OSPAR COMMISSION

Scoping study to identify key waste items from the fishing industry and aquaculture

Marine Litter Regional Action Plan Action 35

Environmental Impacts of Human Activites

2019

OSPAR Regional Action Plan Marine Litter

Scoping study

Action 35

"Identify the options to address key waste items from the fishing industry and aquaculture, which could contribute to marine litter, including deposit schemes, voluntary agreements and extended producer responsibility."

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1. Title

OSPAR scoping study concerning the elaboration of programs and measures relating to Action 35 “Identify the options to address key waste items from the fishing industry and aquaculture, which could contribute to marine litter, including deposit schemes, voluntary agreements and extended producer responsibility” of the OSPAR Regional Action Plan for prevention and management of marine litter in the North East Atlantic. The following report refers then to the OSPAR Convention (1992).

2. Contents

2.1. Table of illustrations

3. Definitions and glossary

3.1. Definitions for four key expressions used in this document:

Key waste items from the fishing industry and aquaculture: these activities generate plastic macro-waste such as nets, buoys, bags or crates, organic waste such as empty shells, wooden piles and metallic waste such as oyster tables made out with metal. The present study only focuses on plastic waste since wooden piles and steel tables are easily turn into secondary materials for waste-to-energy or metal recovery.

Voluntary agreement: refers to a legal form of agreement between organizations, in contrast to a top-down legally binding political decision. This is a form of alternative instrument to traditional legislation, seen as more efficient than "command and control" regulation in the field of environment protection to underline the added value attached to work. Attention needs to be brought on the fact that EPR schemes and deposit schemes (market-based solutions) could be voluntary agreements (legal form).

Deposit scheme: this is a specific type of voluntary agreement where waste generators and waste collectors negotiate to leave and collect waste in specific collection points. This also refers to market-based Deposit Refund Scheme (DRS) or Containers Deposit Refund (CDR) where consumers get a refund on the packaging of the products if they leave it in the appropriate collection point.

Extended Producer Responsibility (EPR): like deposit schemes, this is a market-based policy approach in which producers or users pay a tax to finance the treatment or disposal of the specific waste they generate throughout their activity.

3.2. Glossary:

ALDFG Abandoned, Lost or otherwise Discarded Fishing Gear

CNPMEM Comité National des Pêches Maritimes et des Elevages Marins (Committees for Maritime Fisheries and Fish Farming)

CRC Comité Régional de Conchyliculture (Regional Committee of shellfish aquaculture)

CDR Container Deposit Refund

CPs Contracting Parties of OSPAR

DFG Derelict Fishing Gears

DIRM Direction Inter-Régionale de la Mer

DPMADirection des Pêches Maritimes et de l'Aquaculture (Department of Fisheries and Aquaculture / Ministry of Environment)

DPG Deutsches Pfandsystem GmbH

DRS Deposit Refund Scheme

EC European Commission

EIHA OSPAR's Environmental Impacts of Human Activities Committee

EPR Extended Producer Responsibility

EU European Union

FAO Food and Agriculture Organisation

FFL Fishing for Litter

HDPE High-density polyethylene

ICG-ML Intersessional Correspondence Group on Marine Litter

IMTA Integrated Multi-Trophic Aquaculture

IRDL Institut de Recherche Dupuy Lôme

GES Good Environmental Status

GFCM General Fisheries Commission for the Mediterranean

GRT Gross Registered Tons

LDPE Low-density polyethylene

MAP Mediterranean Action Plan

MDPE Medium-density polyethylene

MOU Memorandum of Understanding

MSFD Marine Strategy Framework Directive

NEAFC North East Atlantic Fisheries Commission

OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic

PAMM Plan d'Action pour le Milieu Marin (Action Plan for Marine Environment)

PE Polyethylene

PET Polyethylene terephthalate

PP Polypropylene

PRF Port Reception Facilities

PVC Poly vinyl chloride

RAP Regional Action Plan

R&D Research and Development

RSC Regional Sea Convention

SDG Sustainable Development Goal

SGW Ship-Generated Waste

SME Small and medium-sized enterprises

UNEP United Nations Environmental Program

WFD Water Framework Directive

4. Summary

This scoping study identifies different options to handle and manage plastic waste items from the fishing industry and aquaculture - old fishing nets, oyster bags, cones, crates and mussels' nets – in France and in Europe. This report aims at sharing the work in progress of the Marine Cooperation on the French national project PECHPROPRE for recycling fishing gear, initiating data collection on plastic marine litter from aquaculture and evaluating potential options to tackle the issue.

Regarding aquaculture this work is also, the result and analysis of a questionnaire sent to OSPAR Contracting Parties on best practices at a regional level. It focused on marine litter from aquaculture to find out if data and innovative initiatives could be collected to address marine litter from aquaculture.

Through case studies, each of the options below is analysed with its advantages/drawbacks and conditions for duplication:

- Voluntary agreements are a legal form of action, but their applications may be very diverse. It came out in general that voluntary agreements have better chance of working if they are backed with a regulation, if they had strong partnerships, durable local establishment, motivated and charismatic project leaders and good communication over the actions.
- There are no examples of deposit return schemes in use in the fishing and aquaculture industries. Case studies in other sectors showed that these market-based tool seem to better work when the process is backed by mandatory regulations – like voluntary agreements - and when the pricing for refund is correctly set.
- EPR is another market-based instrument that is the most global and integrative one, probably needing the largest transaction costs to be launched and maintained as well. Again, this option finds no application or example in the fisheries or aquaculture sectors, but case studies from other industries show the highest certainty on results.

The provided inventory of best practices does not claim to be exhaustive, nor find the "one best way". Further research is probably necessary, pilot projects should be tested at various scales to maybe find the appropriate solution for each type of waste at each scale.

On a global level, one of the priority action in the G7 Action Plan to Combat Marine Litter includes "identifying the options to address key waste items from the fishing industry and aquaculture which could contribute to marine litter, and implement pilot projects where appropriate (including deposit schemes, voluntary agreements and end-of-life recovery)"[1]. The G20 maintains that the tools to reduce marine litter have to be as diverse as the challenge of marine litter itself. There is no "one size fits all" solution. It is reiterated the need to address pollution from sea based sources, including key waste items from the fishing and aquaculture industry as well as from the shipping sector.

On a regional level for the Baltic, there are some actions addressing waste related to fishing and aquaculture. In the series "Regional actions addressing sea-based sources of marine litter" (HELCOM 2015) Action RS8 plans to "identify the options to address key waste items from the fishing and aquaculture industry, which could contribute to marine litter, including deposit schemes and extended producer responsibility".

5. Introduction

Approximately 80 per cent of marine litter originates from land-based sources and 20 per cent from ocean-based sources (UNEP, 2009). The importance of these sources in terms of their contribution to the marine

1 G7 Action Plan on Marine Litter, 2015

litter problem varies significantly depending on the scale of these activities in the area, as well as the policies regulating them. In the OSPAR area sea-based sources (fisheries) are an important source of marine litter.

However, the ocean-based key sources of marine litter include fishing equipment particularly damaging to the environment with lost or abandoned fishing gear and aquaculture farms, especially shellfish farms with oyster bags, mussels' nets, various plastics from crates, cones, elastics, plastic baskets etc. The question of marine litter from aquaculture will be all the more urgent as the FAO forecasts aquaculture already accounts for 50 per cent of the world's food fish (FAO)[2]. Thus the scale of these marine activities is surely about to expand and the waste produced will increase.

In a context where very few reliable data are available on waste from these activities at both an international and national level, the scarcity of information leaves room for a new challenge, trying to gather and make sense out of the lack of data and coherence on these specific topics. The figure below shows that the OSPAR beach litter monitoring programme and the IBTS surveys of litter on the sea bed provide long-terms datasets on the occurrence of litter from fisheries in the OSPAR region. Both datasets show that fisheries are a very important source of marine litter in that region. The challenge for public regulation authorities will be to find the right level of intervention, so that the sector continues to thrive while minimizing its negative environmental impacts.

2 FAO (Food and Agriculture Organization of the United Nations), Fisheries & Aquaculture Departement,

6. Synopsis of Background Information

As mentioned earlier, there are very few reliable data on the magnitude of losses and the quantities of marine litter produced by the fishing and aquaculture sectors. Many of the reports are more than ten years old, the items specified, the units and methods used at that time differ from each other. According to a report by Eunomia published in 2016[3], combining figures with "*an estimated of intentional dumping of waste to provide an indication of the scale of these losses within the European Economic Area*" estimates that losses go from 1,700 to 12,000 tons of fishing waste and from 3,000 to 41,000 tons of aquaculture wastes per annum. It does not give any further precision on the nature of these waste, be they plastics or other. Actually, according to FAO in 2017, there is no global estimates of the amount of plastic waste generated by the fisheries an aquaculture sector[4].

The following table (**Table 1**) from this same report summarizes the estimations of net losses in several regions:

3 "Study to support the development of measures to combat a range of marine litter sources" (01/2016), Eunomia & Research Consulting for the European Commission DG Environment

4 [4] http://www.fao.org/3/a-i7677e.pdf

Table 1 - Summary of estimations of net loss in OSPAR countries

Fishery	Length of net lost (km)	Number of nets lost
Baltic (Sweden)	156	1,448
North Sea & NE Atlantic (Norway)*	69	685
UK (all coastal fisheries)	36	325
English Channel and North Sea (France)	8	
Brittany (France)	6	
Cantabria (North Spain)*	606	6,064
Algarve (Portugal)*	160	16
Mediterranean (France)**	13	
Total	*1,053*	

Note: for fisheries marked with an asterisk (*) the estimated length of ghost nets/year was not available and so figures have been estimated from the number of nets lost, assuming an average net length of 100m. The method was partially applied to fill gaps for the French Mediterranean, marked (**).

Additional note on Table 1: The most common Norwegian nets are 27.5 meters long. Some types are a bit longer so an average of 30 meters is a reasonable straightforward length to use in this type of calculation. The individual nets are put together in links, and it is the number of individual nets in a link which is entered in to the table, therefore a more appropriate estimate for the North Sea & NE Atlantic (Norway) 'Length of net lost' should be 20.5 km (Norwegian Fisheries Agency, pers. comm. 2019).

According to SPEKVIS project in Belgium, it was estimated that every year, 90-130 tonnes of dolly rope are purchased by Belgian fishermen. It is estimated that 50% of this quantity ends up in the sea as a result of wear and tear or illegal dumping[5].

There remains a high uncertainty on the actual losses and discards of fishing gear. For instance, another source provided "anecdotal evidence" that up to 30kms of gear are frequently discarded per vessel during each trip, with no less than 50 vessels navigating the area for 4 to 8 weeks (MARELITT, 2013).

5 http://www.vliz.be/nl/open-marien-archief?module=ref&refid=286349

The Centre for Environment Fisheries & Aquaculture Science (Cefas) was commissioned a report[6] for OSPAR Action 36 on measures to combat marine litter from the fishing sector. It gives an overview on different practical solutions such as:

- a national code of practice or guidance
- voluntary agreement with the fishing sector
- integration of waste facilities for the different waste streams (domestic, operational, Fishing for Litter or dolly ropes)
- an Indirect Fee System where the fee for landing waste from a vessel is incorporated in an overall port charge and does not depend on the quantity of waste landed.

The reading of Eunomia's and Cefas' reports respectively offers a wide overview of the fishing industry in OSPAR countries and actions to deal with marine litter from fisheries. As detailed in Annex 11.2 the project PECHPROPRE stands in another category, as a voluntary agreement with the fishing sector and the specific objective of recycling fishing gear.

The present report will identify the options to address key waste items from the fishing industry and aquaculture, which could contribute to marine litter, and each of these options, is detailed through examples with its advantages, drawbacks and conditions for duplication. The report then focuses on aquaculture taking as a basis the questionnaire that has been completed by contracting parties.

The first step toward this work was characterizing key waste items from aquaculture and fisheries.

6.1. Key waste items from fisheries

The following table summarizes the key waste items found on docks in fishing harbours (so potentially at sea as marine litter). It describes the type, the material, the location of the waste, and gives a short comment on how each waste is collected and/or recovered. The table shows that the wastes from the fishing industry are composed of just a few materials, mainly plastic, wood and ferrous materials. It also shows that some of these items are directly collected and recovered by the informal sector (cable, anchorage chains).

6 « A review of Marine Litter Management Practices for the Fishing Industry in the North-East Atlantic Area » (03/2017), Cefas

Table 2 - Key waste items from the fishing industry

Type	Material	Origin	Comments
Industrial Non Dangerous Wastes			
Hooks	Ferrous	Docks, garbages, netting area	Often found hunging to nets
Cable	Ferrous	Netting areas, docks	Very small quantities because cables are collected by Travelling people
Anchorage chains	Ferrous	Docks, garbages for MSW	Very small quantities because cables are collected by Travelling people
Palets	Wood	Harbors garbages, fish trade houses	If these wastes were sorted out, they could be treated and recycled
Fishing nets	Plastics or synthetic		
Ropes in PP			
Expanded Polystyrene (EPS) boxes			
HDPE Crates			
Wrapping plastic LDPE			
Specific industrial wastes (common to all fishing ports)			
Wood, used paint brushes	Various (wood, metal, paint)	Technical areas reserved to fishers	These devices are used for the maintenance of ships
Dirty gloves	Textiles		
Towels and rags for painting			
Organic Wastes			
Wastes from packaging fishes and shellfishes	Organic	Fish trade houses	Generally thrown with other MSW

Sources: David BEAULIEU & Bienvenu KUIBO, « Guide de Gestion des déchets Portuaires »

According to the head of the association Echo Mer who has been based in La Rochelle for 17 years and elaborated the table, fishing gear are found in large quantities and could find an outcome as recycled material. For example, in Sweden and Denmark, the companies FFNorden and Plastix have been working with the recycling of ALDFG for some years very successfully.

