu'il... Il est rouge ! – Oui.
			It's red! – Yeah, it's bright red	

1366	01:24:14:02	01:24:16:16	and you can see it's a piece of plastic that's been shaved.	Ça vient d'un fragment qui s'est cassé.
1367	01:24:18:02	01:24:19:08	So...the first evidence of...	Voilà...
1368	01:24:19:13	01:24:23:02	So...the first evidence of... ..plastic inside the faeces	Ce sont les premières traces de plastique
1369	01:24:23:07	01:24:25:09	of walruses in the Arctic.	jamais découvertes dans les selles
1370	01:24:25:23	01:24:27:11	..plastic inside the faeces of walruses in the Arctic.	d'un morse de l'Arctique.
1371	01:24:27:19	01:24:31:12	Yep. – Is this plastic that's coming the whole way up the food chain,	En effet. – Il a remonté la chaîne alimentaire
1372	01:24:27:19 01:24:31:17	01:24:31:12 01:24:34:04	Yep. – Is this plastic that's coming the whole way up the food chain, from the plankton to the mussel, to the walrus?	En effet. – Il a remonté la chaîne alimentaire du plancton aux moules, jusqu'au morse ?
1373	01:24:34:12	01:24:37:10	We know that the mussels have the plastic in.	On sait qu'il y a du plastique dans les moules,
1374	01:24:38:07	01:24:40:23	The whole nature in the way that the walrus feeds, it's very likely	et vu la façon dont le morse s'alimente,
1375	01:24:41:12	01:24:43:24	that it's come from its prey.	ça vient sans doute de ses proies.
1376	01:24:41:12 01:24:44:14	01:24:43:24 01:24:47:10	So, that's it. In the Arctic – one of the most remote, seemingly pristine	ça vient sans doute de ses proies. Donc en Arctique, l'une des régions
1377	01:24:47:15	01:24:49:13	places in the world -	les plus reculées du monde,
1378	01:24:49:21	01:24:51:08	there is plastic from the very bottom of the food chain	on retrouve du plastique
1379	01:24:51:13	01:24:54:04	all the way up to the top.	dans toute la chaîne alimentaire.
1380	01:24:54:15	01:24:56:15	What does that mean for such a precious, fragile ecosystem,	Quel impact ça peut avoir
1381	01:24:57:19	01:25:00:18	like the Arctic, that's already under tremendous pressure	sur un écosystème aussi riche et fragile,
1382	01:25:00:23	01:25:06:20	from mankind and the way we live?	qui est déjà terriblement menacé par notre mode de vie actuel ?

1383	01:25:07:06	01:25:09:04	As more plastic enters the environment,	Plus on en jette dans la nature,
1384	01:25:09:20	01:25:13:01	there's going to be more plastic available for animals to ingest	plus les animaux risquent d'en ingérer,
1385	01:25:13:18	01:25:15:15	and we're going to see more plastic than anything else inside	et on en trouvera plus de traces
1386	01:25:16:13	01:25:19:12	and we're going to see more plastic than anything else inside	dans leur estomac ou leurs selles. C'est terrible.
1387	01:25:16:13 01:25:22:03	01:25:19:12 01:25:25:21	the animals, and I think that's quite shocking.	dans leur estomac ou leurs selles. C'est terrible.
			With evidence of microplastics throughout the entire food chain,	Ces traces de microplastiques dans toute la chaîne alimentaire
1388	01:25:26:14	01:25:27:21	it raises the question, 'What effect is it having on us?'	posent question :
1389	01:25:29:00	01:25:30:18	it raises the question, 'What effect is it having on us?' Scientists have now discovered that plastic is entering our bodies	quel impact ont-ils sur nous ?
1390	01:25:33:20	01:25:35:13		Les chercheurs ont découvert
1391	01:25:35:18	01:25:39:24	from a whole host of different sources.	que le plastique s'introduit dans notre corps par divers moyens :
1392	01:25:41:08	01:25:44:02	From the air we breathe, the water we drink, the food we eat.	dans l'air qu'on respire, l'eau qu'on boit,
1393	01:25:45:02	01:25:46:04	From the air we breathe, the water we drink, the food we eat. The research about how all this plastic may be affecting us	et ce qu'on mange.
1394	01:25:48:03	01:25:51:03		L'étude de l'impact du plastique sur notre corps
1395	01:25:51:23	01:25:53:09	is in its infancy.	n'en est qu'à ses débuts.
1396	01:25:54:08	01:25:57:12	But the evidence we have about how it affects marine life	Mais connaissant ses conséquences sur la vie marine,
1397	01:25:57:23	01:25:59:14	paints a disturbing picture.	c'est très préoccupant.
1398	01:26:07:10	01:26:10:22	As the ocean plastic crisis becomes ever more apparent,	La crise du plastique devenant chaque jour plus manifeste,
1399	01:26:12:02	01:26:15:00	more and more people are taking action	de plus en plus de gens se mobilisent

