RESPONSE

Building Response Frameworks under existing & new Marine Pollution Challenges in the Black Sea

Milestone 6

Training objectives and plan defined

Co-funded by the European Union

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Document information and version control

Project Acronym	RESPONSE
Project Title	Building Response Frameworks under existing & new Marine Pollution Challenges in the Black Sea
Grant Agreement Number	EU grant agreement No 101124661
Work Package	WP3
Related Task(s)	T 3.1
Milestone Number	6
Milestone Name	Training objectives and plan defined
Due Date	31 May 2025
Date Delivered	
Dissemination Level	Public — fully open

Version control

Revision-N°	Date	Description	Prepared By	Reviewed By
1	20.04.20124	1st Draft	Razvan Mateescu	Anastasia Tsavdaridou
2	20.05.2024	2nd Draft	Anastasia Tsavdaridou	Razvan Mateescu
3	29.05.2024	Final Version	Razvan Mateescu	Anastasia Tsavdaridou

Project background and context

The RESPONSE, supported by the European Union EMFAF, under Grant Agreement no 101124661 has duration of 36 months, starting from 01.10.2023. The project consortium involves six partners from five different countries: Greece, Bulgaria, Romania, Ukraine and Georgia. Five of the participants are based in countries bordering on the Black Sea, and the lead beneficiary, the Aristotle University of Thessaloniki (AUTH), has a long history of working with the region and with members of the consortium. The partnership includes one university, two research institutes and three environmental NGOs: the Black Sea NGO Network (BSNN) regional NGO network based in Varna, Bulgaria; the National Institute of Marine Research and Development (NIMRD), based in Constanta, Romania, leading research institute for the Black Sea; the Institute of Market Problems and Economic-Ecological Research (IMPEER), Odesa, a public institution, part of the National Academy of Sciences of Ukraine; the Black Sea Branch of Ukrainian Environmental Academy of Sciences (BSBUEAS) is Odesa-based NGO with a team of professional researchers; and the Greens Movement of Georgia / Friends of the Earth (GMG/FoE) – Georgia, an NGO, part of the international environmental network. All three beneficiaries from EU Member States have extensive experience in marine pollution projects under the Horizon 2020 and Horizon Europe programmes.

RESPONSE aims to identify and promote the development and establishment of new-generation advanced training schemes and curricula to support early warning, region-wide mechanisms for monitoring natural and man-made disasters. Various training programs, platforms and curriculum have been implemented to monitor marine pollution and ensure knowledge integration and dissemination. Still, training material, best practices, standards and protocols often differ among platforms and programs, hindering progress towards implementing an integrated, transdisciplinary and multidisciplinary marine pollution training system. Peculiar events, such as armed conflicts, create new environmental and societal challenges that call for international, coordinated responses.

RESPONSE acknowledges the importance of deeper understanding of marine ecosystems and river-delta-sea connections, the need for development of harmonized procedures, standards and methodologies in marine monitoring across the Black Sea countries to support healthy and resilient seas and foster integrated marine governance. The sustainable changes that are required for the establishment of efficient, advanced training schemes that would be integrated with the challenges, goals and specificities of the scientific and social context and make the most of the untapped capacity of stakeholders to promote regional awareness in the field.

In view of the background and context described above, the four overarching objectives of RESPONSE are: 1) IDENTIFY and UNDERSTAND the institutional and societal gaps and needs for effective, integrated, transdisciplinary and multidisciplinary marine pollution training systems; 2) DEVELOP effective training programs by assembling, integrating, and improving the most promising approaches and results into a comprehensive framework that consists of a set of methodological training tools, databases, policy recommendations, and background information; 3) SUPPORT the implementation of the EU and Regional Strategies, by developing operational guidelines for effective application, updating, monitoring and management of training programs on marine pollution; 4) EMPOWER marine pollution training, monitoring and mitigation by involving, inspiring and influencing stakeholders through *a broader vision of co-design, co-creation, co-establishment, co-implementation and co-assessment of the training programs*.

Executive summary

This document outlines a comprehensive framework for the design and implementation of marine pollution preparedness and emergency response training, developed under the RESPONSE Project with a focus on the pollution caused by regional armed conflicts. It provides a structured methodology to guide planners, institutions, and stakeholders in building resilient, inclusive, and operationally effective training systems.