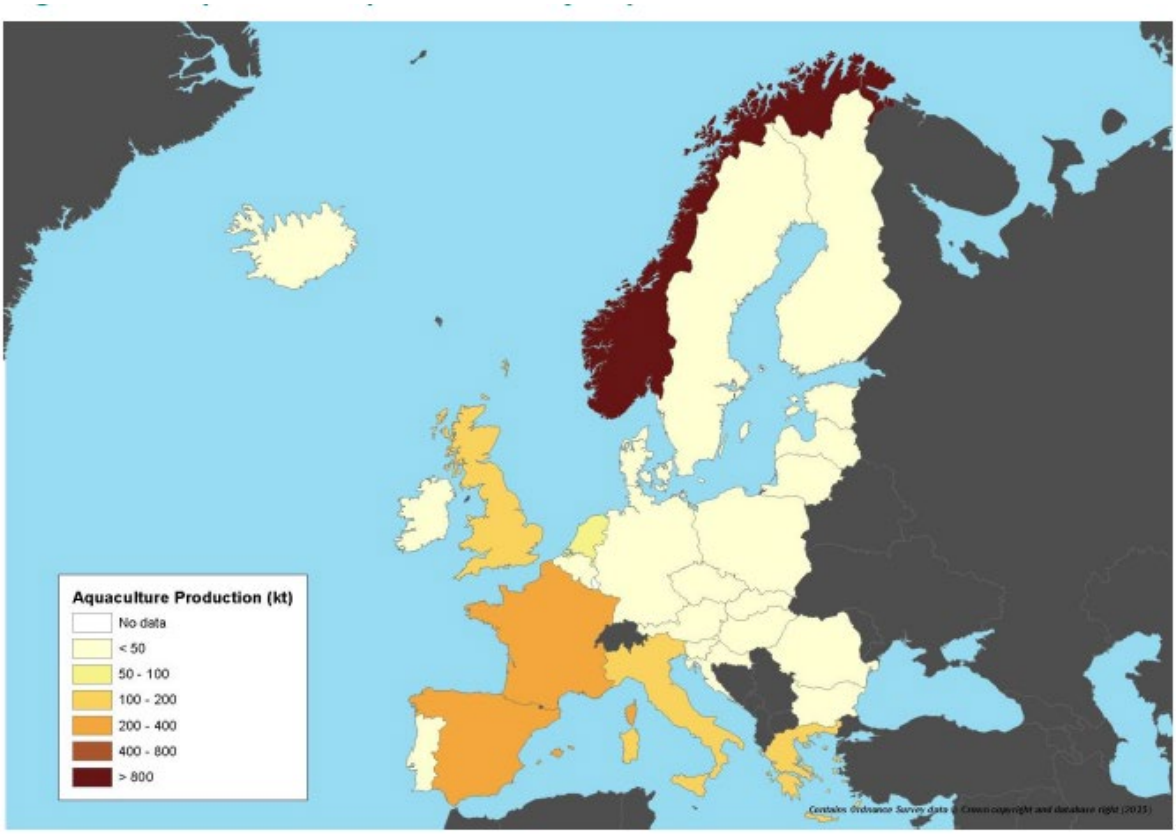
6.2. Key waste items from aquaculture

In OSPAR countries, the largest producer of aquaculture is Norway with salmon fish farming (1.2 million tons in 2013[7]). Spain, France and the UK have relatively similar production level with respectively 224 Kt, 202 Kt and 195 Kt. But Spain and France produce a majority of shellfish farming where the UK also produces a lot of salmon and trout in Scotland. Nonetheless, fish farming negative externalities concern microbiological pollution (residues of feed surplus, chemical treatments, antibiotics, fish's effluents) more than marine macro waste[8]. Focus is thus made on shellfish farming, its production methods and the waste associated.

Figure 1 - Aquaculture production by capture, 2013

7 FAO, "World fisheries production, by capture and aquaculture, by country" (2013).

8 Interview with Jérôme Lafon, FranceAgrimer, 26/05/2017



Source: Eunomia report (2016) "Study to support the development of measures to combat a range of marine litter sources", FAO, *World fisheries production, by capture and aquaculture, by country (2013).*

Various production methods of production generate both by-products and waste.

- By-products include empty shells and sea waters contaminated with micro-biological pollution.
- Waste have anthropogenic origins and those with the most important impact are made out of plastics.

Introduced in the 1960s in the specialized fish and shellfish industries, plastics have quickly replaced traditional materials. Due to marine hardworking conditions, farmers need lightweight, resistant and preferably cheap equipment. Today, even the metal of the lockers structure is sheathed with plastic. For these activities, carried out in often hostile environments, plastics offer many advantages: lightness to facilitate manipulations, resistance to abrasion and oxidation which ensures an increased durability of the material used in shellfish production.

The following table summarizes the most common plastics found in shellfish farming such as High Density Polyethylene (HDPE), Polyethylene (PE), Polypropylene (PP) and polyethylene terephthalate (PET).

Table 3 - Key waste items from shellfish farming

Shellfish farming equipment	Polymers	Description
Oyster bags	PE, HDPE	Pocket with diamond or square mesh, extruded mesh of high resistance to soiling, reinforced or not with longitudinal filaments on the walls, welding of a reinforcing strip
Solids rods	PVC	Devices to close the pockets
Collecting cup for spats Tubes	PP, HDPE, PVC PVC	Devices to catch oyster spats in the form of larvae
Mussels net Various weight and meshing Braided nets	HDPE PP PA or PP + cotton	Extensible net for consolidating bunches of mussels, diamond extruded mesh in PE, high resistance to breakage, suitable for rough use at sea
Protection nets (rigid or elastic)	HDPE or PP or PP + cotton or PET	Anti-predator nets
"Carrots" nets	PP	Large-mesh nets on mussels sites
Tahitians	PE	Plastic with fringe stapled on pile, anti-predator
Poles mantles	PP	Neutral sleeve, plastic, anti-predator placed on the top of the poles
Cones	PP or PE	Hard plastic part at the bottom of the poles anti predator
Elastic films for poles	HDPE, PP, MDPE	Woven net or stretch film

Source: final report SEAPLAST, Synergie Mer Et Littoral – 07/2017

These plastics will require specific treatments if they are to be recycled: they are old, covered with marine organic residues, sometimes eroded, damaged or crushed. Quantities need to be substantial enough to make the process economically sustainable for any local authority, company or NGO that is or will be in charge. Some waste occurs in such small quantities – paint brushes, used gloves, glass – that it would be difficult and expensive to take them into a specific process of treatment.

Data on waste from aquaculture is still lacking, in France as well as in the other CPs. The following OSPAR questionnaire on aquaculture aimed at gathering data in the first place. If the result cannot be satisfactory in itself, but it provides a first step and can be considered a challenge to go further to establish recent reliable data in every OSPAR countries.

AQUA-LIT project, an European project, will provide the aquaculture sector with a toolbox that can showcase existing, under construction and already implemented tools, case studies, best practices, as well as a database that creates links between stakeholders for addressing the three main components of marine littering: prevention and reduction, monitoring and quantification, and removal and recycling. AQUA-LIT report on key litter items from aquaculture will be available by the end of June 2019.

6.3. Results of OSPAR questionnaire on aquaculture

A questionnaire has been sent to OSPAR Contracting Parties between August and October 2017. It focused on marine litter from aquaculture to find out if data and innovative initiatives could be collected to address marine litter from aquaculture. The results were rich in information pointing out various findings.

6.3.1. Elaboration of the questionnaire

The questionnaire comprised 12 questions:

- Please indicate which country you are based in
- What kind of organisation do you represent?
- Please indicate the types of aquaculture your country produces
- Do you have an institution (ministry, independent structure, union) in your country that is dedicated to aquaculture?
- Do you have data on marine litter from aquaculture (losses following bad conditions, used equipment)?
- Do you take actions against marine litter from aquaculture in your country?
- What kind of actions have been/are being conducted?
- Would you consider plastic waste from aquaculture as an important issue?
- Please develop the reasons of your previous answer
- Do you know initiatives in your country to collect and recycle plastics from aquaculture?
- How effective do you think the following measures could potentially be, or are, in preventing marine litter from aquaculture in your country? With the possibility to range from «very effective» to «not very effective» including an «effective but politically sensitive» answer. The options were:
    - Strengthen legislation making industrial solid waste management compulsory for aquaculture companies
    - Improve the existing jurisdictions to be more specific on the nature of waste from aquaculture and how they should be treated
    - Help private bottom-up initiatives (NGO or business) take actions to collect and recycle old plastics from aquaculture
    - Help local government insure a specific collection for aquaculture waste such as oyster bags, mussels nets, fish farming nets, ropes etc. and develop specific recycling branches
    - Implement an Extended Producer Responsibility to finance collection and recycling of waste from aquaculture industries
    - Economic incentives for shellfish and fish farmers
    - Education and training on best practices
- Do you think of another way to deal with marine litter from aquaculture?

6.3.2. General results

11 out of 16 contracting parties answered to the questionnaire between August 2017 and January 2018. We received 7 answers of Governments/governmental institutions from Denmark, Norway, Germany, UK, Netherlands (2 answers), Sweden, 7 answers from Union of shellfish producers or fish farmers (Denmark (2 answers), Iceland, Ireland, UK, France and Finland) and 2 from NGOs (Denmark and Portugal) so 16 returns in total. The return rate is not as high as expected but remains already meaningful to some extent.

The majority of actors which answered the questionnaire were public national authorities and there was no research centre which answered. This shows that the nature of responses was mostly institutional, picturing the wide scope of national data and initiatives.

The following table represents the type of aquaculture production and lists the institutions in charge of the activity:

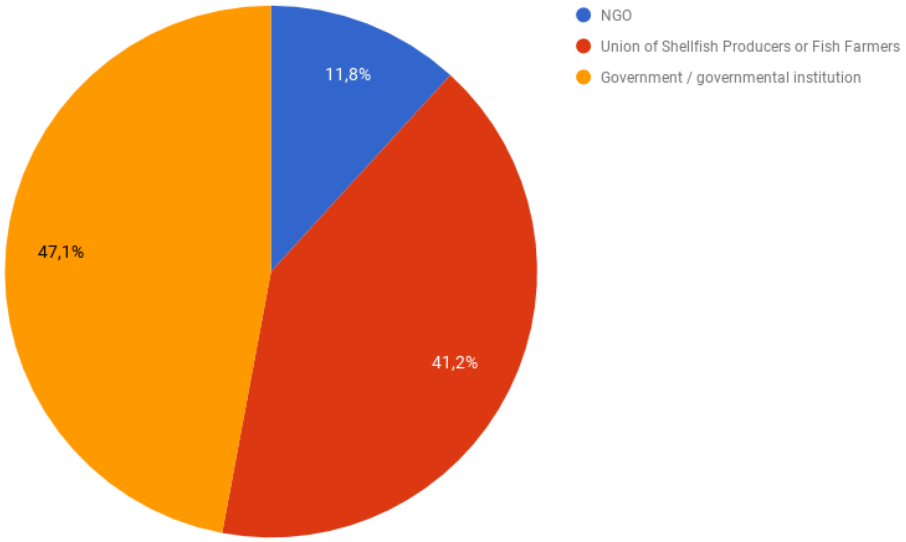
Figure 2 - Type of aquaculture in the answers to the questionnaire and institution of charge of the activity

Countries	Types of aquaculture production of the country				Institution in charge of aquaculture
	Oysters	Mussels	Other shell fish	Fish farming	
Denmark		X		X	Ministry of Environment and Food and Danish EPA and Dansk Akvakultur (professional union)
United Kingdom	X	X	X	X	Department for Environment, Food and Rural Affairs (Defra) and the Centre for Environment, Fisheries and Aquaculture Science (Cefas)
Norway				X	Norwegian Environmental Agency, Directorate of Fisheries, Norwegian Food Safety Authority
Germany (Schwlesig/Holstein)	X	X			The Bundesland Ministry of Environment
Portugal	X				Políticas e Instrumentos da Direção-Geral de Política do Mar (DGPM)
The Netherlands	X	X			Ministry of Economic Affairs and Department of public works
France	X	X	X		Ministry of Environment, Direction des Pêches Maritimes et Aquaculture (DPMA) and Comité National de Conchyliculture (CNC)
Finland				X	Ministry of agriculture and forestry
Sweden	X	X	X	X	Swedish Agency for marine and water management
Ireland	X	X	X	X	No institution in charge of aquaculture
Belgium		x			Flemish Ministry of Agriculture and Fisheries

Iceland				X	Ministry of employment and innovation

The types of aquaculture represented in the answers is mostly oysters and mussels production and oyster farming produces much more macro-waste than the two other activities (cf. 6.2.3. table on aquaculture waste quantification in France).

Figure 3 - Nature of organizations for the OSPAR questionnaire



6.3.3. Key findings

Public authorities responsible for aquaculture in OSPAR countries are generally dependent to another institution:

- **Nearly 80% of recipients answered that their country was taking actions against marine litter from aquaculture through regulation first, raising awareness second.**

Complying with EU regulation - the Water Framework Directive (2008/98/EC) and the Packaging and Packing Waste Directive (1994/62/EC) - already gives guidelines to manage waste from all sectors and not just aquaculture. National or local regulation concerning specifically aquaculture are found in Denmark, UK, Norway, Germany, France and Netherlands. It is often included in the process of granting licensing permits to grow shellfish or fish, or in special legislation for aquaculture, for instance, in which wastes from this activity must be brought onshore.

The other initiatives were beaches clean-ups, retrieval of fishing gear generally by fisher's warning, governmentally funded clear ups, harbor collection points for fish industry, collection and recycling companies for used aquaculture equipment (UK) or plastic equipment in general (Denmark).

Unsurprisingly, the second most popular measure was strengthening the regulation making solid waste management compulsory for aquaculture farms. This is already the case in several countries as mentioned earlier. Enforcement of the law on the contrary may be lacking.

- **Education on best practices is considered as the most effective measure that could be taken**

Education/ raising awareness was considered as very effective by 62,5% of participants. Then came the economic incentives for shellfish and fish farmers considered as very effective by 56% of participants, before

strengthen legislation making industrial solid waste management compulsory for aquaculture companies with 50%, and the implementation of Extended Producers Responsibility to finance collection and recycling of aquaculture equipment (44%). It is interesting to notice that 2 of the 3 “very effective” measures are market-based. On the contrary, improving the existing jurisdictions, encouraging NGOs and locally based actions or help local governments insure a specific collection for aquaculture waste were not considered as very effective.

