

## Course package 'Fishing with a Future'

Sustainable Fishing training for fishing  
academies

OL tool

ResponSEAbLe project WP 5, deliverable 5.5: Educational packages for professionals

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# 1. Introduction

Being a fisher today is different compared to 10 or 20 years ago. The job has changed due to increasing costs, more regulations, farmed fish products on the market and a higher demand for responsible and sustainable fish products. In addition, our seas are used for more than fishing alone, so fishing grounds are under pressure. Also, and partially as a reaction to these developments, the fishing sector itself has experienced large changes in the past 10 years such as new fishing techniques and more market-focused thinking.

To continue to successfully operate in the changing society and the changing fishing sector, competences of those working in the sector need to change and grow. Especially for the sustainable development of the fishing industry, fishers need other skills, knowledge and information than in the past. The way society perceives the environmental and social pressures of fishing is changing and fishers are operating today in a world with multiple stakeholders.

This is where sustainability education and Ocean Literacy comes in. Sustainable fishing education and Ocean Literacy can fill this gap and address marine ecology and the role of fishing in the marine ecosystem, knowledge and understanding of current issues such as stock assessment, selective fishing, marine litter, climate change, certification and cooperation within the fish supply chain, opinion forming, communication skills and personal involvement/responsibility, to name some important themes.

The ProSea Foundation has been developing and conducting sustainable fishing trainings for the past 14 years in the Netherlands, with success. ProSea has provided sustainable fishing courses for (future) fishers since 2004, and in 2011, the course content was included in the official fishing school curriculum and teaching materials. Until now, ProSea has only conducted sustainable fishing courses in The Netherlands.

As a partner of the ResponSEABle project, the ProSea Foundation has worked on the development of educational packages for professionals working at sea. With the Dutch program for fishing academies as an inspiration, ProSea has developed a course framework for an international sustainable fishing course for fishing academies, and 7 additional OL tools about a variety of subjects relevant to sustainable fishing training. In February 2018, an environmental awareness course was conducted for a mixed group of future seafarers and future fishers in Pasaia, Spain. This course confirmed the insights gained in the courses in the Netherlands.

This report describes the international sustainable fishing course framework. In chapter 2 it discusses the main framework of the course. Chapter 3 deals with the course outline and timetable and chapter 4 shows the detailed learning objectives. Finally, in chapter 5, we have included an instructor manual, where we discuss general course didactics and course content.

## 2. Course framework

### 2.1. Scope

The purpose of this course framework is to inspire and assist fishing academies, their teaching staff and other experts to organize and introduce sustainable fisheries training for future fishers, with the ultimate goal to implement this as a structural element in the school curriculum of all fishing academies.

In correspondence to the results of the DAPSI(W)R analyses:

- The course acknowledges the growing demand for seafood, the need for sustainable development, and the culture, history and current economic structure of the fishing industry (drivers D).
- The central activity (A) is fishing, complemented with related activities in the fish supply chain.
- Sustainable fishing empowers (future) fishers to minimize pressures (P) on the ecosystem, protect fish stocks and the marine environment for future generations. The training course aims to help them to find a balance between planet (environmental challenges), profit (economic viability), and people (acceptance of your business by society – a license to operate) in shaping their businesses.
- An essential element of the course is giving participants basic knowledge about marine ecology, our connection to the ocean, increased understanding of fish stocks and other elements of the marine environment (State - S).
- Several subjects in the program address sustainability challenges and environmental impact (I) connected to fishing and the fish supply chain. The program part about fishery management deals with the tragedy of the commons, the EU common fisheries policy and challenges like selective fishing, fish gear choice and fish stock assessment. Lectures about environmental challenges include an explanation about the impacts of marine litter, oil and air emissions.
- The sustainable development of the fishing industry is important for food security and the preservation of fishing communities and culture, including employment in fishing and the fish supply chain (Welfare – W).
- The course addresses a wide variety of Responses (R) to the challenges of (un)sustainable fishing, including legal responses (including MARPOL, CFP) and certification schemes in the fish supply chain (including MSC). Ultimately, this course focusses on the knowledge, awareness, skill and involvement of the participants, and encourages them to identify their personal role and responsibilities.

It is important that the course is experienced as useful by the students, since they will have to choose to use the course content to become a more successful and more sustainable fisher.

The training course comprises of a wide variety of teaching methods, including interactive lectures, video's, animations, workshops, group assignments, games, quizzes and group presentations. The development of seven OL tools in the ResponSEable project contributed greatly to the variety of tools, by adding video's, animations, illustrations and slide shows to the course package.

Overall, the course has three main elements:

- Content and theory – background knowledge and current information
- Communication and presentation skills – hear, see, then practice, and practice again
- Opinion forming and future thinking – learn how to develop personal opinions and to think about the future of fishing

## 2.2. Course implementation

It is essential to keep in mind that this course package is mainly based on the experiences of the ProSea foundation in the Netherlands. It works for future fishers in the Netherlands. For implementation in other countries, the course should be adjusted to the specific situation for that country or region. For successful implementation, several aspects need to be considered.

- Sustainable Fishing training entails all aspects of sustainability: planet (environmental challenges), profit (economic viability), and people (acceptance of your business by society - a license to operate). Sustainable fishing includes a wide variety of subjects, such as fishing methods, economics, fish stock assessment, certification schemes, environmental issues, license to produce and communication skills.
- The fishing industry is very local and often unique. Even within a country, the variation on fishing methods and local circumstances is stunning. Developing a course for the fishing industry means that all those subjects need to be customized and adjusted to not just national, but local circumstances.
- Fishing communities are often small and being a fisherman has a large cultural component. It is essential to strike the right tone and take the cultural aspects of the fishing community in account.
- Traditionally, the relationship between fishers and environmental organizations has been, to say the least, difficult. Implementing a course about sustainable fishing requires a thorough process, that is based on respect for their profession, building trust and stay away from blaming, as much as, transferring course content.
- The level of training and education of fishers is often limited to high school and/or vocational training, and they often speak limited or no English. This has important implications for the course, that includes new and conceptual subjects like fish stock management or economics. The course language needs to be their native language, and, information level needs to be customized.
- In most countries, there are only a few fishing academies, with a limited number of students. Therefore, the academies have limited budgets for the development of new materials and the inclusion of new subjects like sustainable fishing.

## 2.3. ResponSEAbLe main messages

The sustainable fishing course covers a wide range of materials and teaching methods. While individual elements of the course may have specific goals or objectives, together they contribute to the overall message of the course and the main messages of the ResponSEAbLe project:

- We are collectively responsible for the state of the marine ecosystems
- The links between marine ecosystems and people are 'without borders'
- From understanding to ... taking actions (the road might be long)
- A good understanding of DAPSI(W)R, combined with the value chain, is a useful basis for effective Ocean Literacy

## 2.4. General objectives

Those who have successfully completed the course will

1. realize that commercial fishing is much more than catching as many fish as possible;

2. realize that working towards sustainable fishing is an important part of a successful fishing sector now and in the future;
3. be able to demonstrate knowledge and understanding of several aspects of sustainable fishing, including but not limited to:
  - the connection of humankind to the sea;
  - marine ecology,
  - fishing economics and entrepreneurship,
  - the fish supply chain,
  - fishery management,
  - environmental challenges (oil, solid waste and air emissions),
  - reputation and societal acceptance;
4. realize that the modern fishers profession involves interaction with other fishers and with the world surrounding the fishing sector;
5. be able to demonstrate basic communication skills;
6. understand the importance of a positive reputation of the fishing sector;
7. be able to point out (some) personal responsibilities and activities that have a positive influence on (different aspects of) a sustainable fishing company and sector.

## 2.5. Target group

The course is designed for (future) fishers at fishing academies. The maximum number of course participants in the course should depend on course setup and the facilities and equipment available, bearing in mind the aims and objectives of this course.

## 2.6. Course certificate

On successful completion of the course appropriate documentary evidence is required to be issued to the course participant.

## 2.7. Staff requirements

The instructor in charge shall have experience with working with the target group, has had training and/or equivalent knowledge in the subject matter of this course, or will work together with external experts with sufficient knowledge. This knowledge includes but is not limited to sustainable fishing, the marine environment, fishing economy, the fish supply chain, fisheries management, communication and environmental aspects of fishing.