The training framework is built around ten interlinked steps, beginning with the definition of purpose and scope, the geographic coverages, the pollution types and the integration of training into broader institutional, national, and regional systems. These steps include stakeholder identification and extended analysis, ensuring that training reflects the roles, capacities, and institutional responsibilities of key actors. The needs assessment will be reiterated using participatory tools and past incident reviews to define specific capacity gaps as well as a curriculum alignment, co-designed with experts and stakeholders, focused on integration of exercise/experiments based on specific marine pollution tools (e.g., CMEMS, EO data, decision support systems). The training deployment planning engages specifying modalities (in-person, hybrid, digital), site-based exercises, and monitoring procedures, as well the development of training content, including manuals, simulations, case studies, and multilingual toolkits accessible through digital platforms, and also the trainer recruitment and facilitation, supported by a "Training of Trainers" (ToT) approach to ensure sustainability. The evaluation and monitoring step encompass performance-based assessments, feedback loops, and measurable KPIs considering the training schemes' sustainability and institutional uptake, promoting integration with national contingency plans, continuous learning mechanisms, and regional coordination (e.g., Black Sea Commission frameworks).

Furthermore, the document emphasizes the importance of complex/interdisciplinary coordination and support for real-time decision-making in case of emergency, as well armed conflict caused pollution, approached based on specific scenarios as part of marine pollution response exercises. By leveraging stakeholders' expertise, digital infrastructure/toolbox development, policy alignment and the promotion of regional frameworks, Milestone 6 supports for the next steps the creation of scalable, adaptive, and operationally relevant training programs to strengthen marine environmental protection in the Black Sea Basin.

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Outlining the development of operation plans on emergency response and marine pollution preparedness trainings

Steps towards planning comprehensive marine pollution trainings.

Step 1 – Definition of purpose and scope

The first key step in designing and preparing an effective training program aimed at enhancing preparedness and response capacity to marine pollution incidents is the identification of key points such as the objectives of such a program, the geographical coverage it will cover, as well as the types of pollution it will focus on and train participants to address.

In more detail, these key points are presented below:

I. Objectives:

To design an effective training program, its aim and objectives must be clearly defined. Within this framework, relevant examples might include, e.g.:

- to train port authority personnel and shipping operators in implementing port waste reception procedures and pollution prevention measures under specific legislation frameworks (e.g. MARPOL);
- to improve the understanding of local government units and civil protection authorities on their roles in marine pollution emergency response and post-incident recovery;
- to train environmental and emergency response personnel in the rapid assessment, rescue, and rehabilitation - ensuring deployment of a coordinated wildlife response team within 24 hours of a pollution incidents, including armed conflicts;
- to train volunteers for participation in joint naval/marine exercise with focus on marine pollution preparedness and response;
- to introduce authority personnel to new technologies to monitor a pollution incident for immediate response;
- to strengthen the capacities of environmental authorities, emergency response units, and other key stakeholders in responding to marine pollution incidents arising from or occurring during armed conflicts.

II. Geographical Coverage:

The geographical coverage determines the technical content, field exercises, and specific training modules. The training course should clearly define the geographical scope it addresses, as this will shape both the content and the practical relevance of the material. Indicatively, if the course targets local-level response, focusing on specific coastal zones, ports, or MPAs, it should incorporate the distinct environmental, ecological, and operational characteristics of those locations - such as local species at risk, common pollution sources, existing infrastructure, and the roles of local authorities.

If the course is intended for a country-level application, it should be designed to reflect the national legislative framework, response structures, institutional responsibilities, and key challenges specific to that country. This includes alignment with national contingency plans, coordination mechanisms among national and regional authorities, and the integration of real-case scenarios based on past incidents or identified risks within the country's marine environment. Particularly in the case of a training program at the Black Sea basin scale - a shared transboundary marine system - a common regional context should be included.

In either case, grounding the training in the realities of the targeted geographical context will ensure its relevance, effectiveness, and capacity to strengthen preparedness and response at the appropriate operational level.

III. Pollution Types:

A critical step in developing an effective operational training plan for marine pollution preparedness and response is to clearly define the types of pollution the training will address (e.g. oil spills, chemical spills, plastic pollution, sewage, and hazardous substances resulting from shipwrecks and maritime accidents, including armed conflicts). This scope will determine the technical focus, target audience, required equipment, procedures, and response strategies included in the training.

Within the RESPONSE framework, leverage will be drawn from the extensive research conducted during the earlier phases of the project, which thoroughly outlined the key issues related to marine pollution and emergency incidents requiring immediate response. This was achieved through the in-depth analysis presented in Deliverable 1.3, as well as through ongoing interactions and consultations with stakeholders (D1.1, 1.2, 2.1).

