A3.2. Dossier of good practices on safety and sustainability training in the fisheries sector

STARFISH
Modernise Fisheries Training

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INTRODUCTION

Safety in the fishing industry remains a major concern owing to the number and nature of maritime incidents involving fishing vessels. Fishing is the most accident-prone profession. Working conditions are tough and the pace is swift. Besides, the occupational environment is hazardous due to slippery floors, trap lines, nets, knives and awkward working postures (leaning over or kneeling).

From 2014 to 2023, fishing vessels accounted for 12,7% of damaged vessels and 33,9% of vessels requiring assistance ashore, while 54,8% of Search and Rescue operations were devoted to them.[1]

Moreover, 16,9% of injuries involve loss of control of equipment (all ship types) and the number of injuries (Crew, Passengers, Marine casualties) had increased in 2023.[2] Facing these risks, an analysis of trends shows an overall decline in the number of accidents involving fishing vessels, but an increase in rescue operations. These figures underline the predominant role of the human factor, involved in 76% of incidents[3], and highlight the importance of safety training for fishing crews. Increased awareness of best practice, combined with a tailor-made training adapted to vocational realities/necessities, is essential to reduce accidents and ensure safer working conditions at sea.

Not helping either is the fact that fishing vessels are excluded from most regulations concerning deck machinery, such as cranes, fishing reels, and auxiliary winches, whether installed on board or on land. Given the high number of accidents in the sector, the European Social Partners for Sea Fisheries[4] developed recommendations for the standardisation of rules governing the commercialisation, installation, and safe use of such equipment[5].

Despite the development of new rescue technologies and materials, improvements to fishing vessel equipment and preventive measures, this sector remains particularly at risk. Several factors may explain the accident rate on board fishing vessels:

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[1] Figures excerpt from Annual Overview of Marine Casualties and incidents 2024, page 34 & 35: https://www.emsa.europa.eu/publications/download/7981/5352/23.html

[2] Figures excerpt from Annual Overview of Marine Casualties and incidents 2024, page 33: https://www.emsa.europa.eu/publications/download/7981/5352/23.html

[3] Figures excerpt from Annual Overview of Marine Casualties and incidents 2024, page 46: https://www.emsa.europa.eu/publications/download/7981/5352/23.html

[4] Sea fisheries - Sectoral social dialogue - European Commission

[5] See the study and recommendations done in 2018. https://socialdialogueseafisheries.eu/wp-content/uploads/2025/02/descarga-12.pdf

Human factors

- Fatigue and stress among fishers, linked to downsizing and longer working hours.
- Inattention, carelessness and routine, which can lead to mistakes.
- Drug or alcohol abuse among some fishermen.
- Navigational errors.

Technical factors

- Poor condition of machinery and use of obsolete safety equipment.
- Lack of or non-compliance with vessel design and construction standards.
- Use of unsafe fishing gear.
- Insufficient personal safety equipment or survival gear.

The human element remains one of the most decisive contributors to risk in the fishing sector. Chronic fatigue and elevated stress levels, often the result of reduced crew sizes and extended working hours, impair decision-making and slow reaction times. Repetition and routine can lead to lapses in attention or complacency, while addiction issues, including alcohol and drug abuse, continue to pose serious safety concerns. Navigational errors, whether due to human oversight or pressure to operate under challenging conditions, further compound these risks.

External factors

- Challenging weather conditions, exacerbated by climate change.
- Overfishing, offshore wind parks, and climate change impact on the fish stocks, which encourages fishers to take greater risks by going further out to sea.
- Dependence on diesel fluctuating prices (may affect profitability and raise in risk-taking).

The EU fishing fleet is highly diverse but also ageing, with small-scale vessels averaging 39 years of age, large-scale vessels 36 years, and the distant-water fleet around 27 years. While many of these vessels remain operationally sound, older fleets can present challenges in terms of retrofitting for new safety technologies or meeting evolving design standards. In this context, the lack of harmonised EU-wide rules on the installation and safe use of onboard equipment, such as cranes, winches, and reels, becomes particularly significant. At the same time, the sector continues to rely on essential but increasingly outdated machinery and safety equipment. This underlines the importance of enhanced EU support for modernisation, including clear guidelines, funding mechanisms, and standardised regulations for vessel construction and onboard safety gear. Facilitating the uptake of safer, more efficient technologies, particularly for smaller-scale operators, will not

only improve working conditions but also align with broader EU goals on safety, sustainability, and innovation in the blue economy.

Structural problems

- Ageing of the European fleet and workforce, illustrating a lack of investment in the sector.
- Inadequate application of European safety directives.

The sector faces deep-rooted structural issues. Europe's fishing fleet is ageing, both in terms of vessels and crew, highlighting chronic underinvestment in fleet renewal and workforce development. Alarmingly, the application of EU safety directives remains patchy, and only about one-third of EU vessels are currently covered by regulations on fishers' health, safety, and working time. These gaps weaken the enforcement of even basic protections, leaving thousands of workers exposed to avoidable risks.

Hence, the STARFISH initiative promotes training tools that address both procedural safety and operational practice. The various factors stated above highlight a systemic need for better training, risk awareness, and competence-based certification across Member States. Various voices of the sector have consistently underlined these issues in recent policy work, calling for modernisation strategies that embed social sustainability into EU fisheries law and funding. As such, STARFISH aligns with the strategic shift towards integrating safety, lifelong learning, and worker well-being into the sector's transformation. Without a shift from traditional models, the EU fisheries sector risks falling behind in key areas such as safety culture, intergenerational renewal, and the integration of new technologies. Projects like STARFISH represent a crucial step towards equipping fishers not just for emergencies, but for a more complex, data-driven, and sustainable future.

Access to training in safety and sustainability would be important to address some of these factors, make fishers more resilient, and constitutes a cornerstone of risk prevention policy at sea. All fishers must have access to information on safety and sustainability practices on board, so that they can carry out their job with complete peace of mind. The lack of structured, harmonised training initiatives across Member States leads to disparities in onboard safety levels, which may weaken the overall resilience of the sector.

The importance of training, revalidation or maintenance of knowledge, procedures and techniques for safety, survival and sustainability is crucial to reducing accidents at sea and achieve the sustainability goals. At EU level, the integration of sustainability principles within existing safety frameworks is not yet fully

operationalised. In this regard, the STΛRFISH project represents an opportunity to contribute to the establishment of an EU-wide reference for basic safety and sustainability training, tailored to the evolving challenges of the sector.