1400	01:26:15:05	01:26:17:08	to become part of the solution.	pour participer au changement.
1401	01:26:20:23	01:26:22:06	All across the globe, people are giving up single-use plastic items	Dans le monde entier,
1402	01:26:22:11	01:26:26:08	All across the globe, people are giving up single-use plastic items	les gens renoncent aux plastiques à usage unique tels que pailles,
1403	01:26:26:13	01:26:28:10	like straws, takeaway cups and plastic bags,	gobelets jetables et sachets.
1404	01:26:28:15	01:26:31:02	and they're heading to the water's edge.	Ils nettoient même le rivage.
1405	01:26:35:16	01:26:36:21	In Indonesia, they're even mobilising the army.	En Indonésie,
1406	01:26:37:01	01:26:39:06	In Indonesia, they're even mobilising the army.	même l'armée est mobilisée.
1407	01:26:46:15	01:26:49:21	It's seven o'clock in the morning here in Majalaya	Il est 7 h du matin, ici, à Majalaya,
1408	01:26:50:04	01:26:52:13	and...there's a real buzz in the air.	et on sent une réelle effervescence.
1409	01:26:53:22	01:26:57:22	The army have gathered here with some girls from a high school,	L'armée s'est réunie avec de jeunes étudiantes,
1410	01:26:58:22	01:27:01:12	two local NGOs, an elder from the villages around here	des associations locales et un ancien
1411	01:27:01:17	01:27:03:02	two local NGOs, an elder from the villages around here	des villages alentour.
1412	01:27:03:10	01:27:06:20	and they've all gathered here this morning to clean up	Ils se sont tous réunis ici ce matin pour ramasser
1413	01:27:07:01	01:27:09:07	as much plastic as they possibly can.	le plus de plastique possible.
1414	01:27:22:21	01:27:25:05	The clean-up efforts taking place all around the world are incredible,	Les opérations de nettoyage organisées
1415	01:27:25:10	01:27:27:19	The clean-up efforts taking place all around the world are incredible,	aux quatre coins du globe sont géniales,
1416	01:27:27:24	01:27:31:17	but the thought I just can't get out of my head is...	mais je n'arrête pas de me dire
1417	01:27:32:01	01:27:34:20	..we can try to clean up	qu'on peut nettoyer

			our rivers and coastlines,	nos rivières et nos plages,
1418	01:27:35:00	01:27:37:08	we can even try to clean up the plastic that's far out at sea,	voire ramasser le plastique
1419	01:27:37:22	01:27:39:03	we can even try to clean up the plastic that's far out at sea, but unless we turn off the plastic tap,	qui flotte en mer,
1420	01:27:39:11	01:27:43:05		mais si on ne ferme pas le robinet du plastique,
1421	01:27:43:13	01:27:47:18	the unrelenting deluge that enters our oceans every day	ce flux incessant qui se déverse dans nos océans chaque jour
1422	01:27:47:23	01:27:49:19	simply will never stop.	ne cessera jamais.
1423	01:27:52:10	01:27:55:05	If we don't, the result will be catastrophic for all marine life.	Sans quoi, les conséquences seront terribles
1424	01:27:55:10	01:27:56:16	If we don't, the result will be catastrophic for all marine life. From the smallest creature to the largest mammal,	pour la faune marine.
1425	01:27:57:06	01:27:58:16		Du plus petit organisme
1426	01:27:58:21	01:28:00:06	From the smallest creature to the largest mammal, our planet depends on a healthy and thriving ocean	au plus gros mammifère,
1427	01:28:00:18	01:28:04:00		notre planète dépend d'océans sains et productifs.
1428	01:28:04:05	01:28:05:16	for its very survival.	Il en va de sa survie.
1429	01:28:07:04	01:28:08:13	We can do this, we can save our oceans...	On peut y arriver.
1430	01:28:08:18	01:28:10:06	We can do this, we can save our oceans... ..but we need to act	On peut sauver nos océans,
1431	01:28:12:00	01:28:13:08		mais on doit agir
1432	01:28:14:00	01:28:15:24	before it's too late.	avant qu'il ne soit trop tard.
1433	01:28:19:02	01:28:23:19	If you'd like to find out more about the actions you can take	Si vous voulez savoir comment agir pour faire bouger les choses,
1434	01:28:23:24	01:28:27:15	to help make a difference, go to...	rendez-vous sur :
1435	01:28:49:18	01:28:51:16		Sous-titrage :
1436	01:28:51:21	01:28:53:21		Manon de Pierpont
1437	01:28:54:01	01:28:57:00		Université catholique de Louvain Louvain School

				of Translation and Interpretation
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Commentaires

1. Problèmes relatifs au respect des normes en sous-titrage

1.1. Changements de plan

S'il y a bien un premier point essentiel à respecter lorsque l'on adapte un document audiovisuel, c'est d'éviter les changements de plan autant que faire se peut lors du repérage, tout en veillant à ce que la découpe du sous-titre respecte les unités de sens.

Néanmoins, on est parfois contraint de déroger à cette règle, par exemple lorsque le sous-titre placé avant le changement de plan dure moins d'une seconde et qu'il faut alors éviter l'effet « flash » pour permettre au spectateur d'avoir le temps de lire le lire. Il est alors préférable que le changement de plan soit situé plus ou moins en son milieu, ou qu'au moins dix images séparent ce changement d'images du time-code d'entrée ou de sortie du sous-titre.

Or, il arrive que l'intervenant prenne la parole quelques centièmes de secondes avant que le plan ne change. Comme encoder le début du sous-titre en synchronisation avec la prise de parole du locuteur est un autre aspect primordial à respecter en sous-titrage, mais que l'objectif principal reste avant tout de garantir une lecture agréable des sous-titres lors du visionnage, j'ai décidé de faire débuter le sous-titre après la rupture entre deux plans lorsque l'individu commençait à parler moins de sept images avant celle-ci.

En effet, je trouvais cela visuellement perturbant au-delà de ce seuil. En outre, bien que le respect de la fin du temps de parole ne soit pas jugé aussi essentiel que celui du début, j'ai également appliqué ce choix aux sous-titres dont la fin passait inévitablement au-delà d'un changement de plan, quoiqu'en étant moins regardante qu'avec le respect du début de la phrase énoncée.