## 2.8. Teaching facilities and equipment

For the theoretical part of the course, a classroom equipped with presentation facilities and audiovisual materials is recommended. For the workshops, sufficient space should be available to facilitate group work, preferably in separate rooms. Sufficient materials should be available to enable groups to present their results (flipchart, overhead projector, power point or other means of visual presentation).

## 2.9. Teaching aids/OL tools

- Video 'Adverse effects of oil on plankton'
- Video 'Albatross ingestion of plastics'
- Video 'Plankton munching microplastics'
- Video 'Invaders from the sea'
- OL tools developed as part the ResponSEable project (see attachments):
  - Video 'Importance of the ocean'
  - Video 'Will it sink or will it float?'
  - Illustrations 'Who is the best fisher?'
  - Slide show 'The story of the North Sea'
  - Video 'Marine Spatial planning in the North Sea'
  - Animation 'EU Common Fisheries Policy'
  - Slide show 'Mapping of the Value chain in fisheries'

## 3.Course outline and timetable

### Day 1: Sustainability, the Sea (theory and practice)

Time	Activity	By
9.00	Introduction Sustainable Fishing – 3 P's of sustainability (People, Planet, Profit)	ProSea
9.30	Group assignment (TOP 5)	
10.00	Group presentations (TOP 5)	
10.30	Break	
10.45	Marine Ecology or ... how does the sea work? Special local areas	ProSea and local expert
12.00	Lunch	
13.00	Excursion to local 'sea area'	Local expert
16.00	End of day 1	

### Day 2: Fishing economy (profit P) and Societal acceptance (People P)

Time	Activity	By
9.00	The fishing fleet in my country	ProSea and local expert
10.15	Break	
10.30	Profit P – Fishing as a business (making money)	ProSea and local expert

	<ul style="list-style-type: none"> <li>– The fish chain</li> <li>– Economy and sustainability</li> </ul>	
12.00	Lunch	
13.00	Profit P – part 2	ProSea and local expert
14.00	People P - Societal acceptance - Image of fishing	ProSea
16:00	End of day 2	

### Day 3 – Fisheries Management (Planet P), Communication (People P)

Time	Activity	By
9:00	Fisheries management <ul style="list-style-type: none"> <li>- Who owns the fish?</li> <li>- About fishing effort, mesh size, catch rates</li> <li>- Fishing management</li> <li>- Fish stock assessment</li> </ul>	ProSea and local partner
10.30	Break	
10.45	Fisheries management – part 2	ProSea and local partner
12:00	Lunch	
13.00	PEOPLE P – Communication	ProSea and local partner
16:00	End of day 3	

### Day 4 - Environment (Planet P), marine litter workshop, Final workshop

Time	Activity	By
9.00	Environmental challenges <ul style="list-style-type: none"> <li>- Climate change and other air emissions</li> <li>- Oil and marine litter</li> </ul>	ProSea
10.30	Break	
10.45	Workshop – marine litter solutions	ProSea
12.00	Lunch	
13.00	<i>Back to the future</i> – close out workshop	ProSea
15.00	Group presentations	Students
16.00	End of course	

## 4. Specific learning objectives

All detailed learning objectives are understood to be prefixed by the words: “After completing this course the course participant will be able to ....”

### Opening lecture and workshop – sustainable fishing

- Name the main changes in the fishing sector in the last 15 years
- Define sustainable development as a balance of three P's - People, Planet, Profit, where all three P's get sufficient attention
- Name several practical examples of sustainable fishing initiatives in the fishing sector
- Explain why the sector works towards sustainable fishing

### Workshop TOP 5

- Express an opinion about challenges (problems) for a sustainable fishing sector
- Relate his/her opinion to the opinions of other course participants

### Marine environment

- Describe why the oceans are important for all people worldwide, including,
  - Name the importance of the oceans as a source of food
  - Name the importance of the oceans as a source of oxygen
- Describe basic principles of marine ecology and the production of fish
  - Explain the role of phytoplankton as the primary producer (photosynthesis)
  - Give an example of a food chain with phytoplankton at the base
  - Recognize that food chains are connected in food webs
  - Recognize that all large sea life, including fish, depends on the small sea life (phytoplankton, zooplankton and bacteria)
- Explain that coastal seas and open ocean are different in diversity and abundance of sea life, and, production of fish
- Describe the local (coastal) sea, both as fishing grounds and as an area for sea life other than commercially interesting species
  - Describe the area
  - List commercially interesting species
  - List forms of marine life that live there (other than fish)
  - Give an example of a food chain in this area
  - Give an example of the importance of the area for humans

### Fishing economics

- Recognize the development of the fishing fleet in the last 10-50 years regarding size (number of ships) and engine power
- Explain the economic context of recent development in the fishing sector, such as cost reduction and the use of other fishing techniques
- Explain the economics of fishing in general, including all costs and proceeds associated with operating a fishing vessel
- Realize that making money as a fisher not only depends on the amount of fish you catch
- Explain the steps in the fish supply chain ( the way fish travels from fishers to consumer)
- Name the partners and their roles in the fish supply chain
- Recognize that successful fishers are entrepreneurs

### Fishery management

- Explain what fishery management is and explain why it is necessary (Tragedy of the Commons)
- Recognize that rules for fishing are not only made in one country, but in a European context (and sometimes even worldwide)
- Recognize that scientists, governments, fishers and NGO's have different roles in fishery management
- Recognize central themes of the Common Fisheries Policy from the EU, such as technical measures, fish stock assessment, Maximum Sustainable Yield (MSY) and the landing obligation
- Recognize that fish stocks are variable, and that both nature and humans play a role
- Explain why fish stocks may increase or decrease (fish growth, reproduction, natural mortality and fisheries)
- Explain the connection between fishing effort, total catch and fish stock size
- Be willing to try to read publications about fishery management (for example policy briefs from the government and articles from scientists in fishery news) and/or be willing to participate in research projects in the future

### Environmental challenges

- Name the main environmental challenges connected to fishing
- Describe the environmental and economic impact of oil in the marine environment, including the effects of oil on sea birds
- Describe the environmental and economic impact of plastics in the marine environment, including the plastic soup, entanglement, ingestion and microplastics
- Recognize the role humans play in causing climate change

- Describe potential impacts of climate change, including effects on temperature, weather events, sea level and the marine environment
- Name solutions for the environmental issues of oil, marine litter and climate change
- Recognize the role fishers can play in decreasing the amount of plastics in the ocean, including proper garbage disposal, recycling of fishing nets and participation in the Fishing for Litter project
- Recognize that they personally can contribute to solutions for environmental challenges

## People P

- Acknowledge that many players (stakeholders) are interested in the fishing sector, including governments, NGO's and consumers
- Recognize the connection between developments in the fishing sector and societal interest
- Describe his/her views on the image of fishing; how other people see the fishing sector
- List three factors that influence the image of fishing
- Give an opinion about the importance of a good reputation or image
- Name examples how the fishing sector can improve their reputation or image
- Recognize the importance of good communication in improving the image of the fishing sector

## Communication

- Recognize the importance of communication
- Demonstrate basic communication skills, including non-verbal communication and listening to others
- Be willing to talk to people with a different opinion

## Final workshop

- Express ideas about the (sustainable) future of the fishing industry
- Recognize his/her personal responsibility towards the environment
- Prepare a presentation about (an aspect of) the future of the fishing industry
- Demonstrate basic presentation skills

## 5. Instructor manual

### 5.1. General

The instructor manual provides additional information to instructors and teachers. It is designed to help in structuring and organizing this course. It gives guidance on the material that is to be presented and the workshops that should be conducted during the sustainable fishing course. This manual reflects the views of the course developers with respect to methodology and organization as well as what they consider important considering their experience as instructors of this course.

The guidance given is intended to give the instructor an operational baseline to develop a course that will meet the local requirements and to use the instructor's own experience and ideas.

### 5.2. Course elements

The training course comprises of a wide variety of teaching methods, including interactive lectures, video's, animations, workshops, group assignments, games, quizzes and group presentations. The development of seven OL tools in the ResponSEable project contributed greatly to the variety of tools, by adding video's, animations, illustrations and slide shows to the course package.

Overall, the course has three main elements:

- Content and theory  
Knowledge is power. Participants get current and independent information about all aspects of sustainability. Educational methods used are presentations by course leaders and experts, combined with Q&A sessions, excursions and video material
- Communication and presentation skills  
Communication and presentation skills are crucial for successful implementation of knowledge and awareness gained in course, as well as, for cooperation, sharing ideas, and discussing important issues. Skills include participating in group work, personal conversations and discussions (talking with someone you disagree with) and presentations. Educational methods used include demonstrations, discussions, practice and practice some more (communication exercises and presentations).
- Opinion forming and future thinking  
Enable individual participants to process information and challenge them to develop an opinion about (aspects of) sustainable fishing, and to think about the (sustainable) future of the fishing industry. Educational methods include assignments, group work, workshops and exchange of opinions.