- **About 70% of participants consider marine litter from aquaculture is not an issue or remains a secondary one.**

This result is independent from the nature of the dominant aquaculture sector in each country. It would be interesting to have a real harmonization and gathering of data in OSPAR countries to determine whether or not aquaculture is a harmful source of marine litter.

However, OSPAR has put a lot of effort in beach litter survey. Indeed, some information on litter and data on marine litter collected by OSPAR are available online. www.ospar.org https://www.mcsuk.org/ospar/beach/

Generally speaking, according to parties who considered is not an issue, marine litter from aquaculture represents a very small part of marine litter, or this activity does not generate any litter at all. For those who considered it is a secondary issue, it is either because the main concern is emissions of nutrients, organic compounds and Chemicals from the fish farming industry, or because litter is collected and handled by facilities or authorities. For the parties who answered in the affirmative, this is an issue because of the prominent use of plastics, and, as any pollution is a major threat to sustainability of seafood.

Like any survey made with relatively small participation and over a limited time should be treated carefully. These results only give indications on the way marine litter from aquaculture is being perceived in general, and what kind of solutions to remediate the issue may exist. It mostly shows that marine litter from aquaculture is an issue handled by regulation through public authorities and does not seem to raise a lot of concerns so far.

If data could be collected in each country on the level of losses of aquaculture equipment and if environmental impact assessments were made to have a more complete view of the issue that would probably help to tackle marine litter from aquaculture in a more appropriate way.

7. Options to address key waste items from the fishing industry and aquaculture

The measures taken against marine litter and environmental protection in general tend to be regulatory and mandatory: for instance, France has recently taken measures restricting the use of single use plastic cutlery (one of the many source of plastic marine litter). In the same way, the EU Directive on plastic bags aims to reduce consumption of lightweight plastic bags, which regularly end up in the sea. In each country, there are national and/or European regulations that the fishing and aquaculture industries have to comply with (MSFD, WFD among others). Actions can take other forms as well, more or less constraining, on the short and the long run. The various projects and initiatives listed in Annex 11.1 give a wide spectrum of possibilities to deal with marine litter from fisheries and aquaculture. The present work tries to profile different types of initiatives according to the canvas that Action 35 defines - voluntary agreements, deposit schemes, extended producer's responsibility. It sets a range of criteria as a risk assessment tool.

Each of the following options to address key waste items from fisheries and aquaculture is studied under the same canvas:

- Description;
- one to three case studies;
- SWOT analysis;
- summary of the essential criteria and questions to take into account when considering the option.

7.1. Best practices - Voluntary Agreements

In the EU context, the term 'voluntary agreement' usually refers to "an agreement which is not the result of a political decision-making process exclusively within the framework of the official EU institutions but mainly the outcome of negotiations between social partner organizations which are legitimized to produce such agreements by EU legislation. The chief characteristic of voluntary agreements is that they are not enshrined in EU law" (Eurofound)[9]. Environmental voluntary agreements can be seen more broadly as an agreement between two or more partners, be they companies, associations or unions, to lead actions to protect the environment without any regulation commanding them to do so. Solely based on good-willingness, it generally corresponds to small-scale associative projects where one or two charismatic project leaders decide to "make a difference".

These alternatives to traditional "command and control" legislative instruments tend to be more flexible and achieve environmental protection goals at a lower cost for public institutions: no investment of public funds or time consumed to elaborate regulations for instance. But their results may be more uncertain too.

7.1.1. Case study 1 – Local projects: La Navicule Bleue, Echo Mer, TEO La Rochelle

Region: Charente-Maritime, France

The common characteristics in the nature of projects like Echo-Mer, Navicule Bleue, TEO La Rochelle is the strong link with the local communities, the home-grown component of the project that makes them highly legitimate to intervene in the area of environmental protection. For instance, the leader from La Navicule Bleue has turned himself into a shellfish farmer to prove that oyster bags pollution was real. He made close

9 EurWork, Voluntary Agreement

contacts in the sector which helped him build up the network to provide old oyster bags to clean up and recycle[10].

Action and results

Flexibility and agility particularly observed in the projects mentioned in the table. For instance, La Navicule Bleue which is an ESAT (Etablissement Public d'Aide par le Travail – public institution of assistance through work) located in Marennes Oléron, Atlantic coast, started from scratch with no budget but personal funding, and is now a group of three structures that has provided jobs to hundreds of people over only ten years[11]. The project Perlucine based in Bretagne, recycling oyster bags, took less than one year to be launched, sign a partnership with the regional authorities (Region Bretagne), start a feasibility study and secure a voluntary agreement with the factory in Kervellerin and the company Entre Mer et Terre (Mangin, 2017).

Another key component is the charisma and motivation the project leader shows in defending the project. For instance, the assiduous leader of Echo-Mer[12] has been working in the harbour of La Rochelle for 17 years while the head of La Navicule Bleue has been working for 15 years in the region of Marennes Oléron, Echo-Mer launched several projects related to waste management where environmental control was too permissive: ships paint residues for instance, but also up cycling of oyster bags into baskets in partnership with La Navicule Bleue. In the case of TEO La Rochelle, after several years contributing to waste collection on beaches, the leader launched a feasibility study to implement a collaborative inter-sectorial platform to recycle plastic waste, especially from fisheries aquaculture. That leads to a third observation: in the area of South Bretagne and Poitou Charente, project leaders all know each other, making the ecosystem tight and solidary. The network is small but geographically close and works in synergy whenever they can help each other.

Yet, in these two examples, the lack of financial and intellectual supports harms the project's stability. The associative work stays a side-activity for project leaders and the scale remains very local. They do not pretend to grow big, but rather to raise awareness, encourage innovation and duplication of similar projects elsewhere. Their main fragility comes from the absence of institutional support and strong financial assistance to strengthen their structure.

This is not the problem of the SMEL (Synergie Mer Et Littoral), a professional association supported by the Regional Council of Normandy.

10 Interview with Thierry Lèques – 04/10/ 2017

11 Interview with Thierry Lèques – 04/10/ 2017

12 Interview with David Beaulieu of Echo-Mer in the harbor of La Rochelle – 30/05/2017 and 21/09 2017

7.1.2. Case study 2 – Regional project: SMEL

Region: Normandy, France

The SMEL (Synergie Mer et Littoral) is supported by the Regional Council of Normandy and has for purpose to act for marine economy in Normandy.

Action

The SMEL has been in charge of the project SEAPLAST, to help the sector of shellfish aquaculture to organize the recovery from plastic waste and marine by-products, to find applications in the fishing, shellfish or plastics industry. Contrary to the two previous example, they benefit from strong institutional partnerships such as the ADEME (Agence de l'Environnement et de la Maîtrise de l'Energie, - Agency for Environment and Energy Control), the Ministry of Environment, the Marine Cooperation and research partnerships with Ivamer (scienfitic consulting) and NaturePlast (consulting and manufacturing plastics). Phase 1 started in September 2017 and consisted in listing and quantifying the main deposits of plastic waste and shells and how they could be potentially collected and recycled. Phase 2 quantified the deposits. Phase 3 tested the properties of plastics from old marine material, mussels' nets, crates, oyster bags among others. Phase 3 analysed the opportunities of recycling for key waste plastic items from aquaculture. The last phase, Phase 4, ended up in June 2017 testing different solutions of treatment of plastics and their use.

The SMEL epitomizes a project that was highly structured, scientifically conducted and supported with strong partnerships. The nature of the SMEL as a professional association also helped to build up a network of adequate contact. It is not as easy when a one-or-two-people association starts a project on its own without any support.

7.1.3. Case study 3 – National project: Adivalor

Region: France

The case of Adivalor is another example of a highly structured and sponsored project, but at a national scale. Adivalor concerns agricultural plastics and packaging but not marine litter. Yet this example shows that voluntary agreements can reach a national scope and have a considerable impact if managed properly.

Action

Adivalor is a private not-for-profit corporation born in 2001 out of the necessity to organize the collection and recycling of agricultural plastics. The main producers' federations, important agricultural cooperatives, distribution companies and unions gathered to create a branch based on a polluters-pay principle. An eco-tax on new products financed the recovery system of old agricultural plastics. In 2016, 74.000 tons of used plastics have been collected and 91% have been recycled. More than 330 plastic producers and distributors and 300.000 farmers participate to the program with 7.000 collection points[13].

The first and main strength of this collective voluntary solution is the obligation for farmers to dispose of their agricultural waste[14] through specific treatment channels. With collection points generally located next to distributors centres for special equipment, Adivalor offers a convenient solution to farmers to get rid of their waste and comply with the regulation. The second strength is the massification of waste: with larger quantities, the marginal cost of the treatment decreases. It becomes economically interesting to build a recycling branch if it can secure 3 to 4.000 tons of plastics. It remains financially useful for farmers to pay an extra when buying new plastic equipment when they are sure to benefit from an inclusive system of

13 Adivalor – annual report 2016 "Chiffres clés"

14 Article L 541-2 of the Environment Code (France)

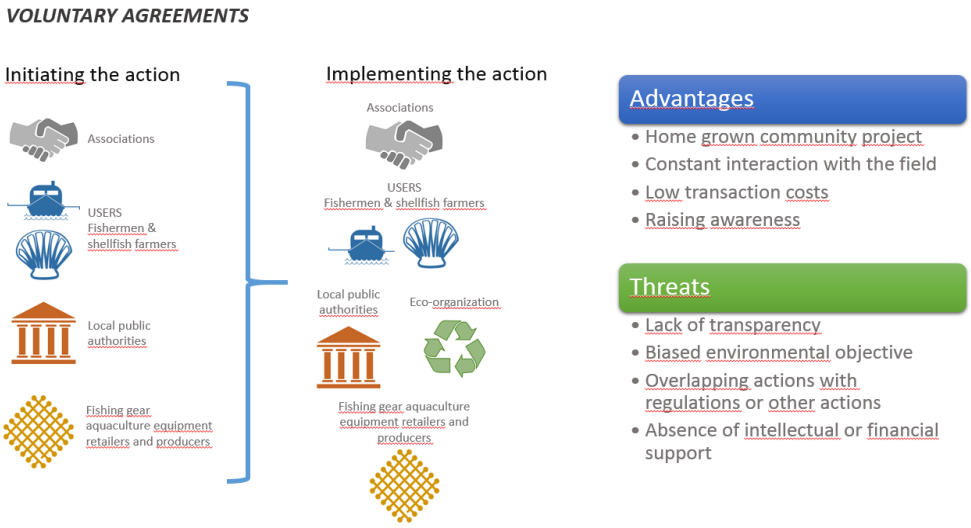
collection and treatment for waste that they did not know how to dispose of before. Thus, it is useful to farmers, to society and to Adivalor.

Besides, Adivalor benefited from the support of the ADEME (Agence de l'Environnement et de la Maîtrise de l'Energie, - Agency for Environment and Energy Control), the Ministry of Environment and many actors from the plastic sector. Both the financial and institutional supports were backing the initiative. Nevertheless, the program took 15 years to reach its full capacity. Even today, recycling rates have not reached 100% for each plastic yet.

7.1.4. SWOT analysis

Examples show that projects associated to voluntary schemes are extremely diverse. The main concern on results is that they remain uncertain: some aspects of the environmental problem may have been underestimated, the financial or institutional support may be shaky or it does not prevent from free-riding behaviour (benefiting from the efforts of the others while doing nothing oneself). But the difficulties in demonstrating the operating efficiency of voluntary agreements does not show that voluntary approaches should be avoided. Rather, understanding the complications and potential downsides of using voluntary schemes could lead to better designed voluntary agreements in the future. Here are operational guidelines when considering voluntary agreements.

Figure 4 - Voluntary agreement in a nutshell



Source: Iris Delahaye

Essential criteria

Governance

- Are the project leaders of the voluntary agreement well integrated into the specific socio-economic sector or community and legitimised with effective previous actions? Do they benefit from working operational teams?
- Is the voluntary agreement backed by any mandatory regulation?

Cost-effectiveness

- Are the environmental issues raised scientifically assessed as the threats to the environment?

- Are the parties concerned with the voluntary agreement ready for such a project? Will the process require awareness campaigns initiation for instance?
- Are the environmental goals and action means of the project assessed as relevant and cost effective (feasibility study and benefit-cost analysis)?

Maturity

- How well is the voluntary agreement integrated in the socio-economic and institutional context?
- How long will it take to be implemented?

Focus should be made on the ecosystem in which the voluntary schemes will occur, especially the partners and the financial support, take into account the legitimacy of the initiative the specific context of the territory and economy. They should especially benefit from more help from authorities when proving there is, undoubtedly, an environmental issue. But these key design components may also include more rigorous goals, improving the preparatory audits and data collection. Not discouraging good willingness is essential as well. Nevertheless, voluntary approaches are more likely to result in significant environmental improvements when backed by a serious legislative constraint.

Table 4 - Voluntary agreement SWOT analysis

	Operating conditions	Strengths / Opportunities	Weaknesses / Threats
Voluntary agreements	Social legitimacy	Home-grown identified project leaders	Top-down project with no previous local presence
		Highly integrated in the local community	Highly controversial project leaders
		Demonstrated proficiency of the project leaders	Absence of visibility and communication brand
		Clear geographical perimeter	Opacity of the operational functioning
	Scientific acknowledgment	Environment impact assessment	Biased opinion on related environmental threat
		Feasibility study on identified solutions	Unclear or biased environmental objectives
		Intellectual resources to share tasks and structure the action	Absence of intellectual resources to structure the action
	Economic viability	Identified financial support	Lack of financial support
		Financial competent support meets the needs for working capital	Underestimation and lack of competence on the real financial needs
		Viable business model if financially auto-financed	Potential personal risks with self-funded projects
		Coherence of current expenditures and real needs	Lack of visibility or coherence to convince investors
	Institutional network	Constant interaction with associations, companies,	No visibility in local, regional or European institutions, loose

	Operating conditions	Strengths / Opportunities	Weaknesses / Threats
		research centres and institutions at a regional, national or European scale	ecosystem of associations, research centres or companies
		Constraining legislation backing the initiative	Absence of legal incentives to take actions
		Official support from both state and non-governmental institutions	Overlapping actions with already existing legal structures

Source: Iris Delahaye

The US National Centre of Environmental Economics concludes its paper on "The Use of Voluntary Approaches for Environmental Policymaking in the U.S" (2004): "*In fact, voluntary approaches may have the greatest potential in areas where it is especially difficult to measure progress. For instance, voluntary approaches that reduce technological uncertainties or share information between affected parties may lead to increased environmental awareness and attitudinal changes, which may, in turn, result in the correction of market failures at the root of many environmental problems.*" In this area of voluntary agreement, the variety of forms and actors compel the analysis to be careful with quick judgments. Each case is included in a specific legal, socio-economic, cultural context that does not prejudge of any results or definitive opinion.

