PLASTIC GIANTS POLLUTING THROUGH THE BACKDOOR : THE CASE FOR A REGULATORY SUPPLY-CHAIN APPROACH TO PELLET POLLUTION

Surfrider Foundation Europe is a European not-for-profit organisation dedicated to the protection and enhancement of Europe's lakes, rivers, ocean, waves and coastlines. It was created in Europe (Biarritz) by a group of surfers who wanted to preserve their playground. Grass-roots activism to protect our ocean and coasts is at the core of the organisation which currently has over 13,000 members and is active across 12 countries through its volunteer-run branches. For 30 years, Surfrider Foundation Europe has been taking action as a recognized authority in 3 areas of expertise : marine litter, water quality and health, coastal management and climate change. Surfrider Foundation Europe is one of the founding members of the Rethink Plastic Alliance. Visit our website : www.surfrider.eu

Rethink Plastic, part of the Break Free From Plastic movement, is an alliance of leading European NGOs working towards ambitious EU policies on plastics. It brings together the Center for International Environmental Law (CIEL), ClientEarth, Environmental Investigation Agency (EIA), European Environmental Bureau (EEB), European Environmental Citizen's Organisation for Standardisation (ECOS), Greenpeace, Seas At Risk, Surfrider Foundation Europe, and Zero Waste Europe. Together they represent thousands of active groups, supporters and citizens in every EU Member State working towards a future free from plastic pollution. More info : rethinkplasticalliance.eu

Authors : Annette Gravier (Surfrider Foundation Europe) and Gaëlle Haut (Surfrider Foundation Europe).

Acknowledgements : We thank for their key contributions the following NGOs as well as members of the Break Free From Plastic Europe movement : SOS Mal de Seine (Laurent Colasse), Sea Mer (Jonathan Henichart), Good Karma Projects (Jordi Oliva Farriol), Antwerpen Schaliegasvrij (Annick Vanisterbercq), KIMO (Arabelle Bentley) and Plastic Soup Foundation (Robert Möhring and Jeroen Gagevos). We thank the following for their key inputs and expertise : Tom Gammage (Environmental Investigation Agency), Georgina Magin (Fauna & Flora International), Madeleine Berg (Fidra), Andy Gheorghiu (Food & Water Europe) and Justine Maillot (Rethink Plastic alliance).
Reviewer: Angela Berrocq.
Graphic design : La Valeur de X

November 2020

CONTENT

EXECUTIVE SUMMARY

This report aims to highlight a massive source of pollution which is damaging biodiversity and threatening our lives : plastics pellets. Pellets, also called nurdles, are the raw material used for the manufacture of plastic products. Their lentil-sized dimensions make them easily spilled, wherever in the supply chain they are handled. They are the second most significant source of microplastic pollution.

Through the presentation of five recent case studies, the report exposes the consequences of plastic production related pollution on the environment and on human lives, detailing in each case how citizens and local associations reacted to the pollution, and how the companies responsible responded.

The five case studies demonstrate the great diversity of the pollution contexts and patterns, and highlight the extent of the problem at European level as regards both the number of countries concerned — Belgium, Denmark, France, the Netherlands, Norway, Spain and Sweden — and the massive quantities of pollution involved.

The five case studies show how much the industry and its voluntary initiative Operation Clean Sweep have failed to reduce plastic pellet pollution and how seriously local communities are calling for urgent legal measures to hold companies accountable for the pollution. The case studies presented in the report underline why the EU should take urgent regulatory action to stop pellet pollution which adds to the already severely polluted water bodies and seas in Europe.

INTRODUCTION

Plastic pellets, also called nurdles, are a raw material used in the manufacturing of plastic items. Their lightness, small size (typically less than 5 mm) and spherical or cylindrical shape makes them easy to transport and mould into plastic objects. Nurdles come in a wide diversity of compositions, shapes, and colours and though pellets are the most common shape, raw material for plastic production can also be in the form of powders and flakes, which are also microplastics and of similar concern if they escape to the environment. An example of this diversity is the variety of pellets which were reported by participants in our Ocean Initiatives citizen science programme in 2019. While most of the reported pellets were either white or transparent, a number were also black, red, blue, orange, green, yellow and even multicoloured.

1- Credits : Surfrider Foundation Europe.

Pellets are spilled at every stage of the plastic chain : during the production (storage, clean-up, loading, unloading), transportation (truck accidents, lost containers during shipping), transformation, or even recycling. Pellets often accumulate in the sea, in surface waters and rivers (for example the Scheldt or the Danube river), and near industrial sites or ports. When spills happen onshore, pellets are often blown or washed into the sewage system, especially on rainy days. They can then travel long distances transported by streams and rivers before finally being released into the sea and the Ocean.

Pellet pollution was first observed in the 1970s, when coastal residents and scientists started to notice pellets on beaches all around the world. It is the second most important source of primary microplastic pollution in the Ocean. A study commissioned by the European Commission in 2018 estimates that, up to 160 000 tonnes of nurdles are lost every year, at every stage of the plastic production and distribution chain in the European Union (EU) alone. The NGO Plastic Soup Foundation estimates this pollution, within the EU, to be equivalent to a loss of eight trillion pellets a year, which represents 265 000 pellets lost per second.

Transported by the currents and wind, pellets can be found everywhere in the world, even in the Arctic circle or in the middle of the Pacific Ocean. Once dispersed in the environment, they are said to

2- Credits : Ocean Initiatives programme, Surfrider Foundation Europe.

be almost impossible to remove. for economic but also technical reasons. However, in terms of economics the equation should contain large fines for this ongoing environmental pollution that also strongly affects health and the climate in the long term. Clean-ups would require high tech material and a considerable amount of time, human resources, time and economic investment to remove them. But even if all these resources were available, it is materially impossible to remove all the pellets after a pollution incident. In 2012, the Hong Kong disaster proved how devastating and persistent pellet spills could be. After the spill, volunteers cleaned up beaches for three months. And yet, in 2018, six years after intense clean-ups, mountains of pellets could still be found on the beaches.

Plastic pellets have been shown to have many impacts on marine ecosystems. They cause severe damage to marine life and threaten terrestrial animals ; because of their colour and shape, they are often mistaken for fish eggs or krill by small and big fish, marine animals such as whales, crustaceans and also birds, and, once ingested, they get stuck in the animal's stomach, causing starvation and death. According to Fidra, more than 220 marine species — including endangered and protected rare species such as puffins — are likely to ingest plastic debris including nurdles. The pollution also impacts the texture of sand as it mixes into the sediment, disturbing other animals such as turtles.

Once released into the environment, pellets are a dangerous chemical cocktail : acting as toxin magnets and transport mediums, they attract, absorb and transport toxic particles (persistent organic pollutants or POPs) that can be 1,000,000 times more concentrated on their surface compared to ambient water. They are not composed only of fossil fuels (which also highlights the significant impact of plastic production on climate change) : to give them specific characteristics, such as their colour for instance, industry also uses harmful chemical additives (phthalates, bisphenol A, flame retardants, etc.), which are then released into the environment. In addition, bacteria such as *E. Coli* (diarrhoea, meningitis…) and *Vibrio spp* (cholera) can fix to the pellets'surface. All these chemical components and bacteria are well known for their harmful effects on ecosystems and human life. Pellets and the toxic components attached can thus enter and accumulate in the food chain, and reach our bodies, through the fish and seafood we eat.

3- Participants of an Ocean Initiative in Le Porge (France) count plastic items, including pellets, 2018. Credits : Ocean Initiatives programme, Surfrider Foundation Europe.

Besides this threat to human health, pellet pollution is also detrimental to coastal communities : they impact recreational activities (such as water sports), deteriorate habitats and affect tourist activities.

Finally, the plastics production and distribution chain is also a large contributor to climate change, which puts humanity and all living beings at risk. As the European Environment Agency points out, greenhouse gases are released throughout the plastic production process: scientists estimate that the plastic industry's consumption of fossil fuels is as high as that of the aviation sector. It is now well-known that if we do not limit our carbon emissions, climate change will harshly impact humans and other living beings, provoking rises in sea-level and more frequent and more intense natural disasters, rendering entire areas uninhabitable for humans, and causing a mass migration phenomenon, among other things.