### 5.3. Theory

Sustainable fishing requires knowledge of sustainable development, basic marine ecology, of the importance and diversity of the marine environment, fishing economy, the fish supply chain, fisheries management, communication and environmental aspects of fishing. Theory gives course participants a better understanding of a wide variety of subjects relevant to

sustainable fishing. Theory can be taught as classroom lectures, preferably supported by expert speakers, video's, pictures and visual presentations.

Tips to present theory:

- Relate subjects to situations, which are familiar to participants
- Use enthusiastic presenters
- Ask questions, as this makes course participants think about the issue
- Encourage course participants to ask questions themselves and to interact during the lectures
- Some points are more important than others and should be emphasized. To ensure that such points are remembered, they must be restated a number of times, preferably in different words
- Reiterate things that are complex – don't worry about repeating information. Find more than one way to get a point across. If someone doesn't understand the first time, you can word it differently and it might be clear the second time (or the third time). Simple analogies are good. Ask if the audience understood the principle

## 5.4. Workshops

The objective of the course is to achieve awareness of the importance of sustainable fishing, stimulate personal involvement, a sense of personal responsibility and commitment to contribute to sustainable fishing.

Awareness and involvement require more than knowledge and theory. To achieve awareness and to instigate a thinking process, the course developers have included several workshops for small groups of course participants. These workshops are seen as essential to achieve awareness. The assignments are designed to give course participants structured time to think about and process the information acquired through the theoretical lectures and movies.

In addition, during the workshops course participants are asked to voice their ideas and opinions, to listen to the opinions of other course participants and to think about their own role and responsibilities. The course developers stress the importance that course participants are given time and space to share their ideas and opinions. In many cases there is not "one solution" and sharing different ideas and opinions about different aspects of sustainable fishing gives the course participants a chance to develop their personal views and sense of responsibility.

Tips for leading workshops:

- Create an "open atmosphere" to lower the threshold to participate
- At the start of the workshop, make sure all groups understand the assignment
- All course participants bring their ideas and opinions to the room. Allow them to share these to add to the value of the workshop
- Give groups enough time to work on the assignments at their own pace. Sharing ideas and opinions takes time
- Do not allow individual members to monopolize the group activity, but ensure that all members have a chance to express opinions and ideas

- Do not steer the group in the direction you want by superimposing your opinion. Giving suggestions (have you thought about?) is often more helpful. In achieving awareness, the thinking process is just as important as the end result
- Be prepared to get some unexpected results – some results you might not agree with!

## 5.5. Evaluation

Because the course includes knowledge as well as awareness, the method of evaluation and the criteria for evaluating competency should take both these aspects into account. The learning objectives used in the detailed teaching syllabus should provide a sound basis for the construction of suitable tests for evaluating the course participants' progress. The effectiveness of any evaluation depends upon the accuracy of the description of what is to be measured.

## 5.6. Specific guidance notes

This section contains guidance to the instructor on the coverage of subjects and workshops listed in the course outline and the detailed teaching syllabus.

### Opening lecture - sustainable fishing

The starting point of the course should be a reference to the long history of (local) fishing by showing an old fishing vessel. Comparing this to a picture of a modern vessel shows that fishing is not the same as it used to be. Going through some of the recent changes in fishing emphasizes that being a fisher today is different than 100, even 10 to 20 years ago. The job has changed due to increasing costs, more regulations, farmed fish products on the market and a higher demand for responsible and sustainable fish products. In addition, our seas are used for more than fishing alone, so fishing grounds are under pressure. Also, and partially as a reaction to these developments, the fishing sector itself has experienced large changes in the past 10 to 20 years such as new fishing techniques and more market-focused thinking.

In these modern times, fishers need to operate as entrepreneurs, who can make well-informed choices in their fishing practices and operate in an ever-changing world. To be able to do this, fishers need new knowledge and new skills, different than the knowledge and skills needed in the past.

The concept of sustainable fishing is introduced as a way of long term thinking about solving environmental challenges. Sustainable development is defined as: "Meeting the needs of the present without compromising the ability of future generations to meet their own needs." In business terms, this definition is often translated into finding an acceptable balance between social, economic and environmental performance, often illustrated as the three P's: People, Planet and Profit. Several examples from other businesses should be given.

Legislation, technical installations, procedures and innovation in fishing techniques all help in the sustainable development of the fishing industry. It should be emphasized that these can only be effective if people, fishers and all others involved, have the right competences and attitude to strive for sustainable fishing and to make the right choices. So, also in the strive for sustainable fishing, competent people are essential. This course is designed to give fishers awareness, knowledge and skills related to the three P's of sustainable fishing, with the goal to enable fishers to make the right business choices, to minimize pressures and to participate in the sustainable development of the fishing industry.

A time schedule of the course should be presented – special attention should be paid to the varied set up of the course as a mix of lectures and workshops. Instructors should stress that

the course is more than listening to information about different aspects of sustainable fishing. Participants are required to be actively involved and to share their knowledge, ideas and opinions (also when these are different than what is presented!).

## Workshop TOP 5

This workshop is set up early in the course program to establish a starting point and assess the current knowledge of the participants about sustainable fishing. It invites them to become actively involved in the course, shows them that their opinions matter and gives a feeling of ownership of the course content. It also enables participants to relate their ideas and opinions to the ideas and opinions of others.

Participants will have prior knowledge, ideas and experiences with sustainable fishing. In this workshop, they are asked to share this knowledge and their opinions about different aspects of sustainable fishing.

The group is divided in subgroups of 4-8 participants and given an assignment. Different types of assignments can be used. One that works very well is asking the groups to make a list of different aspects of sustainable fishing and give their opinion about their respective importance, for example: Make a TOP 5 of the most important aspects of sustainable fishing, (your opinion).

All groups present their results in a plenary session, so all participants are aware of the results of the other groups. The plenary session gives instructors the chance to ask questions when things are not clear and to point out common themes or differences between the groups.

Instructors are encouraged to give participants the chance to voice their opinions and to listen to the opinions of others. At this point in the course, little attention should be given to the correctness of arguments. It is important for the participants to feel that their opinions and ideas are important, so they are more likely to share their opinions, thoughts and feelings during the rest of the course. The instructor should listen closely to the groups and the plenary presentations, because it will give him or her information about the current knowledge and awareness of the participants. This will enable the instructor to emphasize certain information in his lectures later.

## Marine environment

Starting point of sustainable fishing is basic knowledge and a (personal) connection with the marine environment. The marine environmental lecture consists of 3 parts: the importance of the sea for humans (ecosystem services), basic ecological knowledge of 'how the sea works', and, an explanation of the differences between open ocean and coastal seas.

- Over 70% of the world's surface is covered with water – the ocean. The ocean plays a very important role for human life on earth. It provides food and oxygen, regulates our climate, and is economically important, for instance because it provides a means for transport, and over 200 million people work in the fishing industry. The new ResponSEable OL tool 'The importance of the Ocean' shown many ecosystem services in a dynamic video of 2 minutes.
- Most people are familiar with bigger sea life like fish and whales, and fishers have firsthand experience with amazing sightings. However, most plants and animals in the sea are small, and they are very important. Microscopic organisms called phytoplankton or algae are the basis of almost all sea-life. These green plants transform carbon dioxide and water into glucose (sugar) by using sunlight. This process is called photosynthesis. It has oxygen as a by-product. The organic matter (sugars, proteins, lipids, etc.) generated by phytoplankton is passed on to other marine organisms in the food chain. In a food

chain, primary producers such as phytoplankton are consumed by plant-eating organisms (herbivores), which in turn are consumed by animal-eating organisms (carnivores or predators). All food chains are connected in more complex food webs. After all, most organisms eat more than one type of food and can be eaten by more than one type of predator.

In marine food chains, about 90% of the energy of the ingested food is used for processes like movement, breathing, eating and reproduction. A considerable part of the energy is lost as heat. Only 10% of the energy gained from food is used to grow. When a plant or animal is eaten, it is the organic material from this 10% weight gain that is passed on to the next level in the food chain. This 10 percent rule means that you need a huge number of algae at the base of the food chain to produce one big fish at the top of the food chain.