7.2. Best practices - Deposit Schemes

Action 35 of OSPAR Convention mentions deposit schemes as one the options to be studied. Deposit schemes are also cited in the Annex of the G20 declaration on issues to be addressed: "*put in place effective actions e.g. to facilitate the implementation of the polluter pays approach, e.g. 'extended producer responsibility' or deposit schemes - already in place in some G20 countries as appropriate and develop new sources of funding for effective waste management systems, as well as stimulate innovation*" and further in the document, "3*. Areas of prior concern and potential policy measures" with the option to "secure cross-financing of waste management operational activities (e.g. through economic incentives, fees, charges, deposit funds or taxes)*"[15]. Deposit schemes thus echoes to various international negotiations but examples implemented do not specifically concern the fishing industry or aquaculture equipment, but plastics in general.

Deposit schemes correspond to a specific collection point of material, be they clothes or waste. Garbages in the streets are a perfect example of voluntary deposit schemes associated to the social pressure to not throw waste in the street. Applied to fisheries and aquaculture, it consists in enticing shellfish farmers to voluntarily bring their old plastic equipment to collection points and ensure a follow up in the treatment of their waste. But deposit schemes can also include economic incentives to improve recycling, be it plastic bottles or oyster bags.

Deposit refund schemes (DRS) are a market-based instrument consisting in paying a small deposit when buying a good. The deposit will be fully refundable after the good is returned. This scheme exists in particular for plastic bottles in Germany, among others, to prevent marine plastic litter resulting from land base sources. England and Wales are consulted to introduce a scheme for drinks containers. Scotland's consultation has finished and a response is being prepared. Also called "deposit return scheme", it has been described as an efficient motivation to increase recycling (Fulleton & Kinnaman, 1995): consumers do pay an

15 G20 Leaders Declaration Annex « G20 Action Plan on Marine Litter » - Hamburg 2017, p.2-4.

extra when buying a good, but get a refund if they give the waste resulting from the consumption of that good.

From an economics perspective, marine litter from aquaculture and fisheries arises through market failure: for instance, the marginal price of an oyster bag on the market - around 2.5€ per bag in France - does not reflect the marginal cost to society (including other shellfish producers) when oyster bags are abandoned in the nature or not recycled. In addition, the economic cost of marine litter in general remains difficult to define and oceans and beaches are public goods, vulnerable to free-riding, where discretely disposing of old plastic equipment causing degradation of the marine environment, allow to benefit from the equipment without paying the full cost of its usage, at least on the short term (on the long run, fishermen and shellfish producers themselves would be affected by plastic-polluted water). Already applied in Germany for the main land-based sources of marine litter (plastic bags and bottles), DRS applied to fisheries and aquaculture equipment would settle a principle of "polluters pay": equipment would be more expensive in order to finance the collection and recycling of used plastic equipment. The extra-price would be fully refundable if the used equipment was brought back to collection points for recycling.

In theory, this scheme could encourage reuse or return by fishermen and shellfish producers even more since their activity is dependent on the GEnS of the waters. In South Australia, the CDS – Container Deposit Scheme – located in coastal areas helped reducing plastic waste on beaches by threefold (Hardesty et al, 2014). Yet, experience has shown that this system had difficulties to be put in place[16].

7.2.1. Case study 1 – CDR in New South Wales (NSW), Australia

Region: Australia

In Australia, five of the top nine pieces of litter found in the nature, and not only at sea or on beaches, are drink containers. As a result, the New South Wales Premier Mike Baird declared in May 2016 that a new CDR scheme would be implemented in his state starting December 2017 on drink containers. Any bottle or can containing over 15cl will be eligible for a 10 cents refund via depots and reverse vending machine[17].

Action

BehaviourWorks Australia at Monash University was commissioned by the New South Wales Environment Protection Authority to review 47 case studies of CDR schemes worldwide and find out if this solution was relevant to deal with litter[18]. The average recovery of drink containers was 76% among the 47 case studies. In the US, the 11 States that used CDR schemes had 48% of plastic bottles recovery whereas the non-CDR states had barely 20%[19]. In South Australia, one of the oldest CDR scheme in operation, the average recycling rate is 74% for plastic bottles against 36% in the rest of Australia. Out of the 47 case studies, it revealed that some CDR scheme gave to charities, but people were more likely to return bottles if they had a refund. The higher the refund, the higher the return rates.

Results

This study showed two main results:

16 Interview with Thierry Lèques – 04/10/ 2017

17 The Conversation, « Container deposit schemes work: so why is the industry still opposed ? », 05/06/2016

18 BehaviourWorks Australia (02/2016) "WSROC Submission NSW Container Deposit Scheme - Discussion Paper Review "

19 Container Recycling Institute, (10/2013) « Bottled Up : Beverage Container Recycling Stagnates (2000-2010), U.S. Container Recycling Rates & Trends, 2013 »

- These CDR schemes reduced litter in general. Data from 7 US states indicated 69–83% reductions in waste from drink containers against 30–47% reductions in MSW20.
- Government CDR schemes are sustainable. The 40 government schemes worldwide have worked out for an average of 24.8 years and all of them except two are still on-going.

But CDR scheme face a lot of opposition especially from the drinks industry. The key objection is cost: drinks would be 10c more expensive, the industry would lose part of its demand and increase the pressure on jobs (Sjolander & Kakela, 1988). Little published proof support these assertions. The few studies identified were either funded by the beverage industry or theoretical arguments without any empirical data. Manufacturers and consumers will share the costs of the NSW CDR scheme, with consumers paying an estimated 30 dollars into the scheme annually should they not redeem any deposits.

The second anti-CDR argument is that industries can handle the recycling themselves. For instance, Coca-Cola launched reverse vending machine schemes in Dallas Fort-Worth in Texas in 2010 with an ambitious objective of 3 million bottles recovered by month. But the experience showed that technology was uncertain, cooperation with other institutional actors was lacking, reverse vending machine only gave vouchers as a refund and the program ended abruptly in October 2014 reaching only 25,000 bottles recycled[21]. Another example with PepsiCo Dream Machine Initiative also failed showing that B-to-C CDR schemes were mostly unsustainable.

The third controversy concerns the existing sidewalk recycling programs that CDR schemes would potentially cannibalize. Evidence actually showed the effects were the opposite (Viscusi et al.): sidewalk recycling programs rates increased a little. This result may be explained with the "spillover effect" where people are more likely to do one thing if they are already doing something similar (Christmann). Data from implemented CDR schemes suggest that people are more inclined to use sidewalk recycling schemes when they are used to get refund for used containers through reverse vending machine or CDR depots. For instance, in South Australia, the overall recycling rate is 67% whereas it is only 51% in Australia in general.

Three findings from research show that CDR schemes are conditioned to several aspects:

- CDR scheme is more likely to work if recycling collection points are convenient to access (Saphores & Nixon), close to consumer's homes
- CDR schemes are part of a bigger recycling program because clean environment bring cleaner environment (and environment polluted with litter bring more litter), reduced all type of litter in general.
- Industry-based CDR schemes are less likely to work than governmental ones.

7.2.2. Case study 2– Icelandic Recycling Fund (IRF), Iceland

"In Iceland, fishing gear is included in the legislation for an advanced disposal fee under the Icelandic Recycling Fund (IRF). However, this system is not currently employed as the Federation of Icelandic Fishing Vessel Owners (LÍÚ) now manages this waste in place of the advanced disposal fee and the government is satisfied with the results. Discussion with a stakeholder at the IRF has indicated that the LÍÚ gains from taking responsibility for this waste management as they can operate the system more cheaply than via the government's advanced disposal fee."[22]

20 Bottle Bill Resource Guide, USA,

21 « Coca-Cola Recycling closing shop », 30/10/2014

22 Eunomia, "Study to support the development of measures to combat a range of marine litter sources", 2016

7.2.3. Case study 3 – Germany mandatory Deposit Refund Scheme for bottles

Region: Germany

Germany is the common example on DRS of drink containers, regularly cited as one of the most performing one.

Action

Considering that the refillable quota of bottles had fallen below 72% in the 1990s, German authorities introduced a mandatory one-way deposit in 2003[23]: retailers selling beverages in single-use packaging must take back containers of the same material (plastic, metal, glass) as they sell. Small retailers only need to take back packaging from companies of which they sell the products. For each one-way container brought back, people received 25 eurocent, 15 to 50 eurocents for reusable glass special kind of bottles. It applied to every type of bottle except milk, fruit and vegetable juices, babies' drinks.

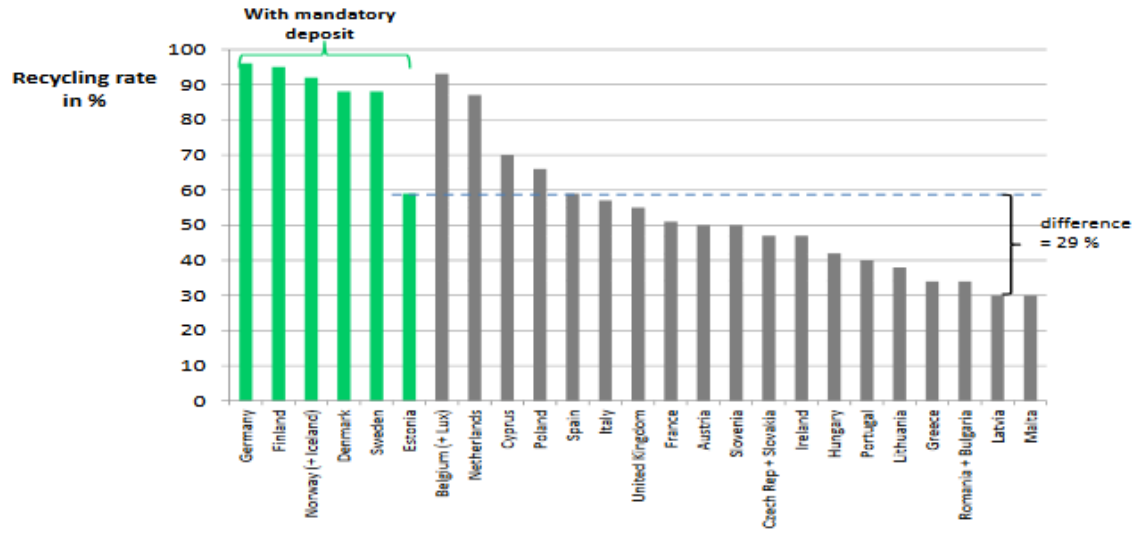
23 Zero Waste Europe, « Beverage Packaging and Zero Waste »,

Results

As a result, nearly 98% of refillables bottles have been returned by consumers and contributed to remove 1 to 2 billion bottles from the streets and sidewalks bins. The coordination of the system is led by DPG (Deutsches Pfandsystem GmbH).

At the European scale, countries which have introduced mandatory deposit refund systems on single-use beverage packaging present the highest return and recycling rates, as well as considerable reductions in littering in general (Pladerer & Vogel, 2009). In Estonia, the recycling rate is 29 % higher than in neighbouring Latvia. In Finland the return rate of drink containers increased by 15 % between 2008 and 2009 in connection with the introduction of a mandatory DRS (Hassi & Pietkäinen 2011).

Figure 5 - Aluminium used beverage can recycling rates in 2009 (EAA, 2011)



The German example shows that mandatory DRS seem to work quite well to obtain high results. But the process had to face strong resistance from the German bottling industry arguing that it would lead to replace glass bottles by plastic bottles and decrease the volume and the quality of kerbside collection (making these schemes financially unsustainable). Some claim that a well-run kerbside collection could be enough, taking the example of Wales in the UK, where 75% of plastic bottles are recycled through this system[24]. Taking the example of countries who both have DRS but do not encounter the same success in recycling rates (61% in Hawaii vs 98% in Germany), the British Plastics Federation (BPF) goes even further arguing that deposit schemes for a specific item like plastic bottle might improve recycling of plastic bottle, but a better kerbside collection will improve recycling of all packaging[25].

7.2.4. SWOT analysis

As a result from the previous example in Australia and Germany, when it comes to waste from fisheries and aquaculture, defining the public of the CDR scheme is the first essential question: who is in charge of bringing key waste items back to collection points? Should it only be fishermen and shellfish farmers? If yes, should the CDR scheme be industry-based (B-to-B option) or governmental? Should it be mandatory?

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24 European Commission, DG External Policies, Policy Department (2011), "A European Refunding Scheme for Drinks Containers", ed. European Parliament.

25 Sandra Laville, 29/06/2017, « Could a money-back scheme clean up the UK's plastic bottle plague ? », *The Guardian*.

The second issue is to find the correct pricing to be cost-effective, how much should people be paid back for bringing old plastic nets, bags and crates. If too low, the incentive will not be strong enough. If too high, the system will not be economically viable. It also requires investments in bins, containers, infrastructures in general. In some touristic areas by the sea side in France and in Europe, finding an appropriate location for the containers may be difficult: not too far from shellfish farms, not too close to private houses, in sufficient space to contain voluminous items such as nets and oyster bags. This option requires heavy investments in infrastructures, to place these special containers with the money-against-plastic systems in harbors and next to shellfish production areas. This option remains based on the good-willingness of fishermen and shellfish farmers to deposit their plastic waste in the right container corresponding to the specific type of plastic (HDPE, PP, PA), taking the time to bring it and knowing which material their equipment is made of.

While deposit schemes already have proven to be worthwhile for different products like plastic bottles it should be noted that this will not be as straight forward for all products. The result was that fishermen started ordering fishing nets from other countries like China and thereby avoiding the deposit scheme.