When looking at the training of fishers, there are already a number of existing international treaties and EU Directives that provide frameworks for fisher training and skills. Λ key international treaty in this area is the International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F) from the International Maritime Organization (IMO) which was adopted in 1995. There are provisions in the STCW-F that apply to all fishing vessel personnel. Chapter 3 of the Convention sets the basic training requirements for all fishing vessel personnel regardless of vessel size, tonnage, engine power and fishing area. This training is often referred to as the 'basic training fishery' and is mandatory for all fishing vessel personnel working on a fishing vessel under the flag of a country which has ratified the STCW-F Convention (Haasnoot et al., 2025).

Currently ten EU Member States have ratified the STCW-F convention, including France, the Netherlands and Spain. Λs such, the basic training fishery provides the most promising structure for transferring knowledge and enhancing the capacities of fishers. However, the STCW-F convention has recently been revised, and the revised STCW-F will come into force from January 1, 2026, for those countries that have ratified the convention. With the revised STCW-F coming up, the time is right to study the new text and identify elements in the basic training fishery that could benefit from modernisation.

Beyond regulatory alignment, this also offers a unique window to reflect on the training needs of younger generations of fishers, the incorporation of digital tools in lifelong learning, and the reinforcement of risk awareness across all roles on board.

This is the objective European STΛRFISH project aims to achieve by modernising the basic training fishery. Modernising could be achieved by offering the basic training fishery in a digital and/or more engaging format. Through modernisation of the basic training fishery, the project aims to develop and maintain skills of fishers, thereby contributing to the prevention of accidents and pollution, and promoting safety on board fishing vessels.

In order to modernise basic fisheries training to better meet the needs of the sector and align with required modalities, the STΛRFISH project consortium analysed good practices in safety and sustainability training. This dossier presents the results of those efforts and aims to serve as a reference framework for policymakers and practitioners seeking to improve the quality, relevance, and accessibility of training in the fisheries sector.

To support this analysis, the consortium organized a brainstorming event focused on identifying good practices in safety and sustainability training. Due to limited participation, the event was complemented by a series of targeted interviews to ensure a broader and more representative collection of insights. This process not only helped identify existing good practices and available training materials but also highlighted the specific needs of trainers and educators involved in basic fisheries training. As these professionals are ultimately responsible for implementing the tools and materials developed through the project, their input is essential.

The combined outcomes of the brainstorming session, interviews, and this good practices report will form the foundation for selecting the most relevant topics and subjects to develop content and learning tools within the STARFISH project.

Research methodology

Initially, this file of good practices brings together the STARFISH project partners' good practices in the field of safety and sustainability training. In parallel, the research phase will explore interdisciplinary links with environmental education, climate adaptation strategies, and machine safety standards—so that the training developed not only prevents accidents but also strengthens the environmental and operational sustainability of fishing activities. Partners have been invited to report on their methodology, the difficulties encountered in implementing their training actions, and the improvements made on the basis of feedback from trainees and trainers.

At the same time as sharing good practice between project partners, each partner was able to mobilise its professional network to report on good practice at European level, as well as current local regulations. A survey document was produced to enable each partner to call on and question its network.

The educational material developed as part of this project applies to Basic Training as recommended in the revision of the STCW-F Convention. Nevertheless, certain chapters in this dossier refer to the content of the Basic Safety Training of the STCW Convention. Indeed, some of the practices presented, and developed in several European countries, are based on the STCW Convention's Basic Safety Training reference framework, applied to fishers. It should also be noted that Chapter III, Part A of the STCW-F Convention incorporates modules and topics presented in the STCW Convention. A few countries have therefore opted to apply the Safety Training requirement to fishing by creating a single training system complying with both STCW and STCW-F (Part A).

As this dossier presents projects using distance learning, a number of terminologies related to distance learning will be used throughout this dossier. To clarify certain terms and ensure a common understanding, here are a few definitions.

Electronic education encompasses various forms, each with distinct characteristics.

- E-learning refers broadly to education delivered via electronic technologies, particularly the internet, featuring online modules, interactive multimedia, virtual classrooms, and webinars, exemplified by platforms.
- An e-course is a structured set of digital learning modules, often self-paced and typically including videos, interactive quizzes, and downloadable materials.
- Distance learning involves educational activities where learners and instructors are geographically separated, often via correspondence courses, online degrees, or virtual classes.
- Blended learning combines traditional face-to-face teaching methods with online instruction, as seen in hybrid university courses where students attend physical lectures supplemented by digital assignments.
- Mobile learning (M-learning) utilises mobile devices such as smartphones and tablets, providing flexible access to short, targeted learning content via apps.
- Massive Open Online Courses (MOOCs) are large-scale, widely accessible online courses, either free or inexpensive, offering extensive enrolments, video lectures, and interactive forums, delivered through platforms.

All these educational forms aim to enhance accessibility, flexibility, and effectiveness, differing mainly in structure, scale, and technological approach.

PART I - GOOD PRACTICES IN BASIC SAFETY TRAINING

1. IMO recommendations and guidance

To begin this dossier on good practice in safety, security and sustainability training, we feel it is important to investigate the recommendations and framework provided by the IMO for the STCW basic safety training[6]. For each course, an instruction and guidance document is produced for the training teams. These documents detail the theoretical and practical elements to be covered. It also gives advice on the methodology and teaching tools to be used. Without listing all the concepts to be conveyed, we can highlight a few practical methodological points; they could assist in guiding the design of distance learning modules to be developed.

1.1. Personal Safety and Social Responsibilities

In this guide, the IMO stresses the importance of considering the pedagogy of training based on the learner's profile. It is important to keep in mind that candidates enrolled in this course may have never set foot on board a ship, have limited or no understanding of operational procedures, and may even come from inland areas. They may have a very rudimentary understanding of what a ship is or even looks like. Accordingly, the course content must be adapted to the appropriate level.