Food chains are not straight lines: they are circular, because nutrients are recycled. Here, bacteria play an important role. Bacteria break down waste products and dead organisms, releasing nutrients and carbon, which can re-enter the food chain via the primary producers.

- Oceans can roughly be divided into the open ocean and coastal seas. The coastal sea is the shallow (<200 m) sea area above the continental shelf. Beyond that, the open ocean extends. The open ocean is relatively deep, on average 3.7 km. The physical and biological characteristics of the open ocean and coastal seas are very different. The open ocean is a nutrient-poor environment, coastal waters contain many nutrients, thanks to run-off from rivers. Other differences include the penetration of sunlight, the temperature, the salinity, and mixing of water layers.

This has consequences for the living conditions for marine organisms in these areas, and for types of plankton, levels of primary production, and food chain lengths. In the open ocean, only the very small phytoplankton cells can survive the nutrient-poor and stable waters. In nutrient rich coastal areas plankton is large (diameter up to 300 µm) and has more complex shapes. Bigger plankton means more food for fish, shorter food chains and therefore, better fishing!

After the general information about marine ecology and the difference between open ocean and coastal seas, it is important to apply this knowledge to the specific sea that the fishers are working in. Show pictures that emphasize the beauty and diversity, elaborate on the importance for humans and show your area as an example of a coastal sea (with a food chain, food web etc). Finally, address that the sea is not used by fishers alone but has lots of activities going on by other (economic) sectors. The ResponSEable OL tools 'The story of the North Sea' and 'Marine Spatial Planning in the North Sea' show examples of this approach for the North Sea.

In addition, the course developers have experienced that a personal connection with the marine environment is achieved most successfully when people have a personal experience with the marine environment. And in the case of a fisher, not just with the fish that they want to catch, but the entire ecosystem that the targeted fish is based on and depends on. Therefore, instructors are encouraged to organize an outdoor excursion. This way participants get the chance to experience the diversity and beauty of marine life in a nearby local marine environment, apply the theoretical knowledge about 'how the sea works', and, get a sense of the entire system that is behind the production of fish.

### Fishing economics

The profit P is part of sustainable fishing. This course emphasizes that fishers are entrepreneurs that should make informed choices, including those related to sustainable

fishing, and information about economic aspects of fishing are an important part of the course.

The part of the course addresses the fishing fleet and fish consumption, basic economic thinking about proceeds and costs, information about the fish supply chain, and, certification.

- Asking questions to the participants, the instructor addresses the history, size and composition of the national (or regional) fishing fleet. It is important to understand the size of the fleet, the fishing methods they use and the economic importance (macro-economy). In addition, when possible, a connection between the catch and (national) fish consumption should be made. Let's put this in perspective: Who eats the fish that we catch? How much fish do people eat? Do we catch enough to supply that fish? How much fish would we need to catch if everyone ate fish twice a week, or once a month, as an example.
- Fishing entrepreneurs need to have a clear understanding of the proceeds and costs of a fishing business and how to influence them. Participants will have some prior knowledge and it is the instructors job to make an inventory of what they know and fill the gaps, and, to challenge them to come up with ideas how fishers can influence both proceeds and costs.  
 Proceeds - Fishers sell the fish they catch, either at an auction, to wholesale, or directly to customers. The price they get will be influenced by the selling method, but also, for example, by the assortment, quality and certificates.  
 Costs - Running a fishing business requires making costs and the participants probably can come up with a long list of costs. These costs can be divided in technical cost (e.g. ship, nets), fuel cost, crew salaries, auction cost, insurance costs, cost for the ship owner (lone interest, and depreciation) and taxes.  
 After completing the list of costs for the ship owner, it is important to focus on how they earn money as crew, as fishers. How does the salary system work? And how about taxes?
- After the fishers land the fish, the fish travels (sometimes a long way) to the consumer, the person eating the fish. The ResponSEable OL tool 'Mapping of the Value Chain of fisheries' shows an example of this approach for the Dutch fishing sector. As a fishing entrepreneur, it is important to understand the different steps the fish takes (e.g. auction, wholesale, processor, exporters, restaurants, retail), what happens to the fish during those different steps, and, how that influences the price of the fish. Why is the fish in the supermarket so expensive, while I as a fisher only get this low price? Ask the students for ideas how they can work with the supply chain in an economical profitable way and give examples where fishers have been successful.

The new ResponSEable tool 'Who is the best fisherman?' emphasizes one of the main aspects of economic thinking. It shows the need for fishers nowadays to be more than just fish-hunters, but fishing entrepreneurs. The series of illustrations shows a tough looking fisher that aims to catch as many fish as possible, and a second skinny looking fisher who also takes quality and cost into account.

## Fishery management

A sustainable development of the fishing industry means a sustainable management of fish stock. In this interactive part of the course, the instructor works with the participants to provide a basic understanding of why fishing management is necessary, what it means, who is responsible for what. The participants work on several assignments to gain understanding about several key aspects of fishery management.

- This program starts with the principle of the 'tragedy of the commons'. When more fishers operate in the same sea, it is profitable for every individual fisher to catch as much fish as

possible (and make the most profit), but when everyone does that without limits, the sea might suffer, fish gets depleted and catch for all fishers goes down. To avoid this, proper management of fish stock and fisheries is important, not just for the sea, but also for business (in the long run).

- A lecture describes that EU countries share seas and share the common resource of fish in those seas. That is why the EU is responsible for fishery management. The Common Fisheries Policy (CPF) is a set of EU rules for managing European fishing fleets and for conserving fish stocks. It gives European fishing fleets equal access to EU waters and fishing grounds and allows fishers to compete fairly. The CFP aims to ensure that fishing is environmentally, economically and socially sustainable (People, Planet, Profit) and that it provides a source of healthy food for EU citizens. Its goal is to have a dynamic fishing industry and to ensure a fair standard of living for fishing communities. Although it is important to maximize catches, there must be limits to make sure that fishing practices do not harm the ability of fish populations to reproduce. The current policy sets catch limits that are sustainable and maintain fish stocks in the long term. It also aims stop discarding by gradually instituting the landing obligation. The ResponSEable tool 'EU Common Fisheries Policy' is an animation that describes the CFP.
- Emphasize that the EU, the fisheries manager, is responsible for the policies. Scientists, NGO's and fishers also play a role in fishery management. Scientists research fish stocks, measure and calculate and give information to the EU. In advisory committees, fishers and environmental NGO's meet and give advice to the manager about the policies. However, at the end, it is the EU that decides.
- The amount of fish (in kg) will increase when fish grow and reproduce, and will decrease when fish die, by natural causes or because they are caught by a fisher. Both nature and humans influence the fish stock in the sea. However, we cannot change the natural causes (only try to understand them) and therefore, fishery management focusses on the role of humans.  
Central themes connected to fishery management are technical measures (like mesh size, selective fishing, fishing effort, fish gear choice and real time closures), fish stock assessment and the landing obligation. Instructors are encouraged to give the participants a series of assignments to help them understand (some of) these important themes. The assignments should be designed with the specific local situation in mind and may vary greatly per country. However, goal of the selection of exercises is to gain a basic understanding of the background of fishery management, and, more understanding of where rules and regulations come from.

## Environmental challenges

Environmental challenges connected to and relevant for the fishing industry include oil pollution, marine litter and climate change. It is important to have a basic understanding of the environmental challenge, the connection to the fishing industry, MARPOL regulations and the role the fishers are playing and can play to contribute to solutions for these environmental challenges.

- Oil

Ecological impacts of oil include toxic effects on zooplankton, fouling of the plumage of birds and the fur of mammals, tainting of shellfish and oiling of coastal habitat such as beaches, mangroves and tidal areas. Economic effects include cleanup cost and damage to fisheries and the tourism industry. The exact impacts from an oil spill depend on a number of factors,

including where an oil spill takes place. Not only accidents with oil tankers are a problem. A small spill or discharge at the wrong place, at the wrong time, can cause a lot of damage.

- Marine Litter

When solid waste ends up in the marine environment, it is described as marine litter. This includes all man-made objects that do not naturally occur in the marine and coastal environment. In many regions, plastics constitute the majority (up to 90 per cent) of the total amount of marine litter. Marine litter includes items that are discarded directly into the sea (thrown or lost), brought to the sea indirectly by rivers, or left by people on beaches and shores. Marine litter is found everywhere in the marine environment, all around the world, but as the RespoSEable OL tool 'Marine Olympics for litter awareness' shows, most of the litter sinks to the sea floor. It is a truly global problem, illustrated by the plastic soup, floating garbage that collects in so-called gyres. Besides on beaches and in the water column, litter is found on the sea floor.