Figure 6 - Deposit schemes in a nutshell

Source: Iris Delahaye

Essential criteria

DRS or CDS remain an attractive solution, giving more responsibility to potential polluters and enticing them to have a better waste management. But conducting a serious feasibility study to check that this solution will be useful in the specific context of fisheries and aquaculture cannot be avoided either. Here are key guidelines that should be taken into account as first steps:

Governance

- Who will be in charge of the process?
- Will the DRS be mandatory?
- Who will be in charge of checking the operational functioning?

Cost-effectiveness

- What pricing should be apply to be successful?
- How expensive is the implementation of this system?

Maturity

- Is kerbside collection effective and could it be more efficient?
- What kind of logistics should be preferred: containers, retailers shops, equipped landfills?

The following table summarizes the various key elements to pay attention to with deposit schemes.

Table 5 - Deposit schemes SWOT

	Operating conditions	Strengths / Opportunities	Weaknesses / Threats
Deposit schemes	Social legitimacy	Clear geographical and thematic perimeter	Low acceptability of users to pay an additional pricing
		Efficient branding and good visibility of actions led	No visibility of the usefulness of the scheme
		Convenience of collection points	Difficult access
		Users responsibility increased	Absence of legal structure or communication to users
		"Spillover effect"	Additional handling
	Scientific acknowledgment	Environment impact assessment	Biased opinion on related environmental threat
		Feasibility study on the deposit scheme	Lack of justification on using deposit schemes
		Intellectual resources to share tasks and structure the action	Absence of intellectual resources to structure the action
	Economic viability	Market-based auto financed solution	Wrong pricing
		Internalizing the marginal cost of end-of-life of the products	Concentrating additional financial burden on specific actors
		Coherence of current expenditures and the deposit scheme	Underestimation of infrastructure investments required
		Financial competent support meets the needs for working capital	Industry-based CDR schemes in B-to-C context

	Operating conditions	Strengths / Opportunities	Weaknesses / Threats
	Institutional network	Constraining legislation backing the initiative	Overlapping actions with already existing structures
		Official support from both state and non-governmental institutions	Absence of legal incentives to implement a deposit schemes

Source: Iris Delahaye

7.3. Best practices - Extended Producer Responsibility

Like DRS or CDS, Extended Producer Responsibility (EPR) is a marked-based instrument that could be defined as a very specific deposit scheme. Like voluntary agreements, EPR includes a large variety of operational methods. But unlike them, EPR is based on regulation.

The principle of EPR has been laid down at European level by Directive 75/442/EEC from 15 July 1975: "in accordance with the principle of "Polluter pays", the cost of disposing of waste, less any proceeds derived from treating the waste, shall be borne by:

- The holder who has waste handled by a waste collector or by an undertaking referred to in Article 8;
- And/or the previous holders or the producer of the product from which the waste came" 26.

Since the first directive which led some Member States to implement an EPR to meet the requirements of the Packaging Directive of 1994, the European Union has extended this management method to other products via different directives. Waste items concerned by the EPR are mainly those whose management at the end-of-life or production residues causes difficulties for recycling or reuse with significant management costs. Each EPR has its peculiarities but EPR scheme are frequently found when it is needed to:

- define minimum targets for re-use, recycling or recovery
- delimit regulatory obligations for financing and / or direct management of field management
- prohibit or limit the use of certain hazardous substances in products
- cover the costs of managing the end-of-life
- modify the eco-contribution according to environmental criteria like design, the lifetime and end-of-life of products in order to encourage producers to eco-design
- informing the owners to induce them to sort waste out correctly
- organize monitoring to check if objectives are being met and introduce potential sanctions for producers who would not comply with the regulations27.

Fishing nets and some shellfish farming key waste items meet several of these aspects: the hazardous effect on marine environment, the incentive to sort out, the necessity to share costs of the equipment's end-of-life and the sanctions associated with the wrong disposal.

Extended Producer Responsibility has also been incorporated into the waste framework directive 2008/98/EC and the revised framework directive 2018/851.

26 Council Directive 75/442/EEC of 15 July 1975 on waste, Art. 11

27 ADEME (2017), "Les filières à responsabilité élargie du producteur – Panorama 2017", p.5

EPR has been implemented in many forms, which may be classified into various approaches[28]:

- "Individual" where the producer and seller takes responsibility himself for the collection and treatment of waste resulting from his products
- "Mutualized" when the producer and seller gives the task of collection and treatment to an external service supplier, in collaboration with other producers. Yet the responsibility remains their own and the service supplier cannot be lawfully endorsed.
- "Collective" when producers transfer their responsibility to a collective "eco-organization" they join, which collects a financial contribution to organize the collection and treatment of waste. There are three types of eco-organizations:
    - Financial: the eco-organization collects money to finance public collection to regional governments and to specific actors like sorting out companies for textiles in France.
    - Operational: the eco-organization organizes and take care of the waste directly with sub-contractors selected through tender process.
    - Combined: the eco-organization provides a financial and operational support to regional governments for waste collection.

The following case studies will illustrate the diversity of EPR schemes and try to identify the administrative costs of designing, implementing, and complying with a policy, sustained by the participants.

7.3.1. Case study 1 – Mandatory EU-based electronic devices collective operational EPR

Region: EU

Many governments and companies have adopted EPR to help address the problem of e-waste — used electronics contain materials that cannot be safely thrown away in regular household trash. Many governments have partnered with corporations in creating the necessary collection and recycling infrastructures. Chemicals and components found in electronic waste (lead, mercury, brominated flame-retardants, cadmium) are particularly dangerous to human health and the environment, like plastics from ghost nets and plastics from fisheries and aquaculture can be to marine environments.

In 2005 and 2006, the EU released a new directive (2002/95/EC) for Waste Electrical and Electronic Equipment (WEEE) for professionals.

Action

The WEEE Directive notably requires:

- eco-design of electronic devices to promote the reuse and treatment of WEEE
- separate collection of WEEE
- systematic treatment of certain components and dangerous substances
- reuse, recycling, recovery of WEEE collected, with high recycling and recovery targets.
- restricted use of harmful substances in member countries
- prohibition to export waste.

Producers are responsible for the end of life of their products and have two organizational possibilities since August 2014:

- set up an individual collection and processing system (without the need for approval)

28 ADEME (2017), "Les filières à responsabilité élargie du producteur – Panorama 2017", p.11

- join an certified eco-organization for the collection and treatment of these equipments. Since 2016, three organizations are authorized to collect and manage the treatment of professional WEEE in France: Ecologic, Eco-systèmes, Récyclum. Government approvals are granted for a 6 years period.

7.3.2. Case study 2 – Financial collective EPR for the textile industry, France

Region: France

The example of the textile EPR in France is different from the other because the first reason why it was implemented was that companies sorting out old clothes had difficulties to sustain their economic activity (social and solidarity economy). This is a situation that is found too in projects recycling fishing nets or oyster bags that have been studied earlier.

Action

Facing the situation, public authorities created the textile EPR for clothes, home textiles and shoes in 2007. Thus, producers or retailers of clothes have two options:

- pay a financial contribution to an eco-organization (Eco-TLC), approved by public authorities, in charge of contracts with sub-contractors and regional authorities to help them financially to operate the collection and treatment processes of old clothes and shoes.
- Or implement an individual system of recovery and treatment meeting strict requirement specifications.

Eco-TLC is thus in charge of developing the recycling branch through its financial support, foster eco-design of new products, raise awareness among the public on the necessity of specific sorting, support R&D on new opportunities and usages.

7.3.3. SWOT analysis

The EPR WEEE showed that EPR found collective solutions in situations where producers, retailers or consumers had to face situation in which they could not get rid of their waste through public collection but had no other alternative either. Another advantage is resource efficiency and recycling productivity: when producers either face a financial or physical burden of recycling their electronics after use, they may be incentivized to design more sustainable, less toxic, and easily recyclable electronics. Using fewer materials and designing products to last longer can directly reduce producers' end-of-life costs. Thus, extended producer responsibility is often cited as one way to fight planned obsolescence, because it financially encourages manufacturers to design for recycling and make products last longer.

The system helped associations, small companies from social and solidarity economy to become financially viable. It indeed fostered innovation to produce clothes that were more resistant, lasted longer or were easier to recycle (with only one material). It generates a source of secondary raw materials and by products useful to other industries. With higher recycling rates, EPR policy approach seems efficient to provide incentives to prevent waste at the source.

But though all its advantages, EPR also includes drawbacks:

- It can impose constraints on competitiveness because the eco-contribution constitutes an additional cost.
- Recycling or collecting actors which did not sign with the officially approved eco-organization can no longer operate and have to close down.
- In the specific case of financial collective EPR, it may be difficult for the public authorities to fix the pricing model to run operations.

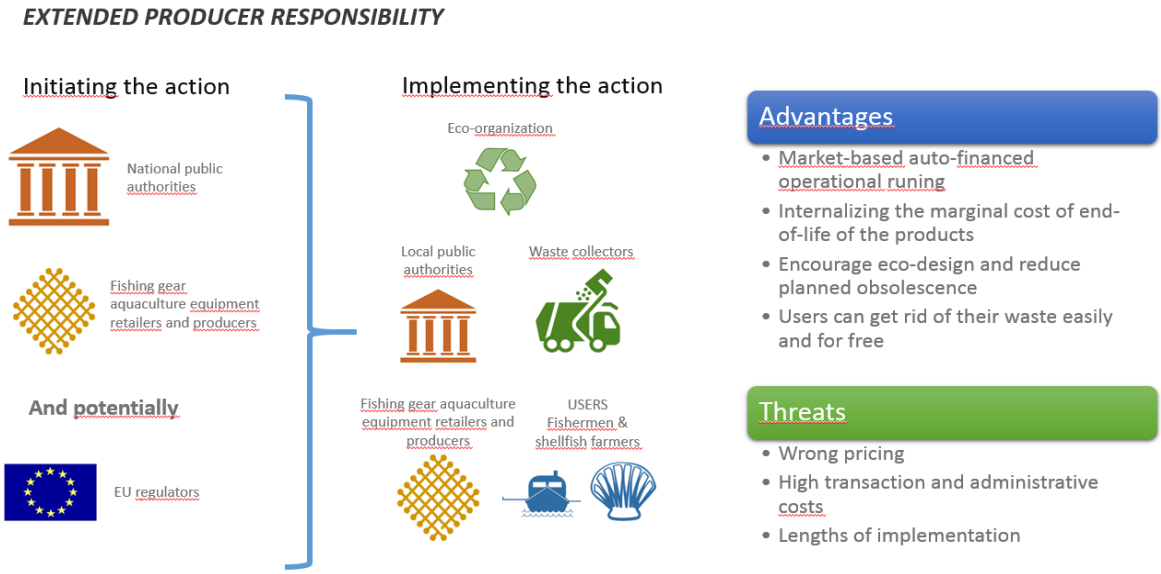
All these aspects could apply to the fishing and aquaculture industries as well. Knowing the harm caused to environment by old fishing gear and plastic equipment, aware of the various initiative trying to collect and recycle old plastics from fisheries and aquaculture, fishing nets producers and plastic aquaculture equipment manufacturers should be induced to take their share in the recycling process. But it requires a few elements to be considered and evaluated.

In the Single-use plastics directive (DIRECTIVE (EU) 2019/904, published June 2019), the European Parliament and the Council of the European Union have reached an agreement on the measures proposed by the Commission to tackle marine litter at its source, targeting the ten plastic products most often found on our beaches as well as abandoned fishing gear.

Regarding fishing gear the Commission aims to complete the existing policy framework with producer responsibility schemes for fishing gear containing plastic. Producers of plastic fishing gear will be required to cover the costs of waste collection from port reception facilities and its transport and treatment. They will also cover the costs of awareness-raising measures. Moreover, European Union members must set an annual target for the collecting of fishing gear in order to recycle it. For more information: http://europa.eu/rapid/press-release_IP-18-6867_en.htm

The Single-use plastics directive is supported by other measures taken against marine pollution, including the Port Reception Facilities Directive (Directive 2019/833, repealing the current Directive 2000/59/EC). The revised PRF Directive includes the requirement for EU Member States to implement a 100% indirect fee system for MARPOL Annex V waste (other than cargo residues), ensuring that waste generated on ships or collected at sea is always returned to land, recycled and processed in ports.

Figure 7 - EPR in a nutshell



Source: Iris Delahaye

Essential criteria

Governance

- Should the agreement be mandatory, negotiated or voluntary depending on the specificities of the fishing and aquaculture industries in each OSPAR country?
- How is waste being managed and regulated in this sector so far?

Cost-effectiveness

- How much does it cost for fishermen and aquaculture farmers to get rid of their waste?
- Does the feasibility study take into account the transaction costs and lengths of implementation?

Maturity

- Have the discussions with the different actors revealed that they need help to manage the end-of-life of their products?

Table 6 - Extended Producer's Responsibility SWOT

	Operating conditions	Strengths / Opportunities	Weaknesses / Threats
Extended Producer Responsibility	Social legitimacy	Users responsibility increased	Potential low acceptability of users to pay an additional pricing (rare)
		Users can get rid of their waste easily and for free	Low visibility on the usefulness of the scheme
		Clear geographical and thematic perimeter with an identified responsibility	Lengths of implementation
		Efficient branding and good visibility of actions led	Absence of communication to users
	Scientific acknowledgment	Environment impact assessment	High transaction and administrative costs
		Foster the use of secondary raw material	Absence of organization in setting up the EPR
		Encourage eco-design and reduce planned obsolescence	Absence of intellectual resources to structure the action
	Economic viability	Market-based auto financed solution	Wrong pricing
		Internalizing the marginal cost of end-of-life of the products	Concentrating additional financial burden on specific actors
		Eco-organization economic viability creating jobs and insuring continuity	Underestimation of infrastructure investments required
	Institutional network	Constraining legislation backing the initiative	Overlapping actions with already existing structures
		Official support from both state and non-governmental institutions	Absence of legal incentives to implement a EPR scheme or absence of public control

It could be interesting to define a differentiated environmental contribution according to the impact and the cost of the end-of-life of the product: the contribution per product range from each producer could be differentiated, within each eco-organization, by product type depending on actual treatment costs and impact on the environment.

7.4. Best practices – Innovation as a complementary approach

Policy instruments, local NGOs and market-based activities are not the only tools available to fight marine litter from fisheries and aquaculture. Innovation naturally finds its place as part of this multifaceted puzzle. For instance in promoting new eco-designs for nets, advanced technologies to recover plastics, new computing tools to calculate and localize ADLFGs or floating plastics or social innovation with new schemes

of cooperation between actors. Innovation may also consist in reconnecting with traditional fishing gear material like hemp, which is less harmful to the environment.

