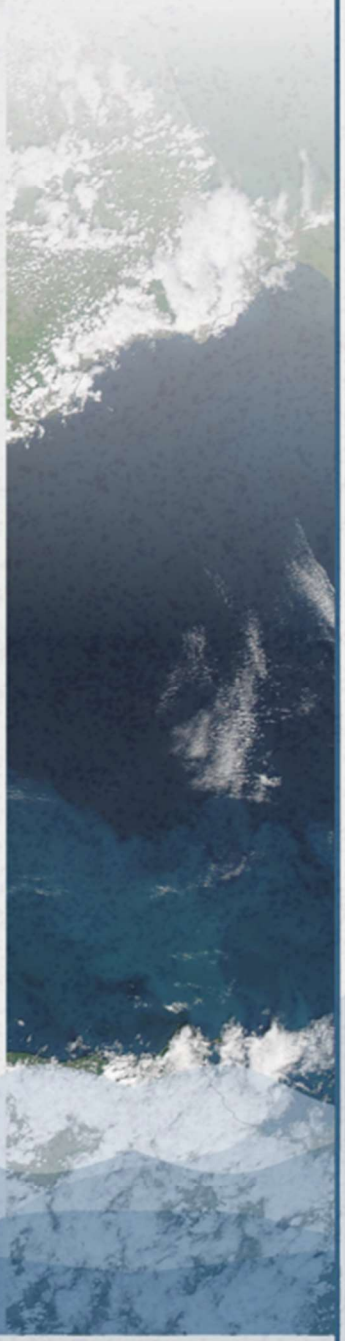
RESPONSE

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



Deliverable D1.2

# Needs assessment report on current training plans, curricula and capacity

Co-funded by the European Union

The RESPONSE project is funded by the European Union under Grand Agreement no. 101124661. Views and opinions expressed are however those of the beneficiaries only and do not necessarily reflect those of the European Union or European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

## 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** | WP1 |
| **Related Task(s)** | T1.2 |
| **Deliverable Number** | D1.2 |
| **Deliverable Name** | Needs assessment report on current training plans, curricula and capacity |
| **Due Date** | 31 July 2024 |
| **Date Delivered** | 31 July 2024 |
| **Dissemination Level** | Public — fully open(automatically posted online on the Project Results platforms) |

## VERSION CONTROL

| Revision-N° | Date | Description | Prepared By | Reviewed By |
|---|---|---|---|---|
| 1 | 20.07.2024 | First Draft | Laiko Oleksandr | Tsavdaridou Anastasia |
| 2 | 29.07.2024 | Final Draft | Laiko Oleksandr | Tsavdaridou Anastasia |
| 3 | 31.07.2024 | Final Document | Laiko Oleksandr | |

# Executive Summary

The growing global threat of marine pollution, which poses risks to both ecosystems and human health, necessitates a readiness to respond effectively. This readiness can be achieved through training organized by authorities, educational and scientific organizations, NGOs, and other stakeholders. An in-depth review of existing training plans and curricula is essential to identify areas for improvement and address current challenges.

The results of analysis of training courses and curricula that are dedicated to response readiness will be used for design of new generation of curricula that take into account solutions of the most significant tasks and challenges that lay ahead for human society and ecosystems of Black Sea Basin. Special attention is paid on risk assessment methodologies, familiarity with and use of ICT tools, accessibility to networks for providing /exchanging data, on influence of armed conflicts as source of serious pollution and damages for marine ecosystems and for human casualties.

New and effective schemes of response readiness forming are to be implemented in training courses as a result of consideration of response successes and failures, of current training plans needs and actual prospects of capabilities of authorities and stakeholders development.

# 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.

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## Aim of the Deliverable

The aim of T1.2 "Mapping of current training plans and curricula" is to perform an in depth review on existing training plans and curricula, in order to identify areas for further improvement and challenges to be further addressed, paying special attention on modern challenges and possibilities that human society and marine ecosystems face in Black Sea Basin.

The achieving of the aim of the Deliverable is supported be the number of the tasks that are to be performed, namely:

- to assess response successes and failures, to analyse the current training plans of response authorities;

- the key factors such as the capabilities of members of the response team in relation with their role are to be analysed;

- to estimate the preparedness of authorities and other bodies responsible for marine pollution mitigation and prevention;

- to identify the compatibility of training courses with modern challenges (taking into account military actions affect) with requirements, global and national standards, safety provisions;

- to study monitoring actions and response equipment use algorithms for the study purposes;

- to analyse the risk assessment methodologies;

- to study the familiarity of response authorities, other stakeholders and trainers with the use of ICT tools;

- to assess the training capabilities of BS authorities;

- to estimate the accessibility to networks for providing /exchanging data concerning common ability of Black Sea Basin stakeholders societies to react on marine pollutions and to prevent them;

- to identify good practices and gaps and to build the rating of their relevance, to make their mapping;

- to identify the key prospects and points for the design of the advanced curriculum and the successful operation of the new training courses that meet actual requirements and challenges that lay ahead of Black Sea Basin society and marine ecosystems, with special attention to response readiness building on military affects.

# CONTRIBUTORS

*Table 1 Names and roles of contributors to this deliverable.*

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# Introduction

In the modern conditions of human life and the constantly growing demand for economic goods, the risks of marine environment pollution are constantly increasing. In addition to the evolutionary challenges caused by economic progress, the risks of negative impact on the marine environment as a result of armed conflicts and natural disasters, such as, in particular, one of the last and most large-scale ones, which was associated with the explosion of the Kakhovskaya hydroelectric power station, became a significant fact of the destructive impact on the marine environment and ecosystem of the Black Sea.

The Black Sea is unfortunately one of the most polluted seas in the world, suffering from many pollutants, and according to some estimates, it is the most polluted sea in Europe. The risks of deterioration of the situation with the level of pollution of the Black Sea are increasing under the influence of security threats.

Therefore, the degree of readiness for rapid response to the challenges of pollution of the marine environment must be at a high level. This is significantly facilitated by the availability of relevant training courses, which in their content and essence meet all modern challenges and institutional requirements.

Conducting an in-depth analysis of the existing training plans and training programs in the partner countries of the Black Sea Basin (namely: Bulgaria, Georgia, Romania, Ukraine) of this project will allow to identify areas for further improvement and challenges that need to be solved in the future. This will contribute to improving the situation in terms of increasing the level of safety and preventing pollution of the marine environment. A valuable informational base will be accumulated that characterizes the main needs, strengths and weaknesses, prospects and threats for the successful conduct of trainings, best practices that will become the basis for the development of new, relevant training programs and syllabus that take into account the critical features of the development of the Black Sea ecosystem.

# 1. Preface

## 1.1 Aims of training plans study

The study of training plans, programs and curricula within the RESPONSE project aims to identify and advance the creation and implementation of next-generation training programs and curricula to support early warning systems and region-wide mechanisms for monitoring natural and man-made disasters. A variety of training programs dedicated to marine pollution responses and mitigation, platforms, and curricula have been put in place to monitor marine pollution and ensure the integration and dissemination of knowledge. The training plans, programs and curricula meet national and international standards in area of marine pollution in general. However, training materials, best practices, standards, and protocols often vary across different platforms and programs, impeding progress toward establishing a cohesive, transdisciplinary, and multidisciplinary marine pollution training system.

The special emergency conditions of the present time, in particular the armed conflict between Russia and Ukraine, also determine the extreme urgency of the need to acquire practical experience in response and prevention of pollution, as well as determine the need for the formation of new protocols in the event of the realization of potential outbreaks associated with the consequences of active hostilities in the Black Sea Basin.

The RESPONSE project acknowledges the necessity for developing harmonized procedures, standards, and methodologies in marine monitoring across Black Sea countries to support healthy, resilient seas and promote integrated marine governance. Sustainable changes are essential for establishing efficient, advanced training schemes that address the challenges, goals, and specificities of the scientific and social context. These schemes should maximize the untapped potential of stakeholders to raise regional awareness in this field.

## 1.2 Methodology and approaches of training courses state of play study

The methodology and approaches for evaluating training courses on readiness to respond to marine pollution challenges and the prevention and mitigation of its consequences are based on concepts aligned with international conventions, agreements, European directives, and national regulations aimed at protecting the marine environment. These methodologies are utilized in the partner countries of the project (Bulgaria, Greece, Georgia, Romania, and Ukraine).

Also, the conceptual basis of the methodology for the training plans study is formed by the factors of compliance with the actual challenges facing the Black Sea countries, in particular, regarding the formation of a common security system and response to threats, which, at the moment, to the greatest extent, are caused by military aggression against Ukraine, which also leads to an increase in the risks of pollution marine area and danger to the population of all other partner countries.

In accordance with the provisions of the specified normative documents, as well as in accordance with the Sustainable Development Goals, the UN agenda, the key principles on which the methodology for evaluating of the state of play with training courses and syllabus in the countries of the Black Sea basin is based include: systematicity, openness, inclusiveness, accessibility, professionalism, rationality and efficiency, presence of public demand, availability,

capacity, practical orientation, compliance with modern trends and tendencies, in particular, innovativeness and implementation of ICT, network technologies, digitalization.

The target orientation of this methodology is the determination of relevant modern factors of needs, strengths, weaknesses, challenges and threats for training courses in the field of capacity building of partner Black Sea basin countries, their official bodies and responsible stakeholders regarding readiness to respond to the facts of marine pollution.

In accordance with the set goals, it is envisaged to carry out evaluation procedures and identify significant success factors and barriers for training courses in partner countries of the Black Sea basin. Namely, in Bulgaria, Georgia, Romania, Ukraine, the following activities are carried out regarding the evaluation of the state of training courses:

- study of the main types of stakeholders, involved in the development and maintaining of the training programs. In all Black Sea basin partner-countries, according to the results of the stakeholder research, their 3 types are distinguished: official bodies (at the national, regional levels) and inspections, state institutions in the field of response to Black Sea pollution; universities, other educational institutions; scientific organizations with competences and responsibilities (obligations defined by law to analyze the marine environment for pollution), public organizations.

- conducting surveys of stakeholders regarding the determination of the number, essence and other indicators of training courses developed and maintained by them (see Del. 1.1 Stakeholder analysis);

- conducting detailed interviews with representatives of the three main types of stakeholders using questionnaires specially designed for this purpose (including instructions for conducting of the interviews), which are also divided into three main types depending on the essence and content of the questions, for the 3 types of stakeholders;

As part of the general methodology, the methods of statistical, logical, system analysis, graphic methods, theoretical analysis, as well as SWOT analysis, deduction and induction methods and other methods were used, which made it possible to evaluate training courses in the field of responding to marine pollution, identifying needs, better practices, strengths, weaknesses, success factors and best practices regarding the dissemination of knowledge about training courses in the field of response to marine pollution risks. The methods used made it possible to formulate recommendations for improving training courses and programs aimed at increasing readiness to respond to marine pollution in all partner countries of the Black Sea basin.

In order to study the state of play with training courses in the field of readiness to response to the challenges of pollution of the Black Sea, the following activates, according to the methodology, were performed:

- analysis of the number, content, essence and all relevant aspects of training courses. Collecting of the information about the training plans, which is available in open sources, including the Internet, as well as familiarization with training programs received personally from the stakeholders;

- surveying the stakeholders in order to determine their total number, titles and content of training courses, in order to select the most significant stakeholders with whom it is advisable to conduct a more detailed interview;

- interviews with the main stakeholders who develop and provide the training courses. Identification of key needs, strengths and weaknesses, prospects for the development of training courses, best practices and components of improving the quality and significance of training programs for modern society and its needs;

- familiarization with training courses, their content and provisions. Determination of actual components of improvement of training courses for the further development of an improved training course on the formation of response and readiness to response to marine pollution in the Black Sea.

## 1.3 Urgency and importance of training courses study

Environmental monitoring under the current conditions in Ukraine, where martial law is in effect, is often weakened, increasing the likelihood of uncontrolled pollution. The risk of ecological disasters rises due to oil spills, leakage of hazardous substances, contamination of water with heavy metals, chemicals, and other pollutants, including those from damaged ships, military equipment, ammunition, and military waste. Additionally, noise pollution levels are increasing, which can disrupt marine life. All this can lead to the long-term degradation of coastal and marine environments, which undoubtedly negatively impacts biodiversity, ecosystem services, and generally human life and safety. The key to addressing these issues is the availability of highly qualified specialists in the field of readiness to respond to marine pollution incidents.

Moreover, the necessity for European integration requires the implementation of European standards for environmental protection, which includes protecting marine waters from pollution. Studying marine pollution issues contributes to the preparation of specialists capable of participating in international projects and programs aimed at protecting the marine environment.

Another important aspect of the relevance of educational programs on this issue is understanding and responding to new challenges, such as climate change and its impact on the marine environment.

International cooperation is also a crucial issue. Participation in international projects helps prepare specialists capable of working in international teams and participating in global initiatives. Organizing conferences and seminars to exchange experiences and knowledge with other countries is very important for enhancing the level of specialist training.

The practical implementation of educational programs should include both theoretical training and the acquisition of practical skills. Educational courses should cover basic disciplines to understand pollution processes and their consequences, as well as provide opportunities to acquire skills in using modern technologies for monitoring and assessing the state of the marine environment.

Thus, educational courses on marine pollution issues are critically important for preparing specialists capable of effectively responding to the challenges of the modern world. In the context of war, the need for European integration, and constant pollution risks, such courses contribute to environmental protection, public health preservation, and Ukraine's integration into the international community.

# 2. Mapping of current training plans and curricula in the BS countries of the Project Partners

## 2.1 Description of authorities engaged in/responsible for respond (Stakeholders)

### Bulgaria

The Bulgarian RESPONSE team has engaged several stakeholders in the mapping of current training courses and curricula related to emergency response to marine pollution accidents. Those **stakeholders have professional relation** to obligations within the legislative, institutional and operational context in Bulgaria, related to monitoring, reporting, management and mitigation of marine pollution in the Black Sea, on national and regional level, and in view of the established and emerging types of pollutants, including pollution from armed conflicts.

The RESPONSE team has also identified **educational and training institutions** that educate seamen, civil protection professionals and environmental engineers, the type of experts employed by the key stakeholders for emergency response. Some of those institutions provide training for bachelor, masters and doctoral degrees and short-term trainings for administrations, companies etc.

The start of the **stakeholder identification process** began with the preparation of a comprehensive list of stakeholders identifying institutions, organisations and professionals which have a legal responsibility to protect the marine environment or provide training in the prevention and mitigation of marine pollution from either routine operational activities or accidents and emergencies. To compile the stakeholder list, the RESPONSE team used brainstorming, consultations with experts, internet search and input from other projects and databases of the organisation.

The next step has been the identification of obligations of Bulgarian stakeholders in view of the legal framework designating all responsible entities involved in the process of preparedness and response in case of accidental marine pollution and in the routine prevention and monitoring activities.

In the process of work, the RESPONSE team has established the stakeholders' role, level of responsibility and coordination with other actors as well as their level of interaction with other institutions and agencies. The roles have been identified in view of the institutions' responsibilities related to the state of the marine environment, to emergency response and pollution prevention and mitigation, to sharing of best practices and collaboration between institutions.

The team has used an online survey (see Del. 1.1 Stakeholder analysis) and face-to-face interviews to identify roles and responsibilities. Consultations and discussions with experts have also been used. The number of stakeholders engaged in the consultation is 32, including18 respondents to the online survey, 5 participants in face-to-face-interviews, and 9 experts provided brief comments or some information (but declined to take face-to-face-interviews). The team has also used open access information sources.

The RESPONSE team has also tried to understand what each stakeholder needs are and how the power of each individual stakeholders could affect project outcomes: in terms of authority,

resources and connections, in terms of attitudes and concerns, and also in view of the extent to which they can be useful to the project and affect positively the project outcomes.

The RESPONSE team has **prioritized the stakeholders** that are responsible for addressing emergency situations and emergency response in the Black Sea and has also established the relation of those stakeholders (in any) with specialized educational institutions and establishments that provide training to the employees involved in emergency response and pollution management. The training courses, plans and curricula of those institutions have been of special interest to the team.

The analysis of the Bulgarian legal framework has identified some **roles of institutions**. In the event of marine accidents with pollution of the marine environment, the Bulgarian national legal framework follows the provisions of the Law on Maritime Spaces, Inland Waterways and Ports of the Republic of Bulgaria (LMSIWPRB), the Merchant Shipping Code, the Disaster Protection Act, and the related National Disaster Protection Plan and National Plan for Combating Oil Spills in the Black Sea. The institutions involved are: Ministry of Transport and Communications and its subordinate Executive Agency 'Maritime Administration' and State Company 'Port Infrastructure'; DG Border Police of the Ministry of the Interior; DG Fire Safety and Civil Protection also part of the Ministry of the Interior; Ministry of Environment and Waters and its subordinate Black Sea Basin Directorate (BSBD) and environment agencies (RIOSV) of the coastal districts; Ministry of Defence with Navy; Ministry of Education; the regional governments/governors of Varna, Burgas and Dobrich; the mayors of the coastal municipalities. The legal framework does not specify about all types of pollutants and emergency reactions.

The regular monitoring and marine pollution prevention mechanisms are associated mainly with the Marine Strategy of the Republic of Bulgaria, Ordinance No 273/2010 of the Council of Ministers, transposing the EU Marine Strategy Framework Directive (MSFD) and other waters and environment related national legislation related to EU directives. Monitoring is conducted by scientific institutes and the BSBD, and the Health Inspectorates. Pollution prevention by merchant vessels is regulated by international conventions such as MARPOL 73/78, Ballast Waters Convention, STCW, SAR 79, SOLAS'74, etc. transposed in EU and national legislation.

The team has considered the following institutions from the first group because of their central role in emergency response and marine pollution. The **Ministry of the Interior** and its General Directorate Fire Safety and Civil Protection and its regional divisions in the coastal area. The divisions of Fire Safety and Civil Protection have important role in emergency response, being also responsible for the National Disaster Risk Management Plan 2040 and Guidelines for planning, conducting, and evaluating trainings and exercises, 2023. In the operational response to marine accidents and pollution the divisions for Fire Safety and Civil Protection are involved but they are not leading actors. The Border Police under the Ministry of the Interior, is also part of the institutions involved in marine emergency response situations.