1.2. Pertes d'informations liées aux contraintes spatio-temporelles

À l'instar des sous-titres professionnels, mes choix de traductions étant souvent régis voire restreints par la vitesse de lecture et le nombre de caractères autorisés par ligne. L'espace étant donc parfois insuffisant pour me permettre de coder l'entièreté de la traduction, j'ai malheureusement été contrainte de supprimer des termes çà et là.

Certaines pertes d'information étaient effectivement inévitables si je souhaitais éviter de tronquer une unité de sens au sein du sous-titre, ou lorsque le nombre de caractères disponibles était réduit. Cependant, j'ai veillé à ce que cela ne soit pas trop fréquent, et que les informations sacrifiées n'étaient pas essentielles.

Par exemple, dans le premier sous-titre n° 1, que je voulais avant tout traduire par « Notre planète bleue est confrontée à l'une des pires menaces de l'histoire de l'humanité. », j'ai décidé de supprimer l'adjectif de l'expression « planète bleue ».

Sachant que cette expression prend tout son sens dans le contexte de ce documentaire traitant de la pollution plastique des océans, j'aurais pu la privilégier en réduisant la phrase et écrire « Notre planète bleue n'a jamais été aussi menacée/autant en danger. » (« *Our Blue Planet is facing one of the biggest threat in human history.* »).

Cependant, la narratrice Liz Bonnin n'est pas exclusive dans ses termes : elle parle bien de *l'une* des pires menaces. J'ai donc songé à utiliser « peut-être » afin de nuancer la traduction comme ses propos, mais suivi de l'adverbe de temps « jamais », cela semblait renforcer son ambiguïté avec « sans doute ».

J'ai donc finalement traduit la phrase par « Notre planète fait face à l'une des pires menaces de l'histoire. » (à écrire avec minuscule à histoire, selon le *Petit dictionnaire d'orthographe et de typographie pour le sous-titrage*), car, bien que cela m'oblige à couper le sous-titre, il s'agit de la solution qui reprend les notions

les plus importantes et qui respecte donc le plus le sens de l'original, mais surtout celle qui permet de respecter le nombre de caractères utilisables dans le codage. En effet, ne pas utiliser l'adjectif « bleue » représente plutôt une perte stylistique que sémantique, car on comprend très vite que l'on parle des océans.

2. Choix de traduction

2.1. Terminologie

J'ai également rencontré divers problèmes de terminologie. L'équivalence était parfois inexistante, j'ai donc dû user de diverses stratégies pour contourner ces derniers.

Les mots « *trillion* » et « *billion* » n'étaient pas censés poser de problème de traduction, puisque selon les dictionnaires français, « *trillion* », ancien synonyme de « *billion* », équivaut à un milliard de milliards, soit 10^{18} , et un « *billion* », ancien synonyme de « *milliard* », vaut un million de millions, soit mille milliards (10^{12}). Toutefois, en anglais, « *trillion* » se dit « *quintillion* », « *billion* » se traduit par « *trillion* », et « *milliard* » par « *billion* ». En effet, les anglophones utilisent l'échelle courte (« *billion* » = 10^9), tandis que nous utilisons l'échelle longue (« *billion* » = 10^{12}), je les ai donc converties, sauf celle de « *trillion* », peu idiomatique en français. J'ai donc décidé de la traduire par « mille milliards », comme recommandé par l'OCDE dans son guide de style, mais lorsqu'il n'était pas multiplié par un nombre, je l'ai traduit par les syntagmes « d'innombrables » ou « une myriade » (bien qu'une myriade signifiait anciennement « 10 000 »).

N° ST	Langue source	Langue cible
3	Trillions of pieces of plastic are choking the very lifeblood of our earth.	D'innombrables plastiques détruisent l'élément vital de notre Terre.
1073	And yet, with an estimated 51 trillion pieces of plastic	Mais avec 51 milliards de particules de plastique
1250	Trillions of microplastics, tiny pieces of plastic	Une myriade de microplastiques, minuscules fragments de plastique,

Le terme anglais *plastic* m'a posé un dilemme : selon le dictionnaire du *Petit Larousse*, il semblerait que le substantif masculin *plastique* n'ait pas encore reçu officiellement l'acception de déchet (voir sous-titre n° 3) ou de produit en plastique (sous-titre n° 1403), mais qu'il désigne uniquement les matériaux synthétiques à proprement parler (acception à laquelle il faut d'ailleurs privilégier le terme « matières plastiques », et qui peut s'utiliser au singulier comme dans le sous-titre n° 1286, ou au pluriel comme dans le sous-titre n° 959).

Cependant, comme le rappelle le site de *Futura Sciences*, l'usage du terme *plastique* tend à se généraliser (voire à se normaliser au Canada, comme en atteste la *Banque de dépannage linguiste*) pour désigner un débris plastique ou une matière plastique, voire plusieurs débris plastiques tout en restant au singulier. J'ai également rencontré des difficultés avec la forme adjectivale. En effet, selon le dictionnaire de l'Académie française, lorsqu'apposé à un autre nom tel que *sac*, le terme *plastique* reste invariable, puisque cette structure grammaticale lui confère justement un caractère d'adjectif tout en préservant sa qualité de substantif. Adopter la définition de l'Académie m'aurait donc permis d'économiser un caractère à chaque occurrence de l'adjectif *plastique* précédé d'un terme tel que « déchets » ou « emballages », mais j'ai préféré me référer à la définition du CNRTL, qui n'applique pas cette règle et préconise l'emploi du pluriel, de plus en plus courant dans ce cas (voir sous-titre n° 1084).