At each stage, and particularly at the beginning, it is essential that the instructor familiarizes trainees with a ship's layout and environment. This can be achieved by illustrating the differences between hazards such as trips, slips, and falls in a maritime environment and those on land, due to the ship's complex design and constant movement. Extensive use of diagrams, photographs, or videos of the ship's layout can facilitate this understanding. However, trainees should not be conditioned to passively accept information without question, as this could hinder their ability to think critically or show initiative. The goal is not to create workers who mechanically follow instructions, but rather individuals capable of thoughtfully engaging with their tasks. The guidelines state:

'*Trainees can be encouraged to think independently about a situation by presenting a scenario and asking them to respond, for example:*

[6] Validated Model Training Courses – Model course on Personal Safety and Social Responsibilities / On Proficiency in personal survival techniques / On Fire Prevention and Fire Fighting

- *At the scene of a road accident, what would you be expected to do?*
- *During a tour of the docks, what would you observe and what hazards might you be exposed to?*
- *How can chemicals used to clean utensils, bathrooms, and toilets be harmful? What precautions should be taken?*'

These questions should be asked regularly as trainees deepen their knowledge, to keep them engaged rather than passively accepting information without pondering. They should be encouraged to think before answering, to develop their reasoning skills and to question themselves. It is important to emphasize that only this approach allows them to take responsibility for their own safety and that of their fellow crew members. By developing their ability to reflect and react to the constantly changing conditions of the ship's environment, they will be able to confidently apply the fundamental safety principles they have been taught.

This document also provides elements of a teaching method applicable to the design of our remote learning. The IMO encourages trainers to use photographs or images of different parts of the ship.

'*Videos may also be used. As photographs or images, they should illustrate operations on board the ship and give an idea of the potential hazards that could arise during operations*.'

The IMO also specifies that questions based on hypothetical scenarios may be used to assess the candidate's ability to apply the principles learned in different situations. However, they should not be used as a criterion for failing or repeating the training.

1.2. Personal Survival Techniques

Regarding the training in Personal Survival Techniques, the IMO specifies the following:

'*It is important to emphasize that on board ships, rules and regulations must be strictly observed and every precaution must be taken to maximize safety with minimal impact on the environment. Trainees must be informed of the measures and actions to be taken to prevent accidents on board.*

Instructors may use relevant case studies or multimedia materials to explain the potential hazards and fundamental principles of sea survival. This will help trainees to better understand the principles of survival at sea.'

By doing so, instructors may illustrate the hazards faced by ship crews who lack survival skills and the correct use of survival equipment. Such absence of knowledge impede trainees to intervene quickly for their survival.

Instructors can use real-life safety images or symbols to reinforce trainees' ability to retain relevant information'

The IMO encourages trainers to illustrate the various topics in this module by using multimedia tools and participative facilitation practices, with group role-playing or making trainees active by asking questions. This practice is encouraged, for example, in the following thematic: Emergency Situations, preparing for abandonment, ship rescue sling and helicopter rescue sling description. Participation is encouraged through presenting concrete illustrations of different survival situations or the equipment used, leaving the trainee active by inviting them to name survival procedures and equipment. Regarding the evacuation procedure, the guide provides an example of a teaching practice that is interesting both distance learning and face-to-face:

'*Instructors may divide trainees into groups to discuss certain difficult situations arising while abandoning a ship. After the discussion, instructors should summarize the results and focus on the following (non-exhaustive) situations that could emerge: inability to release certain life-saving appliances; lack of lighting; absence of personnel assigned to certain tasks; adverse weather conditions and rough seas; heavy list; confined spaces, injured persons, disabled persons, women and children, etc.*'

WHAT'S IN IT FOR STARFISH?

This guidance shows the importance of offering concrete and precise teaching resources that enable trainees to visualise and understand emergency and safety procedures, as well as the necessary equipment. It also shows the need to approach the concepts in the reference manual through case studies and the presentation of real survival or safety situations at sea to convey the importance of mastering safety equipment and procedures. As part of our project to modernise the basic training, we need to bear in mind that the content and teaching practices must provide a clear vision of the issues involved in safety on board fishing vessels by putting them into perspective through real-life situations, and by offering clear and precise illustrated resources.

2. Basic Training at CEFCM - A teaching approach geared towards practical applications

2.1 Current Basic Training

The "Centre Européen de Formation Continue Maritime" (CEFCM) has been offering distance learning safety courses for around ten years. The first distant training course was the basic safety training certificate for all seafarers, including

future fishermen. The aim of digitalisation was to smoothen training logistics and access to seafarers. This, with view to facilitate completion of the theoretical part of the course from any location, at a pace that suit them. Reducing sailors' travel time also enables companies to integrate training time more easily into their administration. In concrete terms, the digitalisation of basic safety training comprises three training modules:

- On-board firefighting.
- Personal Survival Techniques, and
- Personal Safety and Social Responsibility.

- *Program of the digitalised basic training at CEFCM*

		FACE TO FACE	
	E-LEARNING	**THEORY**	**PRACTICAL**
Personal survivor techniques	9H00 *Evaluation*	1H00	5H00 *Practical evaluation*
Elementary Marine Fire Fighting	8H00 *Evaluation*		10H00 *Practical evaluation*
Personal Safety and Social Responsibility	6H00 *Evaluation* 2h00 *Virtual Class*		
First aid			11H *Practical evaluation*

Satisfaction survey

Each module is made up of sections composed of 15-minute learning nuggets. To ensure that trainees progress safely through the course, and to check that they have acquired the necessary knowledge, only the first chapter of the module is accessible at the start. The next chapter unlocks only when the learner achieves at least 80% success rate of the nugget exercises. The training module ends with a summative assessment covering all the concepts tackled in the chapters of each module. The module assessment is considered valid when the learner achieves a success rate of 80%.

The distance learning theory phase must be validated before the practical phase. Practice takes place the following week at the safety training centre. To bridge the gap between theory and practice, a discussion period with a trainer is scheduled for each module, in the practical phase, to review complex concepts and expand

on them if necessary. The aim of this period is also to remobilise knowledge prior to the practical phase.

At the end of each training session, a satisfaction survey is completed by the trainees, giving us feedback on the organisation and content of the training, both for the distance learning part and the practical phase.

The trainees are satisfied with the way their training is organized. They find it interesting to be able to complete the theoretical part at any location and at their own pace, depending on their professional schedule and availability. The creation of micro learning capsules allows them to divide their attention span and follow the training in several stages, thus offering a degree of flexibility.

The trainers are also satisfied as they can concentrate on the practical phase. As the CBS training is destined to all seafarers, its content goes further than the current practice for fishers and their installation on board. In effect, some of the teaching objectives and practical exercises do not correspond to fishers' requirements. The additional module on fishing could be a solution to focus on the resources and situations encountered on board fishing vessels.

2.2. Digitisation of the Certificate of Proficiency (COP) in Survival Craft and Rescue Boats and Advanced Marine Fire Fighting (AMFF)

CEFCM is currently in the process of digitising the Certificate of Proficiency (CoP) in survival craft and rescue and advanced marine firefighting. This digitalisation is being carried out under DEFFINUM, a French call for proposal launched as part of the national plan to revive and transform training. The aim is to support training bodies and educational structures in the development of digital training initiatives and the development of digital tools for apprenticeships.