Entanglement and ingestion are the two primary kinds of direct damage to wildlife:

- Entanglement means that an animal becomes encircled or ensnared by litter. This may happen accidentally or because the animal is attracted to litter out of curiosity or when in search of food or shelter. Entanglement can impede natural behavior in all sorts of ways and can eventually lead to death;
- Ingestion occurs when animals swallow litter items. Generally, animals swallow litter items because they resemble their natural prey. Typical examples of such food mix ups are when turtles eat plastic bags (mistaking them for jellyfish), and when birds feed plastic pellets to their young (mistaking them for fish eggs). Ingestion can lead to malnutrition or starvation. The swallowed litter items can accumulate in the digestive tract and make the animal feel "full", while the litter has no nutritional value.

The marine environment contains a vast quantity of tiny pieces of plastic smaller than 5 millimeters in diameter. Called microplastics, much of this material is microscopic in size. As small animals at the base of the food chain ingest microplastics, the toxic chemicals in plastic enter the food chain. These chemicals interact with numerous biological processes and may eventually pose risks for humans eating contaminated marine organisms.

Marine litter also causes serious damage to people, property and livelihood and has significant economic repercussions on coastal and fishing communities. Adverse impacts include damage to fishing vessels and gear, safety risks at sea, damage to power stations, contamination of beaches and clean-up cost.

Fishing is one of the contributors to the marine litter problem, but can also be part of the solution, for example through projects like fishing for litter.

- Climate change

Climate change is a pressing issue on political agendas and the media are full of it. Climate change has been investigated by scientists for decades, of which the last two decades by The Intergovernmental Panel on Climate Change (IPCC). The IPCC defines climate change as: "any change in climate over time, whether due to natural variability or as a result of human activity".

The sun warms the Earth's surface and atmosphere. Some of the sunlight striking the earth is absorbed and converted to infrared radiation (heat), which warms the surface. The surface also emits this infrared radiation back to the atmosphere. Greenhouse gases (GHGs) like carbon dioxide, methane, and nitrous oxide in the atmosphere trap this infrared radiation like the glass walls of a greenhouse. This process warms the atmosphere and is called the "greenhouse effect". Without the natural greenhouse effect, life on Earth as we know it would

not be possible. The average world temperature would be -18°C, rather than +15°C which is the current average.

Greenhouse gases are produced by natural processes, such as volcano eruptions, natural forest fires, and decaying plants and trees. Since the beginning of industrialization around 1750, humans have also started producing GHG. Some examples of human activities producing GHG are combustion of fossil fuels (by cars, airplanes, ships, etc.), electricity and heat production, and agriculture. Since the beginning of industrialization, concentrations of GHG in the atmosphere have notably increased. This enhances the natural greenhouse effect. Of all greenhouse gases produced by humans, the amount of CO<sub>2</sub> is the most influential.

During the past century, scientists have also measured that, on average and worldwide, global air and ocean temperatures are rising, snow and ice are melting, and sea levels are rising. According to the IPCC, anthropogenic (human) greenhouse gases have very likely caused most of these changes over the last 50 years. The IPCC-report states that it is very likely that the observed change in world temperatures is not only due to natural processes.

There is scientific consensus about the causes and occurrence of climate change. But the future effects, consequences and developments of climate change are much more difficult to predict and subject to many uncertainties. That's due to the complexity of processes in the Earth's climate system. Nonetheless, some predicted effects include sea level rise, loss of biodiversity, increase of human diseases, damage to coral reefs and unpredictable weather patterns.

## People P

With the changes in the fishing industry in the last 20 years, the interest of stakeholders for fishing and fishers has increased. Nowadays, everyone seems to have an opinion about fishing. In addition, consumers are increasingly critical and demand to know where their products come from.

Sustainable development of the fishing industry is more than earning good money in as responsible way (Profit P) and taking care of the environmental (Planet P). A sector like fishing also must be aware of the people part of sustainability (People P). The people P is about fair salaries for workers, a safe working environment and tolerable working hours, but also about the relationship between fishing and society.

It is often said that for economic sectors, acceptance by society is a license to operate, or in case of fishing, a license to produce. As some stunning examples in the past (like the Brent Spar) have shown, society can withdraw this license, for example by stopping to buy certain products (like fish), or voting in political parties that are more critical of the industry. This aspect of the People P will be explored during a workshop.

In this workshop, after an introduction of the People P, instructors should ask participants to think about the image of fishing (group assignment 1; what do others think about fishing and fishers) and about the identity (group assignment 2; what do I think about fishing and fishers). After the results are presented and summarized, participants are invited to share ideas and opinions about the difference between the image of fishing and their identity, between what others think and what they think themselves. Keeping in mind that the image may give insight in how society thinks about fishing and about the acceptance by society, participants should be encouraged to think about the causes of this difference (why do we have this image), the consequences (how can a good image be helpful?), and ways to improve the image or to ensure that the image more closely resembles the identity of fishers and the fishing industry.

## Communication

When everyone seems to have an opinion about fishing, and the fishing industry and individual fishers have to deal with more interested stakeholders, good communication is important. When the image of fishers and the fishing industry is different than you think it should be, communication might be essential. For a lot of fishers, communication to people outside the fishing industry is a new skill.

Good communication is difficult and as with most skills, practice makes perfect. In this workshop, the participants will practice basic communication skills, including being aware of non-verbal communication, communication styles and the importance of listening. How do you talk to people that you do not agree with? How do you present a good story? How to ask questions? Why is it important to use understandable language?

## Final workshop

At the end of the course, the students will get a final group assignment. Since the course is called 'Fishing with a future', this assignment should be focused on their ideas about the (sustainable) future of the fishing industry. Groups will choose a theme that is important for the future of the fishing industry, for example:

- Sustainable fishing techniques/net design
- Ship of the future
- Cooperation in the fish supply chain
- Fishing and marine litter

Guided by a set of questions, and using the knowledge, awareness and skills they have gained during this course, they will prepare a presentation about their ideas of the future of this theme. Special attention should be paid to how they view their own involvement and responsibilities.

The course is concluded by the presentations of the different groups.

## 6. Attachments

### 6.1. Importance of the Ocean

#### A dynamic short video

ResponSEable project WP 5, deliverable 5.5: Educational packages for professionals

Written by: ProSea Foundation, marine education ([www.prosea.info](http://www.prosea.info))

Produced by: GRID Arendal ([www.grida.no](http://www.grida.no))

#### Introduction

This Ocean Literacy tool is a result of the ResponSEable project, that has received funding from the European Union's Horizon 2020 Framework Program for Research and Innovation. The project goal is raising awareness of European citizens on how – whoever they are – they affect, and benefit from, the ocean. To do this, the project focuses on six main issues (or Key Stories) that capture the complex interaction between people and the oceans. One of the issues the project focusses on is Sustainable Fisheries (SF). As a partner in the ResponSEable project, the ProSea foundation leads the development of educational packages for professionals working at sea. Therefore, as part of the key story SF, recognizing the need for education, ProSea is developing OL materials for fishers.

ProSea has develop a sustainable fishing course for future fishers. The training course comprises of a wide variety of teaching methods, including interactive lectures, video's, animations, workshops, group assignments, games, quizzes and group presentations. The development of seven OL tools in the ResponSEable project complements the existing materials and contributes greatly to the variety of tools, by adding video's, animations, illustrations and slide shows to the course package.

This document describes an Ocean Literacy tool aimed at fishermen. The tool 'Importance of the Ocean' shows the various benefits of the ocean for life on earth and the role of the ocean in everyday life, even though you may not realize it. By showing photographs/illustrations/videos of all elements/activities, a keyword and by gradually increasing the speed of the video, the viewer will get impressed by the many benefits and ecosystem services the ocean provides. This makes the viewer more aware but will also invoke a 'wow-factor', induce interest and inspiration, which will make it easier to continue with a lecture/discussion on the importance of the ocean and other subjects.