De plus, je trouvais que l'absence du pluriel avait tendance à choquer le regard, car elle ressemblait à un oubli d'accord, et que cela permettait de se calquer sur la graphie sur celle des microplastiques, qui eux, ne sont pas une matière plastique en soi, mais bien des fragments de matières plastiques.

N° ST	Langue source	Langue cible
3	Trillions of pieces of plastic are choking the very lifeblood of our earth.	D'innombrables plastiques détruisent l'élément vital de notre Terre
959	Plastics like this one is just full	Les plastiques comme celui-ci sont remplis

1084	and I looked around me, and I saw more plastic bags than fish.	et j'ai vu plus de sacs plastiques que de poissons.
1286	Up here in the Arctic, the plastic becomes really, really brittle quite quickly.	Ici, le plastique devient vite particulièrement cassant,
1403	people are giving up single-use plastic items like straws,	<i>les gens renoncent aux plastiques à usage unique tels que pailles,</i>

2.2. Anglicismes

Comme mentionné dans le *Petit dictionnaire d'orthographe et de typographie pour le sous-titrage*, traduire le substantif ou l'adjectif anglais *alternative* en effectuant un calque de l'anglais est largement déconseillé par l'Académie française, mais aussi par le *Petit Larousse*, pourtant plus représentatif de l'usage.

Afin de découper correctement le sous-titre en unité de sens lors du codage des caractères, la seule solution de substitution – si j'ose dire – possible pour l'occurrence de ce terme sous sa forme substantive était la synonymie, grâce au syntagme nominal « moyen de remplacer », dans « *[to focus on finding] an alternative [to the billions of plastic sachets]* », que j'ai traduit par « [chercher] un moyen de remplacer [les milliards sachets] ».

Pour ce qui est de l'adjectif épithète, j'ai été forcée de le remplacer par un complément prépositionnel du nom (comme dans le syntagme nominal « matériau de substitution », traduction de « *alternative material* »), ou de privilégier l'utilisation d'un autre adjectif qualificatif, comme pour « *[to be open to finding out about] alternative fishing techniques* », que j'ai décidé de rendre par « [être ouvert] aux nouvelles techniques de pêche », car le contexte s'y prêtait parfaitement.

En effet, Liz Bonnin s'apprête alors à rencontrer un pêcheur de homard qui a accepté de tester un nouveau système de nasses à crustacés sans cordage, ce qui constitue plus une *nouvelle* méthode (il s'agit toujours de pêcher le homard au casier, mais de façon, cette fois-ci, à préserver les baleines noires en évitant

qu'elles ne s'empêchent dans les câbles) qu'un *autre* mode de pêche (comme la pêche à la palangre, au chalut, etc.), c'est pourquoi je me suis permis d'effectuer un procédé de coloration, en nuanciant à l'aide d'un adjectif plus précis.

N° ST	Langue source	Langue cible
490	He's focusing on finding an alternative to the billions of plastic sachets used in Indonesia and other developing countries.	Il cherche un moyen de remplacer
		les milliards de sachets
		utilisés en Indonésie et dans d'autres pays émergents.
497	I've arranged a meeting with this young entrepreneur who's been developing an alternative material to plastic.	J'ai rendez-vous avec un jeune entrepreneur
		qui développe un matériau de substitution au plastique.
768	Some fishermen here are open to finding out about alternative fishing techniques.	Certains pêcheurs sont ouverts aux nouvelles techniques de pêche.

2.3. Expressions et jeux de mots

Afin de traduire l'expression « *plastic tide* », métaphore non lexicalisée en anglais, mais largement répandue (les anglophones l'utilisent d'ailleurs souvent pour créer un jeu de mots avec l'expression « *turn the tide (on plastic)* »), et pour laquelle je n'ai pas trouvé d'équivalent en français, plusieurs possibilités s'offraient à moi. En effet, au cours de mes recherches sur la pollution plastique, j'ai lu divers syntagmes susceptibles de correspondre en français : certains étaient des calques faisant également référence à l'élément aquatique (mer de plastique, raz-de-marée plastique, marée de plastique, océan de plastique, torrent de plastique), ou à un élément liquide (soupe de plastique), tandis que d'autres rendaient l'idée de l'énorme quantité de débris plastiques qui flottent dans les océans par les expressions « île de plastique » ou « continent de plastique ».

Après plusieurs recherches, mais sans avoir obtenu la traduction du terme exact dans un glossaire, j'ai trouvé plusieurs métaphores qui peuvent rendre « *plastic tide* » en français : crise du plastique, mer de plastique(s), (raz-de-)marée (de) plastique(s), océan (de) plastique(s), torrent de plastique(s), et gyre(s) de plastique(s), îles de plastiques, et continent(s) de plastique(s). Selon moi, 'gyre', 'île' et 'continent' ne conviennent pas, car il s'agit des termes employés pour

désigner les gigantesques vortex présents dans les océans. Or, elle citera aussi les plus grands fleuves et les régions les plus reculées du globe, eux aussi touchés par la crise du plastique. J'ai également trouvé « soupe de plastique », mais il semblerait que la 'soupe' (« *plastic soup* ») fasse plutôt référence aux microplastiques qu'aux déchets plastiques de plus grande taille. Je pense choisir l'idée du torrent ou de la marée/du raz-de-marée pour reprendre le jeu de mots avec l'océan, mais rester juste dans les termes.