Since 1991, the industry has tried to tackle this issue through a voluntary initiative called Operation Clean Sweep (OCS). Endorsed by PlasticsEurope, this voluntary charter has failed to prove its efficiency over the last 30 years. The voluntary nature of the initiative is not conducive to significant changes in the companies' methods: while OCS provides a toolkit of best practices to avoid accidental pellet pollution, the lack of monitoring and enforcement mechanisms significantly limits the implementation of strong measures concerning the plastics transformation chain. In Europe, approximately 60 000 companies work with pellets at some stage of the plastic supply chain (production, transports, recycling...).

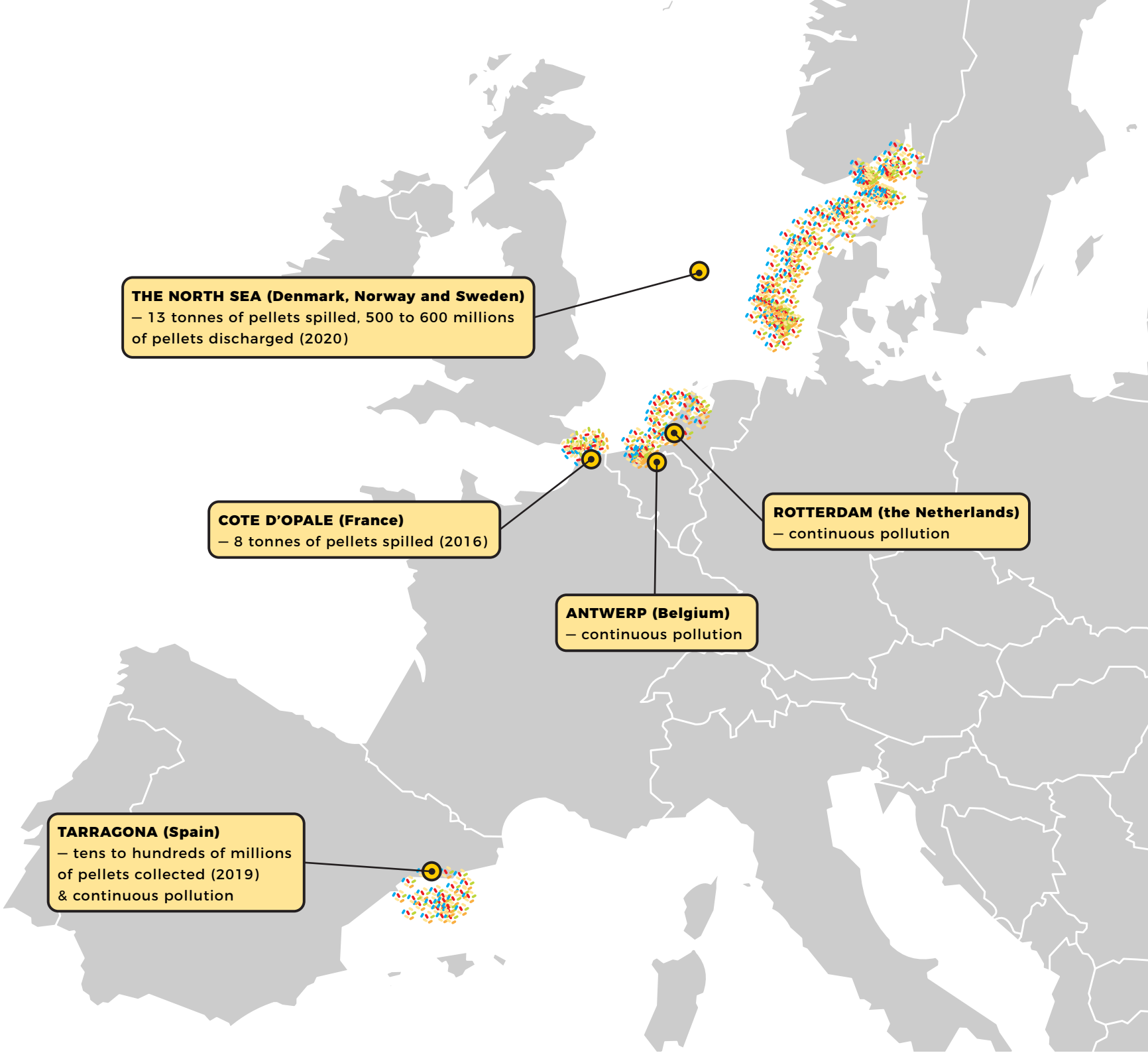
4- Tarnos (France), 2014. Credits : Ocean Initiatives programme, Surfrider Foundation Europe.

In order to make known the 5 “stories” exposed in this report, Surfrider Europe has drawn on both academic and media sources, and most importantly on the work and testimonies of grassroots groups and NGOs (data, studies…) which have for the most part been fighting pellet pollution for years. Interviews were also conducted with local associations and residents who had witnessed the pollution and/or have been fighting against it.

The report focuses on accidental pollution patterns, illustrated first by a truck accident along the Côte d’Opale (Opal Coast) in the North of France, and secondly by a massive pellet loss that occurred during shipping activity in the North Sea. Continuous pollution patterns involving plastic producers and transformers are then exemplified through several cases in the vicinity of major European ports : Tarragona (Spain), Rotterdam (the Netherlands) and Antwerp (Belgium).

These case studies provide lessons to prevent pellet pollution in the future and all point in the same direction : the EU needs to legally set obligations and to exercise control over the whole plastics transformation chain, as voluntary initiatives have proven inefficient in tackling pellet pollution. This problem needs to be tackled using a full Supply Chain Approach : a system of obligation and verification that ensures wherever pellets are handled, companies are using best practices to stop them being lost to the environment.

MAP



CASE STUDIES

COTE D'OPALE (FRANCE)

Overview

On 23rd February 2016, on the highway between Boulogne sur Mer and Marquise, in the North of France, a tank-truck spilled about eight tonnes of plastic pellets on the road, over a distance of three kilometres. The spill occured because a bottom discharge valve opened accidentally. These valves are normally locked and sealed. If not, vibrations or vandalism can cause the valves to open.

During the spill, two drivers lost control of their vehicles, causing two (fortunately minor) road accidents. The firefighters arrived first in the polluted area and closed the road for one hour to avoid additional traffic accidents. The Interdepartmental Authority in charge of Road Maintenance (DIR) organised a clean-up immediately after the spill and removed pellets using a vacuum sweeper in the zone for two weeks. Because of wind created by vehicles, pellets were found as far away as the city of Calais, about 50 kilometres from the spill. In addition to the DIR's street sweeper, two private street sweepers were called in to help clean up the area. However, lack of technical resources meant they were unable to collect all the plastic pellets, and the rest spread into the environment.

5- On the side of the road, two days after the spill and after multiple clean-ups. Credits: Jonathan Hénichart, Sea Mer.

Specificity

Unfortunately, pellet spills during truck transportation are very common. For example, three years after this accident, on 7th November 2019, another truck accident occurred in the Morbihan region in Brittany (France), leading to a spill of 28 tonnes of pellets.

Consequences on the environment

The spill on the Cote d'Opale impacted several protected beaches and water bodies. The area impacted is famous for its beauty and exceptional biodiversity. It hosts one of the French marine natural parks and several Natura 2000 areas. The park is home to a wide variety of hab-

6- In a small river close to the highway, a tributary of the Wimereux river. Credits : Jonathan Hénichart, Sea-Mer.

7- Transportation of pellets by runoff and rain close to the highway. Credits : Jonathan Hénichart, Sea-Mer.

itats — estuaries, sandy beaches, rocky shores, sandbanks, etc- and to more than 200 animal and plant species, including ten marine mammal species, almost 70 species of seabirds, around a hundred species of fish, more than 50 species of plants and countless invertebrates.

Volunteers from the association Sea-Mer, helped by volunteers from SOS mal de Seine investigated the spill in the weeks following the incident, monitoring the dispersion and accumulation of the pellets week after week. They observed that pellets were transported by water runoff and, on rainy days, were washed into the highway drainage system. Once transported by the water, most of the pellets ended up in the Denacre stream, which flows into the Wimereux River, and, ultimately, into the sea. Following this trail, pellets were found on the coastlines. On Wimereux beach, the quantity of pellets found was four times higher than usual.

According to the NGO Sea-Mer volunteers, some pellets were still visible eight months after the spill, on the road, in stormwater ponds, on the banks of the Wimereux river, on Rochette beach, and on Slack beach.