#### Part A – OL Tool framework

##### Target group

Fishermen in training

##### Learning objectives

All detailed learning objectives are understood to be prefixed by the words: "After using this tool the trainee will"

- be able to name the main benefits of the ocean for humans
- recognize the role the ocean plays in your everyday life

- be inspired by the importance of the ocean

## Part B – OL Tool description and timetable

The video is 2 minutes long and has the following main content:

- Waves crashing – aerial view of the ocean
- TEXT: What the ocean does for you
- TEXT: Diversity of life
- Marine mammals, Fish, Nudibranchs, Anemones, Zooplankton, Phytoplankton, Shark, Turtle, Sea star, Seal
- TEXT: Largest Source of Oxygen
- Air bubbles, forest, kelp mangrove
- TEXT: food source
- Crabs, Fishermen catching fish, People harvesting seaweed, fish market, shrimp
- TEXT: Climate regulating
- Phytoplankton, Earth, weather, clouds, ice
- TEXT: Rare and valuable metals
- Computer chips, hydrothermal vent
- TEXT: Oil and gas
- Oil rig, life under rig, gas station
- TEXT: Shipping
- Military ship, cargo ships, cruise ship
- TEXT: jobs
- Officer of ship, fishermen fixing net, small scale fishermen sailing out to sea
- TEXT: underwater network of internet cable
- Map with cables on seafloor, smart phone
- TEXT: Medicine research
- Researchers studying algae
- TEXT: food and additives
- Tooth paste, ice cream, beer, sparkling water
- TEXT: Source of renewable energy
- Sun, wind mills, wind park, waves
- TEXT: Recreation
- Kite surfers, divers, shark and ray, marina, people on the beach
- TEXT: The ocean, with its many uses, is essential to our current and future way of life
- Beach, child on beach, child looking at ship
- TEXT: Responsible, ResponSEable

## 6.2. Marine Olympics for litter awareness

### A series of video's

ResponSEAbLe project WP 5, deliverable 5.5: Educational packages for professionals

Produced by: ProSea Foundation, marine education ([www.prosea.info](http://www.prosea.info)).

### Introduction

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ProSea has develop a sustainable fishing course for future fishers. The training course comprises of a wide variety of teaching methods, including interactive lectures, video's, animations, workshops, group assignments, games, quizzes and group presentations. The development of seven OL tools in the ResponSEAbLe project complements the existing materials and contributes greatly to the variety of tools, by adding video's, animations, illustrations and slide shows to the course package.

This document describes an Ocean Literacy tool aimed at young fishermen. The tool 'Marine Olympics for Litter Awareness' creates awareness of the fact that an estimated 70 to 75% (to even 94% in some areas) of the marine litter sinks to the bottom, and only 15% floats and the other 15% washes ashore on beaches. That means that we only see a small part of all the waste. The video series is meant as an introduction to the litter issues and an invitation to an open discussion.

## Part A – OL Tool framework

### Target group

Fishermen in training

### Learning objectives

All detailed learning objectives are understood to be prefixed by the words: "After using this tool the trainee will be able to"

- Recognize that the majority of marine litter sinks to the sea floor

### Teaching facilities

A classroom equipped with presentation facilities and audiovisual materials is required.

## Part B – OL Tool description and timetable

### Description

*'Marine Olympics for Litter Awareness' is a humoristic series of videos that addresses the fact that most litter sinks. In the setting of a marine aquarium, a voice over introduces five Olympic athletes during their warm up as they attempt to choose a plastic item that floats.*

*Objects include a rope, a can, work gloves and a plastic bottle. The athletes throw their chosen item in an aquarium (in their own specific way) – the best floater wins. After throwing it in, the video can be paused, to ask the audience what happens...*

*After all the athletes have done their thing, the tone of the voice over gets serious.*

- Around 90% of all litter that enters the sea ends up on the sea floor.
- Plastic constitutes over 80% of all marine litter. Even plastic that floats at first, can sink when it breaks.
- Ropes and nets sink after a long time or remain floating just below the surface.
- Litter is brought to the sea by winds, sewage or river, but only a small part of this litter is found on beaches.
- The litter we find on beaches is only a small part of the total amount of litter. Most litter sinks.

## Timetable

Six videos of each 2 minutes

- Soccer player
- Tennis player
- Swimmer
- Shot put athlete
- Hurdle runner

### 6.3. *Who is the best fisherman?*

#### A story with illustrations

ResponSEAbLe project WP 5, deliverable 5.5: Educational packages for professionals

Produced by: ProSea Foundation, marine education ([www.prosea.info](http://www.prosea.info)).

#### Introduction

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This document describes an Ocean Literacy tool aimed at young fishermen. The tool 'Who is the best fisherman' illustrates that a successful fisherman is an entrepreneur who balances proceeds and income of his business, in contrary to the believe that the best fisherman is always the one that catches the most fish.

#### Part A – OL Tool framework

##### Target group

Fishermen in training

##### Learning objectives

All detailed learning objectives are understood to be prefixed by the words: "After using this tool the trainee will"

- realize that commercial fishing is much more than catching as many fish as possible
- realize that making money as a fisherman not only depends on the amount of fish you catch, but also on quality of your product and related cost

##### Teaching facilities

A classroom equipped with presentation facilities and audiovisual materials is required.

## Part B – OL Tool description and timetable

### Description

The OL tool consists of a power point presentation of 7 slides and a questions/discussion session.

- 1) A tough looking fisherman shows off his big catch of a variety of fish. A second fisherman looks less impressive, both in stature as in his much smaller catch (especially in comparison to the tough fisherman).  
The question is: "who is the best fisherman?".
- 2) Both fishermen earn money by selling their fish, and the tough fisherman seems to get twice as much money in his hands as the other fisherman, because he caught more fish.  
The question is: "who is the best fisherman?".
- 3) However, since the catch from the second fishermen has better quality (MSC certificate), and a better assortment (bigger fish), he gets extra money and earns the same as the tough fisherman.  
The question is: "who is the best fisherman?".
- 4) In addition, the tough fisherman used a lot more fuel, and therefore has to spend a large amount of his proceeds on costs, where the other fisherman has less cost and so earns more money  
The question is: "who is the best fisherman?".
- 5) The tough fishermen only focused on catching as much as fish as possible and not on reducing fuel costs. The other fishermen did take all the costs into account and thought about how to reduce them.  
The question is: "who is the best fisherman?".
- 6) In the end, the nerdy fishermen made the most money and drives away in a fancy, big car. The tough fishermen did not make much money, and drives away in a dull car.  
The question is: "who is the best fisherman?".
- 7) Credits: ResponSEAbLe project, ProSea, EU logo

During the presentation, the facilitator is encouraged to give students time to reflect among each other, ask questions and share their views about who is the best fisherman.

### Timetable

Two timetables are presented, since this OL tools can be used as a standalone program, or as part of a more comprehensive program about fishing economy and entrepreneurship.

#### Timetable – Standalone use

0.00 The students are asked to write down on a post-it what it means to be 'the best fisherman'.

All post-its are collected on a flip chart.

0.05 OL tool – showing of slideshow, share responses

0.15 Discussion

0.25 Six questions, asking for the students' opinion about the question 'who is the best fisherman'?

Please indicate the importance, between 0 (not at all important) and 10 (very important).

1. The best fisherman drives the biggest car (0-10?)

2. The best fisherman catches the most fish (0-10?)
3. The best fisherman earns the most money (0-10?)
4. A smart entrepreneur makes sure his proceeds are maximized (0-10?)
5. A smart entrepreneur tries to have as few costs as possible (0-10?)
6. A smart entrepreneur pays attention to proceeds and costs (0-10?)

0.27 The students are asked to write down on a post-it what it means to be 'the best fisherman'.

All post-its are collected on a flip chart.

0.30 End

#### Timetable - as part of

The OL tool can be integrated in a program about fishing economy and entrepreneurship.

0.00 The students are asked to write down on a post-it what it means to be 'the best fishermen'.

All post-its are collected on a flip chart.

0.05 OL tool – the best fishermen - showing of slideshow, sharing responses, discussion

0.25 The Fishing fleet – interactive presentation

0.35 Assignment – Proceeds and cost associated with operating a fishing vessel

0.50 The fish value chain – parts 1-3 - interactive presentation

1.20 Short break

1.35 Meeting an innovative fisherman – talk about entrepreneurship

2.20 Six questions, asking for the students' opinion about the question 'who is the best fisherman'?

Please indicate the importance, between 0 (not at all important) and 10 (very important)

1. The best fisherman drives the biggest car (0-10?)
2. The best fisherman catches the most fish (0-10?)
3. The best fisherman earns the most money (0-10?)
4. A smart entrepreneur makes sure his proceeds are maximized (0-10?)
5. A smart entrepreneur tries to have as few costs as possible (0-10?)
6. A smart entrepreneur pays attention to proceeds and costs (0-10?)