In France, a project of bio plastics called BioFiMa and Seabac has been conducted to study properties and potential of bio plastics to replace – among other use - fishing gear and aquaculture equipment. Launched in laboratories in 2010 with the project BioComba, now led in partnership with the Université de Bretagne Sud, the Institut de Recherche Dupuy de Lôme (IRDL) and the engineering consulting firm SeaBird, this project has resulted, after several years of research and development, in a biodegradable monofilament that is bio sourced from organic residues of vegetables. Its properties are almost similar to normal oil-based plastics like PP, PE or PA[29]. Seabac is a bioplastic crate that can be used for food storage (fish, shellfish and others). Seabird also found a bioplastic to replace HDPE, a resin called SEA113. But the product is less resistant to abrasion and erosion – which is problematic in the specific case of fisheries and aquaculture – and the price is two to threefold more expensive than regular nylon items. The lead researcher in the Université Bretagne Sud and IRDL points out that the price represents an investment for environment that no other plastics will secure since it will degrade naturally in the ocean, but also that lobbying from plastics manufacturers and lack of price competitiveness hinder the development of such a product.

The following table summarizes the projects led in France and in the Netherlands on bioplastics.

29 SeaBird website :

Table 7 - Innovation projects in France

INNOVATION			
PHApack	Innovation	Morbihan	The objectives of the project PHApack was prototyping bioplastics out of food residues with marine bacteria. It followed the laboratory project BioComba (2010-2011) to strengthen knowledge and competences and develop bioplastic packaging. This bioplastic is composed of polyhydroxyalcanoate (PHA) obtained through microbian synthesis. Laboratory (BioComba) > Prototyping (PHApack) > Industrializing (BluecoPHA).
BLUECOPHA	Innovation	Vannes/Lorient	Lead by Europlastique, BluEcoPHA is taking to an industrial scale what PHApack prototyped as bioplastic devices for various uses, among them, fishing activities and aquaculture.
BioFiMa mono & Seabac	Innovation	Lorient	BioFiMa is a monofilment made out of bioplastic from the food industry, that is 100% biodegradable (transforms into H2O and CO2). Seabac is a bioplastic biodegradable crate that can be used for food storage (fish, shellfish and others). Seabird also found a bioplastic to replace HDPE, a resine called SEA113. R&D is still on-going and prototypes are being released.
	Innovation	The Netherlands	Project research on micro plastics that occur when mussels seed are collected

Stimulating technological innovation is long-term process. Bioplastics are example of the several-years running program requiring large investments. It is also the result of building a wide network of technology suppliers, as the BioComba / Seabac project, but also in Europe the Danish Clean Technology Development Programme in which policy makers led companies which had economic incentives to develop clean technologies, data and contacts to support research centres for finding efficient technological solutions to specific environmental problems (Kemp, 2011). Examples of cooperation between research centres, companies and public authorities are numerous. But such policies are not easy to build up as they need special competence on the part of policy makers who must understand the technological background, the production processes, the identified relevant environmental issue and possible solutions, to act as “matchmakers”.

Table 8 - Innovation SWOT analysis

	Operating conditions	Strengths / Opportunities	Weaknesses / Threats
Innovation	Social legitimacy	Exploiting synergies	Disconnection from real needs
	Scientific acknowledgment	Long-term engagement	Long-term R&D
		Transform the market and make a difference	Risk of failure
		Improve sustainability of	Promoting second-rate polluting technologies
	Economic viability	Opportunity to create th game changing product	Important investments
	Institutional network	Serious backing from other research centers and protyping tests	Policy makers need to understand the ecosystem

8. Conclusion

Implementing better practices in fisheries and aquaculture is an on-going process, not an end, and in this respect, all OSPAR Contracting Parties can learn from each other's experiences. Sharing experiences and analysing the observations made during pilot crash tests can help each country move toward a more sustainable waste management without compromising competitiveness.

The involvement of local public institutions is essential to achieving these goals as they know better than any other national or international institutions the issues and opportunities that can be found locally. Yet, governments and European convention also provide "a predictable working environment, delivering innovation through R&D, introducing biosecurity measures and by setting incentives to produce within acceptable norms, etc." (OECD, 2015) which are no less essential as well to conduct public policies. In this respect, OSPAR definitely has a role to play.

9. Recommendations for a further approach

9.1. #1 Gather and share data

Gather and share reliable data in each OSPAR CP on marine litter from fisheries and aquaculture to understand the full picture of waste generation in these activities. Ecological Impact Assessments led in highly productive coastal areas and harbours should complete the study and help evaluating the environmental impacts.

9.2. #2 Communicate on the actions led and better share knowledge in the professional sector

Marine litter from aquaculture and fisheries may sound like a narrow topic to be studied, but it revealed that a lot of initiatives were carried out everywhere in Europe through motivated people with good will at all levels of decisions and perimeters. Giving it more visibility, raising awareness on the means already engaged, updating aging websites, gathering initiatives under a common denomination (even though projects may be different) could contribute to achieve this goal. However, it requires investments in communication and development that involves a cost-benefit analysis. The debate could extend beyond the circle of technicians, public policy officers and directly concerned NGOs into the realm of public debate.

9.3. #3 Creating economic incentives to recycle

Economic incentives were largely approved in the OSPAR questionnaire as one very effective way to help reducing marine litter, and examples in Europe and abroad corroborated this view. Two options were studied in this perspective. Extended Producer Responsibility showed higher potential results than Deposit Refund Schemes. But it will require in both cases investments and generate administrative and transaction costs due to negotiations with unions, fishing nets and aquaculture equipment producers, retailers, public authorities, potentially at a European level, to formulate the implementation frames. Thus before launching such strategies, further studies via pilot-projects need to be initiated and tested. In a context where fishermen and aquaculture farmers need to take care of their waste, having the possibility to give back old equipment for free is very attractive. On the long run, it should be more efficient in terms of recycling rates and coordination. Yet, the conditions and operational schemes would require feasibility studies to specify the functioning of the EPR.

9.4. #4 Foster bottom-up voluntary initiatives in the sector of fisheries and aquaculture

Even though these schemes of action were not completely endorsed in the questionnaire, the various interviews led in France and the different case studies explored (cf. 7.1.1) revealed that actors on the field often proved to be highly motivated, with a solid knowledge of local issues (but also felt somehow neglected by central administrations). These solutions that are voluntary-based are actually good compromises for States as they may not require as much investments as the other market-based options. An NGOs asking for funding for its local action is less constraining to finance than engaging negotiations to develop an EPR scheme. Also in the context of OSPAR CPs, it could be interesting to have local project leaders of each country talking to each other directly on their experiences from the field and imagine how actions could be merged or learn from each other.

9.5. #5 Encourage prototyped pilot projects to promote innovation

The perfect one-size-fits-all scheme to reduce marine litter from fisheries and aquaculture does not exist: the size of the marine farm, of the fishing vessel, the socio-economic circumstances, political agenda, social bonds between actors, the legal status and specificities of each area of production make it impossible to determine at an OSPAR level a greater. Further studies and local pilot projects will contribute to identify local specificities and management best practices that will help both private and public initiatives.

In this respect, innovative programs offering for instance a new vision of the role of fishermen or farmers, discovering unprecedented ways to grow shellfish, fish and algae at the same time like in Integrated Multi-

Trophic Aquaculture (IMTA) models, inventing new bioplastics, all of these creative unconventional ideas may find in the sectors of fisheries and aquaculture field of tests and expansion where environmental sustainability has become urgent.

9.6. #6 Encourage awareness raising toward professionals

Many pieces of fishing gears from net repair can be found in harbours and on board ships. Awareness raising to be sure those are cleaned up and do not end up in the sea are important.

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12. Appendices

12.1. Complete list of projects identified in Europe and France on marine litter from fisheries

Name	Type of initiative	Location	Brief description
MARELITT		EU, Italy, Ireland, Croatia, Bulgaria & Baltic Sea	MARELITT is an EU-funded project, aiming at identifying good practices for the removal of litter and derelict fishing gear from the sea (objective set out in the MFSD). After assessing existing marine litter removal projects in Europe's four regional seas, MARELITT is supporting seven organisations in setting up their marine litter removal or derelict fishing gear removal projects. The experience gained through this process is gathered in the MARELITT Toolkit.
MARELITT Baltic	Voluntary agreement Collection Recycling Raising awareness	Poland (East Baltic), Sweden (West Baltic), Estonia (8 areas in Estonian waters)	WWF Poland, the municipality of Simrishamn, Keep the Estonian Sea Tidy and WWF Germany decided to team up to set up the first regional project aimed at reducing the impact of derelict fishing gears on the Baltic environment, they developed : -operations to remove DFG with methodologies according to various seabeds - a code of conduct for the fishing industry - a compilation of recommendations for regulations on prevention in for of a recommendation paper on national and EU level - a feasibility study on economic solutions for DFG recycling
MARELITT Italy	Voluntary agreement Collection Raising awareness	Mediterranean Sea, Ligurian coast Fishing port of San Remo	OLPA is setting up a Marine Litter Retention project in San Remo and intends to involve the eleven bottom trawlers that are registered in the port to improve the marine environment and in particular the environmental status of the sea bottom by reducing marine litter. They also seek to promote behavioural change among stakeholders, raise awareness on marine litter issues and provide evidence on marine litter hot-spots in Liguria

Name	Type of initiative	Location	Brief description
MARELITT Ireland	Voluntary agreement Collection Raising awareness	Celtic Sea / Cork County	MARELITT Ireland develops a framework of local solutions for marine litter removal, promotion of sustainable fishery practices (Environmental Management System), improving knowledge on marine litter in the area. BIM is developing an industry-led marine litter retention project in the County of Cork.
MARELITT Croatia	Voluntary agreement Collection Raising awareness	Northern Adriatic Sea, Istrian Coast (HR)	The Centre for Marine Research is starting a marine litter retention project in Rovinj to remove marine litter, collect data on marine litter in the Northern Adriatic Sea and raise awareness on the problem of marine litter
MARELITT Bulgaria	Voluntary agreement Collection Raising awareness	Bulgarian Black Sea Coast, Province of Burgas Fishing port of Nesebar	UBBSLA is starting the first marine litter retention project in the Black Sea to raise awareness on marine litter and promote behavioural change among local stakeholders; collect information on marine litter in the area
DeFishGear	Voluntary agreement Collection Recycling Raising awareness	Adriatic & Ionian Seas Lead partner in Slovenia	The DeFishGear approach to combat marine litter entails sharing scientific knowledge and obtaining accurate, coherent and comparable scientific data that will ultimately facilitate the implementation of coordinated and multi-sectoral actions through various methodologies for monitoring marine litter. - WP4 aims at addressing knowledge gaps and research needs to facilitate effective decision making against marine litter and its impacts in the Adriatic and Ionian Seas - WP5 aims at addressing the emerging threat of microplastics - WP6 aims at piloting measures to address DFGs through FFL schemes and recovery schemes with Aquafil among others.
AQUA-LIT	Recycling Raising awareness	EU, Mediterranean Sea, North Sea, Baltic Sea regions	AQUA-LIT will develop a toolbox of innovative ideas and methodologies to prevent marine littering from aquaculture activities and to remove litter from aquaculture facilities.

Name	Type of initiative	Location	Brief description
LINEOUT	Voluntary agreement Collection	UK	The Marine Conservation Society has partnered with Coleraine Borough Council to provide LINEOUT bins for discarded and lost recreational fishing gear (monfilament line and tackle). Bins are installed at all Council harbours, ports, marinas and informal fishing marks.
Vislood		Belgium	Test of alternative unleaded throwing weights in recreational sea fishing. Focus on weights that do not use alternative heavy metals.
Spekvis		Belgium	Sustainable alternatives for plastic dolly rope.
CleanSea 2013-2017		EU	Towards a Clean, Litter-Free European Marine Environment through Scientific Evidence, Innovative Tools and Good Governance. CleanSea's aim was to generate new information on the impacts (biological, social and economic) of marine litter, develop novel tools needed to collect and monitor litter and protocols needed for monitoring data (litter composition and quantities) and evaluate the impact of mitigation strategies and measures in order to provide policy options to policy makers in the EU.
Healthy Seas	Voluntary agreement Collection Recycling Raising awareness	Netherlands	Collecting waste fishing nets and cleaning shipwrecks from nets, for the purpose of recycling these fishing nets (polyaminde 6) for the production of high quality products (e.g. socks). Closing the loop of materials for the creation of circular economy, by engaging industry, NGOs and consumers.
Ghost Fishing Foundation	Voluntary agreement Collection Raising awareness	Worldwide Based in the Netherlands	The Ghost Fishing Foundation is collaborating worldwide with various local groups of technical divers and salvage companies to remove lost fishing gear. With projects in The Netherlands, Belgium, Germany, Croatia, Malta, Greece, UK and USA, they work on existing projects, set up new ones and document these through visual media, informing a wide audience, raising social awareness and sharing best practices

Name	Type of initiative	Location	Brief description
Global Ghost Gear Initiative (GGGI)	Voluntary agreement Collection Raising awareness	Worldwide	Launched in September 2015, it is the first initiative dedicated to tackling the problem of ghost gear at a global scale with a great diversity of participants including the fishing industry, the private sector, academia, governments, intergovernmental and non-governmental organizations.
Fishing for Litter and Ghost Nets retrieval	Voluntary agreement Collection Recycling Raising awareness	UK (base), Denmark, The Netherlands, Belgium, Lithuania, Estonia, Germany, Faroe Islands, Isle of Man	Fishing for Litter: Fishermen voluntarily participate in the project by collecting the litter that ends up in their fishing gear and bringing it ashore where port staff weigh and monitor the litter in accordance with UNEP codes. The aim of the project is to raise awareness of the marine litter – problem and get an idea of the types of litter that exist in the sea. Ghost Nets retrieval: they are having a holistic approach on the issue where they both retrieve nets but also focus on the nature of the problem.
PECHPROPRE - France			
DéchAct	Voluntary agreement Collection Recycling	Hauts de France	Study project on waste management in 8 harbours, 4 mussels farms zones and 11 nautical bases. Quantifications of mussels safety nets (burried by Veolia till now), shells and undersized mussels are on going. Results are expected for September 2017 (Nautique Conseil)
SEAPLAST	Voluntary agreement Collection Recycling	Normandie	It helps the sector of shellfish aquaculture to organize the recovery from plastic waste and marine by-products and find applications in the fishing, shellfish or plastics industry. The first step of the project so far consisted in listing the main deposits of plastic waste and shells that can be collected and recycled. The second phase was about testing in laboratories the properties of old plastics from nets, oyster bags etc. They are now studying the life expectancy of these recycled materials and looking for industrial partners. By far the most advanced project.
PNMI	Voluntary agreement Collection	Bretagne	PNMI is conducting a study on marine litter in harbours