8- Pellets on Wimereux beach. Credits : Jonathan Hénichart, Sea-Mer.

Impacts on local communities

There was a direct risk for the population : because of the spread of pellets, other drivers were in danger of losing control of their vehicles and causing traffic accidents. On February 23rd, immediately after the spill, two car-drivers lost control of their vehicles because of the pellets and went off the road. Traffic was suspended for a whole day after the spill, to prevent other accidents occurring : this led to unexpected and severe traffic disruptions.

Conclusions

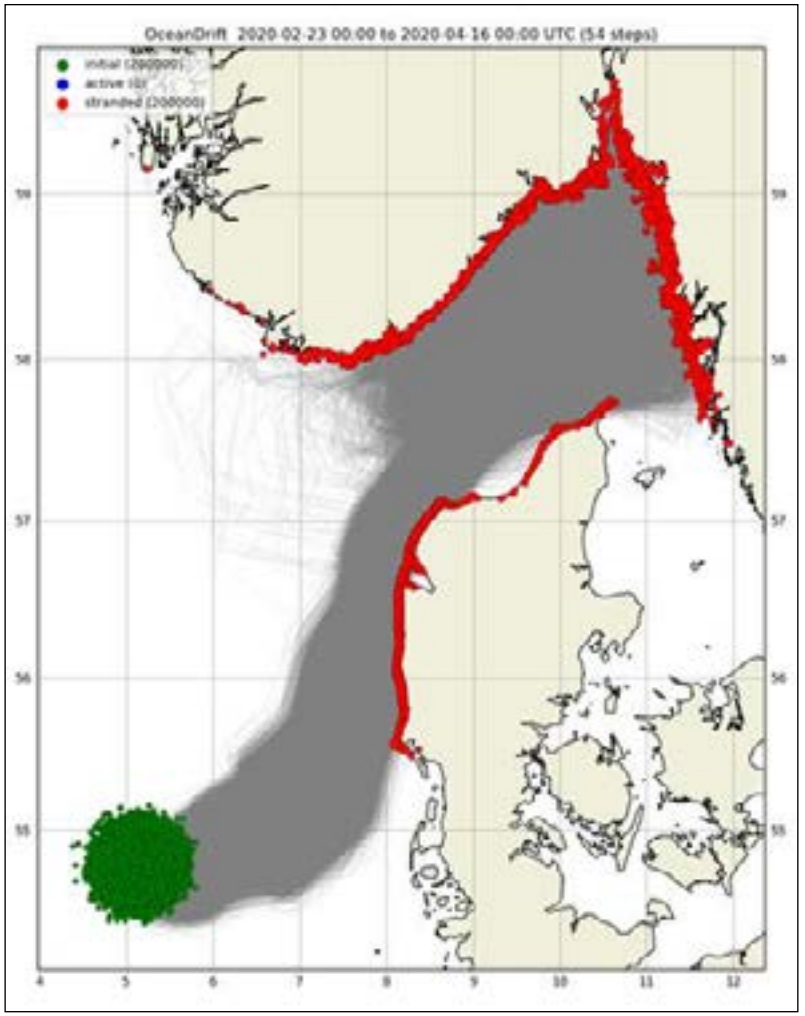
Accidental spills often occur during truck transportation, and their effects are long-lasting. The pellets are dispersed and accumulate in the environment, often environments of considerable value, before being washed into the sea and the Ocean. Clean-ups are far from being enough to solve the problem. As for the firefighters, they are not trained to deal with this specific kind of chemical pollution. The best solution remains to avoid accidental spills in the first place by improving transportation security and by ensuring that all appropriate measures and precautions have been taken at all stages of the transformation chain to ensure that containers are properly sealed and that spills do not occur when pellets are in transit.

THE NORTH SEA (DENMARK, NORWAY AND SWEDEN)

Overview

On 23rd February 2020, an accidental plastic pellet spill occurred in the North Sea. The vessel "MV Trans Carrer", owned by the shipping company Sea-Cargo and operated by Seatrans Ship Management, was travelling from Rotterdam (Netherlands) to Stavanger (Norway) to a plastic pipe manufacturer, with 26 tonnes of industrial plastic granules on board. During the night of the 22nd to the 23rd of February, a storm ruptured one of the plastic pellet containers, resulting in a spill of 13 tonnes of pellets, in the North Sea, when the vessel was near the Danish west coast. According to Svenn Roger Gundersen, the East District Police Coordinator in charge of environmental crimes, between 500 and 600 million pellets were discharged directly into the sea.

On the same night, a crew member noticed that a container had been damaged. On the 24th of February, once arrived in Tanager, Sea-Cargo notified the spill to the Norwegian coastal administration and the insurance company *GARD*. The Norwegian police weighed the containers to evaluate the proportion of spilled pellets and concluded that the spill was more than 13 tonnes. On the 16th of March, the governor of Oslo received news of the accident for the first time. In parallel, since the storm and the accident, pellets had begun to be found in the Oslo Fjord, and other locations along the coastline, and hundreds of areas were reported as being polluted. After analysis of the pellets, the Oslo Fjord Outdoor Council concluded the pollution was very probably a consequence of the Sea-Cargo spill.



9- Model of the spill establishing Sea-Cargo's responsibility. Source: Norwegian Meteorological Institute: https://www.dagsavisen.no/nyheter/innenriks/tonnevis-med-plastpellets-pa-avveie-1.1709569

Although the Norwegian authorities were quickly informed of the spill (on the day of the accident), the public was not informed until April. The connection between the spill and the pellets found on the coast was established only two months later.

Specificity

The consequences of the spill affected several European countries, polluting the coastlines of Norway, Sweden and Denmark.

Pellet spills during shipping transportation are not rare : in the past few years, many cases of pollution caused by shipping accidents and storms were reported all around the world, for example in New Zealand (2012), South Africa (Durban, 2017) and Hong Kong (2012), with disastrous consequences. One year before, in January 2019, another shipping accident, caused by a storm, provoked a huge plastic pellet spill in the same area : around 270 containers fell from the MSC Zoe ship and were lost, spreading millions of nurdles into the sea. The incident resulted in long-lasting pollution on the coastline, especially in the Friesland region, which affected the environment and biodiversity in the Wadden Islands *(North-Frisian islands)*, and, as always, the clean-up was extremely complex. Around 24 million plastic pellets are estimated to have been washed ashore along the northern Dutch coastline, nevertheless ending up in the sea.

10- Maps of the pellet accumulation areas after SeaCargo's accident. Source : Oslofjorden Friluftsräd, "OF and the Naturvernforbundet reported a pellet spill in the Oslofjord": https://www.oslofjorden.org/of-og-naturvernforbundet-anmelder-pellet-utslippet-i-

Consequences on the environment

Four months after the spill, around 700 locations polluted by plastic pellets were identified along the Norwegian coast, and other locations were found in Sweden and Denmark. Several zones were identified and mapped thanks to the work of local associations : the area runs along the Skagerrak coastline, including the Oslo Fjord, and extends as far as the Swedish west coast. According to the NGO KIMO, large quantities of pellets were found near Öckerö and Goteborg in Sweden, Holstebro in Denmark, or Arndal in Norway.

The consequences on the environment and biodiversity are dramatic : marine animals can ingest pellets, mistaking them for food and this causes concrete damage to the fragile ecosystem of the Oslo Fjord. But clean-ups of the coastlines also imply environmental damage : to take off the pellets, hours of intense cleaning are needed to remove all the pellets, and this also impacts living-organisms.

According to a councillor on the Oslo Fjord Outdoor Council, even after multiple clean-ups between March and May 2020, only one tonne of pellets, out of the 13 tonnes spilled, had been collected on the coastlines. While some pellets end up on the beach, these can also be pushed back into the sea by the wind. A huge part of the pollution will never be cleaned up, but will stay in the sea, and will end up in the food chain and intoxicate the environment and our bodies for at least hundreds of years. The effects are already visible : on the Norwegian beaches and in the Oslo Fjord, the Norwegian authorities have found the corpses of hundreds of ducks whose death is considered to be related to the pellet spill in the North Sea. The Oslo Fjord's ecosystem is extremely vulnerable, impacted by severe industrial pollution that has been going on for decades.

Impacts on local communities

The pollution has had harmful impacts on the residents and their way of life. The Oslo Fjord region is Norway's major population area, with around two million people living around the fjord, including the population of the capital. The pollution has impacted recreational activities, and has also had concrete economic consequences, spoiling the landscapes and leading to a decline in tourism.