2.4. Explicitation

J'ai parfois dû clarifier certaines notions, soit par souci de compréhension du fond, soit pour une question cohérence avec le reste du texte. Par exemple, lorsque Liz Bonnin participe au sauvetage d'un phoque, elle dit « *So the plan now is to get that young seal back to IFAW headquarters and give it 24-hour care because she's in such a bad state* ». Sachant qu'on sait très bien dans ce contexte que l'on parle du phoque, puisqu'on vient d'apprendre qu'il s'agit d'un bébé phoque gris empêtré dans un filet maillant, mais que le sexe de l'animal n'est précisé que dans ce sous-titre, je me suis permis d'expliciter en traduisant par « À présent, il faut emmener cette jeune femelle au siège d'IFAW et lui donner des soins intensifs, car son état est grave ».

J'aurais donc pu traduire par « ce phoque femelle », puisque les syntagmes « une phoque » ou « une phoque femelle » sont respectivement inexistantes ou incorrects en français, mais cela ne réglait pas le problème d'incohérence avec l'usage répété des pronoms féminins « *she* » ou « *her* » dans la suite de la séquence.

Peut-être qu'utiliser uniquement le masculin aurait parfaitement convenu dans le cadre d'une traduction littéraire, mais je trouvais cela gênant au niveau de l'audition, notamment lorsque Liz Bonnin s'exclame : « La pauvre ! ». J'ai donc décidé, pour le sous-titre ci-dessous, de remplacer le nom masculin « phoque » par le substantif « femelle », afin de pouvoir utiliser les pronoms féminins par la suite sans que cela soit grammaticalement incorrect.

N° ST	Langue source	Langue cible
600	So the plan now is to get that young seal back to IFAW headquarters	À présent, il faut emmener cette jeune femelle au siège d'IFAW
601	and give it 24-hour care because she's in such a bad state	et lui donner des soins intensifs, car son état est grave.

3. Orthographe et normes typographiques

3.1. Trait d'union

Selon le *Petit dictionnaire d'orthographe et de typographie en sous-titrage*, le trait d'union a tendance à marquer le fait qu'un syntagme s'est figé, qu'il est reconnu dans un sens déterminé par les locuteurs d'une langue, qu'il s'est *lexicalisé*. Dans ce recueil de normes typographiques en sous-titrage, l'utilisation du trait d'union dans « raz-de-marée » est laissée à l'appréciation du sous-titreur. La 9^e édition du *Dictionnaire de l'Académie française* orthographie ce terme sans trait d'union, tandis que le *Petit Larousse*, plus représentatif de l'usage, propose les deux graphies, à l'instar du *Petit Robert* ou de *Termium*.

J'ai donc choisi la graphie la plus récente et que je trouve la plus logique : ce syntagme, composé notamment du mot « raz » et signifiant justement « courant marin » en Normandie et en Bretagne (n'y aurait-il pas d'ailleurs lieu de s'interroger sur ce pléonasme, signifiant à vrai dire « courant de marée de marée » ?) s'est figé et est devenu un nom composé, il conviendrait donc selon moi d'y ajouter des traits d'union.

Toujours selon le *Petit dictionnaire d'orthographe et de typographie en sous-titrage*, le trait d'union n'est indispensable avec un nom épithète que si son unité syntaxique n'est pas directement compréhensible en additionnant le sens de ce dernier à celui du nom auquel il est apposé, ou si ce trait d'union équivaut à « et » j'ai laissé le syntagme « indicateur clé » orthographié selon les règles sans si syntagme « indicateur clé » n'est pas lexicalisé, contrairement à « mot-clé », par exemple.

J'ai d'ailleurs hésité à écrire « les bio-indicateurs », ce qui aurait donné lieu à une coloration du terme original « *key indicators* », puisque l'équivalent scientifique en anglais « *bioindicator* » existe, mais cela ne convenait pas, car on ne peut pas dire « les bio-indicateurs » au sens superlatif. En effet, il faudrait alors ajouter « les meilleurs », solution trop longue pour le codage des caractères.

3.2. Accentuation

Comme recommandé par le *Petit dictionnaire d'orthographe et de typographie en sous-titrage*, j'ai accentué les majuscules dans mon sous-titrage, comme dans « À Amsterdam », « aux États-Unis », « À présent », dans le titre « NOYÉS SOUS LE PLASTIQUE », etc. Contrairement aux Immortels, mais à l'instar du *Petit Larousse* ou du *Petit Robert*, je n'ai pas appliqué la règle – déconseillée et donc potentiellement dérangeante pour le regard du spectateur, à raison, selon moi – introduite par la réforme de l'orthographe de 1990 selon laquelle, notamment, il ne faut plus mettre d'accents circonflexes sur « île » ou « îlot », qui fait littéralement fi de l'étymologie du mot.

3.3. Majuscule

J'ai évidemment écrit en lettres capitales le titre du film « *Drowning in Plastic* », que j'ai traduit littéralement par « Noyés sous le plastique », car les métaphores par rapport aux plastiques faisant référence à l'océan ou à l'eau sont nombreuses et répandues, notamment celle-ci.

J'ai mis une majuscule, comme rappelé par DioKuan (2011), le mot « Terre » lorsqu'il désignait le corps céleste lui-même uniquement l'astre, mais pas lorsqu'il représentait l'élément s'opposant à la mer.