The **Academy of the Ministry of the Interior** in Sofia and the **training Centre for Specialization and Vocational Training in Fire Safety and Civil Protection** in Varna provide training in fire safety and civil protection, rescue activities, chemical, biological and radiation protection etc. primarily for employees of the Ministry of the Interior. The RESPONSE team has studied **four academic curricula** from the Academy. They represent curricula for specialties with two profiles - full-time and part-

time study. The training is related mostly to fire safety and civil protection with some components related to environment protection and disaster prevention.

The Academy and the Centre for specialization provide short emergency response trainings (e. g. from several hours to 2 weeks) to the staff of administrations and enterprises involved in emergency response and combating pollution. Training courses can be designed to suit specific customers or companies e. g. the Lukoil Neftochim Refinery.

The leading institutions addressing marine accidents and emergency response situations in the Black Sea, for rescue, pollution prevention and follow up measures, are the branches of the Executive Agency Maritime Administration in Varna and Burgas, Bulgarian Ports Infrastructure Company that are under the Ministry of Transport and Communications. The Navy under the Ministry of Defence is often part of emergency response situations, especially when polluting military artefacts are to be eliminated. The Maritime Rescue Coordination Centre, the system monitoring the vessel movements VTS, the expert unit National Board for aircraft, maritime and railway accident investigation are also involved.

The leading experts in charge of emergency response have usually graduated from the Naval Academy of Varna (training maritime professionals for the navy and for the merchant fleet) or from the **Technical University of Varna** (training both professionals for the merchant fleet and experts in civil protection and environmental protection, at the Department of Ecology and Environmental Protection). Seagoing professionals for the navy, under the defence ministry, receive some general training on protection of the marine environment. Maritime professionals for the merchant fleet, in addition to navigation and ship mechanics, are trained and certified in the application of all mandatory international maritime conventions related to the protection of the marine environment, such as MARPOL73/78 and protocols, Ballast Water Management Convention 2004, STCW etc. The international maritime conventions of IMO and the professional training and certification for seamen are internationally regulated. They are transposed in the EU legal framework, which is transposed in the Bulgarian national framework. The RESPONSE project is focused on **national training plans and curricula related to national legislation and applied by the Bulgarian national authorities** in cases of accidents on the coast and in the Bulgarian Maritime Search and Rescue Response Area and in the inland waterways of the Republic of Bulgaria.

The Technical University of Varna trains civil protection and environmental engineers. **Eight academic curricula** for education in civil protection and environmental protection engineering of the Technical University of Varna have been reviewed. One academic curriculum for education of civil protection professionals from the **Technical University of Sofia** is available and will be reviewed as well.

The Bulgarian Maritime Administration conducts trainings related to protection of the marine environment for operators of vessels under the Bulgarian flag and for the port administrations of the Bulgarian ports. It conducts drills every three months and exercises once a year, according to national legislation in compliance with IMO and EU regulations. The Maritime Administration is also responsible for the Plan on the accommodation of ships in need of assistance in inland waters and the territorial sea of the Republic of Bulgaria, also available for analysis, relevant to „VTMIS Places of Refuge EU Operational Guidelines “, 2015.

Regional governments and regional environmental authorities along the coast are involved in emergency response and marine pollution accidents. They perform coordinating and monitoring functions. The coastal District Administrations and municipalities, under the Ministry of Regional Development and Public Works coordinate rescue, emergency response activities and remediation measures. They set up marine and coastal rescue coordination centres and provide institutional support if necessary.

The final group of stakeholders - marine research institutes, academia, public health administrations, environment agencies, water management authorities like the Black Sea Basin Directorate, NGOs - are involved in the monitoring and follow up mitigation measures, public awareness, environmental education and practical training activities. Some NGOs are involved in specific monitoring and awareness activities, e. g. the "Green Balkans" ("Zeleni Balkani") NGO help monitor dolphin mortality on the southern Bulgarian coast. Volunteer NGOs and volunteer teams (registered as legal persons or not registered and operating as part of larger umbrella organizations) like the "Extremist Club" (club "Ekstremen") with members with specific professional capacity, training and equipment for rescue operations, marine and coastal activities, caves investigation, etc. cooperate with the government structures of the interior ministry and the maritime administration. They also provide rescue and environmental awareness training for youth and volunteers.

Institutions under the Ministry of Environment and Water such as the Black Sea Basin Directorate and the Regional Environmental Inspectorates (RIOSV) assess and monitor pollution of the marine environment originating from most of the familiar pollution sources. The quality of bathing waters is monitored by the Regional Health Inspectorates that are subordinate to the Ministry of Health. Scientific research institutes, another important group of stakeholders with their invaluable expertise on monitoring the quality of the marine environment. They are involved in regular monitoring activities and monitoring after marine pollution accidents. Those institutions employ people with scientific and environmental background. Their staff are not involved in emergency response trainings.

The activities of researchers and environmental agencies are most closely related to Marine Strategy of the Republic of Bulgaria. The Marine Strategy is a strategic document that outlines the vision, objectives and actions for the sustainable development and use of marine and coastal resources. Researchers and environmental agencies are part of coordination teams in case of disaster response to marine pollution and/or marine accidents but they are mostly involved in monitoring and follow up mitigation measures. Their staff and experts are not involved in any civil defence training courses, plans or curricula. International cross-border projects associated with aquatic and marine pollution bring together scientific institutes and academia in contact with environmental agencies and administrations, and NGOs. They disseminate good practices and collaborating with institutions.

The RESPONSE team can also provide **some additional documents for reference** and **needs assessment**. They reveal some response mechanisms and structures, as well as limitations, training needs etc. The National Black Sea Oil Spill Emergency Plan for Bulgaria which is part of the National Disaster Protection Plan was adopted by Decision No 868 of the Council of Ministers on 1 December 2011. The Disaster Protection Plan for Burgas District is provided for analysis and reference, as it follows the requirements of the National Disaster Protection Plan.

A regional document for review and analysis provided by the RESPONSE team is the Black Sea Contingency Plan as Annex II to the Protocol on Cooperation in Combating Pollution of the Black Sea Marine Environment by Oil and Other Harmful Substances in Emergency Situations of the Black Sea Convention 1992. The Final Report on the Investigation of a serious maritime accident - the grounding of the "Vera Su" vessel on the Bulgarian coast on 20.09.2021, is also provided. It reveals situation with reaction in real life situation which is very useful for analysis.

The BSNN team has been in contact with Pollution Monitoring and Assessment Officer at the Permanent Secretariat of the Black Sea Commission. She has delivered and provided to BSNN presentation on management of source-to-sea pollution and reduction of chemical pollution in the Black Sea, with some information on pollution from the destruction of the Kakhovka Dam and hydroelectric power plant in the war in Ukraine and the framework for the reaction to chemical pollutants especially POPs like the per – and poly-fluoroalkyl substances PFAS, the focus of particular attention at the EU level.

## Georgia

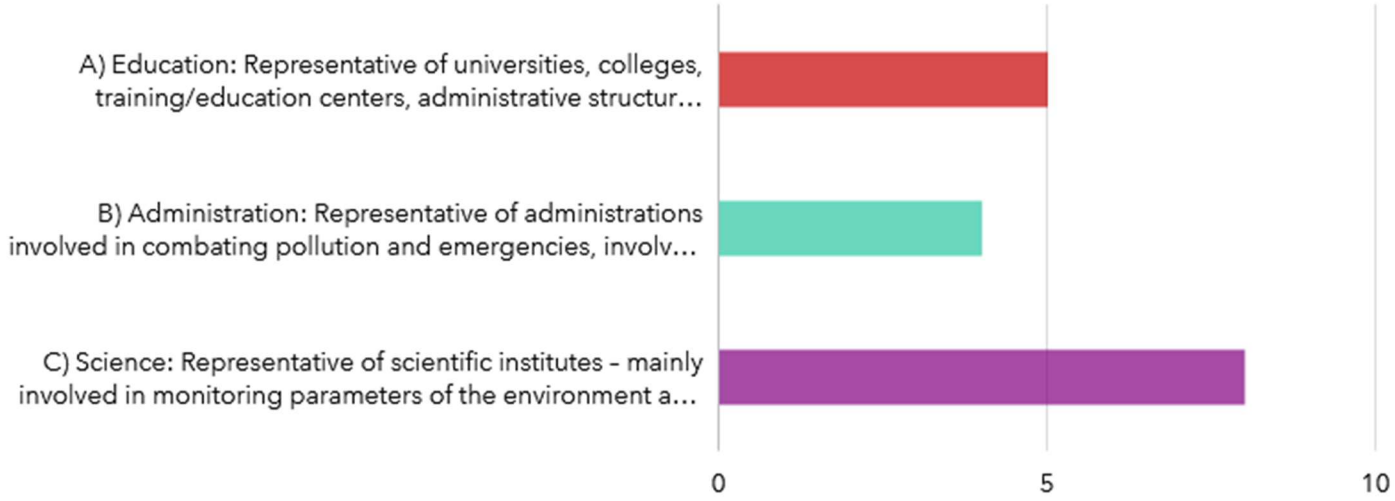
Large number of stakeholders were contacted with the request to provide responses and agree on interview as required. In total 17 responses were collected, 1 was repeated submission and 1 was not relevant, so in total 15 detailed responses are available and these are reproduced in Appendix I.

The respondents were of the following category:

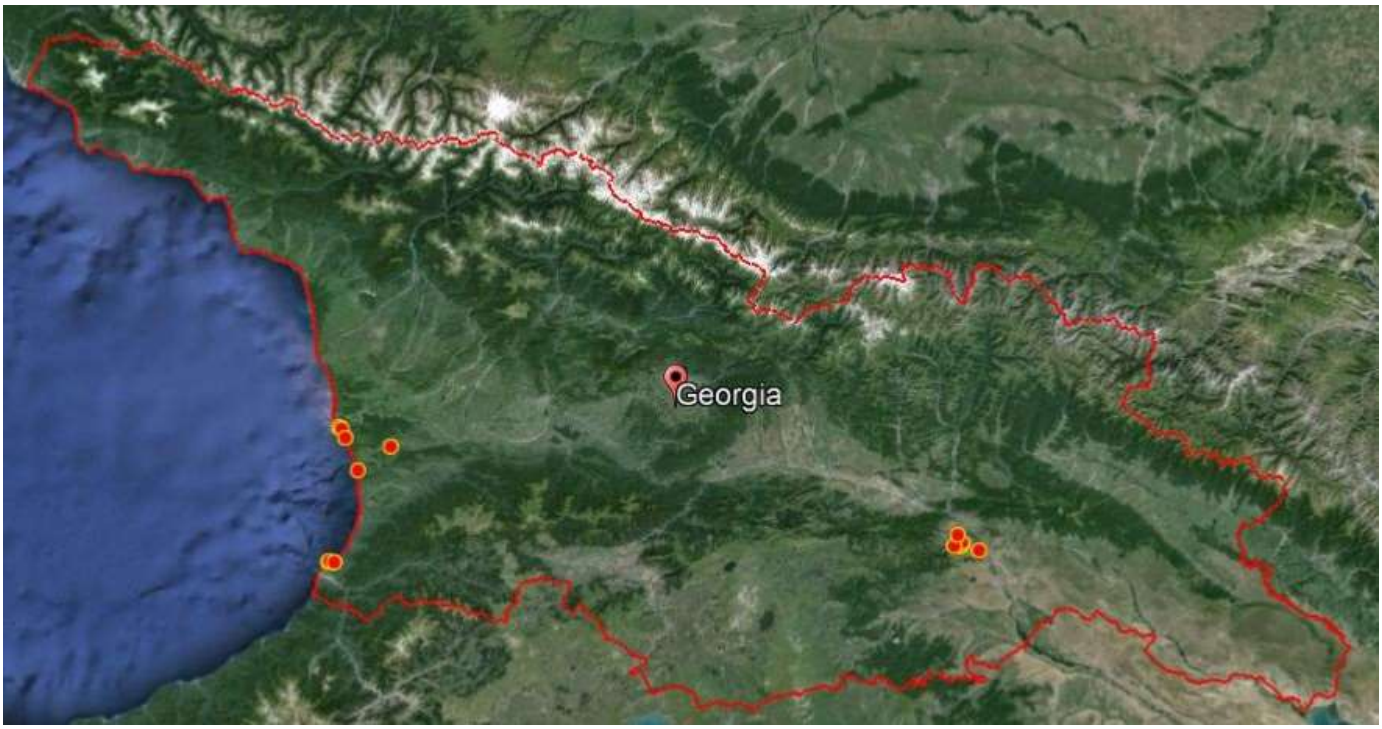
A) Education: 5 representatives of universities, colleges, schools, training/education center.

B) Administration: 4 administrations involved in combating pollution and emergencies.

C) Science: 6 scientific institutes, and others (agencies, laboratories etc.), NGOs (involved in specific monitoring and awareness activities), as well as a tourism entrepreneur.



Geographical distribution of respondents is provided on this map:




Specifically, the following stakeholders have been engaged in providing feedback required by the RESPONSE project from Georgia:

**Governmental Institutions:**

- Ministry of Environmental Protection and Agriculture of Georgia: Engaged in policy formulation and administration regarding the protection and sustainable use of marine biodiversity. The Ministry includes several departments, such as the Department of Environmental Supervision, the Water Division, the Biodiversity Division of the Forest and Biodiversity Policy Department, which are responsible for various aspects of marine environmental protection and pollution response.

- Legal Entity of Public Law (LEPL) National Environment Agency of Georgia: Responsible for controlling the quality of water in rivers, lakes, and the Black Sea. It conducts regular monitoring, including chemical and biological research, and publishes annual reports on the state of the environment.

- LEPL Maritime Transport Agency (MTA): Responsible for maritime transport and related facilities within Georgia's borders. It conducts annual training on the liquidation of oil spill accidents and monitors compliance with environmental standards.

- Kolkheti National Park Administration: Responsible for the management and protection of Kolkheti National Park (KNP), which includes coastal and marine areas. The administration engages in activities related to the conservation of marine biodiversity and the monitoring of marine pollution.

**Educational and Research Institutions:**

- Batumi Shota Rustaveli State University: Engages in monitoring and protecting Black Sea biodiversity. The university has a faculty dedicated to natural science and healthcare, which includes the Institute of Phytopathology and Biodiversity Conservation, concerned with freshwater and marine ecosystems of Kolkheti.

- Batumi State Maritime Academy: Provides education and training in various maritime fields, including marine pollution preparedness and response. The academy's training courses try to meet both global and national standards.

- Ivane Javakhishvili Tbilisi State University (TSU): The M. Nodia Institute of Geophysics at TSU conducts research on sea and atmospheric dynamics and has developed forecasting systems for the Black Sea. It is involved in scientific research projects and conferences.

- Public school No. 4 from Poti: Education includes topics related to Black Sea pollution.

**Non-Governmental Organisations:**

- **The Greens Movement of Georgia / Friends of the Earth – Georgia (GMG/FoE-GE):** A national NGO with local branches, engaged in policy work on marine and coastal management. It focuses on pollution abatement advocacy, public awareness, and mobilizing support for pollution reduction and response capacity, beach litter counts.

- **Georgian Rural Council:** Provides training in strategic development and sustainable development for Black Sea coastal communities. It also engages in activities to promote recreation tourism and improve livelihood conditions in the coastal region.

**Training Courses, Plans, and Curricula Analysed:**

- Training courses on marine pollution, waste management, emergency response have been analysed. These courses are provided by institutions like the LEPL Maritime Transport Agency, Batumi State Maritime Academy, the Greens Movement of Georgia.

- The situation with training courses in Georgia reveals a need for improved coordination, incorporation of up-to-date knowledge, inclusiveness in training programs.

**General Description of the Situation with Training Courses, Plans, and Curricula:**

- There is a range of training courses and programs related to marine pollution and environmental protection, but they often lack coordination and consistency.

- Many training programs incorporate data from scientific research and monitoring but need to be more widely accessible and inclusive. FAIR data principles not well applied.

- There is some emphasis on practical training exercises and simulations, especially in maritime academies and governmental institutions.

- Challenges include inadequate material and institutional support, insufficient funding, and the need for more frequent and comprehensive monitoring and training activities.

- Important aspects of Black Sea and climate change should be considered as a priority.

**Additional Information:**

- Ongoing activities include developing a sustainable fishing concept supported by the Swedish Government (SIDA), participating in international initiatives like EMODnet and the EU Horizon 2020 Black Sea Projects BRIDGE and DOORS. Latter is particularly notable due to major cruise conducted very recently in Georgian Black Sea waters (June, 2024). These projects provide training as well, e.g. in Blue Economy, eDNA and other fields.

## Romania

From the total number of stakeholders involved in NCCZ/National Council of the Coastal Zone were contacted with the face-to-face interviews a total of 12 stakeholders providing comprehensive responses on the training's curricula related to marine pollution, preparedness and response.

The respondents were of the following category:

A) Education: 3 representatives of universities, 2 training/education centers.

B) Administration: 2 administrations involved in combating pollution and emergencies.

C) Science: 2 scientific institutes, and 3 NGOs (involved in specific monitoring and awareness activities), as well as a tourism entrepreneur.

The descriptions of the considered stakeholders that have been engaged in providing required responses for Romania are:

Educational Institutions

University of Bucharest, with a history of over 160 years and a constantly confirmed prestige, the University is gathering 19 faculties, expressing a continuing concern for interdisciplinary and transdisciplinary collaboration and comes with a wide educational offer that includes many areas of study, including marine and coastal zone activities.

Ovidius University of Constanta is a public higher education institution founded in 1961 and transformed into a comprehensive university in 1990. It has study programs in medical and natural sciences, humanities and engineering, social and economic sciences, law and administrative sciences, theology and arts. It is the largest university in South-East Romania and the largest university of the European Union at the Black Sea.

Maritime University of Constanta, is a new university (1990) but it is training the future professionals for transport related activities and develop research activities in related maritime scientific domains, thus bring a contribution to the local, regional and national development, through the involvement of academics at a social, economic and cultural level.

Research Institutions

GeoEcoMar (National Institute of Research - Development of Geology and Geoecology) is the research and development institute of national interest in geology, geophysics and geoecology with emphasis on aquatic, marine, deltaic, and fluvial environments, constituting a pole of excellence in marine research, functioning as European and national center for studies of the large-type macrosystems river delta sea.