2.25 The students are asked to write down on a post-it what it means to be 'the best fishermen'.

All post-its are collected on a flip chart.

2.30 End

## 6.4. The story of the North Sea

### A slide show

ResponSEAbLe project WP 5, deliverable 5.5: Educational packages for professionals

Produced by: ProSea Foundation, marine education ([www.prosea.info](http://www.prosea.info)).

### Introduction

This Ocean Literacy tool is a result of the ResponSEAbLe project, that has received funding from the European Union's Horizon 2020 Framework Program for Research and Innovation. The project goal is raising awareness of European citizens on how – whoever they are – they affect, and benefit from, the ocean. To do this, the project focuses on six main issues (or Key Stories) that capture the complex interaction between people and the oceans. One of the issues the project focusses on is Sustainable Fisheries (SF). As a partner in the ResponSEAbLe project, the ProSea foundation leads the development of educational packages for professionals working at sea. Therefore, as part of the key story SF, recognizing the need for education, ProSea is developing OL materials for fishers.

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This document describes an Ocean Literacy tool aimed at young fishermen. The tool 'Story of the North Sea' builds on the general information about marine ecology and the marine environment in the course and applies this information to fishermen working in the North Sea. The OL tool can be used as an example for the development of similar slide shows for other regional seas.

## Part A – OL Tool framework

### Target group

Fishermen in training

### Learning objectives

All detailed learning objectives are understood to be prefixed by the words: "After using this tool the trainee will"

### Teaching facilities

A classroom equipped with presentation facilities and audiovisual materials is required.

## Part B – OL Tool description and timetable

### Description

Starting point of sustainable fishing is basic knowledge and a (personal) connection with the marine environment. The marine environmental lecture consists of 3 parts: the importance of the sea for humans (ecosystem services), basic ecological knowledge of 'how the sea works', and, an explanation of the differences between open ocean and coastal seas.

After the general information about marine ecology and the difference between open ocean and coastal seas, it is important to apply this knowledge to the specific sea that the fishers are working in. A powerpoint presentation about the North Sea can serve as an example:

Slide 1: The North Sea is surrounded by land. Winds and rivers bring in water with nutrients and sediments. From the north, from the west and from the Baltic, ocean currents bring in water with nutrients. The North Sea is a shallow (94 m on average, but many areas are between 25 and 40 meters deep) and very turbid sea (lots of sediments and nutrients), but because it is so shallow, sunlight often reaches the seafloor.

Slide 2: People often see the North Sea as a green-gray-brown mass with hardly any life. If you look closer, you can see that there is a lot of life (and different life forms) in the North Sea.

Slide 3: The North Sea seafloor consists mainly of sand (and sandy sediments), so a lot of the life you find there is adapted to sandy sediments. Because the North Sea is so rich in food and nutrients (from both land as well as ocean currents), the North Sea is rich in phytoplankton, scavengers (shrimp, fish, crabs) and predators feeding on these scavengers.

Slide 4: Hard substrates are relatively rare in the North Sea. When there is hard substrate, it is often teeming with life. Life on hard substrates is quite different from the life thriving on the sandy seafloor of the North Sea.

Slide 5: A lot of food (nutrients ...) enter the North Sea by means of rivers, wind and ocean currents. Even though the North Sea is very turbid, sunlight can often still reach the seafloor because the North Sea is relatively shallow (94 m on average, but many areas are between 25 and 40 meters deep). The food chains are short, and the North Sea is very productive which makes it very interesting to fisheries. 5% of all fish caught worldwide is caught in the North Sea.

Slide 6: A regional sea connecting to the North Sea... is the Waddensea, which is an interesting and spectacular sea. It's listed on the same list as the Grand Canyon, the list of World Heritage sites.

Slide 7: The Waddensea is an intertidal sea, which means that twice a day, large portions of the seafloor are exposed to air, direct sunlight and increased temperatures. People can walk over these mudflats, even from the mainland to one of the islands, if you have the skill and a certified guide. When the water moves and the seafloor is exposed, all life either moves away with the water or retracts in the seafloor. A lot of the animals in the Waddensea are therefore benthic.

Slide 8: The abiotic conditions (light, water/air, temperature, salinity, ...) change drastically because of the tides (low tide – high tide), twice a day. Only a handful of species can cope with these changes. But the species that do, are very abundant in the Waddensea, because it is extremely rich in food/nutrients. This is the exact opposite for areas which are scarce in food but have very stable conditions, like coral reefs and rain forests. In such areas you find an extreme variety of species, but only a small abundance for each species.

Slide 9: The Waddensea is a main hot spot for migratory birds to rest on their migration route (from south to north). Mainly because the Waddensea is so dense in food and the food is so accessible. Twice a day the water moves away with the tide and the mudflats, with sometimes 80 worms per m<sup>2</sup>, are exposed. Dinner is ready!

Slide 10: The North Sea is a special area for MARPOL ANNEX I, V, and VI

- Because there is a lot of shipping in the North Sea, a lot of ships per day
- Because there are many people living around the North Sea

- Because of the shallow nature of the North Sea and the fact that ocean currents flow into the North Sea, the North Sea is a relatively vulnerable to impacts of solid waste and oil.

The Waddensea is a particularly sensitive sea area (PSSA)

- Because the Waddensea is of immense value for migratory birds, fish (nursery function), seal pups (nursery function) and other species.
- Because the Waddensea is very vulnerable to impacts of shipping (especially oil) due to it being an intertidal area where most life is benthic.

PSSA's and Special areas are two instruments the IMO (International Maritime Organization) uses to protect marine areas which need further protection than standard regulations 'do'.

### Timetable

The OL tool should be integrated in a program about marine ecology and the North Sea.

## 6.5. Marine Spatial planning

### An animation

ResponSEAbLe project WP 5, deliverable 5.5: Educational packages for professionals

Produced by: ProSea Foundation, marine education ([www.prosea.info](http://www.prosea.info))

### Introduction

This Ocean Literacy tool is a result of the ResponSEAbLe project, that has received funding from the European Union's Horizon 2020 Framework Program for Research and Innovation. The project goal is raising awareness of European citizens on how – whoever they are – they affect, and benefit from, the ocean. To do this, the project focuses on six main issues (or Key Stories) that capture the complex interaction between people and the oceans. One of the issues the project focusses on is Sustainable Fisheries (SF). As a partner in the ResponSEAbLe project, the ProSea foundation leads the development of educational packages for professionals working at sea. Therefore, as part of the key story SF, recognizing the need for education, ProSea is developing OL materials for fishers.

ProSea has develop a sustainable fishing course for future fishers. The training course comprises of a wide variety of teaching methods, including interactive lectures, video's, animations, workshops, group assignments, games, quizzes and group presentations. The development of seven OL tools in the ResponSEAbLe project complements the existing materials and contributes greatly to the variety of tools, by adding video's, animations, illustrations and slide shows to the course package.

This document describes an Ocean Literacy tool aimed at fishermen. The tool 'Marine Spatial Planning' illustrates that a lot of activities take place at sea, with the North Sea as an example.

## Part A – OL Tool framework

### Target group

Fishermen in training

### Learning objectives

All detailed learning objectives are understood to be prefixed by the words: "After using this tool the trainee will be able to"

- describe which activities take place on the North Sea.

## Part B – OL Tool description and timetable

### Description

The OL tool is a short animation. The North Sea harbors a lot of anthropogenic activities like fisheries, renewable energy, sand extraction, recreation and many others. An animation starts with a (blank) map of the North Sea. Then, one by one, all various activities are added on the map. The result is a map with an overview of all activities happening in the North Sea.

- Our magnificent North Sea, important for us in many ways [1]

- 5% of fish caught worldwide, come from this North Sea [2-3]
- The North Sea is used by ships transporting goods, oil and passengers [5]
- Sustainability targets add a substantial number of wind parks [6]
- All these activities make the North Sea very busy [7-12]
- And you thought that was it? In addition to these activities, the North Sea is shared by all countries that border it [13-19]
- Every country has its exclusive economic zone where a lot of activities take place. Let's take the Netherlands as an example. [19-20]. Its economic zone is used for military exercises [21], natural gas and oil exploration [22], sand winning for coastal protection through beach replenishment [24] and gravel extraction for the cement and concrete industry [25]. Wind mills, nature protection, fisheries, and the list goes on... [25-27]
- Just like on land, areas in the sea are increasingly set aside for nature protection [26-27]
- And while the Netherlands fits in the North Sea 18 times, the North Sea is busier than you think and that is only increasing! That is why it is more important than ever to coordinate the activities [27-29]

## Timetable

The OL tool should be integrated in a program about marine ecology and the North Sea.