N° ST	Langue source	Langue cible
175	And for those who manage to take off, they won't touch land again	Ceux qui parviennent à prendre leur envol ne toucheront terre
207	I mean, I... There are very few places left on the planet	Il reste très peu d'endroits sur Terre

Je l'ai également utilisée dans les expressions « bon Dieu », « mon Dieu » et « nom de Dieu » (mais aussi « Seigneur », même si ce c'est peu pertinent de le

relever, puisque ce terme n'apparaît qu'en début de sous-titre à chacune de ses utilisations), car selon DioKuan (2011), « Dieu » porte la majuscule s'il appartient à une religion monothéiste, mais également dans les expressions formées autour ou à partir de ce terme, bien que Jean-Yves Dournon, cité par DioKuan, préconise d'utiliser la minuscule. En revanche, je ne l'ai pas utilisée lorsqu'il s'agissait du pronom personnel désignant la divinité ou d'un adjectif la qualifiant (comme dans les expressions « mon Dieu » et « bon Dieu »), en suivant la règle sur la déférence de DioKuan (2011), que j'ai également suivie dans d'autres cas (par exemple, pour les titres de profession. Par ailleurs, j'ai privilégié « oh » à « ô » dans « oh mon Dieu », car cette expression, à l'origine une invocation, est entrée dans l'usage courant, et sert d'interjection aujourd'hui.

Pour les points cardinaux, j'ai également suivi les règles de français reprises dans DioKuan (2011) et dans la *Banque de dépannage linguistique* : j'ai utilisé la majuscule lorsqu'il s'agissait d'un toponyme (« le pôle Nord ») ou lorsqu'il désignait une région bien délimitée considérée comme un nom propre (« l'Atlantique Nord »), mais la minuscule lorsqu'il s'agissait d'une direction (« la plus au nord du monde »).

N° ST	Langue source	Langue cible
648	the North Atlantic right whale	la baleine noire de l'Atlantique Nord.
1255	We're in Longyearbyen – the northernmost town in the world,	Longyearbyen, la ville la plus au nord du monde,
1257	1,300 kilometres that way is the North Pole.	Là-bas, à 1 300 km, c'est le pôle Nord.

Les occurrences de « professeur » ou « docteur » étaient précédées d'un article défini, la question de la majuscule de déférence ne se posait pas dans ce cas précis. Par contre, je l'ai utilisée pour parler de « l'Homme » au sens d'« être humain ». Je développe ces arguments dans le point ci-après sur l'écriture inclusive.

3.4. Écriture inclusive

Étant donné le contexte actuel, dans lequel la neutralité du masculin est – à juste titre – remise en cause, l'Académie française, pourtant réticente à l'idée de féminiser le vocabulaire et les textes, a finalement cédé à la pression d'une grande partie de la société cette année, et s'est résolue à officialiser les féminins des titres et fonctions. J'ai donc décidé de féminiser les titres honorifiques ou académiques tels que « docteur » et « professeur », qu'on peut comparer avec le masculin du deuxième et du dernier exemple, mais également le nom de métier « biologiste marin ».

N° ST	Langue source	Langue cible
68	Team is led by marine biologist Jennifer Lavers.	La docteure Jennifer Lavers, biologiste marine, dirige l'équipe.
89	and Doctor Alex Bond,	et au docteur Alex Bond,
905	I'm joining Assistant Professor Joleah Lamb,	Je me joins à la professeure Joleah Lamb,
1146	I meet Professor Jamal Jompa,	Je vais voir le professeur Jamal Jompa,
1167	a marine scientist	océanographe ?

Pour parler des « êtres humains », je n'avais généralement pas la place de coder ce syntagme, et il ne convenait pas toujours en termes d'idiomaticité (en effet, on parle plus de « bactéries nocives pour l'Homme » que « pour l'être humain » ou « l'humain »), sauf dans le premier exemple. J'ai donc décidé d'ajouter une majuscule à « Homme » lorsqu'il désignait l'humanité, tous sexes confondus, contrairement à ce que préconise DioKuan (2011) ou encore le professeur Jacques Poitou (2019), selon qui le seul emploi générique possible de ce terme serait dans le syntagme figé « droits de l'Homme ». On peut comparer avec la minuscule du dernier exemple, que j'ai employée lorsque ce terme faisait référence à un être humain de sexe masculin.

En effet, bien qu'utiliser cette antonomase plutôt que « humains » (comme pour « droits de l'Homme » au lieu de « droits humains ») soit largement critiqué dans le cadre de l'écriture inclusive, car ce terme reste un masculin générique, comme rappelé dans le *Manuel d'écriture inclusive* (2016) de l'Association « Mots-clés »

dirigée par Raphaël Haddad, je trouvais cela plus idiomatique pour le deuxième et le troisième exemple d'utiliser la majuscule de déférence que le terme « humains », et il fallait clairement la privilégier au fait d'écrire « homme » avec minuscule pour rester cohérente avec la féminisation des noms de métiers.

N° ST	Langue source	Langue cible
248	is the equivalent of a human eating 10 kg of plastic.	reviendrait pour un humain à ingérer 10 kg de plastique.
967	one strain of which causes cholera in humans.	dont l'une des souches cause le choléra chez l'Homme.
1040	Sea grass can actually kill bacteria that's harmful to people,	Les herbiers peuvent tuer les bactéries nocives pour l'Homme
1217	because of this guy.	grâce à cet homme.

3.5. Points de suspension

Je les ai utilisés lorsqu'ils marquaient l'interruption du discours due à une émotion (ST 224), une hésitation ou une pause marquée (ST 419, 970–980), un sous-entendu (ST 1281–1282), une personne qui coupe son interlocuteur ou termine sa phrase (ST 504–505, 618).