Consequently, CEFCM has seized the opportunity of this proposal to rethink certain safety training courses to modernise them and make them more attractive. Furthermore, it is an opportunity to reconsider our teaching approach and render these training courses more effective for trainees. To achieve this objective, CEFCM has implemented an educational engineering method in which the trainees become the cornerstone of the training system. By doing so, CEFCM will develop an educational progression allowing trainees to project themselves into their practice, to understand that what they are learning will be useful on board, and to grasp the importance of knowing all these concepts. To accomplish these results, CEFCM has adopted a multi-pronged approach:

- Updating and harmonising training materials to facilitate learning of concepts: Each training begins with a complex professional situation for which trainees will have to follow an action plan to resolve. This action plan corresponds to the different chapters of the training material. This enables them to make an initial projection of the usefulness of what will be studied within the course. The document contains a placement test enabling trainees to assess their level of knowledge of the subject, thereby limiting the illusion of command. The action plan unfolds, and the document ends with a 10-question quiz on its content, followed by an overall summary of the topic. This summary can be separated from the material if necessary. Training materials are made available on CEFCM's e-learning platform.
- Creation of educational videos for each theme of these two STCW safety courses (COP and ΛMFF) : These videos were produced taking into account the various research studies on the memorisation of information using digital technology. CEFCM drew up precise specifications applicable to all videos created. These short videos (lasting up to a maximum of five minutes) include an introduction and a conclusion with a presenter, enabling the video to be clearly and explicitly structured. Between these two parts, there are sections referring to the action plan for the professional situation drawn up as part of the training material. The succession of these sections therefore follows a logical progression, allowing the learner to project himself or herself, and understand the objective of the video. The notions are presented and explained by the narrator/presenter. Λt the end of the video, the presenter invites the learner to apply the notions seen in the video by completing exercises on the e-learning platform.

Λfter each instructional video, trainees are invited to complete several application exercises. These activities, of increasing level of difficulty, take the form of quizzes (true, false, multiple-choice questions), in situ exercises with a scenario of on-board situations for which the trainee must choose the most appropriate action among three suggestions. The trainee also disposes of classification and categorisation, as well as image or diagram caption exercises. Λ summary video is produced at the end of the theme, summarising the essential elements required to resolve the professional situation.

Λll videos are designed to meet a number of criteria:

1. Λpply identical graphics throughout the video.
2. Use of animation to explain complex notions, or when illustrating a notion is relevant to the understanding and integration of new pieces of information.
3. Limit the amount of text in the video and use key words, in a legible manner, so as not to create a cognitive conflict between reading and listening.

4. Integrate images to illustrate notions representative of a real-world setting; refrain from using purely decorative images which may distract the trainee.
5. Make the video interactive by including questions directly addressed to the trainee.
6. Inform the trainee on the possibility to pause a video file and play it back whenever necessary.

3. VR-ME – Use of Virtual Reality (VR) in Marine Emergencies (ME) on trawler fishing vessels

Virtual reality (VR) is a lever for vocational training, offering several advantages

1. Immersive learning and increased commitment: Immersion encourages motivation and knowledge retention (Radianti et al., 2020).
2. Practical skills: VR enables trainees to train in complete safety and improve their performance through repetition (Kaplan et al., 2021).
3. Development of decision-making: Interactive scenarios reinforce autonomy and problem-solving (Hamilton et al., 2021).
4. Objective assessment and accurate feedback: VR provide accurate analyses of trainees' performance (Vergara et al., 2019).
5. Accessibility and flexibility: VR reduce geographical constraints and training costs (Baceviciute et al., 2022).

Virtual Reality is transforming professional learning by making it more immersive, interactive and effective, with measurable results and greater accessibility. This teaching method is perfectly suited to the field of maritime safety.

The VR-ME project is the result of an Erasmus+ initiative. This initiative is the result of collaboration between six partners specializing in vocational training (*SGS Technos and IMP*), the development of virtual reality (*SQLearn*), and the European fishing industry (*ARVI, PFA and Europêche*). The main objective of project was to improve the safety of fishermen through the development of a virtual reality simulation training programme. This type of immersive training was then considered non-existent in the fishing industry, and aims to raise the standards of emergency training. The main objective was to develop an innovative virtual reality training tool for marine emergencies on a trawler fishing vessel, making it accessible via a VR kit. This tool is intended for anyone working in or with the fishing industry. It focuses on vocational education and training, safety at work and fishing activities. The training course developed three maritime emergency scenarios: Fire, Abandon ship and Man Overboard.

The VR approach is seen as a valuable complement to traditional safety procedures, providing a safe environment in which to learn. The software is designed to be freely accessible, downloadable and available in five EU languages. VR training also includes introductory and final videos, as well as an evaluation mode to optimize the learning experience.

To achieve the above objectives, the project undertook the following activities under three main results:

Result 1 - Maritime emergencies and procedures - Risk analysis and adaptability to the simulator:

The project started with a study on maritime emergencies on fishing vessels. Partners drew up a list of emergencies to be selected according to several criteria, then the procedures to be followed were developed. Finally, these procedures were written in a language to be converted into a VR simulator. The main objective of this result was to prepare the database and basic information for the simulator and subsequent tutorials.

The risk assessment methodology is based on identification and quantification, which evaluate the RISK SITUΛTIONS related, taking into account two possible origins:

- the risk associated with ΛREΛS, considering the locations, environment and physical space where operations take place in each workplace, and
- the risk situations corresponding to OPERΛTIONS, considering tasks and activities carried out in each workplace.

Result 2 - Development of a marine emergency simulator:

This result consisted of developing the simulator itself. This was clearly an innovative approach; indeed, it represents real cases, interacting with other avatars and re-enacting stress scenarios, all requiring rapid action. The main thrust of this result was to develop a VR environment in which users move around inside a ship and have to deal with several emergency scenarios. These actions are based on the emergencies and procedures selected previously such as Engine room, abandoning vessel, Man Overboard.

Result 3 - Testing, translation and production of complementary material:

This result achieved the following objectives:

- Test the simulator with the targeted final beneficiaries and gather their feedback.
- Produce the manual for correct management of the software.

- Create a set of VR-ME vocational training courses to complement the simulator, which includes: the training programme with the emergency cases studied, the procedural guidelines on emergency case, an introductory module, and the procedure explaining the simulator's expansion possibilities. All content developed to be in English, Spanish, French, Dutch and Greek.