11- Pellet pollution in the Oslo Fjord, Spring 2020. Source : Naturvernforbundet (Norwegian Association for the Conservation of Nature) : https://naturvernforbundet.no/forurensing/anmeldelse-av-plastutslipp-i-ytre-oslofjord-article40360-154.html

Responsibilities and reactions

Several companies in the plastic chain are involved : the pellets within the containers were produced by INEOS, in Rotterdam, and were being delivered to the Norwegian pipeline producer “Pipelife”, in Surnadal. The vessel was operated by Seatrans Ship Management and owned by the shipping company Sea-Cargo. Three months after the spill, Sea-Cargo published a press release on the accident, admitting responsibility for the spill. Sea-Cargo’s insurance covered the fees for the clean-ups, but not the costs for the impacts that local communities and marine life will suffer from for decades as KIMO has underlined.

Conclusions

This spill is one of the most important plastic pollution incidents in Norway, and the effects will be long-lasting, impacting the fauna and flora and accumulating in the sea, on the beaches and in the fjord for decades. Given the rise in container traffic, the likelihood of similar incidents occurring in the future is particularly worrying as container losses are extremely harmful for the sea and the Ocean and, up to now, European and International organisations have set out no specific measures to address the issue of containers lost at sea. The consequences of these losses on the environment and on coastal communities can be as harmful as oil spills.

TARRAGONA (SPAIN)

Overview

In late 2018, a large quantity of pellets – mostly made up of polyethylene according to observations from the local water agency- was found on a beach in La Pineda in Tarragona, in the North East of Spain. A similar type of pollution had been reported repeatedly over the previous years. In a clean-up organised by Greenpeace in March 2019 which gathered around 100 volunteers on La Pineda Beach, 120 million plastic pellets were collected with a ratio of 1,484 spheres per square meter. Six months later, in July 2019, extensive pellet pollution was again reported on another beach in the area, at Miracle Beach in Tarragona, one of the most popular beaches in the heart of the city. This was followed one month later by another pollution episode on the beaches of Llarga and l'Arrabassada, in Tarragona again. Pellets were also found during operations at sea. According to a monitoring protocol followed by Good Karma Projects volunteers after the spill, around 30 to 90 million pellet particles were found on La Pineda Beach immediately after the spill, with a density of approximately 500 to 3000 every m2. The pellets are of different shapes and colours and are deemed to be the result of continuous mishandling and spills from factories located next to the port of Tarragona. Discordant voices believe they might be the result of mishandling at the port.

12- Pellet pollution in the Tarragona area. Credits : Inka Reichert.

Specificity

Pellet pollution in Tarragona is recurrent, affecting several beaches. The pollution has been observed for years now, but responsibilities have not been clearly established. Tarragona together with Barcelona's industrial zone, concentrates around 70 % of the Spanish plastics production industry. According to data from the 2018 public report of the Tarragona Chemical Business Association (AEQT), 19.3 MT of plastics were produced in Tarragona in 2017. Tarragona is home to one of the major areas of concentration of petrochemical industries in Spain and Southern Europe (40 companies are registered in the area). It claims to be the first petrochemical complex in Southern Europe and concentrates a quarter of Spain's entire chemical activity, with most of the main world plastic producers and petrochemistry players (Basf, Repsol, Ercros, Covestro formerly Bayer, Messer, etc) established there ; activities cover the whole plastics production cycle, from the

unloading of oil to refining, cracking, distribution of raw materials and their transformation into final products. The industrial area is particularly close to the beach and coastal residential areas. It has been at the centre of attention since January 14th 2020, when a major accident occurred in a company transforming ethylene oxide gas into plastics, causing 3 deaths, injuring several other people and resulting in potentially carcinogenic gas emissions and the destruction of several buildings around the incident spot. As for the port of Tarragona, the petrochemical companies next to the port generate 60 % of its imports and exports. The extension of the port with the establishment of a specific logistics zone representing additional maritime traffic is a source of concern in this context. Responsibilities should be clearly established and measures put in place so that no new pellets are dispersed in the environment.

Consequences on the environment

This recurrent pollution has contaminated several beaches, including one of the most popular beaches in the area, as well as the nearby dunes. Most importantly, it is repeatedly impacting the Natura 2000 protected area of El Prats of Vila-Seca. This beach is part of the natural protected area of Sequia Major, a vulnerable wetland area and a resting place on bird migratory routes which provides shelter for several species, some of which are in danger of extinction. It is a unique and very diverse fresh and salt water environment which forms on the sandy sediments deposited by the River Francolí, mixed with seawater from the Mediterranean Sea.

13- Credits : Inka Reichert.

Impacts on local communities

All the beaches in and around Tarragona suffer from immense pellet pollution as observed in regular clean-ups organised by NGOs such as Mare Terra Fundació Mediterrània, Ecologistas en Acción, Greenpeace and the association Good Karma Projects. Both separately and jointly, these groups started to monitor the pollution and to call for action and change from the authorities and surrounding industries. This pollution was first formally identified from 2016 onward, as is shown by reports from Spanish authorities on microplastic pollution. Pellet pollution recently made headlines in the local media, revealing strong concern among the local population over this persistent and recurring form of pollution.

14- Credits : Inka Reichert.

Responsibilities and reactions

The companies responsible for the pollution have not yet been identified. Meanwhile, the association of companies present in the Tarragona industrial area has declared that companies have been taking part in Operation Clean Sweep (OCS) since 2017 and presented the initiative in an information session in November 2017. The port of Tarragona also communicated in 2020 on its involvement in the OCS initiative since May 2019. According to an investigation by the local water agency, the spill which occurred in January 2019 was the result of mishandling during loading and unloading operations at the Port of Tarragona. Strong doubts still persist, however, as the pollution is not an isolated occurrence but has regularly been observed around both the port and the industrial site and because field data at the basis of this investigation were collected months after the first pellets were reported on the beach.

The pollution was denounced by one of the political groups — Vila Seca en comu — present on the Vila-Seca City Council which brought the case before the local waste and water agencies, the Seprona (equivalent to the environmental police investigation entity) and the City of Vila Seca together with the NGO Mare Terra Fundació Mediterrània. The latter also addressed a complaint to the Port of Tarragona, the Environment and Nature Protection Departments of the Catalan regional government (Servei de Protecció de la Natura and Serveis Territorials del Departament de Territori i Sostenibilitat of the Gen-

15- Credits : Inka Reichert.

eralitat) and the Environmental Department of the local authorities in Tarragona. Different experts from the local water agency and the environmental police were sent to take field sampling and investigate the pollution. A formal request for further investigation on the toxicity level and environmental impacts of the pellets collected on the beach was formulated by a member of the Catalan Parliament who is a member of the same political group as the group from the Vila-Seca City Council which took several actions to identify responsibilities in the pollution episodes.

Conclusion

The nurdle pollution exposed here results from very recent data collection in the area. However, local activists have underlined that these spills are not new and have been happening since the petrochemical companies arrived in the area 50 years ago.

Since then, no company has been held accountable for the spills that have continuously and repeatedly affected the Tarragona area and very likely spread into the Mediterranean region reaching surrounding areas and impacting exceptional biodiversity hotspots such as the Balearic Islands and the Ebro Delta. While those responsible for the pollution remain unknown, despite two years of involvement in the OCS programme and communication from the surrounding entities, several recurring pellet pollution cases continue to occur at the expense of the environment.

ROTTERDAM (THE NETHERLANDS)

Overview

The London Haven area in the port of Rotterdam is also facing recurring plastic pellet pollution. The Recycled Park Foundation estimates that millions of pellets have accumulated in the harbour basin.

One of the main contributors to this pollution is Ducor Petrochemicals BV factories, a pellet producer. Every year, Ducor Petrochemicals produces about 9 trillion pellets, and a considerable quantity of this production ends up in the area around the production facilities, and in the London Haven area. Despite Ducor's frequent declarations in favour of best practices in pellet production and management, pollution continues to accumulate in the harbour and near the Ducor factory gate.