The National Institute for Research and Development Danube Delta (INCDDD) Tulcea is structured in three main areas: research, design and administration. The Institute conducts basic and applied research to support scientific management in the Danube Delta Biosphere Reserve area and other wet areas of national and international importance, for the conservation of biodiversity and sustainable development.

Governmental Institutions

The National Administration "Romanian Waters" manages the waters in the public domain of the state and the infrastructure of the National Water Management System consisting of reservoirs, flood defense dikes, canals, inter-basin derivations, water intakes and other specific works, as well as the infrastructure of the systems national hydrological, hydrogeological surveillance and monitoring of the quality of water resources in its heritage, for the purpose of knowledge and unitary management throughout the country, of surface and underground water resources. The coastal branch, National Administration Romanian Waters, Dobrogea – Littoral Water Basin Administration has got under its management the coastal zone as part of the stretch of basin water.

The Romanian Naval Authority (ANR) - port authorities in the coastal zone are subordinated to the Ministry of Transport and carry out specific economic activities respecting a complex legislation that integrates environmental, economic, security issues.

Training centers

The Romanian Center for the Training and Development of Naval Transport Personnel – CERONAV dates back to 1976. It ensures the theoretical and practical training of maritime, fluvial, port personnel and personnel on board oil platforms in accordance with national legislation in the field, international regulations and training standards established by various accreditation/recognition bodies.

Active Training SRL, is a small enterprise from Constanta, with a vast experience in delivering training sessions about marine environment, as well as in delivering outdoor activities.

Non-Governmental Organizations

Mare Nostrum, Mare Nostrum- environmental NGO in Constanta, Romania. Since 1994 orientated towards marine and coastal biodiversity conservation and natural resources management, influencing public policies regarding urban management.

Oceanic Club, Oceanic Club - The Society for Oceanographic Exploration and Protection of the Marine Environment OCEANIC - CLUB was founded in 1992. It was the first Romanian non-governmental organization with representation outside the national borders: France, Italy, the Kingdom of Morocco, the United States, Germany, Angola. Central objectives are the exploration

and protection of the natural and cultural heritage of humanity and the development of scientific research in the fields of biology, ecology, geology, geography and archeology in Romania.

Friend of the Danube Delta - Nongovernmental organization responsible for inclusion in integrated coastal zone management of issues concerning the protection of natural areas, biodiversity, local communities, water sports and river-delta and marine activities.

The general situation of training courses, plans, and curricula reveals the following:

• There is a range of training courses and programs on environmental protection, marine pollution, not covering all need of regional and local operators in case of emergency, despite the existence of the legal framework encompassing the institutional participation under the coordination of responsible local and regional authorities.

• the training programs do not incorporate actual data from scientific research and monitoring, especially European Services based on Satellite/Earth Observation, all needed to be update according with state-of the art technologies and up-to-date knowledge.

• There is a general procedure and data exchange protocols in relation with the training's availability, especially for theoretical training exercises and simulations, especially between maritime academies bodies/research centers and governmental institutions.

• The collaboration challenges include funds rising challenges, correlated with insufficient support/funding for networking and general association in the marine pollution domain, thus delaying the exchange of training material and institutional support to maritime operators in marine pollution western Black Sea/Romanian sector, especially for those stated with the Operational Commandment for Marine Decontamination, and the National Contingency Plan Against Marine Pollution.

• Ongoing activities include developing and participating in national (MSFD implementation support projects) and international initiatives involving Black Sea, like ESA and CMEMS use-case projects, SeaDataNet and EMODnet, but also EU Horizon 2020 Black Sea Projects (Iliad, BRIDGE and DOORS).

## Ukraine

In the research process, 7 stakeholders of the three types were involved:

**(A)** representatives of universities, colleges, educational centers, administrative structures that provide training in civil defence and response to emergency situations (internal, maritime, naval professionals, administrations) - representatives of universities, colleges, training/education centers, administrative structures providing civil defence and emergency response training (interior, navy, seagoing professionals, administrations). **3 Stakeholders took part in the interview**;

**(B)** representatives of administrations involved in combating pollution and emergencies, involved in training (of their staff), coordinating or managing emergency situations - representatives of administrations involved in combating pollution and emergencies, involved in training (of their staff) , coordinating, or managing emergency situations. **3 Stakeholders provided responses on the interview**;

**(C)** representatives of scientific institutes, as well as agencies, laboratories mainly engaged in monitoring environmental parameters and pollution of the marine environment (regularly or in case of emergencies, natural disasters, etc.) - representatives of scientific institutes, and others such as agencies, laboratories – mainly involved in monitoring parameters of the environment and marine pollution (regular or in case of emergencies, natural disasters, etc.)**1 Stakeholder have been engaged in the interviewing**.

**(A)** The first group includes representatives from: Kherson State Maritime Academy - Kherson State Maritime Academy (KSMA); Odesa State Ecological University, Odesa National University named after I.I. Mechnikov.

**(B)** The second group includes the State Environmental Inspectorate of the South-Western District; Department of Ecology and Natural Resources of Odesa Regional State Administration, Administration of Sea Ports of Ukraine;

**(C)** The third group includes the Ukrainian scientific center of Ecology of Sea (UkrSCES).

In the complex, the activities of all identified stakeholders are aimed at ensuring control, monitoring, prevention and elimination of emergency situations at sea.

Control functions are provided by the State Environmental Inspection of the South-Western District. State inspectors go to every case related to sea pollution, if there is a report about it. If it is in the water areas of the ports, there is Resolution of the Cabinet of Ministers of Ukraine No. 670 of 07.17.2019, which clearly defines the procedure for the actions of the State Environmental Inspectorate. Also, state inspectors go out on a case-by-case basis to carry out state supervision, control and take water samples if there is contamination.

The monitoring function is entrusted by the state to the Ukrainian scientific center of Ecology of Sea (UkrSCES). The institution is a leader in the activities of the Ministry of Environmental Protection and Natural Resources of Ukraine related to the marine environment, especially in the implementation of complex marine ecological monitoring. Thanks to its expertise and experience, UkrSCES provides reliable and comprehensive monitoring of the state of the marine environment, which is the basis for making effective management decisions and developing environmental protection measures. The center's activities contribute to Ukraine's fulfillment of its obligations within the framework of international agreements and directives, as well as contribute to the preservation of unique marine ecosystems for future generations. The full-scale invasion of the Russian Federation on the territory of Ukraine in 2022 had a significant impact on the activities of UkrSCES. The Institute faced limitations in the implementation of full-fledged monitoring of the marine environment. However, experts continue to take samples of water, bottom sediments and biota along the shoreline. This makes it possible to obtain up-to-date data on the state of marine ecosystems in coastal areas. Remote monitoring methods, satellite information and mathematical modelling are actively used. This approach makes it possible to continue observing the marine environment even in conditions of limited access to certain water areas.

The Department of Ecology and Natural Resources of the Odesa Regional State Administration is responsible for organizing the elimination of the consequences of emergency situations at sea.

Training courses on monitoring, prevention of pollution, liquidation of consequences are carried out by higher educational institutions. Among the 8 conducted surveys, 4 were conducted with university representatives.

In total, we have analyzed about 20 educational (training) courses; in particular, we should highlight the courses taught at the ecological faculty of Odesa State Environmental University (Department of oceanology): "Engineering Oceanology", "Modelling of Oceanic Processes", "Oceanosphere", etc.

Also there are 2 training courses from Odesa maritime academy that deal with response readiness for pollutions and marine disasters. These courses were thoroughly analyzed

- Basics of ecology and environmental protection

(https://www.omctf.od.ua/uploads/files/programs/osnovi_ecologii_svo.pdf);

- Basics of Ecology

(https://www.omctf.od.ua/uploads/files/programs/EMV_ecologia.pdf);

But Interviews with representatives of the Odesa maritime academy were not possible because of the war-time restrictions.

Educational courses taught at universities are theoretical in nature, students do not have the opportunity to implement them in practice. The same applies to the limited opportunities for regular monitoring of the marine environment by relevant scientific institutions. (In particular, because of Russia's military aggression). The courses taught in "maritime transport universities" are oriented towards teaching the MARPOL 73/73 Convention and the SOLAS Convention.

## 2.2 The training capabilities of BS authorities

### Bulgaria

The Bulgarian legal framework specifically the Disaster Protection Act and other related legislation identifies the institutions responsible for reaction to disasters, accidents and situations which require emergency response on the coast and at sea. Those institutions and responsibilities have been identified under 2.1. In case of an accident on the coast, inland waterways, coastal waters, the territorial waters and/or in the EEZ of Bulgaria, response is provided by coordination units under one of the regional governors of Varna, Burgas, Dobrich, or the prime minister and the Council of Ministers if the scope of the accident transcends the boundaries of one of the coastal regions.

The emergency response teams – coastal or marine – comprise a number of institutions: regional/national administrations, police/border police, maritime administration (emergency response and marine rescue coordination centre), fire prevention units at the ministry of the interior, health authorities (ambulance), environmental authorities, scientific institutes, NGOs and media.

Funding for the education courses and training of professionals for regular and part-time courses, short courses and other special courses is provided mainly by the state budget. For educational institutions under the Ministry of the Interior education courses for its employees are part of the ministry budget. The education courses of the Technical University of Varna are mostly subsidized by the state, though students pay a certain tax (which does not cover the cost of education) for each semester. The short courses for employees of administrations, institutions, companies are paid by the budget of the respective institutions or companies. The training institutions have adequate equipment for training. The training equipment for professional seamen is relevant to the requirements of the international conventions. The training equipment for civil protection and environmental engineers is also adequate. Its approval is part of the accreditation of the institutions.

Training equipment is also available at the above-mentioned Centre for Specialization and Vocational Training in Fire Safety and Civil Protection in Varna. The equipment for training includes fire safety equipment, civil protection and rescue activities equipment, chemical, biological and radiation protection equipment etc. The firefighting and rescue teams of the interior ministry (operating on the coast) include divers (trained at another center in the NW of the country). The Centre in Varna has equipment for training of volunteer rescue teams (NGOs), with equipment for climbing and protective equipment. In real life situations the operating rescue teams are provided with basic equipment like boats, booms for containing pollution on the surface, tugs, floating crane, firefighting equipment for shore activities, climbing and protective equipment. The equipment is property of different institutions.

Monitoring and response equipment for marine traffic is part of the international and regional VTS arrangements. Professionals using it are adequately trained. VTS is supported by various forms of communication equipment VHF radio, AIS equipment for automatic location of vessel. Use of internet and ICT data tools is also essential for training at all institutions. That monitoring and response equipment is part of routine work on monitoring the sea area for regular traffic, emergencies, accidents, pollution etc. The authorities maintain the necessary equipment for responding to signals of distress of persons, ships and aircraft in the Bulgarian Maritime Search and

Rescue Response Area. The responsible institutions use quantitative methodologies for risk assessment to improve management and safety in shipping. Risk assessment is part of the training on subjects like civil protection and environmental protection engineering at the Technical University of Varna. The Ministry of Transport after big accidents convenes a board of independent experts that investigate the accident and provide recommendations to reduce risks and improve safety, like in the case with the 'Vera Su' accident in 2021.

The authorities described are part of the national emergency response units and structures reacting to accidents on the coast and in the sea. They employ personnel with adequate training according to national standards and legal framework requirements that transpose EU and IMO regulations.

The Bulgarian navy, maritime administration, interior ministry with border police and the structures of integrated fire safety and rescue activities take part in the annual Exercise Sea Breeze, multinational Partnership for Peace maritime exercise in the Black Sea, involving Standing NATO Maritime Group 2 and other PFP navies, including exercise with emergency response to accidents with cargo ship at sea.

Scientific knowledge related to marine pollution in particular is integrated in both the practices of firefighting and the educational and training activities on regulatory framework. The regulatory framework of phasing out of per- and poly-fluoroalkyl substances or PFAS in the EU, persistent pollutants with high concentration in firefighting foam and any other articles, is part of the training curriculum at the training institutions. PFAS have been used in chemical production since the 1940ies but pollution with PFAS and their persistence results in long-term exposure associated risks such as bioaccumulation potential, mobility, long-rate transport potential including pollution of the Black Sea is comparatively new to the region. PFAS are serious pollutant of the air, soil and waters.

The Ministry of the Interior has Department 'Centre for Research and Expertise' with sector 'Expertise and Technical Information' that collects and analyses information, including from testing facilities for firefighting.

## Georgia

The training capabilities were derived based on the analysis of stakeholder responses and experiences of project team members, taking account of various factors such as stakeholder roles, legal framework support, funding sources, equipment availability, use of modern technologies and methodologies. Below is provided an assessment based on this information.

**Legal Framework Support:**

Ministry of Environmental Protection and Agriculture of Georgia (MEPA) is responsible for managing environmental protection and agricultural development. It includes various departments, which play critical roles in marine environmental protection and pollution response. MEPA operates under several national laws and international agreements, including the Bucharest Convention and the EU-Georgia Association Agreement.

**Funding Sources:**

MEPA and its associated agencies receive funding from the state budget and international donors. For example, the Georgia Resilient Agriculture, Irrigation, and Land Project (GRAIL) is co-funded by the World Bank and the Government of Georgia, aiming to improve irrigation, land management, and climate resilience.

**Equipment Availability:**

National Environment Agency is equipped with necessary tools for monitoring water quality, including chemical and biological parameters. The agency tries to ensure compliance with international standards. There were several projects, such as series of RMBLAS initiatives which supported Georgia in monitoring Black Sea waters, mostly in partnership with National Environment Agency (NEA). NEA reports also to the Black Sea Commission through national focal points on marine biodiversity, water monitoring, pollution from land bases sources, emergency response.

Laboratory Research Center utilizes available laboratory equipment for chemical and microbiological analysis. However, there is a need expressed for equipment like atomic absorption spectrometer and chromatograph.

Maritime Transport Agency is equipped with monitoring tools for maritime traffic and pollution control, but it requires better equipment for handling marine pollution incidents.

**Risk Assessment Methodologies:**

Risk assessment is incorporated into training programs across institutions like the Maritime Transport Agency (MTA) and the NEA. These methodologies help in preparing for and responding to marine pollution incidents.

**Familiarity and Use of ICT Tools:**

ICT tools are used for monitoring, data collection, and reporting. However, there is a need for better integration of these tools into training programs to enhance real-time response capabilities. FAIR principles are underdeveloped.

**Accessibility to Networks for Providing/Exchanging Information:**

Georgian institutions are part of national and international networks, facilitating the exchange of knowledge and best practices. The H2020 BRIDGE and DOORs projects, as well as projects such as RESPONSE contribute to this exchange among stakeholders. H2020 BRIDGE and DOORs projects are starting to provide for FAIR data sharing at the regional level e.g. through DOORS Black Sea SoS portal. Data sources in Georgia include scientific research, monitoring reports, and international collaborations, but there is no marine or maritime data portal available in Georgia.

**Assessment of Authorities Responsible for Training:**

Regional, National, and International Coverage: Institutions like the Maritime Transport Agency and Batumi State Maritime Academy offer training programs that try to meet national and international standards. These institutions participate in EU-funded projects and collaborate with international organizations. Training courses try to align with global and national standards, but

there is a strong need for more comprehensive and updated programs that incorporate the latest scientific and technological advancements.

**Capabilities of Training Team Members and Response Readiness:**

Training team members possess the necessary skills and experience, particularly in institutions like the Maritime Transport Agency. Continuous upgrading of knowledge and skills is essential to keep up with scientific and technological advancements.

**Incorporation of Up-to-Date Knowledge and Technological Advances:**

Institutions like the M. Nodia Institute of Geophysics use modeling systems for predicting pollution spread. There is a need for more comprehensive integration of up-to-date knowledge and early warning systems in training programs.

Strong impetus is provided by H2020 projects BRIDGE and DOORS, with their FAIR compatible data portals and Black Sea cruises, EMBLAS and DOORS projects being particularly helpful with marine cruises in Georgia. It is expected that data will be shared through Black Sea SoS platform.

**Conclusion:**

The training capabilities of Georgian authorities responsible for marine pollution response are slowly progressing but require major improvements in coordination, funding, equipment, and the integration of modern scientific and technological advances. Comprehensive training programs aligned with global and national standards and incorporating the latest knowledge and practical training exercises are essential to enhance response readiness.

## Romania

The training capabilities were evaluated based on the analysis of face-to-face interviews, considering the role of the training provider as specified by the institutional and legal framework for marine pollution responses and mitigation, as well as their experience, availability of training facilities/equipment, and access to the best available technologies and methodologies.

**Legal Framework Support:**

In Romania, the National Contingency Plan Against Marine Pollution (NCPAMP) is designed to rapid response in case of emergency/marine pollution, but Ministry of Environmental, Waters and Forest (MEWP) is responsible for managing marine environmental protection in its special departments, with operational and non-operational roles in marine environmental protection and pollution response.

NCPAMP Members are: Romanian Waters Administration – Dobrogea-Littoral, County Police Inspectorate of CT and TL, Inspectorate of gendarmes, Coast Guard, Inspectorate for emergency situations TL, General staff of the air forces, Fleet commandment CT, the county directorate of public health, veterinary health and food safety department, CT Maritime Ports Administration, EPA, Environmental National Guard, ARBDD, NIMRD, the Romanian agency for saving life at sea, Authority for Offshore Operations Regulations

**Funding Sources:**

MEWP and its associated bodies and national authorities (EPAs included) receive funding from the state budget and international/European projects funding schemes.

**Equipment Availability:**

Several questioned institutions are equipped with necessary tools for monitoring water quality, including marine pollution chemical and biological parameters. The research institutes and universities have special designed labs at European standards, and also ongoing projects, supporting monitoring Black Sea waters, mostly in project based schemes/there is no a marine observatories network for marine pollution/environment monitoring in Romania. But MEWF sustain projects for MSFD implementation and also partnerships and reporting to the Black Sea Commission through national focal points on marine biodiversity, water monitoring, pollution from land bases sources, emergency response.

NGOs do not utilize available laboratory equipment for marine pollution in – sit and laboratory analysis but develop a continuous monitoring of all available sources of information, including field inspections.