VR simulation tests

Virtual Reality simulator tests were carried out in France, Spain and the Netherlands. Information days were held in these countries, as well as in Greece, to gather external feedback and improve the simulations. Participants from the fishing industry were impressed by the realism of the VR development and praised the VR-ME scenarios, and the user-friendly interface. In the Netherlands, where tests were conducted with new entrants to the sector, participants particularly appreciated the realism of the training environment. They reported that this learning method had increased their enthusiasm for practising emergency procedures. Overall, the simulator training improved participants' readiness for basic safety training and the management of potential emergency situations on board vessels. It was also well received by policymakers and members of the European Parliament: "*As legislators, we should spare no effort to prevent any accident from happening and ensure that our fishers operate under the best possible safety and working conditions*". The consortium was subsequently able to pool their expertise to pioneer a new learning tool to better prepare crews for maritime emergencies. The digital programme will help better instruct fishers on the hazards involved in fishing operations and the procedures to follow in case of emergency. The implementation of these measures would certainly help minimising accidents and fatalities at sea. In addition, the safety of human life must be at the forefront of EU legislation to ensure its protection as part of sustainable fishing. For this purpose, the consortium stated that EU policies must be aligned with international standards on training and certification. It would be a huge step forward to bridge the existing legal gaps at EU level on harmonised vocational training and recognition of certificates.

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To create this VR experience, a list of the different emergency or safety situations was drawn up according to the areas on board and the type of operation being carried out. This was then used to draw up the procedure to be followed and develop the experience in virtual reality. The methodology used in the development of this experience can guide the STARFISH project team in creating the STARFISH serious game.

4. Audio-visual trainings

Another good practice in the fisheries safety sector is the development of audio-visual training courses to ease the understanding of procedures, safety equipment and safe working practices. To illustrate the use of videos in maintaining and developing safe work practices, several examples from the cooperative of fishing shipowners of the port of Vigo (ARVI; Spain) will be explained in this section.

4.1. 'SAFE FISHING'

The SAFE FISHING project developed standardised occupational health and safety training for the European trawling industry using innovative ICT-based educational tools. It had the following objectives:

- Establish European-wide standards for occupational risk prevention in trawling
- Create innovative ICT-based training materials, specifically a comprehensive DVD

The project addressed three critical gaps:

1. Traditional training methods: Existing safety training relied on outdated approaches unsuitable for fishers who spend extended periods at sea
2. Lack of standardisation: No unified European training standards existed, limiting workforce mobility and knowledge sharing
3. Generic training content: Current programmes were too general rather than sector-specific, with inadequate periodic updates

The project utilised audiovisual technology to create accessible, vessel-based training materials. Partners conducted comprehensive risk assessments, identifying 223 occupational hazards and 756 preventive measures across trawling operations.

The resulting DVD enables both classroom and self-directed learning, allowing professionals to select modules relevant to their specific working environment. This approach facilitates continuous professional development whilst vessels are at sea, improving safety standards and reducing workplace accidents.

4.2. *Seguridad predictiva*: Tools for improving occupational risk prevention and maritime safety conditions on board

This project, led by the Organization of Producers of Freezer Vessels for Hake, Cephalopods, and Various Species (OPPC-3), aims to simplify predictive safety for maritime fishing companies and workers through comprehensive audiovisual resources. Its main objectives include:

- Ensuring greater regulatory compliance.
- Establishing an innovative predictive safety protocol specific to maritime fishing.
- Enhancing onboard living and working conditions.
- Achieving a 'Zero Accident' target.
- Strengthening maritime safety procedures post-accident.

The project produced two units containing five audiovisual scenarios, each 5-10 minutes long, depicting critical tasks such as net shooting and heaving under challenging conditions (e.g., bad weather, fatigue, poor lighting, inadequate training). Each unit initially presents an optimal scenario (new, fully equipped vessel; good weather; rested, trained crew using PPE), followed by variations simulating potential accidents. This method aims to proactively address occupational risks and enhance workplace safety.

4.3. FORMAR – FEGAPESCA Training Package

FEGAPESCA is a federation formed by ARVI's fishing organizations and associations. It developed a Formar package with six phases, using audiovisuals on maritime prevention and safety. These audiovisuals are accessible on any device, in an attractive format and encourage awareness from any place or time.

Formar project phases:

1. general risks and preventive measures	20 3D videos on falls, Electrical & Fire Hazards (Electrical contacts, Fire/Explosion), Environmental Hazards (Extreme temperatures, noise), Physical hazards (falling objects, trapping, overexertion, cuts, blows), Other hazards (living beings, inhalation of harmful substances, natural causes, thermal contacts).

2. tasks aboard coastal, offshore, and deep-sea trawlers	20 3D videos on vessel operations (start/tack maneuvers, unlashing trawling doors), fish processing (sorting, gutting, loading/unloading), vessel maintenance (tasks and procedure), other tasks (cooking, navigation, stowage…)
3. Surface longline fishing (coastal and deep-sea)	20 3D training videos on boarding (transfer and boarding procedures), gear preparation (armors, bait, buoys), capture (mother line, buoys, lights, reels), processing (hoisting catches, cutting, unloading), maintenance (cleaning, kitchen tasks)
4. Onboard maritime emergencies	5 training videos on engine room fire (procedures for handling engine room fires), fire in accommodation areas (procedures for handling fires in living quarters), flooding above freeboard deck (procedures for handling upper deck flooding), flooding below freeboard deck (procedures for handling lower deck flooding), ship abandonlent
5. Coordination of repair and maintenance activities	It covers all stages of proper coordination procedure, targets (shipowners, self-employed, and contractors), helps manage interaction between crew, ower staff, and contractors
6. First aid onboard	Λudiovisuals on First Λid onboard (in progress)

The common objectives of all the project highlighted are to reduce occupational accidents in the maritime fishing sector, improve conditions for a better living and working conditions onboard and to modernise training by providing modern, practical and accessible training. These various initiatives have borne fruit, as the incident rate recorded by the Prevention Department and the Λutonomous Community of Galicia has fallen since 2013. In 2013, the prevention service recorded an incidence rate (number of accidents per 100 exposed workers) of 3.55%, compared with 0.95% in 2022. In the Λutonomous Community of Galicia, the incidence rate in 2014 was 6.8%, compared with 5.17% in 2022. The availability and distribution of these prevention videos will therefore have an impact on the accident rate recorded on fishing fleets.