Specificity

Following an enforcement request submitted by the Dutch NGO Plastic Soup Foundation (PSF), the DCMR (the Environmental Department

16- Map of pellet pollution in the Port of Rotterdam. Source: Plastic Soup Foundation: https://www.plasticsoupfoundation.org/en/2020/01/plastic-soup-foundation-takes-legal-action-against-structural-plastic-pollution-2/

of the Rijnmond Region) compelled Ducor to pay a penalty of 15 000€ per established violation and to organise the clean-up of the harbour. This case is emblematic : it is the first time a court of justice has condemned a company to clean-up pellet pollution in Europe.

PSF also took the case to the Omgevingsdienst Zuid-Holland Zuid (the Environmental Department of South Holland) and to fifteen municipalities in the Rijnmond region and submitted an enforcement request (for the clean-up of the area near Ducor factories). The NGO is still waiting for their decision.

Consequences on the environment

In the Rotterdam region known as the Rijnmond, two natural reserves are impacted by this pellet pollution : the Grensmaas and the shore of the Escaut river. Research conducted in the context of the Clean Rivers project – a project led by Plastic Soup Foundation, IVN Natuureducatie and Stichting De Noordzee along the Maas and Waal rivers in order to monitor and acquire data on riverine litter in these areas — showed that nurdles were present in 43 % of the monitored areas. The enforcement request against Ducord which was addressed to the Environmental Department of South Holland by PSF is based on the pollution of a Natura 2000 zone and will determine the company's responsibility on this matter.

Following the DCMR's decision, Ducor organised several clean-ups of the area : they collected four bags of pellets, and 17 bags of coarse solid waste, showing the scale of the pollution. Four months after the clean-up, the London Haven area was still full of plastic pellets. As can be seen in the videos and photos taken by PSF members, the floor is still covered with plastic pellets, despite the clean-up. Near Ducor's factory gate, plastic pellets were still easy to find, as well as in other locations in the harbour (Lekhaven…).

17- Pellet pollution in the London haven. Source : Plastic Soup Foundation : https://www.youtube.com/watch?v=qPgyAh43toc&feature=youtu.be

Impacts on local communities

The Dutch NGO PSF took legal action against Ducor and conducted a detailed research on plastic pellet pollution in the Netherlands, including the case of Rotterdam.

Responsibilities and reactions

At first, Ducor acknowledged it was partly responsible and organised several clean-ups of the harbour. However, the company only recognised co-responsibility for the pollution, and claimed other factories

in Rotterdam's harbour shared the responsibility. On the basis that it recognised no more than co-responsibility, Ducor finally decided to fight against the DCMR's decision, and this led to a temporary suspension of the penalty payment. Arguing that the pollution problem was wider than Ducor's activity, the company contested the fine, and called for a joint approach regarding pellet spills. In parallel, the company stated it would improve pellet pollution monitoring around the factory. In March 2020, Ducor joined the OCS program and announced its intention of assuming its social responsibility". Since then, Ducor has promoted actions to raise awareness about this issue, in collaboration with Plastics Europe (i.e. online conference), but still refuses to take the full responsibility for its own pollution by contesting the penalty decided by the DCMR.

The other companies involved in handling plastic pellets in the area have up to now refused to recognise any responsibility in the pollution affecting the port.

After PSF's enforcement request, the regional environmental department DCMR stated it would make pellet contamination a priority, thus showing growing interest from the authorities. As Ducor is not the only polluter in the port, the DCMR's control of the facilities regarding pellet spills will be stricter and more frequent, and the DCMR does not exclude the possibility of taking further coercive measures in case of bad practices.

Conclusion

This case highlights the weakness of the pellet handling companies'commitment to adopt best practices in order to limit pellet spills. Despite Ducor's decision to join the OCS program, the pollution continues to accumulate. Even with the compulsory decision coming from judicial authorities the industry has tried to resist ; extra precautions are needed to improve security within the facilities and avoid pellet spills and structural pollution. As underlined by PSF, "Voluntary commitments under Zero Pellet Loss or Operation Clean Sweep, unfortunately, offer no guarantee that nurdles will not end up in the environment". In the United States, there have been several examples of lawsuits following pellet pollution. In Texas, thanks to the mobilisation of local residents, Formosa Plastic was sentenced to pay a 50 million dollar fine and committed to a "zero waste" objective after several years of continuous pellet pollution.

This case is also an illustration of how often actors in the plastic transformation chain blame others in the same chain, in order to avoid assuming their own responsibility. It shows that only a supply chain approach can avoid such situations occurring and being repeated at different times and in different places.

ANTWERP (BELGIUM)

Overview

Antwerp harbour has been facing huge and persistent pellet pollution from production plants. In the industrial cluster, the existing plastic manufacturing plants spill a massive number of pellets, mostly during production and transportation, causing immense trouble for the residents and the ecosystems.

The independent media channel Mondiaal Nieuws revealed that in 2017, about 4000 kg of pellets were found in the Antwerp port area. In an operation called “Plastickeuteljacht” (“Plastic Droppings” in English), organised by the citizen initiative Antwerpen Schaliegasvrij in November 2019 along the Belgian coast and in the Scheldt Estuary, volunteers collected around 22 000 pellets in 50 samples on a total surface of 3 square metres, a colossal number. The further the volunteers moved away from the harbour, the fewer pellets were found, proving that the source of the pellet contamination is the chemical and plastic chain industry in the port area, and not the North Sea.

Specificity

Antwerp’s (petro) chemical cluster is the largest in Europe, and the second largest cluster in the world, Houston (United States) ranking on N°1. Situated in the Port of Antwerp, it is home to over 500 chemical companies, as well as five oil refineries and four steam crackers. On a global basis the city is also ranked amongst the most air-polluted areas. Antwerp harbour is considered as an important European hub

18- Photography taken during the nurdle hunt in Antwerp, in 2019. Credits: Antwerpen Shchaliegasvrij.

for the production of plastics : thirteen plastic conversion or recycling companies, and ten pellet-production facilities have been identified, which is generating a massive pollution problem. Among these companies, some industrial giants like Exxonmobil, INEOS, BASF, Sabic, Covestro or Borealis. are represented.

In January 2019, the UK-Switzerland-based company and Europe's ethylene producer No. 1 INEOS announced a three billion euro investment for Project One, which represents the largest petrochemical investment in Europe for 20 years. This includes the construction of a new virgin plastic production factory, composed of an ethane cracker, which will convert ethane — originating from US fracked gas — into ethylene, and a propane dehydrogenation plant, which will change propane into propylene. Ineos was founded in 1998 in the Port of Antwerp. According to Ineos, the company operates several manufacturing sites in Belgium — including Antwerp.

INEOS's "Project One" is highly criticized by a growing number of citizens in Antwerp, in Belgium and beyond, because of its expected impacts on the environment and climate, among many other things. Local and European associations have highlighted the obvious contradiction between INEOS'Project One and the EU Green Deal and the Single-Use Plastics Directive. With the Green Deal, the EU committed to move toward a more circular and less polluting economy ; however, as activists underline, the production of plastic and of additional disposable plastic items — the new factories are expected to produce hundreds of thousands of tonnes of plastics each year — would result in extra air pollution. The production process, which relies on fracked ethane extracted in the US and shipped to the EU, shows little regard for the devastating impacts on local communities in the USA. It also completely ignores and torpedoes European and international climate commitments. Moreover, in order to build the new facilities, INEOS plans to deforest an area of about 50 hectares.

Beyond these devastating impacts on climate and nature, and according to I estimates, the new factories will become crucial integrated units for the production of more nurdles, which will worsen the pollution in the Antwerp harbour, while impacting frontline communities.

19- Photography : pellet pollution in the Galgeschoor Natura 2000 area. Source : Port of Antwerp : https://www.portofantwerp.com/nl/galgeschoor-plastic-challenge

Consequences on the environment

The pellet pollution is affecting areas protected under the Natura 2000 and Ramsar conventions in Belgium and beyond. Near the port of Antwerp, a protected natural reserve called Galgeschoor, covering more than 100 hectares, is endangered by this "historical" pellet pollution. Year after year, pellets are incorporated into the environment and the vegetation, particularly because the ground is very muddy in this marshy environment. This situation is putting a protected swamp and its unique fauna and flora at risk. For example, the grey goose and the common teal spend their hibernation period in the area, and it is a place of living and reproduction zone for several wading bird species. In response to this disastrous situation, the port of Antwerp organises every year a voluntary clean-up of the Galgeschoor, which is far from being sufficient : even after the clean-ups, millions of pellets still remain in the environment.