Name	Type of initiative	Location	Brief description
Fil&Fab	Market-based Collection Recycling Raising awareness	Bretagne	Fil&Fab aims at producing 100% recycled fishing nets. Currently looking for funds.
Navicule Bleue	Voluntary agreement Collection Recycling Raising awareness	Golfe du Morbihan	The project Terre-Mer Chantiers led by Navicule Bleue is focusing on recycling plastic waste from aquaculture and fishery while providing work for disabled people.
Actions in plan GALPA	Voluntary agreement Collection Recycling Raising awareness	Pays Basque	The project for CCI Pays Basque is to create a craft shop dedicated to reparing, recycling and recovering fishing gear
RécupNet	Voluntary agreement Collection Recycling Raising awareness	Languedoc Roussillon	After conducting surveys among fishermen, RécupNet is trying to organize the recycling process. Yet, data is patchy and the local fishing industry quite small.
Net Sea	Voluntary agreement Collection Recycling Raising awareness	Bouches du Rhône	The objectives of Panala Environnement is to promote marine and terrestrial ecosystems through innovative projects. Net Sea project aims at recovering and recycling plastic marine litter, especially fishing nets.
APAM	Voluntary agreement Collection	Provence Alpes Côte-d'Azur	APAM has conducted surveys in 8 different harbours and launched experiments with big bags to collect and quantify plastics waste from fisheries. They are trying to find recycling options such as decoration, secondary raw

Name	Type of initiative	Location	Brief description
	Recycling Raising awareness		material transformation (at a local scale with Testa, NT Industrie)
SHELLFISH			
Shellfish without litter	Voluntary agreement Collection Raising awareness	Sado Estuary, Portugal	Fishermen collect shellfish inside the estuary during the low tide and to extract the molluscs (razor clams), fishermen use salt to make the clams come to surfasse and leave thousands of empty plastic packages in the intertidal beds of the estuary. For this purpose, a campaign called “Mariscar SEM Lixo” (fish for shellfish without trash) will be organised involving fisherwomen from the Sado estuary as community leaders, promoting best-practices and involving local stakeholders to reach the wider community that uses the estuary and seagrass beds.
Echo Mer	Voluntary agreement Collection Recycling Raising awareness	Marennes Oléron	In partnership with an ESAT (professional integration for people far from employment), they collect and recycle oyster bags into baskets. It corresponds to around 1 ton of oyster bags per year . Once the Regional Shellfish Committee required the ESAT to clean some oyster bags and send them to Intermas to be recycled.
Terre-Mer Chantiers (Navicule Bleue)	Voluntary agreement Collection Recycling Raising awareness	Poitou Charente	Terre-Mer Chantiers is one of the three structures of the group Navicule Bleue which focused on providing insertion jobs for disabled people and former fishermen. It collects and washes around 50 tons of oyster bags per year, washes oyster bags and ships them back up to Spain (Intermas). Terre Mer Chantiers provides a dozen of jobs for people engaged in integration processes, but Navicule Bleue provides more than 200 jobs as a whole in the three branches different branches.
TEO	Voluntary agreement Collection Recycling Raising awareness	Poitou Charente	TEO is a"société coopérative d'intérêt collectif" (cooperative community-oriented enterprise) working on environment and sea-based activities seeking to reconcile sustainable development and the social economy

Name	Type of initiative	Location	Brief description
Perlucine	Voluntary agreement Collection Recycling Raising awareness	Golfe du Morbihan, Damgan	Perlucine aims at collecting oyster shells and oyster bags from 34 oysters from " Le Tour du Parc" producers bringing their empty shells at a specific location to clean and send them for recycling to Usine de Kervellerin to support the creation of jobs for people engaged in integration processes. Small scale project.
Cooperative de Cancale	Voluntary agreement Collection Recycling Raising awareness	Bretagne	Oyster bags cleaning then sent to Intermas for recycling
INNOVATION			
PHApack	Innovation	Morbihan	The objectives of the project PHApack was prototyping bioplastics out of food residues with marine bacteria. It followed the laboratory project BioComba (2010-2011) to strengthen knowledge and competences and develop bioplastic packaging. This bioplastic is composed of polyhydroxyalcanoate (PHA) obtained through microbian synthesis. Laboratory (BioComba) > Prototyping (PHApack) > Industrializing (BluecoPHA).
BLUECOPHA	Innovation	Vannes/Lorient	Lead by Europlastique, BluEcoPHA is taking to an industrial scale what PHApack prototyped as bioplastic devices for various uses, among them, fishing activities and aquaculture.
BioFiMa mono & Seabac	Innovation	Lorient	BioFiMa is a monofilment made out of bioplastic from the food industry, that is 100% biodegradable (transforms into H2O and CO2). Seabac is a bioplastic biodegradable crate that can be used for food storage (fish, shellfish and others). Seabird also found a bioplastic to replace HDPE, a resine called SEA113. R&D is still on-going and prototypes are being released.

Example of a different market-based approach: SORETEX

Soretex is a very small company that recycles plastics like PE, PP, PVC and HDPE in Normandy. It collects various type of plastics. But in the areas of shellfish farming, it collects emptied oyster bags with very few organic residues and no metallic attach. They are brought by truck on site 100km away, in Cormelles-Le-Royal. Oyster bags are cleaned up, relieving them of 20% to 30% of their weight. Then washed, steamed, injected and turned into granulates that are sold to plastics companies. Out of 10 tons of oyster bags come 6 tons of granulates ready for use. Clients are plastic goods manufacturers in France, Belgium and China. In 2016, 80 tons of oyster bags had been collected in Normandy. The administrative costs are nearly balanced with the price of granulates. Yet this scheme only works because transportation fees are paid by the local Shellfish Committee and the DREAL (Direction Régionale de l'Environnement, de l'Aménagement et du Logement – Regional Directorate for Environment, Planning and Housing).

12.2. Description of PECHPROPRE

The Marine Cooperation is a French association gathering 150 cooperatives of bunkering for fishing vessels, unions, insurance and banking systems for fishermen. They have been chosen by the Ministry of Environment to lead the project PECHPRORE, with five predefined objectives:

- **Objective 1**: providing an exact overview of plastics used in the fishing industry: data is essential to public decision processes and project management. In this respect, the Marine Cooperation launched several questionnaires. Results are coming back slowly and the collected information need to be harmonized, but responses are expected to improve data on plastics from fisheries
- **Objective 2**: listing the environmental and legal constraints for these waste. An updated report on legal and environmental constraints has been released in July 2017.
- **Objective 3**: understanding the current waste management systems in the different regions. The survey on current waste management systems is an on-going process that should keep progressing till the end of the project
- **Objective 4**: conducting a technical and economic feasibility study on a solution for old plastics from the fishing industry in France. The technical and economic feasibility study is being conducted by the Comité français des Plastiques en Agriculture. A report is expected by the end of 2017.
- **Objective 5**: raising awareness on the need for integrated management of old plastic. Future results from the inquiries should help building up an appropriate tool to raise awareness among fishermen

The scope and scale of the study is limited to metropolitan French shores and to "small-scale fishing" with fishing vessels shorter than 25m with the ship-owner onboard. Small-scale fishing represents 95% of the French fishing fleet[30].

The types of marine taken into account are plastics: fishing nets, lines, crates, dredgers, floats, buoys, beacons, fishermen boots and gloves. They are mainly composed on a mixture of synthetic polymer of various origins: high-density polyethylene (HDPE), low-density polyethylene (LDPE), polypropylene (PP). Plastics used for fisheries can be shaped with heat.

Once the overall study on plastic marine litter is completed in France, a further study is to be led by the Marine Cooperation in 3 European countries on the management of old plastics from the fishing industry.

30 DPMA, Ministry of Environment

The project is thus divided into three phases:

- Phase 1: estimate the quantities of new and old plastics used for fisheries
- Phase 2: identify a financially sustainable solution to be repeated at a large scale
- Phase 3: look for inspiration and comparison with other European countries

12.2.1. Quantification of new plastic fishing gears

The Marine Cooperation identified four different types of actors to be interviewed:

- Manufacturers of plastic fibers: further data are expected with the final report of PECHPROPRE scheduled for mid-2018.
- Manufacturers of products and/or importers: they are 11 in France, the most important one is Le Drezen who accounts for 90% of the market share of trawl sales with 2,000 tons of new nets sold per year. Most of the retailers buy plastic fishing equipment from competitors or foreign countries to complete their product ranges.
- Wholesalers and professional sellers: they are 48 in France, some of them have a historic local establishment selling generally high quality equipment and the rest is are Internet-based with more attractive prices.
- Distributors and Marine Cooperatives: 150 local marine cooperatives distribute special equipment for all kind of marine activities.

In order to estimate the quantities of plastic fishing gear put up on the market in France, two questionnaires were set up: one for manufacturers and one for wholesalers/cooperatives. It aims to collect quantitative and qualitative data – quantities of new plastic equipment each year, characterization of the materials, information about supply chain and their sensitivity to environmental issues. In this survey, the pre-existing network of the Marine Cooperation is crucial. Nevertheless, answers to the survey remain difficult to obtain (low response rate) and the possibility for the interviewed to choose the units of the quantities he gives makes it difficult to harmonize data.

12.2.2. Quantification of old plastic fishing gears

Through the preliminary interviews, four types of information sources were identified:

- Two among the users: the fishermen themselves and ships owners who both may know the frequency of replacement for fishing equipment
- Two among the authorities: port authorities, officials in the French Chambers of industry and Trade on one side (43 out of 126 are directly involved in the harbor development and management), public authorities or private companies with a public service delegation responsible for waste collection and treatment in port on the other side.

Two different questionnaires were designed for these two categories, one more focused on quantities of waste generated and their treatment on board and in ports, and the other one on reception facilities, pricing for waste collection and sorting out. The Marine Cooperation has also included questions on biodegradability of nets to evaluate fishermen's sensitivity on the sustainable treatment of fishing waste.

A third questionnaire was designed for industrial fishing fishers and ship owners because they have longer boats offering more possibilities to stock and sort out waste on board.

To distribute the questionnaires and collect the answers, the Marine Cooperation has been working with sub-contractors:

- the consulting firm Suez Consulting (former Safège) in Bretagne on 39 ports
- the joint association SMEL (Synergie Mer et Littoral – Synergy Sea & Coastline) in Normandy for 15 ports
- The Marine cooperation itself is collecting responses in 5 ports
- the APAM in Provence-Alpes-Côte d'Azur for 8 ports in Mediterranean Sea
- the Marine Nature Park in Picardie and Opal Sea in the North coasts of France who had already created a specific questionnaire before.

The Marine Cooperation also benefits from the experience and scientific expertise of the Comité français des Plastiques en Agriculture (CPA – French Committee on Plastics for Agriculture) who already implemented a similar system of plastics recovery for farming activities.

Through its sub-contractors, the Marine Cooperation has collected data from 57 fishing ports and 197 fishers, 28 through the SMEL, 163 through Suez Consulting, 6 through its own network. 157 of them were established on the Atlantic seafront and 20 in the Mediterranean Sea.

Results and analysis of these responses are still on-going. Yet, the Marine Cooperation and its partners have met a few difficulties to collect data from these actors, for various reasons:

- Fishermen are often at sea and when they are back on shore, they are not necessarily very eager to answer to questionnaires
- A lot of fishermen have no idea of the type of plastic theirs nets are made of, nor the quantities they estimate to lose or buy or remain vague on the price of the equipment. But they generally know the frequency of replacement for their equipment
- Relations with fishermen are all the more difficult as questionnaires are given by a consulting firm asking for their contact details.
- Some of the ports that have been studied in the first time happened not to be the most relevant ones according to the information collected during site visits. The bibliographic review that justified this choice in the first place was based on data that had not been updated recently.
- The name of the project «Pechpropre» (CleanFishing literally) sounds accusing for fishermen

12.2.3. Initiatives led under PECHPROPRE

The Marine Cooperation has identified 9 local initiatives in France specifically dealing with marine litter from fisheries now gathered under the common name of PECHPROPRE:

1. **DechAct** (PNMEPMO – North Coasts) : launched by the Marine Nature Park of Picardy Estuaries and Opal Sea helped by two consulting firms, Hydro-consultant and Nautique Conseil, their goal is to facilitate waste disposal onboard, improve port reception facilities and collection on-shore, create a network of best practices to raise awareness and develop common waste treatment plants.

2. **Seaplast** (SMEL – Normandy): the project is to recycle plastic waste from both fisheries and aquaculture in Normandy and find outlets in plastics processing. They work with Ivamer, specialized in marine resources management and NaturePlast on bio plastics. They are quantifying and characterizing waste in Normandy and testing various recovery chains and uses for secondary materials.

3. **Marine Natural Park of Iroise** (Bretagne) focuses on marine litter in harbours and how to gather all the stakeholders to manage these waste.

4. **Fil&Fab** is a young association working on ghost nets and debris lines of water mark. They want to build up a platform dedicated to innovation and research to manufacture 100% recycled fishing nets and other designs.

5. **Navicule Bleue** (Poitou Charente) is leading several projects, one of which is “Gens de la Mer” specializing in the sorting of marine plastics waste and especially fishing nets.

6. **Interdepartmental Committee for Marine Fisheries and Marine Farming and Chamber of Industry and Commerce** (Basque Country) took over the activities of the association of young fishermen Itsas Gazteria that organized actions similar to Fishing-for-litter back in 2002. Today, with other local partners, they are trying to launch back the collection of old fishing gear to recover, repair or recycle them. This project remains incomplete and looking for funding.