WHAT'S IN IT FOR STARFISH?

The development and use of educational videos is good practice in prevention and in illustrating procedures or risk situations. The prevention videos developed as part of the above projects can be used both remotely and in face-to-face situations to illustrate or support what the trainer is saying. The fact that specific emergency or on-board safety situations are shown makes it clear how important it is to master the various procedures. The division into phases with different themes is also interesting. Firstly, it helps to target a specific audience or working environment. Secondly, it allows professionals to quickly and easily find the video they need, whether they want to refresh their knowledge or upgrade their skills.

PART II – GOOD PRACTICES IN SUSTAINABILITY TRAININGS

1. ProSea sustainable fisheries training

Over the past fifteen years, ProSea has developed and executed trainings that inspire maritime professionals, including sea fishers, to increase the sustainability of their operations. ProSea has been organising sustainable fisheries training called 'Fishing with a Future' for students at Dutch fishing colleges since 2004.

The 'Fishing with a Future' course focuses on sustainable fishing as a balance in planet (environmental challenges), profit (economic viability), and people (acceptance from society). The connection between these three aspects is essential for a fisher who is operating in a changing world. The course forms a concrete basis for knowledge and awareness needed for a fisher to cope with changes in policy (e.g. fisheries management), changes in our use of the ocean (e.g. marine spatial planning) and a changing relation between fisheries and society. 'Fishing with a Future' emphasises the three pillars of sustainability:

- Planet (environmental challenges),
- Prosperity/Profit (economic viability), and
- People (social acceptance —your license to operate).

General training program overview

- Day 1: Introduction to sustainability as a balance between the three Ps (People, Planet, Prosperity), marine environment (Planet), and marine spatial planning.
- Day 2: Value chain and entrepreneurial skills (Prosperity), and the relationship between society and the fishing industry (People).

- Day 3: Fisheries management, fish stock assessment, and continued focus on People through communication skills.
- Day 4: Environmental challenges such as marine litter and climate change (Planet), and a wrap-up on sustainability.

The training materials consists of PowerPoint presentation, workshops, interactive games, quizzes, and a final assignment for the participants. E-learning modules for some topics are also available (such as 'Marine Ecology' and 'Solid waste') and can be use in advance of or during the training. Most training sessions also feature guest lectures by experts, followed by interactive Q&A sessions to deepen understanding and engagement.

Target group

The training targets active and future fishers, fish traders and other stakeholder who wish to:

- take their personal responsibility in the sustainable development of the fishing industry.
- examine how social, ecological and economic sustainability can be complementary.
- increase cooperation in a sustainable fish supply chain.
- become future leaders in a sustainable fish industry.

2. Catching the Potential

The main goal of Catching the Potential (CTP) was to develop an international/EU standard on sustainable fisheries training. This standard was developed based on training pilots in seven European countries in cooperation with the consortium members: Europêche (Belgium), Novikontas (Latvia), Berufsbildungszentrum am Nord-Ostszee Kanaal (BBZ am NOK; Germany), CEFCM (France), CETMAR (Spain), Enaleia (Greece), Bord Iascaigh Mhara (BIM; Ireland), Escola do Mar dos Açores (Azores, Portugal), Pelagic Freeze-trawler Association (PFA) and ProSea (the Netherlands).

CTP started with a desk study to gather information about sustainable fisheries training for fishers, including the identification of best practices in sustainability training of fishers in EU countries and identification of elements on sustainable fisheries in existing instruments and guidelines. The desk study showed that several countries provide training on various aspects of sustainable fisheries to fishers, but it also showed that the ProSea training 'Fishing with a Future' offered the most holistic approach to sustainable fisheries training. The desk study also

revealed that some additional topics should be added to this training, mainly on social sustainability topics such as fair wages, a safe working environment, slavery, and corruption.

The training materials from ProSea's Fishing with a Future course (see previous section) were adapted to fit the specific context of each country where pilot trainings were conducted and translated to each countries' language. Country-specific pilot sessions provided valuable insights into what sustainable fisheries training means at a broader, cross-national level.

Overall, the CTP's foundational materials and training approach proved highly effective. The topics covered were relevant to a wide spectrum of fishers—from those working on large trawlers spending weeks at sea, to small-scale fishers operating solo on coastal vessels.

Lessons learned from the various pilot trainings were carefully considered during the development of the CTP Standard for Sustainable Fisheries Training. This standard, along with a comprehensive trainer's manual, is now publicly available and can be accessed at www.catchingthepotential.eu/project/. In addition to the summary provided below, key insights from the pilots are also embedded throughout the standard and manual, highlighted in text boxes where they directly relate to specific content.

2.1. Lessons learned

2.1.1. Customizing the training

- It is essential to customize the training to reflect the reality of the local situation (fishing fleet, supply chain, marine environment), so it is easier for participants to understand and to identify with the content.
- It is a challenge to customize the training – the aim is to keep the general content and approach and put that in the context of the local situation. One risk is that customizing simply means adding more (local) content, another is that too much of the original content is cut. It is important to keep in mind that (1) the training still reflects the training objectives and content as intended and as indicated by the STCW-F Convention, and (2) that the content is presented in such a way that participants can identify with the training, including by adding local examples.
- The training needs to be adjusted to fit with the target group. This includes language, cultural aspects, and comprehension level/experience.
- All parts of the training are included for a reason. Trainers and teachers should be aware of this and have good reasons to discard or change parts of the training.

- Having a mixed group of participants (new entrants and experienced fishers) resulted in having good discussions and on bringing forward different perspectives.

2.1.2. Local network

- In many countries, sustainable fisheries training was not included in the curriculum of the fishers. This indicates a gap in the training and education of EU fishers. However, teachers and trainers are keen to include sustainable fisheries training, but do not always have the resources or knowledge to do so.
- Building local networks can support and facilitate the structural implementation of this training. This may include involving the fishing industry, fishing/maritime academies, fish supply chain, scientific institutes, and NGOs.

2.1.3. Length of the training

- Sustainable fisheries training cannot be done in one day. It is not possible to cover all the subjects in enough detail in one day and address local examples. This creates the risk that there is no time to have a more in-depth discussion on sensitive topics and that content must be simplified too much. This diminishes the ability of participants to engage with the subject of sustainable fisheries and to form and share their opinions and ideas.