## 6.6. EU Common Fisheries Policy

### An animation

ResponSEable project WP 5, deliverable 5.5: Educational packages for professionals

Produced by: ProSea Foundation, marine education ([www.prosea.info](http://www.prosea.info)).

### Introduction

This Ocean Literacy tool is a result of the ResponSEable project, that has received funding from the European Union's Horizon 2020 Framework Program for Research and Innovation. The project goal is raising awareness of European citizens on how – whoever they are – they affect, and benefit from, the ocean. To do this, the project focuses on six main issues (or Key Stories) that capture the complex interaction between people and the oceans. One of the issues the project focusses on is Sustainable Fisheries (SF). As a partner in the ResponSEable project, the ProSea foundation leads the development of educational packages for professionals working at sea. Therefore, as part of the key story SF, recognizing the need for education, ProSea is developing OL materials for fishers.

ProSea has develop a sustainable fishing course for future fishers. The training course comprises of a wide variety of teaching methods, including interactive lectures, video's, animations, workshops, group assignments, games, quizzes and group presentations. The development of seven OL tools in the ResponSEable project complements the existing materials and contributes greatly to the variety of tools, by adding video's, animations, illustrations and slide shows to the course package.

This document describes an Ocean Literacy tool aimed at young fishermen. The tool 'Common Fisheries Policy' is an animation that describes the CFP. The CFP is a set of EU rules for managing European fishing fleets and for conserving fish stocks. It gives European fishing fleets equal access to EU waters and fishing grounds and allows fishers to compete fairly. The CFP aims to ensure that fishing is environmentally, economically and socially sustainable (People, Planet, Profit) and that it provides a source of healthy food for EU citizens. Its goal is to have a dynamic fishing industry and to ensure a fair standard of living for fishing communities. The current policy sets catch limits that are sustainable and maintain fish stocks in the long term. It also aims stop discarding by gradually instituting the landing obligation. This animation is part of the course in the section about fisheries management.

## Part A – OL Tool framework

### Target group

Fishermen in training

### Learning objectives

All detailed learning objectives are understood to be prefixed by the words: "After using this tool the trainee will"

- Recognize that rules for fishing are not only made in one country, but in a European context (and sometimes even worldwide)
- Recognize that scientists, governments, fishers and NGO's have different roles in fishery management

- Recognize central themes of the Common Fisheries Policy from the EU, such as technical measures, fish stock assessment, Maximum Sustainable Yield (MSY) and the landing obligation

## Teaching facilities

A classroom equipped with presentation facilities and audiovisual materials is required.

## **Part B – OL Tool description and timetable**

### Description

The OL tool is a short animation:

- European seas
- Every EU member state located at sea has a part of the sea they may call their own and manage as such
- But fish...? Fish don't have boundaries.
- This makes it difficult to determine the amount of fish that live in each part of the sea.
- And... how can these fish then be shared fairly between the Member States?
- In the past... every country tried to harvest the maximum amount of fish for themselves. In the 1970's, this resulted in depletion of some fish stocks. In the end... there was less fish for everyone
- This resulted in lower catches and loss of income for fishers. Some fishers even had to stop fishing.
- But then the question was... which country needs to fish less for the stocks to recover?
- No country benefited from this situation, so the EU came up with an idea: more teamwork!
- The result was the Common Fisheries Policy, the CFP.
- One of the main goals of the CFP is to harvest as much fish as possible, now and in the long-term.
- As a fisher you influence fish stocks. More fishing means more catch, but that only works up to a certain point.
- When you fish too much, the quantity of adult fish decreases. As a result, fish will produce less offspring and the fish stock will decrease.
- The goal is to fish in such a way that fish stocks remain stable. You only want to catch the interest of the capital (fish stock).
- Researchers inform EU policy makers about consequences of catch limits. Then NGO's and the fishery sector also give their opinions and advice. In the end it's the policy makers job to make the final choices.
- To achieve the goal of the CFP, the EU regulates
  - o the number of fishing vessels
  - o the total allowable catch of each country
  - o the number of fishing days
  - o mesh size

- The conclusion: management is in everyone's benefit, for fish consumers as well as for fishers who want to keep on fishing in a successful and economically rewarding manner.

### Timetable

The OL

## 6.7. Mapping of the Value chain in fisheries

### An interactive power point presentation

ResponSEAbLe project WP 5, deliverable 5.5: Educational packages for professionals

Produced by: ProSea Foundation, marine education ([www.prosea.info](http://www.prosea.info))

### Introduction

This Ocean Literacy tool is a result of the ResponSEAbLe project, that has received funding from the European Union's Horizon 2020 Framework Program for Research and Innovation. The project goal is raising awareness of European citizens on how – whoever they are – they affect, and benefit from, the ocean. To do this, the project focuses on six main issues (or Key Stories) that capture the complex interaction between people and the oceans. One of the issues the project focusses on is Sustainable Fisheries (SF). As a partner in the ResponSEAbLe project, the ProSea foundation leads the development of educational packages for professionals working at sea. Therefore, as part of the key story SF, recognizing the need for education, ProSea is developing OL materials for fishers.

ProSea has develop a sustainable fishing course for future fishers. The training course comprises of a wide variety of teaching methods, including interactive lectures, video's, animations, workshops, group assignments, games, quizzes and group presentations. The development of seven OL tools in the ResponSEAbLe project complements the existing materials and contributes greatly to the variety of tools, by adding video's, animations, illustrations and slide shows to the course package.

This document describes an Ocean Literacy tool aimed at fishermen. The tool 'Mapping of the Fish Value Chain' gives fishers insight in what happens after they sell their fish at the auction. Fishers are a part of the fish value chain and as a fishing entrepreneur it is important to know how the steps in the value chain works, to understand who is involved in bringing the fish from the vessel to the consumers plate and how the price of fish products is formed.

## Part A – OL Tool framework

### Target group

Fishermen in training

### Learning objectives

All detailed learning objectives are understood to be prefixed by the words: "After using this tool the trainee will be able to"

- explain the steps in the fish supply chain (the way fish travels from fishers to consumer)
- name the partners and their roles in the fish supply chain
- recognize that successful fishers are entrepreneurs

## Part B – OL Tool description and timetable

### Description

While working with the same product, fish, there are many different roles in the fish value chain.

**Part 1:**

Students are encouraged to think about the value chain and identify the different players in the chain, by thinking (in duo's) about several questions:

- What is a fish value chain?
- Which way does the fish 'swim' to get to the consumer?
- What are the different players in the value chain?

After a plenary inventory of the answers, a fish value chain is constructed/presented.

**Part 2:**

In every step of the value chain, value is added to the product and costs are made. Fishers often wonder how is it possible that consumers pay more than 12 euro for a fish fillet, when you only receive 1.17 Euro for the fish? Students are encouraged to think about the different steps in the fish value chain – who does what and what does that cost?

After a plenary inventory of the answers, the value created is explained by looking into every step of the value chain, using one example of a fish caught by the fishing fleet.

**Part 3:**

Finally, to illustrate that fishers can get more involved in the fish value chain, an example of a shorter chain and its benefits is presented. After this, the students work in small group on an assignment that challenges them to work on ideas to create more value for a fish of their choice in the value chain.

**Timetable**

The OL tool should be integrated in a program about fishing economy and entrepreneurship.

0.00 The students are asked to write down on a post-it what is means to be 'the best fishermen'.

All post-its are collected on a flip chart.

0.05 OL tool – the best fishermen - showing of slideshow, sharing responses, discussion

0.25 The Fishing fleet – interactive presentation

0.35 Assignment – Proceeds and cost associated with operating a fishing vessel

0.50 The fish value chain – parts 1-3 - interactive presentation

1.20 Short break

1.35 Meeting an innovative fisherman – talk about entrepreneurship

2.20 Six questions, asking for the students' opinion about the question 'who is the best fisherman'?

Please indicate the importance, between 0 (not at all important) and 10 (very important)

2.25 The students are asked to write down on a post-it what is means to be 'the best fishermen'.

All post-its are collected on a flip chart.

2.30 End