Romanian Waters Administration – Dobrogea-Littoral is equipped with monitoring tools for maritime traffic and pollution control, but it requires better equipment for handling marine pollution incident, similar with 2023 war event/dam break in Ukraine.

**Risk Assessment Methodologies:**

Risk assessment is incorporated into training programs across institutions like the Romanian Naval authority, CERONAV and Educational and Research Institutions. These methodologies help in preparing for and responding to marine pollution incidents, including satellites/EO supervised ones.

**Familiarity and Use of ICT Tools:**

ICT tools are used for monitoring, data collection, and reporting in all questioned institutions and organizations. But there is a need for better integration of these tools into training programs to enhance real-time response capabilities for authorities involved in NCPAMP.

**Accessibility to Networks for Providing/Exchanging Information:**

All the questioned institutions are part of national and international networks, facilitating the exchange of knowledge and best practices in the domain of marine/river/deltas pollution. Several focused national projects, as well as European projects such as RESPONSE contribute to the national beneficiaries/stakeholder's support and networking. As well for scientific support for modern monitoring, reporting and collaborations, despite of lack of IT platforms for marine or maritime data exchange/networking.

**Assessment of Authorities Responsible for Training:**

Regional, National, and International coverage for professional training: encompass two Institutions: the Romanian Maritime Authority Transport and CERONAV offering training programs that try to meet national and international standards in area of marine pollution. These institutions

participate in national and EU-funded projects and collaborate with international framework organizations. The training courses organized periodically or at request are align with international regional and national standards, but there is a strong need for more comprehensive and updated programs that incorporate the latest scientific and technological advancements in domains of remote sensing monitoring and forecast/Early Warning Systems.

**Capabilities of Training Team Members and Response Readiness:**

Training teams have the necessary skills and experience, particularly in institutions like the CERONAV, but there is a need for continuous upgrading of knowledge and ITC skills is essential to keep up with scientific and technological advancements in the curricula.

**Incorporation of Up-to-Date Knowledge and Technological Advances:**

Universities and Research Institutions in Romania are developing forecast modeling systems for predicting pollution and oil spills, and there is a need for more comprehensive integration of up-to-date knowledge and early warning systems in training programs of CERONAV and NGOs project base ones.

**Conclusion:**

The training capabilities of Romanian authorities responsible for marine pollution response are in continuous developing stage, being now under several on-going project major improvements in coordination, funding, equipment, and the integration of modern scientific and technological advances. Comprehensive training in marine pollution are subject of modernization in order to meet the global, European, regional and national standards, thus being subjects of incorporating of the latest knowledge and EO support training exercises, but also EWS support the rapid response to emergencies situations.

## Ukraine

**The training capabilities in sphere** of response on marine pollutions are supported by general and specific **legislative framework**. The main regulatory framework relied on by the interviewed respondents:

- Law of Ukraine "On Environmental Protection";

- Law of Ukraine "On Transportation of Dangerous Goods";

- Law of Ukraine "On Sea Ports of Ukraine";

- Water Code of Ukraine;

- Decree of the Cabinet of Ministers of Ukraine dated July 17, 2019 No. 670 On approval of the Procedure for the interaction of the state enterprise "Seaports Administration of Ukraine" and the State Environmental Inspection to ensure compliance with the legislation on environmental protection in case of detection of cases of discharge of pollutants by ships (vessels) in within the water area of the sea port;

- Decree of the Cabinet of Ministers of Ukraine dated February 29, 1996 No. 269 On approval of

the Rules for the protection of inland sea waters and the territorial sea from pollution and clogging;

- Decree of the Cabinet of Ministers of Ukraine dated June 3, 2013 No. 406 Some issues of seaport water areas;

- Decree of the Cabinet of Ministers of Ukraine dated April 19, 2017 No. 275 On approval of the Regulation on the State Environmental Inspection of Ukraine.

The main international document that all surveyed stakeholders are guided by is the MarPol - the International Convention for the Prevention of Pollution from Ships.

Also, the following international documents in the field of ecology and environmental protection in maritime transport are specified in the educational programs for the training of seafarers:

- UN Convention on the Law of the Sea of 1982. Part XII. Protection and protection of the marine environment;

- International Convention for the Safety of life at Sea - SOLAS;

- International Convention on the Control and Management of Ship Ballast Water and Sediments;

- International Maritime Dangerous Goods Code (IMDG Code);

- The International Safety Management Code (ISM Code);

- International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code).

Institutions of higher education adhere to national standards in their work. The quality of education at the national level is controlled by the National Agency for Higher Education Quality Assurance (Ukraine).

Training programs for seafarers are governed by the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW).

There is a problem of reducing higher education institutions, reorientation to general knowledge and moving away from narrow specialization, for example, marine biology, marine ecology.

**Research institutions** (Ukrainian Scientific Center for Marine Ecology) participate in the national Environmental Monitoring Program, which is correlated with the EU Marine Strategy Directive.

Research and educational institutions conduct scientific research on the order of relevant Ministries - the Ministry of Environmental Protection and Natural Resources of Ukraine, the Ministry of Education and Science of Ukraine. Scientists and teachers are involved as experts in meetings of ministries. There is a problem that researchers are not interested in teaching activities, which limits the dissemination of the latest scientific achievements among students.

Mainly research institutions and institutions of higher education join international projects. In particular, such projects as EU4EMBLAS, which promotes the development of monitoring in the

Black Sea and became the basis for the development of the Marine Environmental Protection Strategy of Ukraine, were noted. The EFFECTIVE, EMODNET projects were also named. National research institutions are included into European database networks, in particular, OBIS. There is a practice of implementation of international ecologically oriented projects in the field of blue economy at educational institutions, in particular under the program Horizon, Black Sea Next, Erasmus (joint educational programs). In order to participate in international projects of the State Environmental Inspection of Ukraine as the central executive body, appropriate changes in legislation are required.

Regional authorities act in accordance with their powers, perform mainly monitoring and coordinating functions, and are members of the Commission for Technological and Environmental Safety and Emergency Situations.

The surveyed respondents cooperate with international organizations:

- Danube Commission

- The European Maritime Safety Agency, which provided access to its own software product, in which it is possible to monitor the appearance of new oil or other stains near the seaports of Ukraine almost online, participation in technical assistance projects

- The Marine Environment Protection Committee (MEPC) and other sub-committees on the protection of the marine environment, which are based on the International Maritime Organization.

**The main Funding Sources** for the training programmes in Universities, Scientific Organizations, State (regional) authorities include funding from the state budget and local budgets. In some cases International or European projects funding can be involved. As for NGOs, engaged in response-oriented trainings, the most of its funding is formed due to the projects, supported by International or European funds.

**The training capacity** of the Stakeholders in sphere of marine pollution response readiness is formed by Equipment Availability. The most of the equipment of Universities, Scientific Organizations, State (regional) authorities is purchased due to the funding from the state budget and local budgets. European or International funding and material support also play significant role in the process of capacity building. Especially since full-scale military invasion in Ukraine the material and financial support of emergency services plays great role.

The response training capacities of NGOs is formed, mainly, due to the European or International projects support.

**The schemes of state-private, public-private partnership** and cooperation are also actively used. For instance, The State Organization "Association of the Sea ports of Ukraine" obtained training equipment from specialized producing and trading corporations as advertising sample in order to test to promote new types of equipment.

The most of the interviewed stakeholders **use ICT tools** for communication, monitoring, data collection, common-use data bases creation and for reporting, dissemination of necessary information and basic knowledges that are especially actual since the war in Ukraine.

But there is a great demand on more **digitalized and real-time interactive** services of all response-oriented processes. And this is one of the challenges that lies ahead of Ukrainian and all Black Sea basin stakeholders.

**Factors of success** in the involvement of stakeholders in the process of promotion of maritime safety courses are high involvement in international structures: the Committee of the International Maritime Organization on the Protection of the Marine Environment and other subcommittees on the protection of the marine environment, on the basis of the International Maritime Organization, the Danube Commission, numerous international technical assistance projects on the safety of navigation, safety and protection of the marine environment in the regions of the Black and Caspian Seas, which is implemented by the European Maritime Safety Agency and other projects. ISO 14000 Environmental Management Standards Certification applies.

The Ukrainian scientific center of Ecology of Sea (UkrSCES) is a leading partner of dozens of international projects on monitoring the marine environment, in particular, EMBLAS Project. Participation in international projects allows you to exchange experience, gain access to modern methods and technologies for monitoring the marine environment, and also contributes to the integration of Ukraine into the European Research Area.

The weak side is the decline of stakeholders' interest in specialized courses related to the state of the marine environment in the process of unifying education for "non-transport specialties".

As a result of interviews with key stakeholders, their main learning opportunities were identified, which allow implementing programs in the field of combating marine pollution. Such stakeholders are represented by: State Enterprise "Ukrainian Sea Ports Authority" (USPA), State Environmental Inspectorate, Odesa National Maritime Academy and others.

State Enterprise "Ukrainian Sea Ports Authority" obligations in a realm of environmental protection are established by national legislation and international standards. Thus, in accordance with Article 15 of the Law "On Seaports", the company is formed specifically for the purpose of localization and liquidation of emergency pollution in the water areas of seaports, ensuring the implementation of environmental legislation and taking measures to eliminate the consequences of sinking ships. That is, the organization of work on raising sunken property in the water area of ports.

In accordance with the resolution of the Cabinet of Ministers of Ukraine No. 406 dated 03.06.2013, the jurisdiction of State Enterprise "Ukrainian Sea Ports Authority" includes the water areas of sea ports, these are 13 sea ports, their water space, for which we are responsible as the main water user. According to the rules for the prevention of pollution of inland sea waters and the territorial sea, we are responsible for monitoring the state of the water areas of sea ports in the area of our water use, receiving ships and delivering to shore and floating reception facilities ship waste and other pollutants created on ships, cleaning their water areas from pollution that may occur during normal operation of ports, sediments, etc., as well as localization and liquidation of emergency pollution and other spills of polluting substances, which are considered extra- ordinary.

In 2021, the environmental protection marine strategy of Ukraine was developed, which defined the main tasks and priorities in this area. On January 5, 2022, the Environmental Monitoring Program was adopted, in which the Ukrainian scientific center of Ecology of Sea acts as the main

monitoring entity. This program defines measures and indicators for all 11 descriptors provided by the European Maritime Strategy Directive. The Ukrainian scientific center of Ecology of Sea is the main institution for monitoring the marine environment in Ukraine, whose activities meet the requirements of the European Directive on Marine Strategy. The center plays a key role in the implementation of national and international programs aimed at the preservation and sustainable development of marine ecosystems. Thanks to its expertise and experience, UkrSCES provides reliable and comprehensive monitoring of the state of the marine environment, which is the basis for making effective management decisions and developing environmental protection measures. The center's activities contribute to Ukraine's fulfillment of its obligations within the framework of international agreements and directives, as well as contribute to the preservation of unique marine ecosystems for future generations.

UkrSCES is actively involved in international activities and participates in a number of important projects. Today, UkrSCES is a participant in 8 international projects, in particular, the EMBLAS project. EMBLAS is a long-term project that started back in 2016 and went through several stages of transformation. It is now called EU4EMBLAS (European Union for EMBLAS) and actively promotes the development of monitoring in the Black Sea. Thanks to the EMBLAS project, even in the pre-war period, a basic assessment of the state of the marine environment was developed, and the project also contributed to the formation of the environmental protection marine strategy of Ukraine. In the process of developing a marine environmental protection strategy, the results of UkrSCES were used, as well as the results of the work of other research institutions and institutes, such as the Institute of Marine Biology, Odesa National University named by I. Mechnikov, Odesa State Environmental University, Institute of Market Problems and Economic and Environmental Research of the National Academy of Sciences of Ukraine, etc.

The UkrSCES has a developed research and laboratory base for the analysis of chemical indicators of the state of the marine environment. The Department of Analytical Research and Monitoring Organization of UkrSCES carries out: Research on the level of pollution of various environmental objects - water, bottom sediments and hydrobionts by priority pollutants, study of radiation pollution of the environment. UkrSCES laboratories are equipped with modern chemical-analytical devices and equipment that meet international requirements for the analysis of chemical substances in various objects of the natural environment. UkrSCES specialists have extensive practical work experience, good theoretical training, a number of employees have completed internships in leading laboratories (Monaco, Vienna, Budapest, Istanbul) and received international certificates. UkrSCES specialists perform the following types of work:

- Analysis of pollutants. Petroleum hydrocarbons. Measuring devices – spectrophotometers UR-20, SPEKORD M80 (Carl-Zeiss-Jena, Germany), spectrofluorimeters "Turner-430", "SPF-500" (USA). Individual hydrocarbons of petroleum origin (aliphatic, aromatic and polycyclic) by the method of chromatography-mass spectrometry, measuring device – GC/MS MD-800 with GC-8060 chromatograph (Fisons Instruments, France). Organochlorine pesticides, POPs and polychlorinated biphenyls, PCBs (Ar-1254 and Ar-1260), measuring device - gas chromatograph "MEGA2 8560" ("Fisons Instruments", France). Toxic metals (Cd, Pb, Zn, Cu, Ni, Cr, Fe, Al, Hg, As, V, Mn, Mo, etc.) by the method of flame or non-flame atomic absorption spectrophotometry, measuring devices - atomic - absorption spectrophotometers "AA-220" and "AA-800" (Varian, USA). Synthetic surface-active substances, SPAR (detergents) by the spectrophotometry method.

Total organic carbon, C org. by the gas chromatography method. Phenols by spectrophotometric method, spectrophotometer "Varian" (USA).

- Standard hydrochemistry: Cations and anions (sodium, ammonium, chlorides, sulfates, fluorides) by the method of ionic liquid chromatography, liquid chromatographs.

- Biogenic elements (nitrites, nitrates, phosphates, polyphosphates, organic nitrogen and phosphorus, total nitrogen and phosphorus, silicon, ammonium nitrogen) by the spectrophotometric method, - spectrophotometers "UV-160A"- (Shimadzu, Japan), "UV-VIS Cury 1E " (Varian, USA).

- Dissolved oxygen, BOD, COD, alkalinity, chlorinity, total mineralization, pH, salinity - by standard hydrochemical methods.

The research vessel "Boris Oleksandrov" (formerly "Belgica" (Belgium)) was transferred to the Center. But no scientific flight was carried out. The Ministry of Environment and Natural Resources of Ukraine does not provide sufficient funding for the Black Sea monitoring program. These works are performed at the expense of international projects. State authorities are trying to transfer the monitoring system to market self-financing, but the "vision" of a clear mechanism for transferring monitoring costs to maritime commercial activity has not yet been proposed.

Kherson State Maritime Academy has simulators that allow you to simulate the struggle for the survivability of a ship in emergency situations. Cadets undergo training and receive appropriate certificates.

The marine environmental protection strategy was the result of complex work that brought together all the assets of Ukraine, including thanks to the implementation of national and international projects, such as EFFECTIVE. The EMODNET project is database oriented. UkrSCES is one of the hubs of international oceanographic data, access to the OBIS database, and is part of a number of European database networks that include not only oceanographic data, but also biological and ecological data.

UkrSCES currently uses and forms several databases:

- Database "Regional Database on Pollution (RDB-P)" of the project "Environmental Monitoring of the Black Sea for Nutrients";

- Database of the project "Inventory, Assessment and Remediation of Anthropogenic Sources of Pollution in the Lower Danube Region of Ukraine, Romania and Republic of Moldova (MIS-ETC Code 995)".

As well as international and national geo-information systems used to manage the quality of the marine environment:

- WebGIS CoCoNET;

- Case Study on Quick-Response Models and Strategies in Case of Accidents Impacting on CoCoNET MPAs;

- Marine protected areas of the Black and Mediterranean Seas.

Changes are also taking place in Ukrainian national legislation, including adaptation to European environmental legislation. Currently, there is a draft resolution of the Cabinet of Ministers of Ukraine on the functioning of the state environmental monitoring system and its subsystems under consideration at the Ministry of Environment. One of the participants in such a state monitoring system could be space agencies, which can provide access to real-time situations - what happened, what occurred with the relevant indicators. State Emergency Service of Ukraine, the State Agency for Water Resources of Ukraine will provide information on fish resources, and we, as a subsystem link, will populate this database. The State Agency of Ukraine for Melioration and Water Management, the Ministry of Community Development, Territories, and Infrastructure of Ukraine will provide information on water resources, including drinking water. And the Ministry of Health will provide information on assessing the impact of pollution on the environment and its impact on humans.

## 2.3 Current state and the main features of training plans in preparedness and response to marine pollution in partner BS countries

### Bulgaria

The **Academy of the Ministry of the Interior** in Sofia and the **training Centre for Specialization and Vocational Training in Fire Safety and Civil Protection** in Varna provide training in fire safety and civil protection, rescue activities, chemical. biological and radiation protection etc. primarily for employees of the interior ministry.

The **Academy of the Ministry of the Interior** in Sofia provides training.

The RESPONSE team has studied **eight academic curricula** from the Academy. They represent curricula for specialties for bachelor and master of science, full-time and part-time study and two doctoral programmes. The training includes engineering and natural science subjects, fire safety and civil protection and some subjects related to environment protection and disaster prevention.

Those are as follows:

Curriculum 1 - Area: technical sciences; Specialty: **Fire and Emergency Safety**; Educational qualification degree: "**Bachelo**r"; Professional qualification: "Fire and Emergency Safety Engineer" **Regular training**: 4 years; Subjects: engineering subjects, natural sciences, fire safety, chemical, biological and radiation risks, fire safety equipment, water rescue, ecology, statistics and operational analysis etc.

Curriculum 2 - Area: technical sciences; Specialty: **Fire and Emergency Safety**; Educational qualification degree: "**Bachelo**r"; Professional qualification: "Fire and Emergency Safety Engineer"; **Part-time study**: 5 years; Subjects: engineering subjects, natural sciences, fire safety, chemical, biological and radiation risks, fire safety equipment, water rescue, ecology, statistics and operational analysis etc.