2.1.4. Objectives and approach

- It should be very clear that the main objective of the CTP training standard is to give a broad view of the concept of sustainability. In the description of the individual parts, it should be made very clear how the individual parts of the training tie back to the overall theme of the training, to sustainable fisheries, and to the Triple P concept. In addition, it also needs to be clear that the objective of the CTP training standard is to involve fishers in the concept of sustainable fisheries and inspire them to include it in their own thinking and their (future) career in fisheries.
- It is important to be clear about the objectives of the training and to create the right expectations. In a training for local stakeholders (e.g. policymakers, scientists, industry representatives), some participants complained that there was not enough nuance and detail in the training, but by doing so

they reason from their own level of expertise, level of education, and their wishes and needs and not necessarily from the actual target group.

- The training needs to find a balance between theoretical content and interaction. The content is important to raise the knowledge level of the participants, but the interactive part gives the participants the possibility to talk about that content with peers and to connect that knowledge to their own circumstances. It is important to realize that active participation is not always common in our educational system. When possible, theoretical content could be reduced in favour of more interaction. The pilot training in the different countries showed that some participants are reluctant to participate in the (inter)active sessions, in every pilot it resulted in a better understanding of the subject, despite the different cultural backgrounds of participants.

WHAT'S IN IT FOR STARFISH?

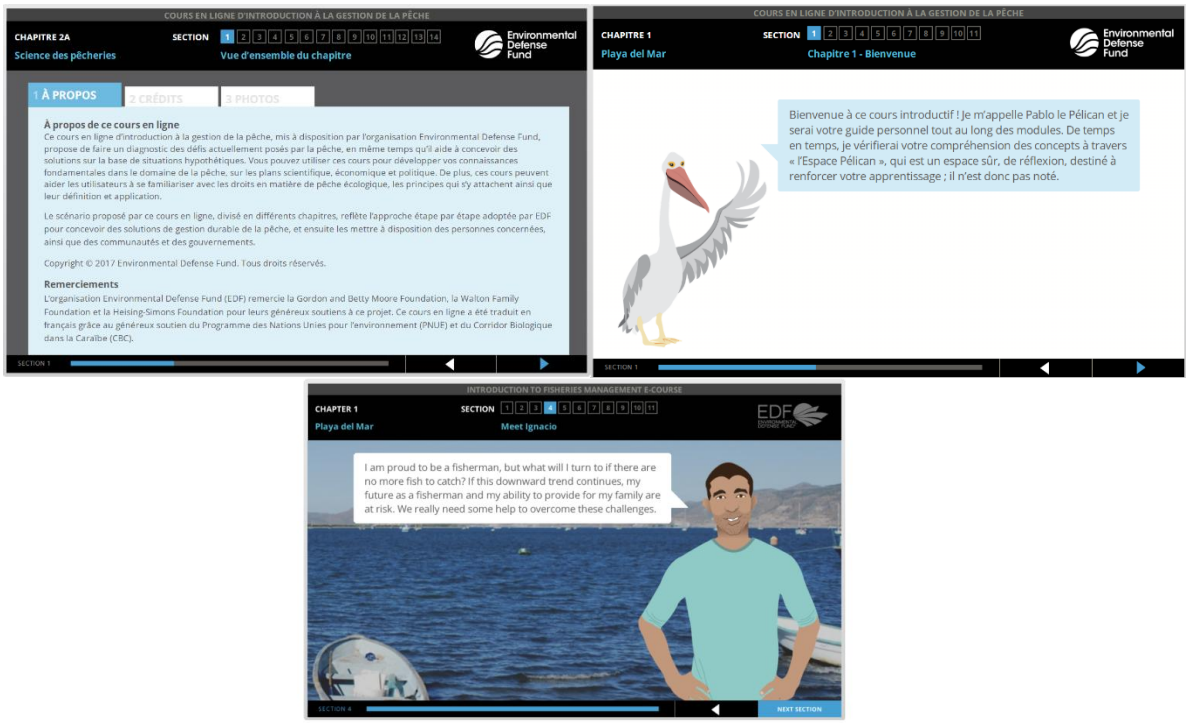
This feedback gives us some keys to sustainability training, particularly in terms of content and organisation. It shows how important it is to be able to integrate local cultural, regulatory and professional elements so that the training can be adapted to the trainees' professional and living environment, while maintaining the initial objectives of the training. This also shows the importance of involving a variety of profiles at different levels of the training, such as trainers, scientists and armaments specialists, in order to anchor and perpetuate this training. We will also have to ensure that we retain the practical side of this training programme and strike a good balance between practice and theory in order to put the various concepts into perspective and make them easier to understand.

3. Fishery management e-course

An online course on fisheries management has been developed by the Environmental Defence Fund for its Virtual Fisheries Academy. This course is also available on the 'Small-Scale Fisheries Resource and Collaboration Hub' (SSF Hub), which is an online, interactive, multilingual platform for small-scale fishermen, fishery workers, their communities and allies. It provides access to free tools and resources to strengthen small-scale fisheries governance and community development. As a collaborative space, the SSF Hub is intended to be used by those working in and with small-scale fishing communities to implement the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines).

The ‘Introduction to Fisheries Management’ e-course provides fundamental knowledge of the science, economics and politics of fisheries. With this course, trainees visit the hypothetical Playa del Mar fishery, where they learn from stakeholders about the challenges facing their fishery. They work together to design a management programme. Trainees are guided throughout by a pelican, and asked questions during their progression. They follow two characters, one representing a small-scale fisherman, and the other working for the industrial fishing industry. At the start of each chapter, trainees have access to an introduction including a general presentation of the e-learning capsule.

The objectives are to diagnose the challenges facing the fishery, and to understand the limits of conventional management and attributes of sustainable management.[7]



Screenshots of the fishery management e-course

[7] E-learning modules available via the link: https://virtual-fisheries-academy.thinkific.com/bundles/english

WHAT'S IN IT FOR STARFISH?

Having an avatar guiding and accompanying the trainee makes for an engaging experience. The same applies to storytelling, which immerses the trainee and provides a clear vision of the different environments. Structuring the progression by showing the work environment and the issues involved in two different techniques gives a clear understanding of what is at stake in both types of fishing, without setting them in opposition to each other.

4. Serious games in sustainability trainings

The 'Serious Games pedagogical method' is based on the use of games for educational purposes, combining fun and motivating aspects with specific learning objectives. Numerous studies have demonstrated its effectiveness in terms of engagement, intrinsic motivation and knowledge retention. These studies highlight the value of this method for promoting active learning, complex problem solving and the development of cross-curricular skills such as collaboration and decision-making. Designing an educational serious game requires a rigorous approach that begins with a clear definition of the educational objectives and identification of the target audience. Then comes the appropriate selection of game mechanisms that can effectively support these objectives. It is also important to incorporate regular evaluation and feedback phases, in order to adjust the educational and game content according to the results obtained, thus ensuring the relevance and effectiveness of the system.