Step 2 – Identification of the stakeholder groups to be involved

After defining the Purpose and Scope, the next essential step in designing a training course on marine pollution preparedness and response is to identify and develop a deep understanding of the target audience and key stakeholders the course is intended for. This involves considering the following key aspects

- Identify relevant stakeholders (the methodology applied in D1.1 is proposed).
- Conduct a stakeholder analysis: influence, capacity, and role in preparedness/response.
- Take into consideration the stakeholder's input in co-designing stage for the training agenda/syllabus delineation (consultation with stakeholders is proposed as implemented in D2.1).

In addition, the planner must develop a clear understanding of the nature and roles of the involved stakeholders—whether they are decision-makers, technical personnel, or operational responders. This includes assessing their background, any prior training they may have received, the timing of their most recent participation in training courses or preparedness exercises, as well as their existing expertise and operational capacity in responding to marine pollution incidents.

Within the RESPONSE framework, this step was thoroughly implemented through an extensive mapping and analysis of the involved stakeholders, resulting in a comprehensive understanding of the stakeholder network, as documented in Deliverable 1.1, 1.2 & 2.1.

Step 3 – Needs assessment

As part of the training design process, and once the target stakeholder groups to be involved in the training courses have been identified, a thorough assessment of their specific needs must be carried out. This step is essential to ensure the training is relevant, effective, and tailored to the actual capacities and gaps of each group.

Key needs can be identified through close collaboration with stakeholders, using methods such as surveys, interviews, or participatory workshops. Additionally, reviewing past pollution incidents and response actions can help highlight weaknesses or gaps in preparedness. It is also important to assess the existing training frameworks and the technical and operational capacity of the stakeholders to determine what is already in place and where improvements are needed.

Within the RESPONSE project, these steps were actively implemented through an in-depth analysis of stakeholder profiles using a combination of tools—including direct communication, one-on-one discussions, questionnaires, interviews, and co-creation workshops—as documented in Deliverables D1.1, D1.2, and D2.1. Moreover, a review of existing training structures and the identification of critical gaps were conducted, along with an evaluation of stakeholders' operational capacity and readiness to participate in training activities.

Step 4 – Definition of the training content, materials and further requirements

Core components of the training program should be shaped to ensure operational relevance, technical accuracy, and practical impact in the field of marine pollution preparedness and response. Such key elements might include the structured development of co-designed curricula aligned with stakeholder needs, the creation of targeted exercises and simulations to enhance applied learning, and the specification of digital tools and platform functionalities to support training delivery and performance assessment.

I. Co-designed curricula alignment

Objective: Ensure that all training requirements are directly aligned with curricula collaboratively developed by relevant stakeholders, including maritime institutions, academic partners, regulatory bodies and NGOs and groups of volunteers.

Actions: Map training modules to competencies defined in the co-designed curricula; Integrate feedback from end-users and industry to ensure real-world relevance; maintain a dynamic alignment process to adapt to evolving operational challenges in Marine Pollution (MP) management; Ensure compliance with national and international standards for maritime training and pollution control.

II. Exercises/experiments development – Syllabus Specifications for selected MP Modules of the training curricula

Objective: Design practical exercises and experimental activities that align with the specific syllabus requirements of selected Marine Pollution (MP) training modules.

Actions: Develop hands-on exercises and scenario-based simulations tailored to the core competencies of each Marine Protection (MP) training module; Define learning outcomes, performance metrics, and safety protocols for each experimental component; Integrate real-time data, Earth Observation (EO) data and marine forecasts from Copernicus Marine Environment Monitoring Service (CMEMS) and MP Decision-Support Systems (DSS) into exercises to simulate realistic MP intervention conditions; Ensure that exercises support both individual skill development and team-based operational coordination; Align experimental content with the latest scientific standards, environmental policies, and regulatory requirements.

III. Toolkit/IT Platform Requirements

Objective: Define the functional and technical requirements for the IT platforms and toolkits that will support the delivery and application of MP training programs.

Actions: Specify user needs, accessibility standards, and interoperability requirements for the training toolkit; Identify the digital tools, software, and platforms necessary for real-time simulation, Environmental Impact data analysis/ Net Environmental Benefit Analysis (NEBA), and interactive training; Ensure the platform supports modularity for scalable and customizable training delivery (e.g., by role, region, or threat level); Integrate visualization tools for marine environmental data,

early warning systems, and pollution modeling; Prioritize user experience, multilingual support, and security compliance in platform design.