The pollution not only affects this Natura 2000 area, it is also impacting the Schelde river : after their nurdle hunt in 2019, Antwerpen volunteers concluded that billions of pellets had ended up in the river and on the shore because of the industrial activities.

Impacts on local communities and civil society mobilisation

A large coalition of environmental NGOs is fighting against INEOS : among them, Belgian associations such as Antwerpen Shaliegasvrij (Antwerp shale free), Greenpeace Belgium, WWF Belgium and the INEOS Will Fall coalition but also other European organisations and

20- Occupation of INEOS site, 3 October 2020. Credits : Illias Teirlinck.

21- Occupation of INEOS site, 3 October 2020. Credits : Illias Teirlinck.

movements such as Food & Water Europe, Break Free From Plastic, Greenpeace UK, Frack Free United, Client Earth, Extinction rebellion or Women Engage for a Common Future.

The population's awareness of pellet pollution is increasing, as well as anger against the industry and the authorities. Civil society has launched several actions in order to protest against INEOS's new factories : petitions, communication on social media, a joint letter to the Flemish government… One of the most emblematic actions undertaken by the associations was the occupation of the INEOS site in October 2020.

Citizens are tired of seeing the pellet accumulation near the city and of suffering the consequences of plastic production near their homes, the associations seem determined to fight back, and protest against the industry's – and in particular INEOS's — impacts and expansion.

Responsibilities and reactions

In 2017, Antwerp harbour decided to react to this issue publicly, and signed a charter with companies of the plastic chain, establishing the goal of "zero pellet loss". The initiative was launched in the framework of Operation Clean Sweep, which is conducted by industry, and involves voluntary commitments from the industry, logistics and transport sectors to prevent pellet spills. However, despite the clean-ups organised by the Antwerp harbour authorities, new pellet pollution keeps accumulating as the port authorities themselves have stated. According to the harbour's 2019 sustainability report, which is based on weekly and yearly monitoring of the quantity of pellets collected, the pollution is clearly not decreasing : *"Weekly monitoring clarifies where pollution occurs and where measures may be required. We have been regularly organising big clean-up activities since 2017. In 2017, 2018 and the first quarter of 2019, 3.4, 3.3 and 3.3 tonnes of pellets respectively were removed from the environment. There is still no reduction, so an extra reason to take further action"; "Despite the measures companies have taken, our approach in the fight against plastic pollution has not yet demonstrated the required results."*
Along with fifteen other companies, INEOS signed the Operation Clean Sweep charter. The company has been communicating since then on its efforts to reduce pellet spills (i.e. extra-personnel to check up the vehicles between each journey). However, according to Antwerpen Schaliegasvrij, INEOS had one year to tackle the accumulation of pellets in the estuary in the Schelde river estuary and in the port of Antwerp, without any improvement so far : *"Despite the fact that INEOS had one year to tackle the plastic pollution in the port of Antwerp and the Scheldt estuary, the situation is unchanged. Again, INEOS is contributing to the problem and not to the solution".*

Conclusion

Despite the charter adopted by the port of Antwerp and the plastic processing and production companies, and actions carried out within Operation Clean Sweep, pellets continue to accumulate and pollute the harbour and the environment, while the industry pursues its efforts to expand and increase the demand for plastics, in total disregard of the imperative need to curb plastic and carbon emissions.

CONCLUSION

KEY FINDINGS FROM THE CASE STUDIES

These case studies show that pellet pollution is pervasive and recurrent, and requires a large-scale approach at continent level since it impacts all European countries and territories without distinction, even those which do not host any pellet producers, as is the case of Denmark. All the cases involve a large diversity of actors along the plastic production and distribution chain : transporters (through trucks and ships as exemplified by the Côte d'Opale and North Sea studies), pellet producers and transformers (Antwerp, Rotterdam and Tarragona).

Beyond the visible pollution affecting some areas after a spill, an accident or caused through continuous production, pellets are quickly and widely spreading into new areas as the Côte d'Opale and the Tarragona stories show. Pellets are present beneath the surface and are spreading into our waters and seas. Those found on the beach or in the streets are only the tip of the iceberg. We can easily assert that pellet pollution in fact exceeds what we have estimated so far.

Once scattered in the environment, clean-ups remain futile as the Côte d'Opale experience shows, with pellets being still found months after the spill. While they are useful in monitoring pollution and identifying pollution sources, clean-ups do not address pollution at source, they are also expensive, have the potential to further damage the environment and require a lot of human and technological resources. Even with many volunteers and the appropriate tools, it is impossible to clean-up an entire pellet-polluted area, showing that the only way to progress on this issue is to prevent pellet spills from occurring in the first place. The question also remains open why polluters are still not held responsible and forced to pay at least all the costs related to the clean-ups made necessary because of the pollution caused by the industry.

Nurdles remaining in the environment constitute a persistent and long-lasting form of pollution which endangers the biodiversity present for decades, and severely impacts the marine environment and water bodies, as the Tarragona, North Sea or Côte d'Opale cases underline. These nurdles often impact zones of high biodiversity value such as Natura 2000 and Ramsar areas. Their massive impacts justify taking robust legal measures.

The case studies have shown that the impacts and implications of pellet spills are multiple and cannot be limited to a local pollution issue. Pellet pollution, as the Antwerp story proves, is interlinked with other causes of the global destruction of the environment. The plastic industry is dependent on fossil energies, and thus contributes to climate change and the disastrous consequences this will entail for humans and ecosystems. The Antwerp case is a good illustration of this interconnexion : INEOS relies on fracked shale gas extracted in the United States, and shipped to Belgium, thus contributing to methane and CO2 emissions and to worsening pollution caused by plastics. At the same time, new facilities that produce or help produce more virgin plastics are definitely neither in line with the Plastics Strate-

gy and notably the Single-Use Plastics Directive that has mandatory provisions to reduce plastic use in the EU nor with the EUs climate obligations under the Paris Agreement. Allowing the expansion of existing facilities or the development of new facilities would be a contradiction of existing legislation.

These case studies are also useful reminders that a growing number of European citizens are witnessing pellet pollution in their area. The considerable amounts of plastic pellets ending up along and in Europe's water bodies and seas are facing public disapproval. Civil society's awareness of the issue is increasing, provoking debates and mobilizations. It represents a real concern for the population, as is illustrated by the scale of the international mobilization in Antwerp against INEOS or the scandal provoked by the shipping accident in the North Sea. The plastics industry has long blamed citizens for the plastic problem and pointed to incorrect disposal and weak waste management in order to explain the plastic crisis. The cases exposed in the report show how far this narrative falls apart when it comes to plastic pellets. For once, the plastic industry cannot point to citizens'individual responsibility, as it tends to do for other plastic items : with plastic pellet pollution, the industry holds full responsibility.

Finally, these case studies are all recent cases, which proves that while the situation is not new, it still continues to be out of control today, despite repeated declarations from the plastics giants that everything is going in the right direction.

Non-corrective actions, mere declarations and non-controlled best practices from the industry have proven to be unsuccessful in the fight against pellet pollution. Operation Clean Sweep, led by industry players, has shown its limits and has proven to be unable to solve the pellet pollution issue : in almost all the cases described in this report (Tarragona, Antwerp and Rotterdam), the industry players had signed the OCS charter, yet pellet losses keep occurring on a large scale as part of a structural problem. In some of these cases, the industry subscribed belatedly to the initiative. It is disturbing to note that, Operation Clean Sweep not being legally obligatory for the many companies handling pellets, private actors decide to become involved in initiatives which have long existed only after pollution occurs and is relayed by the media. This proves that applying a series of measures to prevent pellet loss should not be an option given to industry players but should be made compulsory by law and strictly enforced. Along the same lines, it is emblematic to note that, despite continuous pellet pollution and the mobilisation of thousands of citizens against pollution, Plastics Europe, in its annual OCS 2019 report, gives the examples of the situation in the ports of Antwerp and Tarragona in its "achievements and best practices" section ! This shows, once again, that the industry players'standards regarding pellet spills do not match reality on the ground.

This is particularly worrying as pellet pollution adds to the estimated 12 million tonnes of plastics that end up in the ocean every year. With plastic production projected to double by 2035 and to almost quadruple by 2050, these case studies plead irrefutably for regulatory measures that put an end to pellet releases once and for all.