Curriculum 3 - Field of higher education: 'Technical Sciences'; Specialty: "**Fire and Emergency Safety**"; Educational qualification degree: "**Master of Science**" ; Professional qualification: "Master of Science- Engineer"; Term of study 1 year; Form of study**: regular training**; Subjects: emergency rescue works in complex and specific operations, Interaction of fire-fighting authorities with other

authorities and organizations and public relations, fire resistance and fire protection of building structures; fire-fighting and rescue equipment; crisis management; complex systems for automatic fire and emergency protection; logistics; modelling the thermodynamics of fire; modelling accidents with hazardous substances; fire safety engineering project management; management psychology; law of the European Union; fire and accident investigation; design of fire-fighting systems; national security management; human resources management etc.

Curriculum 4 - Area: technical sciences; Specialty: **Fire and Emergency Safety**; Educational qualification degree: "**Master of Science**"; Professional qualification: "Master of science-engineer"; **Part-time study**: 2.5 years; Subjects: Fire safety equipment, thermodynamics, firefighting technology, construction materials and fire safety, national security and human resources management, models of accidents with dangerous substances, crisis management, EU legislative framework etc.

Curriculum 5 - Field of higher education: 'Technical Sciences' Specialty: "**Crisis Management**"; Educational qualification degree: "Bachelor"; Professional qualification: "Engineer-manager"; Term of study: 4 years; **Form of study: regular training**

Subjects: emergency rescue equipment and technology, explosive processes, higher mathematics, origin, development and termination of combustion, ecology, evacuation of people, material and cultural values, information technologies, informatics, communication engineering and technology, hazardous substances and materials, crisis management of anthropogenic, environmental, natural and technogenic nature, crisis response forces, hydrology and meteorology, topography, cartography, GIS , legal framework etc.

Curriculum 6 - Area: technical sciences; Specialty: "**Humanitarian crisis management**"; Educational qualification: "Master"; Professional qualification: "Master in crisis management of humanitarian nature"; **Part-time study** 1.5 years; Subjects: medical and safety aspects of humanitarian management, psychology of crisis management, methodology of scientific research, legal framework etc.

Curriculum 7 - Doctoral Programme PhD: **'Occupational Safety and Fire Engineering Technology'**; Educational and scientific degree: "Doctor of Science"; Form of study: "Regular" - Duration of study: 3 years; Form of study: "Part-time" - Period of study - 4 years; Form of study: "Individual" - Period of study - 3 years; Curriculum: individual plan of studies, research activities, approbation,

Curriculum 8 - Doctoral Programme PhD "**Protection of the Population and National Economy in Critical Situations"**; Educational and scientific degree: "Doctor of Science"; Form of study: "Regular" - Duration of study: 3 years; Form of study: "Part-time" - Period of study - 4 years; Form of study: "Individual" - Period of study - 3 years; Curriculum: individual plan of studies, research activities, approbation.

The training **Centre for Specialization and Vocational Training in Fire Safety and Civil Protection** in Varna provides training for employees of the interior ministry with secondary education. Training is on firefighting and fire safety, including technologies and equipment, rescue equipment and services, firefighting and rescue operations, volunteer training. Lectures and training materials are available on the website but the access to them is provided with a password that is provided to trainees.

The Academy and the Centre for specialization provide **short training sessions** on fire safety, civil protection and emergency response trainings (e. g. from several hours to 2 weeks) to the staff of administrations and enterprises involved in emergency response and combating pollution. Training courses can be designed to suit specific customers or companies e. g. the Lukoil Neftochim Refinery.

The Centre in Varna provides training to volunteer rescue teams – mountain and alpine climbers, speleologists, and trained professionals, who can be useful in human life rescue operations on the coast, on stranded vessels, or for recovery of dangerous cargoes from vessels etc. The volunteer NGO club "Ekstremen" at the Tourist Society "Rodni Balkani" in Varna is very active in emergency response and rescue operations. Trainings with the volunteer club are held once a month (3-4 hours training). National trainings with volunteers are held once a year, the length is about one week. The club often takes part in the national naval Breeze joint exercise with the navy and the other government institutions.

The **target audience** of the training courses of the Academy and the training Centre in Varna is primarily employees of the interior ministry or rarely public servants of similar occupational profiles, that are employed by government services and administrations. The curricula are freely available on the Academy website. The forms of training offer some flexibility, even ready to use lectures and materials to be downloaded by trainees. The courses are inclusive; there are no age limitations or other forms of restrictions and limitations. It is essential to stress that the training courses are specially designed for employees of the interior ministry and some volunteer NGO rescue teams. The brief description of the courses indicate that they are of various durations, adapted to different users and are very practically oriented. They include up to date training on theoretical and practical issues, use of scientific methods of analysis and management of pollution, including different types of marine pollution.

The **Technical University in Varna** provides training on the subjects of Engineering Ecology and Protection of the population in disasters and accidents. The The RESPONSE team has studied three curricula that are described briefly below.

Curriculum 1 - Specialty: **Engineering Ecology**; Educational qualification degree: "Bachelor"; Professional qualification: "Environmental Engineer"; **Regular study**: 4 years/8 semesters; Subjects: mathematics, chemistry, informatics and computer technology, engineering ecology, technical subjects, nature disasters, damages to the environment etc.

Curriculum 2 - Specialty: **Engineering Ecology**; Educational qualification degree: "Master of Science"; Professional qualification: "MSc-Engineer "; **Part-time study**: 1 year/2 semesters; Subjects: quality management of air, ecology, limited waste and waste free technologies, ecological law, computer methods of research of the environment, complex design of technical systems, protection of the environment and the marine environment from emergencies and natural disasters, systems of environmental management etc.

Curriculum 3 - Specialty: **Protection of the population in disasters and accidents**; Educational qualification degree: "Bachelor"; Professional qualification: "Risk Engineer"; **Regular study**: 4 years/8 semesters; Subjects: mathematics, chemistry, informatics and computer technology, engineering ecology, engineering and technical documentation, natural disasters, sociology, electronics, meteorology and oceanography, environmental crisis management etc.

The target audience of the training courses at the Technical University is not limited, and there are no restrictions regarding age, gender or any other aspect of inclusiveness. Regular and part time studies are available. Up-to-date knowledge and information are incorporated. The courses are practically oriented and marine pollution considerations and scientific approaches are incorporated in the courses.

Experts (engineers, ecologists) from the volunteer club "Ekstremen" mentioned above provide training on search and rescue and emergency response activities within the training courses of the Technical University.

## Georgia

Training courses in Georgia trying to address issues related to marine pollution preparedness and response include:

**Types of Marine Pollution** courses cover oil spills, chemical pollution, plastic waste, sewage discharge, ballast water contamination, and air pollution from maritime activities.

**Regulatory Compliance** training ensures certain familiarity with international conventions such as MARPOL, the International Convention on Oil Pollution Preparedness, Response, and Cooperation (OPRC), and national regulations.

**Emergency response** include practical exercises and simulations prepare participants for real-life marine pollution incidents (supported by state budget, Black Sea Commission, sometimes supported by oil majors present in Georgia).

**Target audiences** for these training courses include:

- Government Agencies such as staff from the Ministry of Environmental Protection and Agriculture, National Environment Agency, Maritime Transport Agency and some other agencies such as KNP.

- Educational Institutions engaging students and faculty from universities like Ivane Javakhishvili Tbilisi State University, Shota Rustaveli Batumi State University and notably Batumi State Maritime Academy.

- Private sector, employees of companies involved in maritime activities and environmental consulting. Oil majors and privately owned port authorities in Batumi and Poti have their own programs not integrated with national activities.

- NGOs such as The Greens Movement of Georgia/Friends of the Earth and the Georgian Rural Council, WWF Caucasus Office and Fauna and Flora International - Caucasus also have training programs in support of Black Sea biodiversity. There are beach litter monitoring and cleanup training courses reported by Civitas Georgica and TSU (latter including monitoring of river for visible plastic streams).

- Specific courses aim at raising awareness among general public and local communities, including youth and women. Schools are frequently engaged e.g. in beach cleanup action less in monitoring counts.

**Availability of Courses to the Public:**

Training courses are offered some in online and in offline formats, for example:

- Online courses are accessible through institutional websites and platforms like the European Environment Agency's Marine Litter Watch. Example of national portal on training in beach litter monitoring as reported by Civitas Georgica, NGO. MEPA Environmental Information and Education Center is planning to develop Black Sea courses in near future.

- Offline courses are conducted at institutions like Batumi State Maritime Academy and various NGOs.

**Involvement of Youth, Women, and Other Aspects of Inclusiveness:**

Youth involvement as courses target school and university students, encouraging early engagement in marine environmental protection. Some efforts are made to include women in training programs, particularly in leadership and technical roles. Courses are usually free of charge and available in various formats to ensure broad participation.

**Duration of Training Courses:**

Short-term courses typically last a few days to a week, focusing on specific skills and knowledge. Some courses like on beach litter monitoring take 1-2 hours and practical engagement on beach sites.

Long-term academic programs at universities may span several months to years, incorporating extensive curricula.

**Types of Marine Pollutions** considered in the courses reported cover a spectrum of marine pollution types, including:

- Oil pollution strategies for prevention and response to oil spills.

- Chemical pollution for handling and mitigation of chemical contaminants.

- Plastic waste courses addressing the impact of marine/beach litter and strategies for reduction.

- Sewage and ballast water course for managing sewage discharge and ballast water to prevent ecological harm.

**Scientific and Research Results Use:**

National and International projects such as EU/UNDP EMBLAS, EU H2020 BRIDGE and DOORS provide training programs (recent examples include DOORS Black Sea SoS FAIR data portal intro, BRIDGE eDNA intro, Blue Economy workshop series by both projects, etc.).

**Conclusion**

The training landscape in Georgia shows certain improvement in approach towards addressing marine pollution. However, there is a room and a need for significantly enhanced coordination,

funding, and the integration of up-to-date scientific and technological knowledge. Enhancing inclusiveness and accessibility further can ensure broader participation and effectiveness of these training programs.

## Romania

The training plans in preparedness and response to the issues and impacts of the marine pollution, developed in current and respectively, nearfuture training courses, in Romania, covers the following:

**Types of Marine Pollution** courses cover oil spills, chemical pollution, plastic waste, sewage discharge, ballast water contamination, and air pollution from maritime activities.

**Types of Impacts and Regulatory Compliance in relation with main issues of marine pollution,** *incorporating up-to-date knowledge and information,* are developed within several training schemes, providing the bridge of different international conventions implementation, regarding marine pollution, like MARPOL, the International Convention on Oil Pollution Preparedness, Response, and Cooperation (OPRC), and European and national rules and regulations for MSFD continous impelemtation.

**Emergency response** trainings include the presentation of several Decision Support Systems/DSS use, designed for different marine pollution propagation scenarios or maritime activities scientifically approached, as well as marine simulations for the operational stakeholders in case of marine accidental pollution based on scientific and interdisciplinary research results.

**Target audiences** for current and future training courses, include specialised entities/stakeholders, but also *involvement of youth, women, in case of citizen science connected activities for rapid monitoring and response in case of marine pollution, are subsequent*:

Local public authorities

• Municipalities in the coastal zone (Constanta, Mangalia, Eforie, Sulina and Costinesti, Limanu, 23 August, Tuzla, Agigea, Mihai Kogalniceanu, Corbu, Istria, Mihai Viteazul, Jurilovca, Murighiol, Sf. Gheorghe, C.A. Rosetti) plan and manage local development, ensure land management towards environmental protection and development through policies and public awareness activities

Regional public authorities

• The Prefectures Constanta and Tulcea pursue enforcement of the law in the coastal zone and are part of the institutions responsible for the integrated management of coordination of comities for rapid response in case of accidental pollution.

• The County Councils of Constanta and Tulcea counties are responsible for the overall management of the development of the two counties along the coast and contribute by all departments and investing activities specific to problem solving and the development of the coastal zone, including environmental protection of the CZ.

National public authorities

• The Ministry of Environment, Waters and Forests, formulates, and implements through subordinated institutions strategies and environmental protection policies on all variety of aspects in the field, including marine pollution; It also monitors the implementation of projects financed from various sources, as part of the implementation of sustainable development. Given the national and transnational importance of the coastal zone, it is subject to specific legislation and an integrated approach by CNZC/ The National Committee on Coastal Zone.

• The Ministry of Regional Development and Public Administration is mainly involved in planning national and regional territorial development, cross-border, transnational and interregional cooperation, urban and regional planning, housing construction, all relevant to the coastal zone. MRDPA manages a broad suite of programs financed from EU and national funds with impact on the coastal zone in the mentioned areas.

• The Ministry of Health is involved in managing specific services and features in general. Population health issues related to technological risks and industrial emissions in the marine area are considered.

• Ministry of Agriculture and Rural Development (MARD), responsible for agriculture and rural development both in terms of strategies, policies at European and national level, as well as that of their implementation through programs and projects designed to address issues of local, regional and national nature/marine environment. Complex activities taking place in coastal areas in agriculture, aquaculture, marine livestock and fisheries require the involvement of MARD in correlation with other aspects of coastal zone sustainable development and marine environment protection and conservation.

Sectoral agency

• The Environment Protection Agencies in the counties of Constanta and Tulcea and the corresponding structures in the Southeast Region Development respond to environmental quality in the coastal area, checking Development plans, concrete interventions, and their impact, focusing on issues specific to the region, the risks and hazards/related to marine pollution, climate change, natural heritage, biodiversity.

• Danube Delta Biosphere Reserve Administration (DDBRA) Tulcea is the entity responsible for the preservation and management of nature reserves and all aspects that make it unique, in terms of its exposure to the impact of navigation, aggressive tourism and the poverty of the area demographic challenges, climate change.

The National Committee on Coastal Zone (NCCZ) of the Ministry of Environment and Forests, has a responsibility to ensure the integrated management of the coastal zone of the Black Sea. To this purpose, its structure consists of key organisms relevant to managing complex problems in the area. It includes in its structure a permanent secretariat, which is provided by the Ministry of Environment

Public service providers

CERONAV, as main Public Service providers, provide various courses for Port operators and Port Authorities in case of marine pollution monitoring, etc

Interest groups including NGOs

Nongovernmental organizations (Oceanic Club Mare Nostrum, Naval League, Ornithological Society) are responsible for inclusion in integrated coastal zone management of issues concerning the protection of natural areas, biodiversity, local communities, water sports and marine activities.

Balkan Environmental Association (B.EN.A) is an international nongovernmental scientific organization tasked with preserving the environment and culture of Balkan countries. Nowadays our association have more 4,000 active members. The organization is aimed at developing the cooperation and the exchange of environmental information among its members in as well as identifying and appraising the current problems of environmental protection on a national, regional and international basis.

Higher education and research organisations

• The Romanian Academy supports, through strategy, programs and research institutes, the research of critical aspects of the coastal zone. The Romanian Academy ensures the quality of the research products and conditions to support decision making in the areas and issues of interest based on scientific substantiation.

• The National Institute for Research and Development Urban proiect INCERC is the developer of spatial development plans of special importance for Romania, regionally, nationally, cross-border and transnationally. The Institute developed the methodological approach to planning this area, and a suite of spatial development plans. The Institute is not part of NCCZ.

• The National Institute for Research and Development in Tourism (INCDT) is focused on the research and planning in tourism, in ecological and sustainable bases. One area of concern is the Black Sea coastal area, interest reflected in a wide suite of studies, strategies, and tourism projects. It is currently involved with other institutions in developing the Zoning Plan for Coastal Zone, southern sector. The Institute is not part of NCCZ.

Hospitals and medical centers

Public Health Directorate of Constanta and Tulcea are subordinated to the Ministry of Health, representing the public health authority at local level, which carries out national health policies and programs, develops local programs, organizes health structures, statistical records on health issues, as well as planning and carrying out investments financed from the state budget for the health sector.

**Availability of Courses to the Public:**

Specific scientific courses, prepared in different project based schemes by the ressearch institutes are aim to increase the specific expertise and/or public awareness for general public or for different target groups among local and regional communities, including universities and national autorities involved in marine pollution monitoring, modeling and management.

Training courses are offered some in online and in offline formats, for various durations, from Short-term courses typically last a few days to a week, or Long-term academic programs at universities may span several months to years, incorporating extensive curricula.

**Conclusion**

The training landscape related marine pollution within Romanian sector of the Black sea shows certain potential benefits for various professional communities but also general public. By development of the citizen science and rapid response/EWS develpment and research projects, certain training development plans will include specific marine pollution issues according with the present needs within national stakeholders. Certain modern Early Warning Systems and toolboxes for networking and coordination, are on the central authorities attentions, requiring a centralised funding, for European Directives implementation but also for citizen involvement in the genertal issue of marine pollution, encompasing modern/remore sensing techniquies services use.

## Ukraine

**Assessment of issues, covered by trainings courses.** According to interview respondents, it should be noted that in higher education institutions (50%) there are general educational courses of a certain educational competence or specialty, which contain separate components on preparedness and response to the marine environment pollution. While authorities and enterprises (the Administration of Seaports of Ukraine, the State Environmental Inspection of Ukraine, the Department of Ecology and Natural Resources of the Odesa State Administration), whose activities and functions are directly related to environmental protection, have both internal trainings to prepare personnel for the readiness to pollution respond, and conduct training for third-party organizations regarding the implementation of state supervision and control over economical use of nature, including handling in emergency situations due to pollution and overcoming the consequences of hostilities in the form of waste-remnants of war in the environment. Trainings on preparing to emergency situations response and emergency marine environment pollution with practical skills and acquired knowledge using are conducted by the Ukrainian Scientific Center for Marine Ecology.

**Target audience**. The main target audience of higher education institutions (HEI) at the basic level is students, trainees and entrants of educational and professional programs; at the highest level the main target audience is environmental protection specialists who are preparing for specialized institutions and authorities (Ministry of Environmental Protection and Natural Resources of Ukraine, ecology departments of state administrations) and scientific institutions (for example, Ukrainian Scientific Center of Marine Ecology, Institute of Marine Biology, State Organization "Institute of Market and Economic and Ecological Researches of the National Academy of Sciences of Ukraine"). The target audience of specialized institutions is their own employees (advancement of qualifications or internships), teachers and specialists of higher education institutions who have the necessary qualifications, and employees of institutions that ensure safety in the water and marine environment.