As part of the RESPONSE project, a key IT tool designed to significantly support the training program and meet its evolving needs is the RESPONSE Digital Toolkit. This platform is being developed to serve as a centralized hub, integrating and delivering a wide range of educational content, resources, and information. It is specifically tailored to facilitate training activities by providing structured access to learning materials, decision-support tools, and other critical resources relevant to marine pollution preparedness and response.

Step 5 – Structure the training programme

I. Training Deployment Specifications

Objective: Establish clear specifications for the rollout and operationalization of MP training across local, national and regional contexts (institutional and legislative).

Actions: Define deployment modes (e.g., in-person, hybrid, e-learning, define whether there will be simulation drills, field demonstrations and site visits) tailored to different stakeholder groups and operational settings; Set timelines - duration, logistical requirements, and resource allocation for effective training delivery; Develop guidelines for trainer certification, participant selection, and evaluation procedures; Ensure integration with institutional/stakeholders training calendars, emergency response trainings, and continuous preparedness/learning pathways; Establish mechanisms for feedback collection, course iteration, and long-term sustainability**.**

Step 6 – Development of the training materials

The development of training materials will incorporate a diverse and comprehensive set of resources designed to support effective learning and practical application. These will include manuals, handbooks, and standard operating procedures (SOPs) to provide structured guidance, as well as case studies of past marine pollution events, including armed conflicts, to offer real-world context and lessons learned. Multimedia elements such as videos and interactive simulations will enhance engagement and experiential understanding. Where necessary, materials will be translated into local languages to ensure accessibility and inclusivity. In the framework of RESPONSE project, all training content will feature a digital component and be integrated with the RESPONSE Digital Toolkit, facilitating flexible, scalable, and user-friendly delivery across stakeholder groups. Specifically:

I. Development of Training modules

Objective: Create structured syllabus, outcome-based training modules tailored to the core domains of MP preparedness and response.

Actions: Design modular content for opening, intermediate, and advanced levels of MP training/knowledge and practice; Align module content with international maritime training standards and co-designed curriculum frameworks; Incorporate multimedia resources, case studies, and scenario planning to enhance engagement and realism; Provide role-specific pathways (e.g., seafarers, port authorities, environmental specialists, NGOs/groups of volunteers) within the curriculum.

II. MP Exercises, Simulations & Assessment Framework

Objective: Develop robust practical and theoretical frameworks, along with versatile and replicable exercises, to simulate MP incidents, including armed conflicts, and validate trainee competencies across operational contexts.

Actions: Develop versatile and replicable exercise templates adaptable to different marine contexts and pollution scenarios; Incorporate key variables such as spill magnitude, weather conditions, environmental sensitivities, and inter-agency coordination into simulations; Align exercises with international response protocols, national contingency frameworks, and environmental regulations; Frame each simulation with pre- and post-exercise briefings to provide contextual understanding and enhance learning outcomes; Design performance-based assessment frameworks linked to module-specific learning objectives and real-world competencies (according with T2.2); Integrate simulation-based evaluations, decision-making tasks, and scenario response assessments to test operational readiness; Ensure standardization and fairness in evaluation criteria while maintaining flexibility for contextual adaptation; Embed feedback mechanisms and structured post-assessment reviews to support continuous learning and improvement.

III. Teaching Methodology

Objective: Adopt adaptive and evidence-based instructional methods tailored to both preparedness and rapid response contexts by aligning the instructional approach with the distinct demands of preventive training - such as risk forecasting, policy planning, and preparedness strategies - and emergency intervention, including rapid decision-making, operational coordination, and real-time response.

Actions: Use differentiated instructions for preparedness (e.g., policy planning, risk forecasting, NEBA) vs. rapid response (e.g., DSS, field deployment, coordination); Blend classroom instruction with experiential learning and digital simulations; Promote collaborative training and peer-to-peer knowledge exchange; Integrate real-life MP events and lessons learned/case-studies into the training strategy; Use risk assessment, policy simulation, and scenario planning to enhance preparedness training; Focus on decision-making under pressure, communication chains, and field coordination in emergency response training; Develop dual-track methodologies that bridge strategic planning with tactical execution; Ensure both tracks foster interdisciplinary coordination and real-time adaptability.

IV. Teaching platforms

Objective: Use as training resource available Services/Software/toolkits for marine environment (such as the RESPONSE Digital Toolkit)/EO & Model data. Leverage available marine environment tools, EO/forecast systems, and environmental models/downstream services/Early Warning Systems to support MP training.