OUR RECOMMENDATIONS

The Rethink Plastic alliance recommends the adoption of legislative measures at EU level to :

- Hold all companies involved in making, using or transporting pellets accountable by law ;
- Compel companies to follow and respect specific guidelines to prevent pellet loss ;
- Impose that all staff are trained ;
- Set legal obligations for frequent and independent third party audits of these companies ;
- Ensure that companies are working together across the supply chain ;
- Penalise pellet spills in the environment ;
- Deny permits for new infrastructure aiming at increasing plastic production in Europe.

22- Beach in the Landes region, France, 2020 – Credits : Surfrider Foundation Europe.

RECOMMENDED FEATURES OF AN EU PELLET REGULATION :

The main features of any EU Pellet Regulation should include :

OBLIGATION : Economic operators placing pellets or plastic products on the EU market must ensure best practice management systems are in place and applied throughout the supply chain to prevent pellet pollution.

BEST PRACTICE MANAGEMENT SYSTEMS : These systems would be made up of a series of best practice measures and controls to prevent pellet pollution, including requirements for annual reporting and regular third-party auditing and verification.

MONITORING ORGANISATIONS : Formally recognised by the Commission to undertake required monitoring, including regular evaluation of operators and notification to the authorities of significant or repeated failure by operators to meet requirements.

COMPLIANCE AND ENFORCEMENT : Competent authorities carry out checks at regular intervals on operators to ensure compliance and on monitoring organisations to verify continued fulfilment of their function.

REFERENCES

All

Eunomia for DG Environment of the European Commission, "Investigating options for reducing releases in the aquatic environment of microplastics emitted by (but not intentionally added in) products", 23 February 2018 : https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/microplastics_final_report_v5_full.pdf

FIDRA's Nurdle Hunt website : https://www.nurdlehunt.org.uk/the-problem.html#toxic

Mato, Y., Isobe, T., Takada, H., Kanehiro, H., Ohtake, C., Kaminuma, T., "Plastic resin pellets as a transport medium for toxic chemicals in the marine environment" in Environmental Science and Technology 35 (2), 318-324, 2001: https://pubs.acs.org/doi/10.1021/es0010498

Plastics Europe, "Operation Clean Sweep (OCS) Progress report 2019": https://www.plasticseurope.org/download_file/force/4156/181

Rethink Plastic Alliance (RPa), "Our Ocean needs actions, not promises : towards a regulatory approach to prevent plastic pellet loss in the EU", April 2020 : https://rethinkplasticalliance.eu/wp-content/uploads/2020/04/bffp_rpa_pellets_paper.pdf

RPa, "Pellets in the spotlight", 24 February 2020 : https://rethinkplasticalliance.eu/news/plastic-pellets-in-the-spotlight/

Seas at Risk, "Initial contribution to the EC study on production plastic pellets", 7 February 2020.

SOS Mal de Seine, "Granulés plastiques industriels sur le littoral français, rapport initial". May 2009 : http://maldeseine.free.fr/documents%20granules/RAPPORT_version_WEB.htm

Introduction

European Environment Agency, Briefing "The plastic waste trade in the circular economy", 28 October 2019 : https://www.eea.europa.eu/themes/waste/resource-efficiency/the-plastic-waste-trade-in

Hens Tine, "The great spill of the plastics industry : mountains of nurdles on the beach". Mondiaal Neuws, 16 July 2019 : https://www.mo.be/en/report/great-spill-plastics-industry-mountains-nurdles-beach

RPa, 'Time for the EU to get major on microplastic pollution and clamp down on "mermaid tears", 29 March 2019 : https://rethinkplasticalliance.eu/news/time-for-the-eu-to-get-major-on-microplastic-pollution-and-clamp-down-on-mermaid-tears/

Schaart Eline, "Antwerp's big nurdle battle", Politico, 3 February 2020 : https://www.politico.eu/article/antwerps-big-nurdle-battle/

Sea Shepherd Hong Kong, "Six years after the world's biggest pellet spill", 24 July 2018 : https://www.facebook.com/SeaShepherdHK/videos/six-years-after-the-worlds-biggest-plastic-pellet-spill/2019635021381113/

Surfrider Foundation Europe, "Environmental report of the Ocean Initiatives 2019", September 2020, p83-85 : https://www.initiativesoceanes.org/2019/BILAN/bilan_surfrider_2019_engl_WEB.pdf

Williams Martin, "Pellet spill during typhoon sparked big volunteer clean-up on Hong Kong beach", South China Morning Post, 19 August 2012 : https://www.scmp.com/news/hong-kong/article/1018034/pellets-spill-during-typhoon-sparked-big-volunteer-clean-hong-kong

Côte d'Opale case-study

Fabre Mael, "Morbihan. Un camion perd sa marchandise, 28 tonnes de granulés en plastique sur la route", in Ouest France, 7 November 2019 : https://www.ouest-france.fr/bretagne/ploermel-56800/morbihan-un-camion-perd-sa-marchandise-28-tonnes-de-granules-en-plastiques-sur-la-route-6598867#:~ : text = Morbihan.-, Un % 20camion % 20perd % 20sa % 20marchandise % 2C % 2028 % 20tonnes % 20de % 20granul % C3 % A9s % 20en, en % 20La % 20Gacilly % 20 (56), & text = La % 20route % 20est % 20ferm % C3 % A9e % 20 % C3 % A0, les % 2028 % 20tonnes % 20de % 20granul % C3 % A9s

Parc naturel marin des estuaires picards et de la mer d'Opale, "Plan de gestion", December 2015 : https://parc-marin-epmo.fr/documentation/plan-de-gestion

North Sea case-study

Bonn Agreement, "Accidental release of plastic pellets in the North Sea", 12 June 2020 : https://www.bonnagreement.org/news/accidental-release-of-plastic-pellets-in-the-north-sea/

KIMO, "Plastic pellets spill pollutes Danish, Norwegian, Swedish coastlines", 26 May 2020 : https://www.kimointernational.org/news/plastic-pellets-spill-pollutes-danish-norwegian-swedish-coastlines/

Norner, "Skade på container har forårsaket plast-pellets i Oslofjorden", 29 April 2020 : https://www.mynewsdesk.com/no/norner-as/pressreleases/skade-paa-container-har-foraarsaket-plast-pellets-i-oslofjorden-2995380

Oslofjordens Friluftsrad, "Oppdatering på plastutslippet": https://www.oslofjorden.org/oppdatering-pa-plastutslippet/

"Plastic pellets spill tied to container ship", News in English, 30 April 2020 : https://www.newsinenglish.no/2020/04/30/plastic-pellet-spill-tied-to-container-ship/

Plastic Soup Foundation, Millions of plastic nurdles pollute Oslofjord in Norway, 20 May 20 : https://www.plasticsoupfoundation.org/en/2020/05/millions-of-plastic-nurdles-pollute-oslofjord-in-norway/

Sandberg Tor, "Antagelig er tusenvis av ærfugler døde", Dagsavisen, 31 March 2020 : https://www.dagsavisen.no/demokraten/antagelig-er-tusenvis-av-erfugler-dode-1.1693356

Sandberg Tor, "Skandaløst av Kystverket", in Dagsavisen. 5 May 2020 : https://www.dagsavisen.no/nyheter/innenriks/skandalost-av-kystverket-1.1708258

Sandberg Tor, “Store mengder plastkuler funnet på strender : – Fugler spiser dem, blir syke og dør”, Dagsavisen, 20 March 2020 : https://www.dagsavisen.no/demokraten/antagelig-er-tusenvis-av-er-fugler-dode-1.1693356

Sandberg Tor, “Tonnevis med plastpellets på avveie”, in Dagsavisen. 4 May 2020 : https://www.dagsavisen.no/nyheter/innenriks/tonne-vis-med-plastpellets-pa-avveie-1.1709569

Schulze Eric, “Anmeldelse av plastutslipp i Ytre Oslofjord”, Naturvern-forbundet, 29 April 2020 : https://naturvernforbundet.no/forurensing/anmeldelse-av-plastutslipp-i-ytre-oslofjord-article40360-154.html

Surfrider Foundation Europe, “Containers overboard ! 10 proposals to prevent container losses”, 2019 : https://surfrider.eu/wp-content/uploads/2019/03/rapportconteneursen_compressed.pdf

Tarragona case-study

“ACA y el Seprona investigan las bolitas de plástico de la playa de la Pineda”, Diari de Tarragona, 8 February 2019 : https://www.diaridetarragona.com/costa/ACA-y-el-Seprona-investigan-las-bolitas-de-plastico-de-la-playa-de-la-Pineda-20190208-0052.html