**Availability of the courses to the public** (online and off-line forms). Educational programs are posted on the official website of HEI, where there is a complete list of both mandatory and optional subjects (these are work programs, syllabi, methodological support, lecture notes, etc.). In addition, a catalog of object (specific) disciplines with a brief description of these courses is compiled for each educational program. The information is open to anyone interested in educational programs of various levels of training in online and offline formats. There is an open access repository and Moodle e-learning system.

**Involvement of youth, women, other aspects of inclusiveness.** There are no restrictions on the involvement of young people and women in training plans and passing tests in Ukraine. All conditions have been created in HEI for the implementation of the inclusiveness principle and gender equality, in particular, access for persons with disabilities has been established (ramps, elevators, etc.), the possibility of online meetings, conferences and trainings through information and communication technologies Zoom, Google Classroom, Microsoft Teams, etc. has been provided.

**Duration**. The educational component and the scientific component of bachelor's studies last 4 years full-time, of which 1 year is industrial practice, master's studies last 1.5-2 years, of which 1 year can also be assigned to practice. Part-time study lasts 2 years. Specialized structures that conduct and participate in exercises on preparedness and response to marine pollution have other terms for conducting exercises, which are approved by the schedule plan or provided for by the internal procedures of such institutions.

**Incorporation of up-to-date knowledge and information.** Programs are formed by higher education institutions in accordance with the recommended literature and monographs published by specialists of the relevant field. Specialized institutions, authorities and enterprises (Administration of Sea Ports of Ukraine (ASPU), State Ecological Inspection of Ukraine, Department of Ecology and Natural Resources of the Odesa State Administration) are more actively using modern forms of exchange of knowledge and information. In particular, the European Maritime Safety Agency provided ASPU with access to its own software product, in which it is possible to monitor the appearance of new oil or other stains near the Ukraine`s seaports water area almost online. The organization has introduced a pilot project for monitoring the ports water area state using satellites. A memorandum on cooperation with the National Space Agency of Ukraine was concluded.

**Practical usage.** Usually, the practical use of knowledge regarding the response and liquidation of the marine environment pollution consequences takes place in conditional situations, where risks and threats due to emergency situations are considered. In particular, all respondents admit the influence of the state of war and hostilities, as well as the nationwide emergencies and disasters caused by them, on the subject's formation of the educational courses, seminars, trainings, in terms of expanding the list of pollutants. Thus, in June 2023, an ecological disaster occurred in Ukraine caused by the aggressive actions of the Russian Federation, in particular, the blowing up of the dam of the Kahovsky Reservoir, which caused large-scale pollution of the water area in the northwestern part of the Black Sea and its deep-water part. The respondent institutions included or reflected this problem, its consequences and forecasts in the context of their activities (educational, scientific, management) in training courses (i.e., calculating the damage and economic consequences of the marine water area due to the destruction of the Kakhovka Dam), seminars and trainings (i.e., regarding timely response to emergency situations at sea, modeling of the pollution spread, actions of environmental inspectors during emergency situations, etc.).

**Types of marine pollutions considered in the courses.** Within their competence and types of activity, the respondents were divided into three groups: higher education institutions consider the main sources of the marine environment pollution, in particular the issue of oil pollution, treatment of oil pollution, the issue of localization of oil pollution in the event of a spill and, accordingly, the assessment of damage and losses caused the marine environment due to any emergency situations; representatives of administrations involved in the fight against pollution and emergency

situations take into account ship waste, ballast water and other pollutants created on ships, pollution that can occur during regular port operations, as well as localization and elimination of emergency pollution and spills pollutants. Scientific institutions, based on the database of environmental parameters monitoring and the marine environment pollution, along with waste generated during port, shipping and cargo-unloading activities, identify pollutants that cause eutrophication, changes in BOD5, etc. and update existing training courses and trainings for formation of practical skills and effective actions algorithms during emergency situations.

**Scientific and research results use**. Higher education institutions, within the scope of their activities, carry out scientific and research works, the processed results of which are included in the composition of the corresponding educational course (theoretical principles, methodical recommendations, calculations, recommended literature, etc.). Scientific institutions create a primary database based on their own field research on the state and composition of the marine environment. Representatives of administrations and public services do not have the authority to conduct their own scientific research, but they have access to state statistical observations and foreign databases, which are taken into account in their further activities and managerial decision-making.

**International projects and Erasmus+.** The project history of the respondents is diverse: higher education institutions are involved in programs for the creation of doctoral schools, in particular in ecology, schools for training PhD under the Erasmus+ program; they are mostly related to the educational process improvement (this is innovative teaching of the English, virtual reality technology, presentation of 3D virtual reality glasses, special training, etc.). Administrative institutions and organizations, such as SE "Association of Sea Ports of Ukraine" and its regional branches, participate in technical assistance projects regarding safe navigation, security and protection of the marine environment in the regions of the Black and Caspian Seas, which are implemented by the European Maritime Safety Agency. They implemented and maintained the ISO 14000 environmental management system in 2020. In turn, scientific institutions, on the example of the Ukrainian Scientific Center for Marine Ecology, participated in international projects that actively contribute to the monitoring development in the Black Sea, within which, for example, a basic assessment of the marine environment state was developed, and the project also contributed to the formation of the environmental protection marine strategy of Ukraine. Departments of ecology and natural resources under regional state administrations and the State Environmental Inspection act as monitoring and control authorities in international activities.

Thus, the current state of training plans can be characterized as high, covering all types of marine pollution, their sources and disposal technologies, as well as preparedness and response to marine pollution. The specifics are the formation of two types of curricula: first, for the training of specialized specialists, whose further activities are related to the prevention of waste generation, liquidation and neutralization of the marine pollution consequences or activities at sea; secondly, plans aimed at providing basic knowledge on environmental safety and rational nature management for students, postgraduates and interested persons.

## 2.4 Practical use, good practice and gaps in marine pollution trainings

### Bulgaria

The training in emergency response to accidents at sea and marine pollution is part of the professional and vocational training at several educational institutions. They are associated with the navy, the interior ministry, and technical institutions. Those have been described in detail in the previous sections. Professionals with both higher and secondary education are involved in the trainings, as well as volunteers. The institutions involved in the training are government institutions. A couple of private universities provide some related training in national security, chemical and food safety etc.

The Bulgarian legal framework, the Disaster Protection Act and related legislation, describe the procedures, responsibilities, and institutions responsible for emergency response and for addressing the related marine pollution in the coastal area or at sea. The identifies clearly the major institutions involved – navy, border police, fire safety and civil protection units, national security, and others – that take part in regular training exercises. Most significant is the annual Breeze naval exercise with foreign participation and NATO involvement. Mine sweeping, pollution from armed conflicts, is the subject of this year's exercise.

The institutions responsible for training and drills for emergency response to accidents and disasters at sea and marine pollution have been described previously. Here are some **good practices** identified with focus on preparedness for emergency response at sea:

Executive Agency "Maritime Administration" (IAMA) has good preparedness. The IAMA conducts regular training and drills for its staff as well as for others involved in search and rescue operations, spill response and other maritime incidents. The Agency also cooperates with international organisations such as the International Maritime Organisation (IMO) and the European Union (EU) to ensure that its training and training standards are in line with global best practice.

Bulgarian Red Cross (BRC) provides various training courses for volunteers and professionals in the field of water rescue, swimming, diving, including training for responding to marine incidents and pollution. These courses are held throughout the country and cover topics such as first aid, rescue techniques and emergency response procedures.

National Institute of Meteorology and Hydrology (NIMH) provides support. NIMH is responsible for monitoring the weather, climate and water resources in Bulgaria. The institute has a dedicated marine research unit that provides information and forecasts on marine conditions, which can be crucial for planning search and rescue operations and pollution response.

Support from universities and research institutions is provided. Several universities and research institutions in Bulgaria offer programmes and courses related to marine science, environmental protection and disaster management. These institutions contribute to the development of expertise in the field by conducting research and providing education to students and professionals.

Conducting of joint exercises and drills is regular practice. Joint exercises and drills are regularly organised between different agencies and organisations involved in emergency response to maritime disasters and pollution. These events help to improve coordination and communication

between participants and ensure that they are well prepared to work together in the event of a reallife accidents and incidents.

Developing plans and strategies is part of the process. The national and local authorities in Bulgaria are developing plans and strategies for responding to accidents at sea and marine pollution. These documents define the roles and responsibilities of the different actors, describe response procedures and provide guidance on training and preparedness.

International cooperation has been established. Bulgaria actively participates in regional and international initiatives to improve disaster preparedness at sea and marine pollution response. The country is part of the Black Sea Regional Oil Spill Response System (CleanSeaNet) and participates in various projects and working groups funded by the EU and other sources that aim to improve disaster response capacity in the Black Sea region.

Although Bulgaria has established some good practices and initiatives for training and drills for response to maritime disasters and pollution, there are still areas where improvements can be made. Some potential **shortcomings, gaps and deficits** have been identified:

Lack of a comprehensive national approach has been identified. There is currently no unified national strategy or framework for specific responding to marine disasters and pollution in Bulgaria. This can lead to fragmented efforts and a lack of coordination between different agencies and organisations involved in disaster response.

Limited resources can affect emergency response. Funding and resources allocated to training and preparedness for response to disasters at sea and marine pollution do not appear to be a priority. The country's ability to invest in advanced equipment, technology and infrastructure needed for effective disaster response needs more financial support.

Currently, there is limited public participation in disaster response preparedness, which can affect the overall effectiveness of the system. Insufficient public participation and awareness of marine emergency response preparedness and measures affects negatively the success of response efforts.

The age of some infrastructure and equipment can create problems. Although there is basic equipment, insufficient modern equipment and means can create issues in real-life emergency response. Upgrading the infrastructure is costly and time-consuming, though it is essential to ensure an effective emergency response.

Need for closer international and regional cooperation and improved mechanisms for sharing information, resources and expertise can be identified. Closer cooperation is necessary to help improve disaster preparedness and response capabilities across the Black Sea region.

While there are training programs available for marine emergency response and marine pollution, there are difficulties in the process prioritization of competences and leadership of the organizations involved. The response to marine pollution and specific pollutants (except for oil pollution) is not sufficiently addressed in the legal framework. Therefore, it is not possible to plan and allocate resources and manage risks in the event of marine pollution from marine accidents. Those deficiencies can affect the credibility of the disaster response system.

Improved risk-based assessment and planning is necessary to address the national emergency response measures and marine pollution because of accidents and disasters.

The effective of communication and coordination between the different actors can be improved for a successful emergency response to accidents and marine pollution.

In case of **real-life accidents accident** on the coast or at sea in Bulgarian waters response is provided by coordination units under regional or national government and all the institutions involved are identified: maritime administration with emergency response and marine rescue coordination centre, police/border police authorities, fire safety and civil protection units at the ministry of the interior, health authorities (ambulance), environmental authorities, scientific institutes, NGOs and media.

An **independent expert unit** at the Ministry of Transport entitled National Air, Maritime and Rail Accident Investigation Board has been established for the purposes of analysis and improvement of risk management. https://www.mtc.government.bg/en/archive-year/201

A serious accident, the grounding of the Vera Su on the Bulgarian Northern coast has been investigated and described in a report. The report available in both Bulgarian and English is available. Legal framework and instructions for investigation of maritime accidents are available on the website of the transport ministry.

The Vera Su final investigation report provides analysis of the proceedings and identifies recommendations for the maritime administration and the Varna port infrastructure company. They are technical and are related to the specific situation.

The analysis of the Vera Su grounding accident on 20.09.2021, with bulk cargo of urea which began to spill in the sea a couple of days after the accident. Basic equipment for the emergency operation was available but there were no special vessels to reload the bulk cargo and prevent marine pollution. Special barges were provided for the reloading by the EMSA, the European Maritime Safety Agency.

The following conclusions are quotations of the investigating board.

"Further deficiencies have been identified, of regulatory and legal nature in the existing legal framework of Bulgaria. They are related to the type of pollution (serious maritime accident, incident) and the character of the pollutant (different from oil) and the related difficulties in the allocation of means and resources.

The duties of the various departments and organisations involved (discussed previously) are set out in the National Plan for Combating Oil Spills in the Black Sea, which focuses on incidents and accidents related primarily to environmental pollution, but not those of such a nature as in the case of a serious accident.

After a careful examination of the relevant national legislation and guidance documents, the Investigating commission considers that there is no guidance document regulating the sequence of action of the various institutions and thus their hierarchical subordination during the different phases of incidents (casualties). In this respect, the National Emergency Plan for Combating Oil Spills in the Black Sea is the closest. It should be stressed that casualties involving the stranding of

vessels (which do not have an oil spill) differ radically from oil spill incidents and accidents, both in terms of materials, means and resources that need to be invested to address the problems that have arisen and to remedy the consequences. The existing National Emergency Plan to combat oil spills does not cover similar accidents involving bulk cargo which in large quantities would be hazardous to the marine environment, i.e. there is no obligation to activate it under such conditions.

In the absence of a legal basis and plans, there is no way to identify the resources available in advance in different scenarios — collision, grounding, fire, spill, etc., and in principle the marine casualty can develop as a combination (e.g. collision leading to fire, etc.). Emergency medical care centres do not operate in maritime spaces, and DG Fire Safety and Population Protection, with a specific text in the Ministry of Interior Act, is exempt from action in the maritime spaces and the Danube.

Within the meaning of the foregoing, in the case of the legislation thus in force at the time of the accident with m/v "Vera Su", the sequence of the actions of the departments and organisations concerned, respectively their hierarchical subordination during the various phases of the accident, are governed by the legislation of the Republic of Bulgaria, the National Emergency Plan for combating oil spills in the Black Sea, and by the establishment of an ad-hoc coordination group by order of the Prime Minister of the Republic of Bulgaria, for the organisation, coordination and control of the activities carried out by the competent state authorities. Such a coordination working group was established on 02.10.2021 to coordinate the competent public authorities in connection with the accident.

Detailed analysis is needed for preliminary planning of forces and means of rapid response and a detailed National Emergency Plan for various types of marine casualties associated with a significant risk of loss of life and/or environmental pollution that does not only include oil spills.

The Investigating commission considers it is necessary to carry out a specialised and accurate analysis by experts in the relevant fields with legal participation by an appointed inter-ministerial committee to examine and analyse the actions of any institution that would be involved in such a situation, including coordination between them in order to avoid unnecessary delays and a more operational and adequate response to such accidents and incidents." (*end of quote*)

The following links to projects related to training in capacity building and emergency response of the Bulgarian maritime authorities.

- Project **CISE-ALERT** (CISE's operationalization launch through A Long Endurance and Real live Test) https://www.cise-alert.eu/
- Project **EcoDaLLi** (ECOsystem-based governance with DAnube lighthouse Living Lab for sustainable Innovation processes), No 101093908, HORIZON-MISS-2021-OCEAN-02-04-Danube River basin lighthouse – coordination activities https://ecodalli.eu/
- Project **Danube Safety Net** https://danubesafety.net
- Project **EFFECTOR**: An End to end interoperability Framework For MaritimE Situational Awareness at StrategiC and TacTical OpeRations) https://www.effector-project.eu/

## Georgia

Good Practice and Gaps in Marine Pollution Trainings are provided in this subchapter based on Georgian experiences:

**Good Practices:**

1. Institutions like the Batumi State Maritime Academy and the LEPL Maritime Transport Agency provided training programs include practical exercises, simulations, and real-life scenarios to prepare participants for marine pollution incidents. For example, the Maritime Transport Agency conducts regular oil spill response drills, which are crucial for preparedness.

2. Some Georgian institutions participate in international projects such as the EU-funded Black Sea project such as EMFAF RESPONSE, H2020 DOORS and BRIDGE, which provide valuable opportunities for knowledge exchange and capacity building.

**Gaps in Training Programs:**

1. There is a lack of coordination among various training programs, leading to inconsistencies in the training content and delivery. A more unified approach could enhance the effectiveness of programs.

2. Institutions lack the necessary equipment and resources to conduct comprehensive training programs. For example, advanced laboratory equipment and ICT tools are often inadequate, limiting the scope and quality of the training. No marine monitoring vessel in Georgia. No marine and/or maritime data sharing portal.

3. While some institutions incorporate scientific research into their training programs, there is a need for more systematic integration of the latest scientific and technological advancements. Continuous updating of training materials is essential to keep pace with new developments. Modern tools such as eDNA are not even in infancy and are only done as part of the international efforts like EMNBLAS, DOORS or BRIDGE.

4. There is a need for more extensive field training and real-life simulations to better prepare participants for actual marine pollution incidents. There is a need for much more equipment and skills to use them.

**Involvement in Real-Life Emergency Situations:**

1. Maritime Transport Agency is actively involved in real-life emergency situations, conducting regular oil spill response drills and coordinating with other institutions during incidents. Their involvement ensures that staff are well-prepared for marine pollution emergencies. Earlier there were more of such exercises, like DELTA.

2. National Environment Agency monitors the quality of water in the Black Sea and provides data to relevant authorities during pollution incidents. Their role includes regular monitoring and reporting, which is critical for timely response. Still recent example of monitoring intensification with Kakhovka Dam failure in Ukraine the data provided to public was in the format

of pdf document rather than marine data portal such as Black Sea SoS with spatial and time coverage capabilities.

3. Some governmental institutions and NGOs play a role in public awareness, while NGOS provide policy advocacy as well. They have been involved in various initiatives to inform the public and mitigate the impact of marine pollution, such as during the Kakhovka Dam explosion. But much more is needed in the face of major development projects ongoing and forthcoming along the coast and in marine areas, impacting even protected areas such as KNP (e.g. new oil refinery and future submarine cable possibly crossing the park).

**Inclusion of Training Results in Publications and Reports:**

1. Institutions like TSU, IliaUni, BSU, Institute of Geophysics, DOORS and BRIDGE partners, from time to time publish their research findings in scientific journals and reports, but much more is needed in Georgian case as demonstrated by meta-analysis conducted by RESPONSE and its partner GMG/FoE-GE.

2. Training and research results from projects like DOORS, BRIDGE, RESPONSE are included in project reports and disseminated among stakeholders. These reports provide valuable insights and recommendations for improving marine pollution response.

3. NGOs and educational institutions try to use training results to inform the public through media campaigns, conferences, and workshops. This ensures that the broader community is made aware of marine pollution issues and the efforts being made to address them. Good examples were Multi-Actor Forums (MAF) and Mutual Mobilization and Learning (MML) workshops conducted by DOORS & living lab workshops by BRIDGE.