7. **RECUPNET** (Marine Park of the Lion Gulf) started in 2016 and has been working on three different issues: marine litter found in the fishermen’s nets, lost fishing nets and used fishing equipment in the area of the Lion Gulf. Data has been collected during a six-month internship to evaluate the quantities of these different items.

8. **NetSea** by Palana Environnement (Mediterranean Sea), their objective is build up a local recycling branch out of used fishing gear. They are a good intermediary to get in contact with local fishermen and collect data from them. The first objective in Marseille and its greater area is to create a partnership with fishermen to report their observations on abandoned nets and build a network to collect in specific containers damaged nets lying in harbors.

9. The **APAM** Project (Mediterranean Sea – 8 ports), by Association of Coastal Fishery and Sustainable Marine Activities based in Marseille too, aims to explore opportunities for recycling, reduction, reuse (the 3 Rs), quantify and identify materials, organize collection, storage and removal, diversify the profession by involving fishermen in the process and thus give a better picture of fishing practices. The project is quite well advanced. They are currently testing and prototyping street furnitures made out of recycled materials, raising awareness among fishermen with information campaigns and collecting fishing plastic trash in 8 pilot ports of the region, which have been selected for their characteristics in the testing phase.

A few of these projects had already started their own work of data collection and marine project management when the Marine Cooperation established the first contacts. For instance, the Marine Park of the Lion Gulf had investigated on deposits of old fishing gear (around 75m3) and the SMEL had started its own study on 15 different harbors in Normandy where the deposits of various fishing plastics are estimated to be 130 tons. So PECHPROPRE just integrated them to the general scope.

12.2.4. Map of PECHPROPRE initiatives

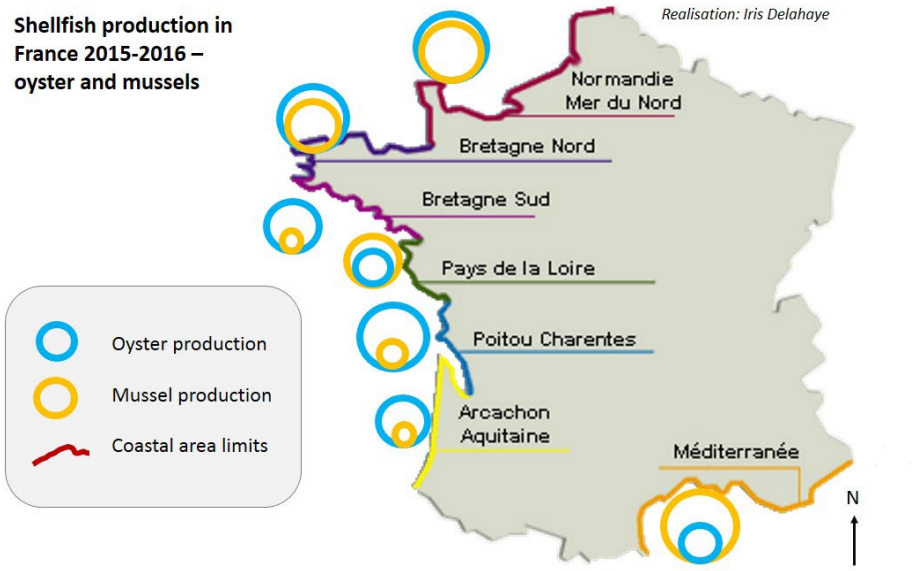
12.3. Description of aquaculture sector in France

France is the second largest producer of aquaculture products, mostly of oysters and mussels with 160,000 tons per year (FranceAgrimer, 2014). They respectively represent around 77,000 tons and 74,000 tons while fish farming only accounts for 20% of aquaculture (and only 2,5% concerns seawaters fish farming[31] in deep waters). The negative externalities of aquaculture, the regulatory restrictions and opposite interests with other users of the sea (residents, shoreline landowners, tourists, fishers) made it complicated for French fish farms to develop (Bostock et al., 2010) and as mentioned previously, fish farming does not generate many macro-waste.

The following map gives the locations of the production regions per volume in France.

Figure 8 - Shellfish production in France

31 France AgriMer « Les filières pêches et aquaculture en France » (2014).



Sources: CNC/France Agrimer 2015-2016, Agreste Poitou Charentes (oct. 2014, n°14), Agreste Bretagne (Déc. 2014 n°81), Soretex, CRC Normandie, CRC Poitou Charentes, CRC Bretagne Sud, Projet Perlucine, CRC Bretagne Nord

12.3.1. Oyster farming

Understanding the processes of oyster production helps to understand the waste the activity generates. The production of mature oysters take three to four years. In the summer, oysters lay microscopic larvae that follow the currents looking for a place to fix. Farmers can build natural collectors with tubes, slate piles, roman tiles or piles of shells downstream the exploitation and collect the larvae that where brought with the current. Or they can buy larvae in hatcheries. Once fixed, the larvae become a spat. After four month, they reach 2 to 4 cm (200 times its initial size as larvae). Farmers collect the spat from the collectors to put them in half-farming for one or two years and bags will be turned regularly. For the following one to two years, oysters are placed in marine areas rich with planktons. Methods slightly vary according to regions:

- Foreshore farming: oysters are bred on the foreshore (the coastal portion regularly recovered by the tides), spread flat on the sand or on iron tables, inside bags that will be frequently emptied, oysters are calibrated and put back in clean bags.
- Deepwater farming: oysters are sown on the sea bed or hung up on ropes moored to floating buoys or tables (only in the Mediterranean Sea)
- Deep open water farming: oyster are hung up on deeper ropes moored to floating buoys offshore

The adult oysters are placed in clay ponds “clear” refining basins, that is to say in less salty waters and richer with planktons, and then stored, cleaned, sort out by size, laid flat in sealed baskets to be sold.

12.3.2. Mussel farming

Mussels are divided in two main species:

- Mytilus edulis produced on Atlantic shores on piles called «bouchots» in France
- Mytilus galloprovincialis produced in the Mediterranean Sea

For *Mytilus edulis*, ropes are stretched horizontally where spats of "Bouchots mussels" can easily fix themselves during the spring. The spats develop there till the end of the summer. The ropes are then wrapped around the Bouchot piles in September. To protect the mussels against the invasion of crabs, the piles are dressed in a skirt or cone or "tahitian". Mussels develop during winter and the following spring. Covering protective nets ("catinage") are wrapped around the mussels to protect them from storms, crabs and birds. Algae must be regularly removed as well. After one year on their pile, mussels are collected to be washed, sorted out and packaged.

Mytilus galloprovincialis are entirely bred on suspended ropes, on fixed or floating structures, in submerged longlines or tables. Submerged longlines were developed to start producing offshore without overloading the coastal areas.

This industry generates waste, identified in the following section: oyster bags, mussels' nets, crates and boxes made of plastics that may end up lying on beaches or at sea.

12.3.3. Identification of aquaculture waste quantities in France

The data in this report have been collected between May 2017 and October 2017

- through 40 oral interviews in person or over the phone with local stakeholders : project leaders from associations, the 8 Regional Committees for Shellfish Farming, managers in the Ministry of environment
- a questionnaire has been designed and sent to OSPAR Contracting Parties (CP) and MEDPOL participants on aquaculture best practices in each country (9 returns from CPs).
- Research on the Internet on specialized websites, in reports from international institutions and research centers.

It seemed important to estimate the quantities of key waste items from aquaculture and give an idea of the magnitude of the issue. But like marine litter from fisheries, information is scarce or old. The questionnaire to OSPAR did not give any result concerning quantities of waste from aquaculture and the following tables for France required several month-long work to be constituted. This massive lack of data should be a motivation to launch further studies on quantification and characterization of waste from aquaculture in Europe.

Table 9 - Oyster bags and mussels nets according to production per region in France

		Oyster marine litter				Mussels marine litter	
Date of data	REGIONS	Oyster production (t)	Estimated oyster bags (t)	Recycled oyster bags (t)	Shells (t)	Mussels production (t)	Estimated mussels' nets (t)
2014	Pays de la Loire	7 600	56	-	1 370	10 000	-
2014	Bretagne Sud	11 000	-	-	>600	3 500	-
2014	Bretagne Nord	21 550	330	-	-	17 500	-
2009/2015	Normandie-Mer du Nord	25 000	435	170	4 555	21 000	70-140
2004	Poitou Charente	44 000	-	145	17 550	5 200	-

2015/2016	Arcachon-Aquitaine	8 000	-	-	1000+755	3 000	-
2015/2016	Méditerranée	7 600	-	-	-	30 000	-
2015/2016	France	124 750	0	371	23 475	90 200	0

Sources: CNC/ France AgriMer 2015-2016, Agreste Poitou Charentes (Oct. 2014 N°16), Agreste Bretagne (Dec. 2014, n°8), CRC Normandie, CRC Poitou Charentes, CRC Bretagne Sud, Projet Perlucine , CRC Bretagne Nord, final report of SEAPLAST (Normandy)

Apart from Normandy, there is no data available on mussels' nets quantification notably because these nets are often shredded into pieces and the field of mussels' nets recycling does not yet show a promising future[32]: the plastic is too degraded and dirty to be recovered in any way. One option would be to promote biodegradable nets for this specific activity or to find another use compatible with the high degradation of the material.

Another reason for the lack of data is that local waste treatment companies do not necessarily sort out waste. For instance, the basin of Thau, in Hérault (South of France) produces nearly 10% of the national oyster production with 13,000 tons of oysters and 3,000 tons of mussels[33]. COVED, a division of PAPREC, collects the waste but does not sort them out by key items. So COVED "estimates" that the shellfish farms in the Basin of Thau generate around 275 tons per year of macro-waste, 50% of them being plastics of all sorts[34].

As a result, the following table includes these "various plastic waste" that are collected in the areas of shellfish farms but that are not identified as key waste items from aquaculture.

Table 10 - Other waste from aquaculture per region in France

		Other plastic waste from aquaculture		
Date of data	REGIONS	Various plastic waste* (t)	Wood** (t)	Metallic waste*** (t)
2014	Pays de la Loire	142	1 363	494
2014	Bretagne Sud	-	-	-
2014	Bretagne Nord	-	-	-
2009/2015	Normandie-Mer du Nord	230+12	-	5-90
2004	Poitou Charente	215	2 940	2 360
2015/2016	Arcachon-Aquitaine	-	-	-
2015/2016	Méditerranée	275	-	-
2015/2016	France	632	4 303	2 854

* Various plastic waste: crates, oyster bags, mussels nets gathered

** Wood: pallets, hampers, Bouchot piles

*** Metallic waste: oyster tables, hooks to fix oyster bags on tables

32 Interview with Benoît Salaun, CRC Bretagne Nord

33 « Les cultures marines en quelques chiffres »

34 Interview with Christian Tirman, Director of COVED (04/07/2017)

Sources: CNC/ France AgriMer 2015-2016, Agreste Poitou Charentes (Oct. 2014 N°16), Agreste Bretagne (Déc. 2014, n°8), Soretex, CRC Normandie, CRC Poitou Charentes, CRC Bretagne Sud, Projet Perlucine , CRC Bretagne Nord, interview with Denis Regler, CRC Méditerranée & Christian Tirman, COVED, final report of SEAPLAST

These three tables reveal that data remains rare and require new quantitative studies in France to support any action in the future on marine litter from aquaculture.

12.3.4. Identification of initiatives

Compiling information from PECHPROPRE, various interviews with stakeholders in the aquaculture/fisheries industries and research resulted in a table that summarizes the initiatives led in France and Europe (see Annex 11.1)

SHELLFISH			
Shellfish without litter	Voluntary agreement Collection Raising awareness	Sado Estuary, Portugal	Fishermen collect shellfish inside the estuary during the low tide and to extract the mollusks (razor clams), fishermen use salt to make the clams come to surface and leave thousands of empty plastic packages in the intertidal beds of the estuary. For this purpose, a campaign called “Mariscar SEM Lixo” (fish for shellfish without trash) will be organized involving fisherwomen from the Sado estuary as community leaders, promoting best-practices and involving local stakeholders to reach the wider community that uses the estuary and sea grass beds.
Echo Mer	Voluntary agreement Collection Recycling Raising awareness	Marennes Oléron	In partnership with an ESAT (professional integration for people far from employment), they collect and recycle oyster bags into baskets. It corresponds to around 1 ton of oyster bags per year . Once the Regional Shellfish Committee required the ESAT to clean some oyster bags and send them to Intermas to be recycled.
Terre-Mer Chantiers (Navicule Bleue)	Voluntary agreement Collection Recycling Raising awareness	Poitou Charente	Terre-Mer Chantiers is one of the three structures of the group Navicule Bleue which focused on providing insertion jobs for disabled people and former fishermen. It collects and washes around 50 tons of oyster bags per year, washes oyster bags and ships them back up to Spain (Intermas). Terre Mer Chantiers provides a dozen of jobs for people engaged in integration processes, but Navicule Bleue provides more than 200 jobs as a whole in the three branches different branches.

TEO	Voluntary agreement Collection Recycling Raising awareness	Poitou Charente	TEO is a"société coopérative d'intérêt collectif" (cooperative community-oriented enterprise) working on environment and sea-based activities seeking to reconcile sustainable development and the social economy
Perlucine	Voluntary agreement Collection Recycling Raising awareness	Golfe du Morbihan, Damgan	Perlucine aims at collecting oyster shells and oyster bags from 34 oysters from " Le Tour du Parc" producers bringing their empty shells at a specific location to clean and send them for recycling to Usine de Kervellerin to support the creation of jobs for people engaged in integration processes. Small scale project.
Cooperative de Cancale	Voluntary agreement Collection Recycling Raising awareness	Bretagne	Oyster bags cleaning then sent to Intermas for recycling

Except “Shellfish without Litter”, the OSPAR questionnaire did not provide any other result of initiative led elsewhere concerning specific plastic waste from aquaculture. The majority of projects led in France aim at recycling macro waste from aquaculture, like the national project PECHPROPRE for fisheries. The major item that is dealt with remains oyster bags. The rest is not considered - yet - because stocks and quantities are too small or because they are too difficult to recycle (more than one plastic component, no sorting, and presence of organic residues, salt or sand).

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