Actions: Integrate satellite-based EO services, CMEMS products, and marine forecasting tools into teaching platforms; Provide access to real-time and historical datasets for pollution tracking and response modeling; Train stakeholders on interpreting model outputs and integrating them into operational decisions; Ensure compatibility of support data & information formats with existing national and regional digital infrastructure; In RESPONSE case showcase the RESPONSE Digital Toolkit and its functionalities.

V. CMEMS-DSS/toolkit demonstrators setup

Objective: Showcase real-world MP applications via demonstrators; Deploy functional demonstrators integrating CMEMS tools, downstream national/regional services and EWS and DSS, as well, for MP advanced research training.

Actions: Set up demonstration environments to showcase real-world applications of EO and EWS/DSS tools in MP scenarios; Provide guided walkthroughs, hands-on sessions, and test cases for training participants; Integrate demonstrators with existing institutional/legislative frameworks and regional systems; Facilitate early user feedback to improve system relevance and usability.

VI. Toolkit Platform Development

Objective: Build a dynamic, user-orientated digital platform to host, manage, and disseminate the (re)configurable training toolkit.

Actions: Design a web-based portal, incorporating interactive dashboards, and customizable trainings pathways, thus enabling the cloud-based access. Such a platform is developing in RESPONSE in the framework of RESPONSE Digital Toolkit, whose functionalities will be showcased.

Step 7 – Trainers engagement and facilitation

Recruiting the right trainers is a key element in ensuring the success of the training program. It involves selecting qualified experts with specialized knowledge in marine ecology, spill response, and emergency management to deliver effective and credible instruction. Involving international or regional organizations such as the European Maritime Safety Agency (EMSA) and International Maritime Organization (IMO) further enhances the program's relevance and quality. Additionally, providing "training of trainers" (ToT) sessions helps build a sustainable pool of skilled facilitators who can continue delivering the training beyond the initial phase.

Step 8 – Evaluation and Monitoring

Evaluation and monitoring are essential components of the training process, aimed at measuring the effectiveness, efficiency, and overall impact of the MP training system against predefined benchmarks. This step involves conducting pre- and post-training assessments to quantify knowledge gained by participants, as well as gathering participant feedback through surveys and forms to capture their experiences and suggestions. Performance is also observed and evaluated during practical drills to assess real-time application of skills. Key Performance Indicators such as the percentage of participants demonstrating improved knowledge or the speed of response during simulations are established to provide clear metrics for success, such as those defined in T2.2. Benchmarking criteria are developed based on the best international practices and aligned with national and regional performance indicators. The collected data is thoroughly analysed to identify strengths, gaps, and opportunities for improvement, with findings used to continuously refine the training curricula, instructional methods, and digital toolkits, ensuring that future training cycles are increasingly effective and responsive to stakeholder needs.

Step 9 – Follow up and sustainability

Follow-up and sustainability are critical to ensuring the long-term impact of the marine pollution training program. Upon completion, participants should receive certificates recognizing their newly acquired skills and knowledge. Efforts should be made to encourage the integration of the training content into contingency plans, reinforcing its practical application within existing frameworks. To foster ongoing collaboration and knowledge exchange, a network or forum for trained professionals should be established, providing a platform for continuous communication

and support. Annual refresher courses or updates should be planned to maintain and enhance competencies over time. Additionally, training outcomes and lessons learned should be regularly documented and shared through reports and policy briefs to inform stakeholders and support policy development.

To ensure institutional uptake and long-term sustainability, mechanisms such as formal inclusion of the training program in national contingency plans, the establishment of Memoranda of Understanding with training centers, and the endorsement of key materials and tools—such as in the case of RESPONSE the Digital Toolkit—by regional bodies like the Black Sea Commission should be actively pursued.

Step 10 - Integration into broader systems

To ensure the marine pollution training program has a lasting and wide-reaching impact, it is essential to embed it within broader institutional, legal, and policy frameworks. This includes aligning the training content and objectives with national emergency response systems, maritime safety policies, and legal frameworks to secure the support and involvement of competent authorities. Strong connections should also be established with European Union mechanisms and regional initiatives, such as the Common Maritime Agenda for the Black Sea, the EU Marine Strategy Framework Directive (MSFD), and regional contingency planning efforts.

Furthermore, active coordination with the Bucharest Convention and the Black Sea Commission will enhance cross-border cooperation and harmonization, reinforcing regional preparedness and response capabilities. Incorporating training outcomes, methodologies, and best practices into the capacity-building components of related national and international projects can generate synergies and amplify the program's long-term impact.