**Responsibilities and Preparedness of Institutions:**

1. MEPA is responsible for developing policies related to marine environmental protection and overseeing their implementation.

2. Universities like TSU, ISU, BSU, Batumi State Maritime Academy and some others play a role in training the next generation of professionals. Their curricula should include modules on marine pollution preparedness and response, ensuring that students are well-equipped to handle future challenges.

3. Institutions like MTA should ensure that their staff are trained for emergency response through regular drills, workshops, and professional development programs. Positions such as environmental specialists, marine engineers, and safety officers has to be filled fully and they should receive targeted training to enhance their response capabilities.

**Examples and Links to Projects and Events:**

- **DOORS Black Sea Project:** This EU-funded project aims to improve marine pollution monitoring and response in the Black Sea region. Georgian stakeholders actively participate in this project, benefiting from international collaboration and access to advanced methodologies.

- **EMBLAS Project:** The Environmental Monitoring in the Black Sea (EMBLAS) project supports Georgia in monitoring marine pollution and implementing best practices. It provided training to stakeholders and tried to integrate scientific research into policy-making.

- **Blue Economy Workshops** organized by various European projects (BRIDGE, DOORS), focus on sustainable development and marine environmental protection. They offer training and capacity-building opportunities for Georgian institutions and stakeholders as well.

**Conclusion**

The training capacities in Georgia demonstrates certain commitment to address marine pollution through training programs, international collaboration, and scientific research. However, there are still gaps in coordination, resource availability, and the integration of up-to-date knowledge. Addressing these gaps through enhanced funding, better coordination, and continuous updating of training materials will significantly improve the effectiveness of marine pollution response in Georgia.

## Romania

The practical use, good practice and present gaps in marine pollution trainings resulted from face to face interviews show a big proportion of the lack of experience/know how and a lack in the present training curricula of scientific data and scientific high-level incorporated tools

**Good Practices and Gaps in marine pollution trainings:**

1. Institutions like the NIMRD, CERONAV, MUC and UB are in them portfolio certain training programs including, theoretical background, practical exercises, numerical model/scenarios simulations, and MSP/GIS scenarios developed for various stakeholders involved in the legal framework afferent to the Operational Commandment for Marine Decontamination, in case of marine pollution incident, as well for implementation of the National Contingency Plan Against Marine Pollution (GO no. 1593/2002)[1] . (

2. Some Romanian research institutes, and civil societies institutions participate in national and European specific designed projects, had prepared specific considered Good Practices Guidelines/Manuals against marine pollutions in specific scenarios/case studies, within EU-funded Black Sea projects, BS Interreg projects, ESA/CMEMS USE-CASE projects (EO4CZM, EO4BSP, EO4SIBS, Forcoast, etc) and H2020 projects (BRIDGE and DOORS), thus providing networking opportunities for technology/knowledge transfer and capacity building at regional and national level.

5. Gaps identified in the trainings include: the lack of periodicity, lack of coordination and lack of high/best available technologies related to monitoring, modeling and management of marine pollution including ITC, for networking and coordination and/or delivery, and also the lack of EWS and modern web driven technologies

[1] National Contingency Plan Against Marine Pollution (GO no. 1593/2002) https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.rmri.ro/EU_2850/Downloads/Depol/SuportCurs1.pdf&ved=2ahUKEwiq0LWyiJ-HAxVmh_0HHWxpB4AQFnoECA4QAQ&usg=AOvVaw1a34VWzlv8E5-dQtqc1u7A0 ,

6. Lack of equipment and ITC resources to conduct comprehensive training programs are emphasized by NGOs and Water/Navigation authorities, but also by local service providers such as CERONAV. For example, advanced laboratory equipment and ICT tools are often inadequate, limiting the scope and quality of the training. No marine monitoring vessel in Georgia. No marine and/or maritime data sharing portal.

7. There is a need for extensive practical exercise in the field emergent technologies services and applications (EO monitoring for emergency situations, and automatic systems usage: UAV, GSP use,… ), including special needs for trainings in case of the real-time data collection, processing and numerical simulations and representation/within EWS in case of the rapid response/digital supervised intervention based on DTO (Digital Twin of the Ocean) technologies for highly potential marine pollution incidents.

**Involvement in Real-Life Emergency Situations:**

There were a series of in the field/real life exercises/ National SAR Maritime organized by RNA/Romanian Naval Authority, but since 2009 just rarely such exercise was organized with national institutional framework participation, and just few notable cases of sinking of ships and shipwreck in the last years in Romania. For the last case of marine pollution hazard in north western Black Sea, produced within war zone in case of the Dam failure in Ukraine, the dam-break from Kakhovka, involving announced several hundred tons of oil derivatives, at national level was activated the procedures of in-situ/weekly and daily/EO monitoring, under the coordination and funding of Romanian MEWF/Ministry of Environment, Waters and Forests. NASA and ESA/ CMEMS support was determinant for the proportion of resources mobilization, and some specific measures were approved, including several funding schemes for MSFD implementation/tender for deep studies extensions.

**Inclusion of Training Results in Publications and Reports:**

Institutions like NIMRD, and Mare Nostrum NGO, in a joint effort developed in Anemone Interreg project (http://www.anemoneproject.eu/?cat=2) a specific deliverable, published on web/with free access, but also their research findings in scientific journals and reports, generally focused on marine monitoring, including regional/Black Sea marine pollution issues and study cases.

In similar way, specific training and research results, from the ongoing projects with regional participation among BS riverine/national research institutions, are included in project deliverable/dissemination materials including recommendations for improving marine pollution response for the national, regional and European stakeholders.

National NGOs are not focused in scientific publications, rather than focused on public awareness using printing materials, and media campaigns, conferences, and workshops, as well.

**Responsibilities and Preparedness of Institutions:**

In Romania, quite a few educational and research institutions are responsible for specific curricula development for marine pollution mitigation and control, as well for development of the specialized tools for the marine environmental protection and conservation.

Universities of Constanta, in contact and direct relation with national and local stakeholders, including NIMRD and GeoEcoMar have a determinant role in long-term training curricula delineations for different level of study level and professionals 'experience.

Local/county authorities in navigation and environmental protection like RNA and ABADL are focused on emergency response through specific instrumentation, encompassing the technologies transfer as well through workshops, and professional development programs, at request.

**Examples and Links to Projects and Events:**

- **Marblue Conference 2023** (https://www.marblue.ro/2022/index.html)
- **EMSEA Batumi Conference in Marine Literacy 2023** (https://emsea.glueup.com/event/emsea-conference-batumi-georgia-80932/)
- **2023 Common Maritime Agenda for the Black Sea Stakeholder Conference** (https://www.bsec-organization.org/news/554082023-common-maritime-agenda-for-the-black-sea-stakeholder-conference )
- **DOORS 1st Stakeholder Conference** (https://www.doorsblacksea.eu/news03_stakeholderconference)
- **H2020 Project s: Iliad** (https://ocean-twin.eu/), **Bridge** (https://bridgeblacksea.org/) **and DOORs** (https://www.doorsblacksea.eu/)

## Ukraine

Currently, in Ukraine there is a certain range of legal acts that regulate the actions of state bodies and business entities in matters of marine environment pollution, environmental damage assessment and prosecution of the guilty, in particular:

- The Convention on the Protection of the Black Sea Against Pollution (the Convention was ratified by Resolution of the Verkhovna Rada N 3939-XII ( 3939-12 ) dated 02.04.94);

- Convention MARPOL 73/78;

- Merchant Shipping Code of Ukraine;

- Order of the Ministry of Environment dated August 19, 2022 N 309 "On the approval of the methodology for determining damage caused to the surrounding natural environment within the territorial sea, the exclusive marine (economic) zone and internal sea waters of Ukraine in the Azov and Black Seas"

- Order of the Ministry of Social Policy dated 17.06.1999 N 112 (with amendments) "On approval of the Regulation on the development of plans for localization and liquidation of emergency situations and accidents"

- Resolution of the Cabinet of Ministers of Ukraine dated 17.07.2019 N 670 "On approval of the Procedure for the interaction of the state enterprise "Seaports Administration of Ukraine" and the State Environmental Inspection to ensure compliance with the legislation on environmental protection in the event of detection of cases of discharge of polluting substances by ships (vessels) within the water area seaport" and other.

At the same time, there are certain gaps that affect the level and effectiveness of the investigation of emergency situations, their descriptions in trainings and educational programs. As an example – the absence of a normative legal act (Methodology) regarding the algorithm of actions of state supervision/control bodies in the matter of detecting pollution, determining the pollution source, the amount of contaminated substances, the culprit of the accident and bringing him to justice. So, for example, the consideration of materials from the spillage of palm oil in the Sea Trade Port "Pivdennyi" (Black Sea) lasted from 2019 to 2021 precisely because of the lack of a step-by-step algorithm of actions.

Representatives of the Odesa State Environmental University take part in the issue of monitoring the Black Sea both as a result of emergency situations and in current plans. The main direction: the impact of pollution on the quality of water resources in the Black Sea basin and predictive modelling of these pollutions (Kakhovskaya HPP 2023). At the same time, the Ukrainian Scientific Center of Marine Ecology takes part in the selection of water samples from the place of pollution, the determination of exceeding the permissible concentrations, the formation of a report on the current situation and the mathematical modelling of the consequences of pollution with proposals for minimizing the consequences. Formation of the annual report on the state of the Black Sea.

Training of personnel to respond to emergency situations is carried out in the theoretical (lecture materials) and practical (trainings, educational alarms directly in practice) aspects. Officials of the environmental safety services and the port captaincy of the Seaports Administration of Ukraine hold practical classes every quarter in accordance with the requirements defined by the Plan for the Elimination of Emergency Situations (PLAS) and the Plan for the Elimination of Accidental Oil Spills (LARN). These measures are carried out in accordance with the Resolution of the Cabinet of Ministers of Ukraine dated 17.07.2019 N670 "On approval of the Procedure for the interaction of the state enterprise "Seaports Administration of Ukraine" and the State Environmental Inspection to ensure compliance with the legislation on environmental protection in the event of detection of cases of discharge of polluting substances by ships (vessels) within the water area seaport".

The main educational institution is Odesa State Environmental University:

- Ecology and environmental protection (regulation of nature use);

- Environmental law and state control (control and supervision of the implementation of environmental legislation, including pollution of the Black Sea);

- Postgraduate education (increasing the level of competence of environmental safety specialists).

## 2.5 Success factors and barriers that affect the scene of preparedness and response to marine pollution incidents. Key performance indicators.

### Bulgaria

The following **success factors and barriers** have been identified with respect to the preparedness to emergency response and marine pollution incidents in Bulgaria.

**Success factor 1:** Practical relevance and demand on the training course(s) results,

- the courses are dedicated to preparing of the staff of local and regional administrations and flag state companies and port administrations and some industrial enterprises for emergency response and reactions to marine pollution accidents;

- the courses related to MARPOL are part of sailors' certification process;

- the course(s) is needed for early warning systems forming by authorities;

- the training results of the course are dedicated to preparing of the staff for emergency response and reactions to marine pollution accidents.

**Success factor 2:** The course(s) meets global and national standards in the sphere of marine pollution preparedness and response (i.e. institutionally actual and up-to-date).

- The course is part of training arrangements on national, regional or EU level

- The course is related to a particular form of legal/regulatory requirements.

**Success factor 3:** The institutions providing the course receive governmental, public, private or mixed support, including funding support, grants.

**Success factor 4:** The course includes discussion of case studies.

- The instructors have experience of being involved in real life emergency situations of response on marine pollution.

**Success factor 5:** The course (for professional seamen mostly) provides training on waste recycling models or other innovations and demonstrates use of equipment.

- The course provides practical emergency and response training at sea, at training facilities.

- The course deals with early warning systems and elements of marine pollution preparedness and response.

**Success factor 6:** The most relevant types/sources of marine pollution are addressed in the training course.

- The course considers new sources of pollution (such as the armed conflicts) and is revised (updated) systematically.

**Success factor 7:** The course has aspects of inclusiveness e.g.:

- information about the course/training modules/curricula openly available to the public on-line;

- free of charge, availability in both online and physical presence form, ICT use, youth and women involved, other aspects of inclusiveness.

**Success factor 8:** The course incorporates data from scientific research and monitoring.

- The course envisages safety provisions, risk assessment, uses forecasting models that improve response readiness and pollution-risk mitigation.

- The course supports cooperation with other like-minded institutions, courses, programmes, networks of data exchange and actualization.

- Learning results of the training course have been included in scientific and other types of publications, or reports.

The following **barriers** have been identified:

**Barrier 1:** Insufficient or lacking financial and technical support, insufficient/lacking modern equipment and means.

**Barrier 2:** Detailed plans (including response procedures and financial responsibilities) for emergency response to marine pollution are available for oil pollution only, no plans for other pollutants with financial responsibilities are available.

**Barrier 3:** There is lack of networks for the "response readiness" data exchange, for cooperation with other like-minded institutions, courses, programmes.

There is need in common professional data portal that can provide necessary information about standards up-dates and to gather the community.

**Barrier 4:** The data on state of the marine environment in case of emergencies or pollution from accidents (especially from military pollutions sources) are restricted for public use in the training course.

**Barrier 5:** Lack of trainers with experience of being involved in real life emergency situations of response on marine pollution.

**Barrier 6:** Lack of methodological support and cooperation in format "authorities-universities-scientific institutions-NGOs".

**Barrier 7:** Some authorities engaged in marine pollution control do not have institutional responsibility (obligations) to organize the "response-oriented" training course. They organize it occasionally.

**Barrier 8:** Some of the courses are oriented rather on marine pollution accidents influence mitigation than on early warning and prediction of marine pollutions.

**SWOT Analysis:**

**Strengths:**

- Training programmes already meet global and national standards in the sphere of marine pollution

- The courses receive governmental, public, private or mixed support, including funding support, grants.

- Training programs with practical exercises, case studies

- Training programs provide training on waste recycling models or other innovations, demonstrates use of equipment.

- The most relevant types/sources of marine pollution are addressed

- Incorporation of scientific research in training programs.

- Inclusiveness (free of charge, availability online and physical presence form, ICT use, youth and women involved) and good stakeholder participation

**Weaknesses:**

- Lack or insufficiency of financial and technical support, lack of modern equipment.

- Detailed plans are available for oil pollution only, no plans for other pollutants with financial responsibilities are available

- Gaps in the integration, lack of networks and data exchange.

**Opportunities:**

- Practical relevance and demand on the training course(s) results

- Enhanced funding from international and national sources (governmental, public, private or mixed support).

- Cooperation with other like-minded institutions, courses, programmes, networks of data exchange and actualization Increased public awareness, engagement and support.

**Threats:**

- The data on marine pollution may be restricted for public use (especially concerning armed conflicts);

- Risks of Limited funding and resource constraints.

- Lack of trainers with experience

- Lack of cooperation in format "authorities-universities-scientific institutions-NGOs"

**Conclusion**

The main Strengths in marine pollution preparedness training programmes in Bulgaria is charachterized by high practical demand on practical results of the trainings. The cources are frequently a part of sailors' certification process. Professionals with both higher and secondary education are involved in the trainings, as well as volunteers.

The future of the training courses development depends on factors of funding sources availability, international collaboration progress, governmental support, and others. One of the main opportunities for the training courses development is the development of cooperation with other like-minded institutions, courses, programmes and building of networks for data exchange, enhanced funding from international and national sources.

## Georgia

The following Success Factors and Barriers can be established for Georgia:

**Success Factors:**

1. Georgia's participation in international projects such as DOORS, BRIDGE, and RESPONSE has facilitated knowledge exchange and capacity building, enhancing the preparedness and response awareness.

2. The involvement of governmental bodies such as the Ministry of Environmental Protection and Agriculture and the National Environment Agency ensures interest in approaches to marine pollution response.

3. Institutions like Batumi State Maritime Academy and the Maritime Transport Agency offer training programs that include practical exercises, simulations, and real-life scenarios.

4. Training programs often incorporate up-to-date scientific research, making use of advanced modeling systems and methodologies developed by institutions like Institute of Geophysics, also application portals like DOORS Black Sea SoS and BRIDGE Black Sea data portal.

5. Training programs try to include a diverse range of participants, including youth, women, and professionals from various sectors. The broad participation would help to build a comprehensive and resilient response framework. Particularly active are Young Black Sea Ambassadors of Georgia (three of them as of to date).

**Barriers:**

1. There is a lack of coordination among various training programs, leading to inconsistencies in training content and delivery.

2. Many institutions lack the necessary equipment and resources to conduct comprehensive training programs, limiting the scope and quality of training.

3. Continuous updating of training materials is essential, but there is a gap in the systematic integration of the latest scientific and technological advancements, state of the art approaches is missing, such as e.g. eDNA.

4. There is a need for more extensive field training and real-life simulations to better prepare participants for actual marine pollution incidents.

5. While efforts are made to raise public awareness, there is still a strong need for more intensive public information campaigns and educational programs.

**SWOT Analysis:**

**Strengths:**

- Governmental support and international collaboration.
- Training programs with practical exercises.
- Incorporation of scientific research in training programs.
- Inclusiveness and good stakeholder participation.

**Weaknesses:**

- Lack of coordination among training programs.
- Inadequate resources and equipment.
- Gaps in the integration of up-to-date scientific and technological knowledge.
- Limited field training and real-life simulations.

**Opportunities:**

- Enhanced funding from international and national sources.
- Improved coordination and standardization of training programs.
- Greater incorporation of technological advancements and scientific research.
- Increased public awareness, engagement and support.

**Threats:**

- Limited funding and resource constraints.
- Potential delays in the implementation of new training methodologies.
- Environmental and geopolitical challenges affecting the region.
- Resistance to change and adaptation to new practices.
- Major development projects without due control.

**Conclusion**

The success of marine pollution preparedness and response in Georgia depends on various factors, including international collaboration, governmental support, and comprehensive training programs. However, challenges such as lack of coordination, resource constraints, and the need for up-to-date knowledge integration must be addressed. By leveraging strengths and opportunities while mitigating weaknesses and threats, Georgia can enhance its capacity to effectively respond to marine pollution incidents. Key performance indicators across external and internal dimensions should provide a framework for assessing and improving the effectiveness of training programs.