Centro de Estudios de Puertos y costas, “Informe técnico — Programa de seguimiento de microparticulas en playas”, 2016, 2017, 2018, 2019 : https://www.miteco.gob.es/es/costas/temas/proteccion-medio-marino/basuras-marinas/basura-programas.aspx

“El misterio de las bolas de polipropileno en las playas”, La Vanguardia, 15 June 2020 : https://www.lavanguardia.com/local/tarragona/20200615/481776037218/playas-tarragona-bolas-polipropileno-pellets.html?utm_term=botones_sociales_app&utm_source=social-otros&utm_medium=social

“La ACA requiere información al Port y a la AEQT por el vertido de bolas de plástico en la Pineda”, Diari Més Digital, 13 March 2019 : https://www.diarimes.com/es/noticias/camp_tarragona/2019/03/13/la_aca_requiere_informacion_port_aeqt_por_vertido_bolas_plastico_pineda_57085_1093.html

“La Generalitat pide al Port de Tarragona y a las químicas información de las bolitas de plástico en La Pineda”, Diari de Tarragona, 13 March 2019 : https://www.diaridetarragona.com/costa/La-Generalitat-pide-al-Port-de-Tarragona-y-a-las-quimicas-informacion-de-las-bolitas-de-plastico-en-La-Pineda-20190313-0051.html

“La playa de La Pineda acumula más de 120 millones de bolas de plástico”, Diari de Tarragona, 17 March 2019 : https://www.diaridetarragona.com/costa/La-playa-de-La-Pineda-acumula-mas-de-120-millones-de-bolas-de-plastico-20190317-0014.html

“Las bolas de plástico aparecidas en la playa de la Pineda llegan al Parlament”, Diari Més Digital, 19 February 2019 : https://www.diarimes.com/es/noticias/camp_tarragona/2019/02/19/las_bolas_plastico_aparecidas_playa_pineda_llegan_parlament_55479_1093.html

“Mediterrània denuncia les boles de plàstic aparegudes a la platja del Miracle de Tarragona”, Catalunya Diari, 26 July 2019 : https://cata-

lunyadiari.com/catalunya-meteo/mediterrania-denuncia-boles-plastic-aparegudes-platja-del-miracle-tarragona

"Millones de bolas de plástico en la playa de la Pineda", Diari de Tarragona, 25 January 2019 : https://www.diaridetarragona.com/costa/Millones-de-bolas-de-plastico-en-la-playa-de-la-Pineda-20190125-0036.html

"Tornen a aparèixer centenars de boles de plàstic a la platja Llarga de Tarragona", Tarragona Digital, 12 August 2019 : https://tarragona-digital.com/tarragona/boles-plastic-platja-llarga-tarragona

Rotterdam case-study

DCMR *(joint environmental protection agency of the province of South Holland and 15 municipalities)*, "DCMR zet milieuvervuiling plastic korrels hoog op de agenda", 26 March 2020 : https://www.dcmr.nl/nieuwsberichten/2020/03/dcmr-zet-milieuvervuiling-plastic-korrels-hoog-op-de-agenda.html

Ducor Petrochemicals, "Ducor commits to the Operation Clean Sweep program", 9 March 2020 : https://ducorchem.com/news/2020/03/operation-clean-sweep/

Keunen Yvonne,"Haven vervuild met enorme berg plastic korrels : 'Daar hoor je niemand over'" in AD, 13 June 2019 : https://www.ad.nl/rotterdam/haven-vervuild-met-enorme-berg-plastic-korrels-daar-hoor-je-niemand-over~a8eb019e/?referrer = https % 3A % 2F % 2Fwww. google. com % 2F

"Plastic Soup Foundation zet eerste juridische stappen tegen structurele plasticvervuiling ?", in De Gouda, 17 January 2020 : https://de-gouda.nl/plastic-soup-foundation-zet-eerste-juridische-stappen-tegen-structurele-plasticvervuiling/

Plastic Soup Foundation (PSF), "After success in Rotterdam, Plastic Soup Foundation tackles pollution in Limburg", 30 April 2020 : https://www.plasticsoupfoundation.org/en/2020/05/after-success-in-rotterdam-plastic-soup-foundation-tackles-pollution-in-limburg/

PSF, "Ducor Petrochemicals to be held responsible for plastic nurdle pollution", 27 March 2020 : https://www.plasticsoupfoundation.org/en/2020/03/ducor-petrochemicals-to-be-held-responsible-for-plastic-nurdle-pollution/

PSF, "Ducor tries to shift the responsibility for plastic pollution", 15 July 2020 : https://www.plasticsoupfoundation.org/en/2020/07/ducor-tries-to-shift-the-responsibility-for-plastic-pollution/

PSF, "Out of control", 9 January 2020 : https://www.plasticsoup-foundation.org/en/2020/01/plastic-soup-foundation-takes-legal-action-against-structural-plastic-pollution-2/

Antwerp case-study

ClientEarth, "Major Ineos plastics refinery faces delays after legal action", 30 April 2020 : https://www.clientearth.org/press/major-ineos-plastics-refinery-faces-delays-after-legal-action/

EOS Wetenschap, "Tienduizenden plastic pellets in Antwerpse haven": https://www.eoswetenschap.eu/natuur-milieu/tien-duizenden-plastic-pellets-antwerpse-haven

Hens Tine, "The great spill of the plastics industry : mountains of nurdles on the beach", Mondiaal Neuws, 16 July 2019 : https://www.mo.be/en/report/great-spill-plastics-industry-mountains-nurdles-beach

Ineos will fall website : https://ineoswillfall.com/

"Le port d'Anvers engagé contre la perte de granulés plastiques", Environnement magazine, 13 October 2017 : https://www.environnement-magazine.fr/recyclage/article/2017/10/13/115105/port-anvers-engage-contre-perte-granules-plastiques

"Na plastickeuteljacht : "Mogelijk tientallen miljarden pellets op oevers van Schelde", HLN, 7 November 2019 : https://www.hln.be/antwerpen/na-plastickeuteljacht-mogelijk-tientallen-miljarden-pellets-op-oevers-van-schelde-br~a77cf3f5/?referer = https://www.google.com/

Oslofjordens Friluftsrad, "Oppdatering på plastutslippet": https://www.oslofjorden.org/oppdatering-pa-plastutslippet/

PlasticsEurope, "PlasticsEurope Operation Clean Sweep — Report 2018": http://www.opcleansweep.eu/wp-content/uploads/2019/03/OCS_A4_Report_2018_ONLINE.pdf

Port of Antwerp, "Galgeschoor Plastic Challenge": https://www.portofantwerp.com/nl/galgeschoor-plastic-challenge

Port of Antwerp, Sustainability report, 2019 : https://www.portofantwerp.com/static/duurzaamheidsverslag/en/PDF/poa_sustainabilityreport.pdf

Port of Antwerp, "Wie heeft de oplossing voor het verwijderen van pellets uit het Galgeschoor ?", 21 August 2019 : https://www.portofantwerp.com/nl/news/wie-heeft-de-oplossing-voor-het-verwijderen-van-pellets-uit-het-galgeschoor

Schaart Eline, "Antwerp's big nurdle battle", Politico, 3 February 2020 : https://www.politico.eu/article/antwerps-big-nurdle-battle/

Schalnger Zoe, "Progress toward a new plastic plant highlights Europe's plastic paradox", Quartz, 12 November 2019 : https://qz.com/1746650/ineos-plastic-plant-in-belgium-receives-permit-to-cut-down-forest/#:~ : text = Already % 2C % 20the % 20port % 20of % 20Antwerp, of % 20microplastic % 20in % 20the % 20environment

Break Free from Plastic is a global movement envisioning a future free from plastic pollution made up of 1,400 organisations from across the world demanding massive reductions in single-use plastic and pushing for lasting solutions to the plastic pollution crisis. More info : www.breakfreefromplastic.org

Surfrider Foundation Europe gratefully acknowledges financial assistance from the **European Union** and generous support from **Plastic Solutions Fund** for this publication. The content of this publication is the sole responsibility of Surfrider Foundation Europe and cannot be regarded as reflecting the position of the funders mentioned above. The funders cannot be held responsible for any use that may be made of the information contained therein.