N° ST	Langue source	Langue cible
224	Oh, my good Lord... That is insane.	Oh là là... c'est fou !
419	On the one hand, you have this... new, affordable lifestyle	D'un côté, il y a... ce nouveau mode de vie abordable,
504	So, you basically just have to bung this in a...	Il faut simplement le mettre dans...
505	– In the hot water,	–... dans de l'eau chaude.
618	So, we'll want to do... It's so young... How old is this...?	Donc il faut... - Il est si jeune ! Il a quel âge ?
979	Oh, that's... brown soup, but it's definitely soupy!	Bon, elle est...
980		plutôt marron, mais c'est une soupe !
1280	We are in a very remote part of the planet...	On se trouve dans une région extrêmement reculée de la planète,
1281	and yet,	et pourtant...
1282	the plastic reaches even here.	le plastique parvient à arriver jusqu'ici.

3.6. Guillemets

Les guillemets devant s'utiliser pour encadrer un discours rapporté, je les ai utilisés lorsque Liz Bonnin évoquait ses attentes passées, l'énonciateur principal se confondant dans ce cas-ci avec l'énonciateur secondaire, puisqu'il s'agit de la narratrice qui rapporte ses propres pensées).

N° ST	Langue source	Langue cible
1230	Like, when I met Nasrun, I was so elated... when I thought that, 'Oh, gosh, OK, there's a solution here, there's an answer.'	Quand j'ai rencontré Nasrun, j'étais si enthousiaste à l'idée de me dire : « Super, donc il y a une solution. »

3.7. Nombres et unités de mesure

Pour ce qui est des mesures horaires (peu importe qu'on exprime une heure déterminée ou une durée), DioKuan (2011) prévoit qu'on peut abrégé l'unité de temps d'une durée complexe et l'écrire en chiffres (« 2 h 30 »), mais aussi, lorsqu'on manque de place, écrire une durée simple en chiffres (par exemple, « 9 heures »), voire abrégé également le mot « heures » si le nombre de caractères est vraiment trop limité. J'ai donc décidé d'exprimer toutes les heures et durées – dont les occurrences sont relativement nombreuses dans le reportage – de la façon la plus abrégée, notamment les durées simples, afin de rester cohérente entre les divers sous-titres. En effet, autrement, les occurrences du mot « heures » ressemblaient à des oublis d'abréviation.

J'ai également uniformisé les durées exprimées en jours, mois, et années en utilisant des chiffres plutôt que de les écrire en toutes lettres (sans évidemment abrégé ces termes, comme en écrivant « 3 j » au lieu de « 3 jours », ce qui est peu courant dans l'usage, et n'existe pas pour « mois » ou « année »), et ce, à nouveau, même pour les chiffres en dessous de 10 (ou 11, selon les différentes écoles). En effet, pour plusieurs sous-titres, notamment le premier et le dernier exemple, je n'avais pas d'autre choix que d'écrire en chiffre ou d'abrégé le terme « heures », et j'ai donc préféré unifier mon sous-titrage en appliquant cette règle

même lorsque le nombre de caractères ne m'y forçait pas (comme pour le deuxième exemple).

N° ST	Langue source	Langue cible
885	I've spent the last 9 months researching this plastic crisis,	Après avoir passé 9 mois à étudier la crise du plastique
1123	half this Great Pacific Garbage Patch every 5 years.	la moitié du septième continent tous les 5 ans.
1263	so you get 24 hours of daylight,	donc on bénéficie de 24 h d'ensoleillement,

J'ai également appliqué cette règle, comme le suggère DioKuan (2011), pour les unités de poids et de longueur : j'ai abrégé « kilogrammes » en « kg » (et en « kilos » lorsque l'abréviation était impossible, voir commentaire suivant) et « kilomètres » en « km ». Certaines mesures étaient exprimées en livres ou en miles, je les ai évidemment converties, mais je n'avais pas besoin de convertir les mesures qui n'étaient pas exprimées dans le système *avoirdupois* – celui des anglophones – (« *1300 km that way is the North Pole* »).

Même si l'abréviation de « tonnes » en « t » me semblait être moins répandue que celles de « kg », par exemple, j'ai décidé de rester cohérente et d'appliquer la règle à cette unité de mesure, comme le conseille d'ailleurs DioKuan (2011), sachant qu'en plus, l'abréviation est utilisée après avoir parlé de « milliers de tonnes » en toutes lettres dans les sous-titres précédents et qu'il s'agit d'un contenu scientifique.

N° ST	Langue source	Langue cible
50	400 miles off the coast of Australia,	À 640 km au large des côtes australiennes,
248	is the equivalent of a human eating 10 kg of plastic.	reviendrait pour un être humain à ingérer 10 kg de plastique.
345	Each day, an estimated 2,000 tonnes of plastic flows down this river	Le fleuve en charrie environ 2 000 t par jour.