5.1. Down By the Sea

The Institute Agro / Montpellier SupAgro has developed the serious game 'Down By the Sea'[8], which aims to raise agronomy students' awareness of natural resource management, focusing on the management of common goods. During the game, students are divided into several groups, each using a common resource. In round, players decide on their fishing effort based on the information available. The stock of resources is then replenished according to the total effort made by all the participants.

This game promotes a better understanding of the socio-economic mechanisms associated with the sustainable management of natural resources. It helps students to intuitively grasp the expected theoretical results, making it easier to

[8] This game can be downloaded via the link: https://www.chezlestices.fr/CapTice/down-by-the-sea/

assimilate the course content. Numerous concepts and theoretical results can be explored through this game, including the tragedy of the commons, the prisoner's dilemma, economic myopia, quota markets and risk aversion.

The 'Down By the Sea' serious game can be played on a PC and consists of five distinct levels:

- Levels 1 and 2: Students interact with an open-access resource, with no regulatory mechanisms. They also have the opportunity to acquire new equipment, some of which will enable them to obtain a sustainable fishing label.
- Level 3 (community-based resource management): Students are confronted with a degraded resource. They can form coalitions to collectively establish various management rules, such as sanctions or benefit sharing.
- Level 4 (Public policy): Students have access to a range of equipment and can trade fishing quotas with each other.
- Level 5 (Protected areas and spatial externalities): Students have access to protected areas rich in fish resources, where fishing is permitted but penalized. These protected areas also generate positive externalities for fish stocks in unprotected fishing areas.

Teaching aids on these different themes are also provided with the game.

5.1.1. Context

Each player represents a fisherman around a lake. The lake contains a given stock of fish, which is regenerated from one round to the next according to the stock remaining at the end of the previous round.

To win the game, the player(s) must manage the resources and generate a profit, according to the objectives set for each round. To do this, participants must analyse and manage the appropriate actions to be taken, individually and collectively, subjected to the constraints imposed by the resource.

The trainers, playing regulators, can freely regulate and configure the game sessions: they can set up taxes or quotas, introduce jolts or provide information on the risks of degradation of the resource (among other things).

At the end, the players are assessed on their individual and collective performances.

5.1.2. Educational aim

To be able to manage a fishery, taking into account the economic criteria of resource management and competition between players in the industry.

- Illustrate how interactions between agents can complicate the management of natural resources.
- Understand the role and rules of institutions, and their ability to endure over time.
- Demonstrate how a quota market works.
- Question and compare the role of market instruments in the management of natural resources.
- Introduce choices in a risky environment and spatial externalities.

WHΛT'S IN IT FOR STΛRFISH?

This is a tool that is currently being used face-to-face with students. This serious game puts them in a concrete stock management situation. Depending on the group's progress, the trainer can make the experiment more complex or modify it. Λ telephone conversation with the teacher, who was also behind the project, highlighted a point that needs to be borne in mind when designing this type of teaching tool to ensure that it lasts. The designers have gone a long way in designing the scenarios. This has the advantage of increasing complexity and covering all the concepts of sustainability, but it also makes monitoring by the trainer and technical management more complex. This complexity of levels leads to technical bugs, which requires special skills to resolve these problems. The advice is therefore to develop a less complex teaching solution with technical tools that are accessible to all trainers, enabling them to update and perpetuate the experience.

CONCLUSION

The aim of this dossier was to highlight good practices in basic safety and sustainability training for the fisheries sector. Some of the elements presented in this file are intended to inform the design and deployment of distance learning modules, which will be a core output of the STΛRFISH. These modules must be carefully structured in terms of organization, content, and validation methods, while remaining accessible and engaging for fishers.

The first step will therefore be to consider the existing regulatory and pedagogical requirements related to distance learning, including the STCW training framework. Educational recommendations from the International Maritime Organization (IMO) offer valuable guidance here, which can be transferred to STCW-F training courses. For example, IMO emphasizes the importance of adapting content to the learner's profile, especially for those with limited experience at sea, and encourages the use of visual materials (diagrams, photos, videos) that represent onboard operations. These tools help trainees to better understand operational hazards. Additionally, IMO recommends the use of hypothetical scenarios, case studies, and multimedia content to promote critical thinking and situational awareness. These methods align with cognitive science principles for effective distance learning, suggesting the value of concrete, interactive, and visually rich learning experiences.

The good practices resulting from the projects presented illustrate promising and adaptable approaches. They highlight the need to customize training content linguistically, culturally, and professionally, based on the learner's background and work environment. Fishers must be able to access these modules easily and within limited timeframes. This is why it is important to break down content into focused segments to prevent cognitive overload and to ensure each module addresses a specific real-world problem, enabling trainees to build concrete skills.

The various training actions presented in this dossier show that maintaining and increasing skills in terms of prevention, safety and sustainability remains complex due to the professional environment in which our target audience evolves. The use of micro-learning capsules could be an effective strategy to segment information and facilitate its assimilation. To optimize learning, these micro capsules will have to incorporate various pedagogical methods to sustain engagement, along with regular evaluations or self-evaluations to track learner progress. The clearer the pedagogical roadmap, the more empowered trainees will be able to apply their knowledge in practice.

The use of audiovisual tools, particularly short, well-structured instructional videos is another best practice. These videos can include animations to explain technical

concepts and interactive elements to reinforce learning. Projects like SΛFE FISHING and Seguridad Predictiva illustrate how such formats improve understanding of onboard safety procedures, especially important for fishers who often work far from training centres. The inclusion of realistic imagery and video footage is essential to ground learning in real-world experience.

The development of emerging technologies such as virtual reality and immersive serious games offers exciting opportunities. They open the field of possibilities by making it possible to create realistic yet safe simulated enabling trainees to practice emergency responses, decision-making, and routine procedures. This approach increases both learner engagement and memory retention, by activating cognitive and emotional processes

In summary, these good practices form a cohesive and complementary set of strategies to ensure the efficacy, accessibility, and sustainability of training in the fisheries sector. They support a continuous improvement model, where risk prevention, professional development, and responsible resource management are all interconnected. These efforts not only enhance the safety and well-being of fishers but also strengthen the resilience and future viability of the EU fisheries sector as a whole.

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