Bien que j'aie choisi de ne pas écrire en toutes lettres les données chiffrées en dessous de 10, car il s'agit d'un contenu scientifique dans lequel les chiffres ont une réelle importance et dans lequel ils sont largement répétés et utilisés, mais surtout parce que je souhaitais rester cohérente avec les autres nombres évoqués

dans le reportage, j'ai malgré tout décidé de ne pas abrégé les unités de mesure précédées du mot « millions » :

N° ST	Langue source	Langue cible
301	Over a year, this adds up to a staggering eight million tonnes.	En un an, cela représente un chiffre alarmant
302		de 8 millions de tonnes
337	over a mile long	mesurant plus de 1,5 km
1342	Despite weighing over a tonne, walruses	Bien que le morse pèse plus d'une tonne,

Je n'ai évidemment pas abrégé les unités de mesure qui n'étaient pas précédées d'un chiffre ou dans lesquelles cette donnée chiffrée devait s'écrire partiellement (voir le premier, le troisième et le dernier exemple ci-dessous) ou entièrement en toutes lettres (comme dans le dernier exemple) :

N° ST	Langue source	Langue cible
674	It's probably 65 almost 70lbs.	Ça doit faire une trentaine de kilos.
692	It's estimated that 3 million miles of this virtually unbreakable plastic rope	<i>Près de cinq millions de kilomètres de cordage en plastique incassable</i>
741	After hours of backbreaking work,	<i>Après des heures de travail acharné, ils parviennent à dégager la bouée.</i>
1076	could remove hundreds and even thousands of tonnes of plastic	<i>permettrait de vider des milliers de tonnes de plastique</i>
1180	Five tonnes a day? A day!	Cinq tonnes par jour ? Par jour !

3.8. Nombres ordinaux

Par souci de place, j'ai utilisé l'expression de « septième continent », métaphore de plus en plus répandue pour traduire « *Great Pacific Garbage Patch* » (que j'ai en outre écrit en nombre ordinal par souci de cohérence avec le reste du texte : « 7^e continent » plutôt que « septième continent »), même si le caractère scientifique du document sous-titré aurait plutôt requis la traduction officielle (« vortex de déchets du Pacifique nord ») et plus technique de cette zone d'accumulation de déchets plastiques. En français, ces expressions très répandues faisant référence à ce gyre en particulier ne portent pas la majuscule,

contrairement à l'anglais (d'ailleurs abrégé « GPGP »). De plus, j'ai trouvé cette graphie sur de nombreux sites fiables, scientifiques ou spécialisés dans l'environnement, comme *Geo* (Geo, 2014 ; Wascowski, 2018), *Science et Avenir* (Sciences et Avenir, 2013 ; Ignasse, 2014), *l'Encyclopédie de l'Environnement* (Ter Halle & Perez, 2020) ou encore *Le Monde* (Garric, 2012), TV5 Monde (de Matos & Fonteneau, 2019) – bien qu'il soit écrit également « 7^{ème} continent » ou « 7è continent » (*sic*) sur cette page web –, mais mieux encore, l'expédition du même nom (« l'Expédition 7^e continent »), visant à nettoyer les cinq gyres océaniques, utilise cette graphie.

4. Conclusion

Outre les rares entorses aux règles que je me suis permises de faire soit par souci de cohérence (uniformisation du sous-titrage) ou parce que le contenu scientifique s'y prêtait (écriture en chiffres de données normalement rédigées en toutes lettres), soit lorsque ces fameuses limites espace/temps ne me laissaient pas d'autre choix, ou, plus rarement, par choix personnel, je me suis conformée aux règles orthotypographiques qui régissent le sous-titrage, reprises dans le *Petit dictionnaire d'orthographe et de typographie pour le sous-titrage* de DioKuan (2011).

Les autres difficultés rencontrées concernaient surtout la terminologie ou l'orthographe spécifiques au sujet développé dans le reportage, à savoir la pollution plastique. En effet, une fois la connaissance de la problématique approfondie et la terminologie nécessaire acquise, l'obstacle de la langue posait parfois des problèmes, notamment lorsqu'il s'agissait d'un néologisme qui désignait un nouveau concept (ici, les « bouées sur appel » des casiers sans cordage) ou en nommer un préexistant, mais dont l'orthographe a évolué (les sacs plastiques, par exemple).

Cependant, comme pour tout sous-titreur, les principaux problèmes rencontrés lors de la traduction de ce reportage étaient liés aux contraintes spatio-temporelles (abréviations, utilisation des chiffres, etc.) et aux changements de plan (lorsqu'il fallait décider de privilégier la synchronisation avec le temps de parole à leur détriment, ou inversement). En effet, je me suis efforcée de

contourner ces deux obstacles majeurs en reformulant au mieux, voire en supprimant des informations – toujours superflues ou facilement comprises grâce au contexte.

C'est justement là que le bât blesse : non seulement cette technique d'adaptation audiovisuelle freine parfois le traducteur professionnel dans son élan de créativité, le forçant à opérer des choix de traduction contestables, inhabituels, lexicalement pauvres, ou visuellement dérangeants, mais ses décisions sont largement critiquées par les téléspectateurs – même lorsqu'il s'agit de la meilleure solution ou de sa seule alternative pour rendre une idée ou transposer le syntagme en français.

La remise en doute des compétences du professionnel du sous-titrage est la conséquence directe de la méconnaissance des normes auxquelles il doit se conformer, à la fois alimentée par la traduction de piètre qualité du sous-titrage amateur (les « *fansubs* »), mais également source de celle-ci. En effet, les *fansubbers* ont appris sur le tas, en examinant le travail d'autres sous-titreur amateurs. Cette tendance est malheureusement souvent critiquée pour la qualité du sous-titrage et des choix de traduction, et le doublage est encore souvent privilégié par le public francophone, sachant qu'au-delà des contraintes liées à l'espace-temps, la bande sonore restreint parfois les possibilités et ne laisse pas libre cours à l'imagination, contrairement au doublage – longtemps préféré de loin au sous-titrage en Europe occidentale (à l'exception de quelques pays, comme les Pays-Bas).

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