## Romania

The **success factors,** identified based analysis of the questionnaire and certain replays from stakeholders regarding training courses in domain of marine pollution and emergency response in Romania, are the following:

- the existence of institutional and legal framework in Romania includes periodic exercise and meetings/workshops for discussion of various marine pollution and associated case studies.

- RNA and CERONAV's training courses for different specialities certification and degree of all personal navigator includes emergency response and prepareness to accidental marine pollution, acorgind with IMO conventions (MARPOL 73/78), regional conventions and national legal framework for marine pollution.

- the assessment of MSFD stage of implementation and associated monitoring is a continuous process through periodic project/grant funding schemes, including training schemes, under the coordination of MEWF.

- training courses in marine pollution are part of the curiccula of all Natural Sciences and technical Faculties in Romania, but also are subject of Romanian NGOs interventions in various public awareness actions, especialy for marne litter pollution.

- Research institutes involved in marine pollution monitoring and marine pollution projects at the national, regional or EU level, have training activities as part of dissemination and technological transfer of the projects results, for various stakeholders, from governmental, public to private domain.

**Barriers** have been identified, as follow:

- Discontinuity of financial support for the marine pollution mitigation actions, including the project based monitoring for marine pollution, give certain inconsistency of coordination for such activities, involving training course for various cases, type of pullution and emergency response in case of pollution

- The level of knowledge for the new EO monitoring technologies and IYC/web technologies determine the practicality level of the training courses and the channel of communication.

- The lack of IT designated platform, as adequate DSS, for marine pollution determine an incomplete decisional process, certain redundant procedures in case of emergency

**SWOT Analysis:**

**Strengths:**

- Governmental support (periodic exercises and meetings are prescribed by institutional and legal framework in Romania)
- Case studies and international collaboration
- Training programs with practical exercises
- Inclusiveness and good stakeholder participation
- Marine pollution are part of the curiccula of all Natural Sciences and technical Faculties in Romania

**Weaknesses:**

- Lack of financial resources and equipment.

**Opportunities:**

- Enhanced funding from international and national sources.
- Improved coordination and standardization of training programs.
- Romanian NGOs interventions in various public awareness actions, especialy for marne litter pollution

**Threats:**

- Limited funding and resource constraints.

**Conclusion**

The strengths and weaknesses for marine pollution training courses in Romania, are related to the existence of such trainings, but at a low level of knowledge and technological actuality.

In the present, there is an opportunity (as a part of SWOT analysis) to extend the transboundary effort to evaluate and control marine pollution, because the Black Sea is the world attention, and its geopolitical importance is reflected in new research and monitoring programs extended in the region Interreg Next program for Black Sea. There is no threats identified for trainings in Romania due to its necessity in society, existence of ongoing specific projects and existence of institutional and legal framework.

## Ukraine

**The success factors** that contribute to preparedness and response to marine pollution incidents, identified as a result of analysis of the interviews with stakeholders with regard to training courses in a realm of marine pollution and emergency response in Ukraine, are notably the following:

In 2021, the Marine Environmental Protection Strategy of Ukraine was developed; the strategic document defined the main tasks and priorities in this realm. In addition, on January 5, 2022 the

Ukrainian Environmental Monitoring Program was adopted. This is especially topical due to the risks presented by the Russian-Ukrainian armed conflict and the potential pollution risks mitigation.

Active involvement in international activities and projects is also considered to be one of the key **Strengths** for stakeholders with regard to training courses in a realm of marine pollution and emergency response in Ukraine, i.e Ukrainian Scientific Center of Ecology of the Sea. (UkrSCES) is an active participant in 8 international projects, in particular, the EMBLAS project, which is a long-term project that started back in 2016 and went through several stages of transformation (It is now called EU4EMBLAS and actively promotes the development of monitoring in the Black Sea).

Research results of the institutes involved in marine pollution monitoring and marine pollution projects at the national, regional level, namely UkrSCES, the Institute of Marine Biology, Odesa National University named after I.I. Mechnikov, Odesa State Ecological University, Institute of Market Problems and Economic and Environmental Research of the National Academy of Sciences of Ukraine, were used in the process of developing a Marine Environmental Protection Strategy of Ukraine, which demonstrates a high level of scientific substantiation of strategic documents during their development.

Certification regarding environmental standards management ISO 14000 was applied by the State Enterprise "Ukrainian Sea Ports Authority" (SE "USPA"). The authority is directly governed by the Ministry of Infrastructure of Ukraine and manages all seaports authorities and other infrastructure objects, contributing to the development of each of them/

In compliance with national legislation, the State Enterprise "Ukrainian Sea Ports Authority" carries out monitoring studies of the state of the water areas of ports, and atmospheric air in the area of the ports. Therefore, we certainly have statistical data on the state of the environment. We have a very extensive monitoring system (i.e. laboratory monitoring, visual monitoring the rounds of the water area of the port, which is carried out twice a day, as well as, monitoring by means of using a system specialized sensors for monitoring the state of the environment ).

The State Enterprise "Ukrainian Sea Ports Authority" have enough material and institutional support necessary to respond (including equipment, IT support, etc.) to prevent and minimize pollution of the marine environment in accordance with national and international legal obligations. The material basis comprised of the appropriate equipment, ranging from specialized forces and means to respond directly to pollution including boom barriers of various types (absorbing, permanent buoyancy devices, for the inner parts of the water area of ports, heavy boom barriers to respond to pollution in the open part of the water area of ports), and specialized vessels of the type of oil scavenger. In addition, such forces and means include specialized oil-collecting skimmer devices for collecting spilled oil or other pollutants from the water surface, as well as specialized sorbents-biodestructors for the final liquidation of the oil film, sprayers of sorbents.

**The barriers** (weaknesses) identified interviews with stakeholders with regard to training courses in a realm of marine pollution and emergency response in Ukraine, as follows:

While understanding the importance of state financing for utilizing the latest technologies and materials to mitigate risks of marine pollution, It is revealed that the State Enterprise "Ukrainian Sea Ports Authority" has obtained specialized oil skimmers and lateral oil product collection systems as technical assistance from the European colleagues to strengthen the capacity to respond to

pollution in the Odesa region. Thus, the lack of public funding threatens the capacity for mitigate risks of marine pollution especially under conditions of the Russian-Ukrainian armed conflict and the potential pollution risks connected with it.

An absence of the need to undergo practical training on the elimination of marine pollution, in accordance with the national legislator of Ukraine could also be considered as a weakness within preparedness and response to marine pollution incidents.

The definite **weakness** with a regard to preparedness and response to marine pollution incidents is a declining interest of stakeholders in specialized courses related to the state of the marine environment in the process of unifying education for - "non-transport specialties".

The lack of IT designated platform, as adequate DSS, for marine pollution determine an incomplete decisional process, certain redundant procedures in case of need for emergency response caused by pollution

**A scope of opportunities** to extend the methodological basis and practical relevance of the training courses is associated with international projects in this realm, especially those related to international technical assistance projects on maritime safety, safety and protection of the marine environment in the regions of the Black and Caspian Seas, which is implemented by the European Maritime Safety Agency and other projects. The main Opportunities in Ukraine include:

- Availability of institutional readiness to develop specialized courses (availability of professional publications, repositories, a staff of highly qualified teachers, opportunities for information dissemination, etc.).

- Possibility of participation in international programs and projects related to marine environment protection.

- Provision of additional, free access to information systems by international partners.

- Collaboration with other universities, government organizations, private entities, and research centers, including those from other countries with extensive practical experience in responding to marine pollution incidents – exchange of experiences, information, monitoring data, participation in training, etc.

- Organization of internships and practical training for students at environmental organizations, seaports, research stations, as well as involving them in the development and implementation of environmental projects.

- Capacity to collaborate with the public, conduct joint seminars, training sessions, environmental campaigns, etc.

**The most of threats** identified for trainings in Ukraine the Russian-Ukrainian armed conflict and the potential pollution risks connected with it. There is a potential threat of the lack of a practical possibility to eliminate the consequences of pollution due to threats of shelling from the Russian side. The most relevant threats include:

- Instability of the political situation and legislative framework regarding environmental protection, which may affect the prioritization of environmental issues related to marine pollution.

- Restrictions on the ability to conduct marine research due to the martial law.

- Presence of a gap between theoretical knowledge and practical skills necessary for effective response to marine pollution.

- Reduction in demand for specialists in marine pollution in the national sector, leading to: reduced budgetary funding for this area; reduction in teaching staff positions; shortened duration of specialized courses.

- Focusing on providing more basic knowledge, reducing in-depth study of specialized courses on marine pollution issues, and the possibility of obtaining specialization in marine pollution issues mainly at the master's level or through advanced training courses.

- Limited funding for the practical aspects of the issue.

**SWOT Analysis:**

**Strengths:**

- Training programmes meet the most of global and national standards in the sphere of marine pollution
- The courses receive support, including funding support, grants.
- Training programs with practical exercises, case studies
- Incorporation of scientific research in training programs.
- Inclusiveness (free of charge, availability online and physical presence form, ICT use, youth and women involved) and quite a good stakeholder participation

**Weaknesses:**

- Lack of financial and technical support, lack of modern equipment.
- Gaps in the integration, lack of networks and data exchange.

**Opportunities:**

- Availability of institutional readiness to develop specialized courses
- Possibility of participation in international programs and projects
- Collaboration with other universities, government organizations, private entities, and research centers
- Organization of internships and practical training

- Capacity to collaborate with the public, conduct joint seminars, training sessions, environmental campaigns

- Availability of institutional readiness to develop specialized courses

- Possibility of participation in international programs and projects

- Collaboration with other universities, government organizations, private entities, and research centers

- Organization of internships and practical training

- Capacity to collaborate with the public, conduct joint seminars, training sessions, environmental campaigns

**Threats:**

- Instability of the political situation and legislative framework regarding environmental protection
- Restrictions on the ability to conduct marine research due to the martial law.
- Presence of a gap between theoretical knowledge and practical skills
- Reduction in demand for specialists in marine pollution
- Focusing on providing more basic knowledge, reducing in-depth study of specialized courses on marine pollution issues
- Limited funding

**Conclusion**

The activeness and success of marine pollution mitigation and readiness trainings in Ukraine depends on many factors, but the main influence is caused by war and instability as a result. The success of preparedness depends on governmental support and international collaboration. One of the main opportunities include creation of networks for data-exchange, knowledge-dissemination and digitalization in order to increase training programs capacity.

# 3. Conclusions

## Bulgaria

Although there are areas where improvements could be made in the training plans and curricula for response to marine disasters and accidents and marine pollution in Bulgaria, the country has a number of achievements:

National regulations and strategies are available. Bulgaria has national regulations and strategies aimed at preventing and responding to marine disasters and accidents, marine pollution and environmental management. These documents provide a framework for the development and implementation of training plans and curricula.

Capacity development of key organisations is implemented. Several key organisations in Bulgaria, such as the Maritime Administration Executive Agency, the Black Sea Basin Directorate and the Ministry of Environment and Water, have experience in marine disaster response and environmental management.

International cooperation is implemented. Bulgaria participates in various international initiatives and forums related to response to maritime disasters and accidents, marine pollution and environmental management. This cooperation allows sharing of knowledge, best practices and resources that can contribute to the development of effective training plans and curricula.

EU Directives are implemented in Bulgaria. As a member of the European Union, Bulgaria is obliged to implement several directives related to maritime affairs, environmental protection, and disaster risk management. These directives set minimum standards and requirements that can help improve the overall effectiveness of training plans and curricula.

Regular evaluations and reviews of existing response measures to marine disasters and accidents and marine pollution are implemented. They identify areas for improvement and inform the development of new training plans and curricula.

In conclusion, although there is room for improvement in training plans and curricula for response to marine disasters and marine pollution in Bulgaria, the country has already made some progress and built up some capabilities in this area. By continuing efforts to build on these strengths and address identified weaknesses, Bulgaria can further improve its preparedness and response capability for maritime disasters and accidents and marine pollution. There is still considerable scope for improving the effectiveness of training plans and curricula in Bulgaria. This requires a concerted, multi-faceted approach that includes increasing funding, investing in modern equipment and resources, encouraging greater stakeholder involvement and ensuring regular review and updating of programmes.

## Georgia

The evaluation of existing training plans and curricula in Georgia based on the opinions of the stakeholders and expert judgement by GMG/FoE-GE RESPONSE team reveals a landscape of marine pollution preparedness and response efforts currently available. While certain strides have been made, there are critical areas that require attention and improvement to enhance the effectiveness of these training programs.

**Summary of Existing Training Plans and Curricula:**

1. Georgia has engaged a range of stakeholders including governmental institutions, educational and research organizations, and NGOs. These engagements has facilitated certain level of interest to marine pollution training.

2. Training programs sometimes incorporate scientific research, ensuring that participants are exposed to the latest findings and methodologies, such as those promoted by European initiative like DOORS, BRIDGE, etc.

3. Some training programs include practical exercises and simulations, which are crucial for preparing participants for real-life marine pollution incidents. For example, the Maritime Transport Agency claims that conducts regular oil spill response drills.

4. Efforts have been made to include youth, women, and professionals from various sectors in training programs. Courses are available in both online and often in offline formats, ensuring some accessibility.

**Effectiveness of Past and Existing Training Schemes:**

1. Past training schemes have to a certain degree enhanced the preparedness of various institutions and individuals to respond to marine pollution incidents. Regular drills and exercises have built a certain foundation of practical skills and knowledge.

2. Participation in international projects such as DOORS and BRIDGE has facilitated knowledge exchange and capacity building. These collaborations have introduced advanced methodologies and best practices to Georgian stakeholders, such as how state of the art marine and maritime FAIR data portals should look like.

3. NGOs and educational institutions have played some role in raising public awareness about marine pollution issues. Initiatives like beach clean-up and machine lerning counts can contribute to more informed and engaged public.

**Main Areas for Further Improvement:**

1. There is a need for better coordination and standardization of training programs across various institutions. A unified approach would enhance the consistency and effectiveness of these programs.

2. Many institutions lack the necessary resources, including advanced equipment and adequate funding, to conduct comprehensive training programs. Addressing these resource constraints is essential for improving training quality.

3. Continuous updating of training materials is necessary to keep pace with scientific and technological advancements. The integration of modern tools such as eDNA and advanced modeling systems should be prioritized, as well as state of the art equipment and capability supply.

4. More extensive field training and real-life efforts are needed to better prepare participants for actual marine pollution incidents. These practical experiences are invaluable for building response capabilities.

5. There is a need for more intensive public information campaigns to raise awareness about marine pollution and response efforts. Engaging the broader community is crucial for building a resilient response framework.

6. Georgia needs research vessel capability, needs functional marine and maritime FAIR data portal.

**Recommendations for Improving Current Training Plans:**

1. Designate a national coordination body to oversee marine pollution training programs, ensuring consistency and standardization across institutions.

2. Secure additional funding from national and international sources to support training programs. Invest in advanced equipment and facilities to enhance training quality.

3. Strengthen collaborations between governmental institutions, educational organizations, NGOs, and the private sector to pool resources and expertise.

4. Implement a systematic process for updating training materials to incorporate the latest scientific research and technological advancements.

5. Increase the frequency and scope of field training and real-life simulations to provide participants with practical experience.

6. Setup and launch comprehensive public information campaigns to raise awareness about marine pollution issues and the importance of preparedness and response efforts. PDF data documents are not sufficient.

In conclusion, Georgia has limited progress in developing training plans and curricula for marine pollution preparedness and response. However, addressing the identified areas for improvement and implementing the recommended actions will significantly enhance the effectiveness and resilience of these training programs. By leveraging strengths and opportunities while mitigating weaknesses and threats, Georgia can build a robust framework for marine pollution response, ensuring the protection of its marine environment for future generations.

## Romania

In Romania, at national level, there is a need of coordination and polarized actions for the implementation of new training curricula for a rapid and adequate response to marine pollution, especially in the context of the new war associated sources of marine transboundary pollution. Several new up-dated training schemes are required for a progress of operational capabilities in rapid and effective intervention in emergency situations, for both of the authorities and stakeholders in the case of real events, as well as for the preparation of environmental specialists and navigatioon staff, and also the degree of understanding of the public, in interrelated situations, including the civic behaviour related to plastics pollution of the marine environment.

## Ukraine

Existing educational plans and educational programs regarding marine pollution are oriented in two directions:

- Practical aspects of combating, preventing and eliminating the consequences of marine pollution on sea transport;

- Theoretical elements of oceanological research, transformation of pollution in the marine environment and risk management;

- Separate aspects of marine pollution risk management in courses related to elements of the development of the "blue economy".

Despite the fact that there are training courses for responsible structures of the Administration of Seaports of Ukraine, this activity is not transparent enough for the general public and remains sporadic, implemented at the expense and at the initiative of international maritime organizations.

The improvement of the current training plans, curricula and educational structure in the field of marine pollution can be related to the further systematization of courses, ensuring the demand for such knowledge among basic stakeholders, local authorities, the restoration of the Maritime Rescue Service, the development of the Navy, other security systems , development of the monitoring system based on the inclusion of financial and organizational elements in the structure of the sectors of the "blue economy" of the Black Sea.

# Appendix I – Questionnaire forms for face-to-face detailed interview with the RESPONSE Stakeholders in Black Sea basin partner-countries

**A: For representatives of universities, colleges, training/education centers, administrative structures providing civil defense and emergency response training (interior, navy, seagoing professionals, administrations)**

Stakeholder's Institution_____,

Name of stakeholder and position _____

_____

(***Signed consent form is obligatory. The interview should be recorded to be used in analyses and publications, if necessary, as described in the consent form***)

1. Does your Institution provide training course/training modules/curricula related to marine pollution, especially addressing marine pollution preparedness and response?

***If yes, please specify*** about the nature of the training course: is it specially designed to address monitoring, reporting, control/management and mitigation of marine pollution; does it address emergency response to natural and technogenic disasters related to pollution, including marine pollution; is it related to civil defense?

_____

_____

2. Is information about the course/training modules/curricula openly available to the public, to what extent, where? ***Please, explain***. Do you provide information applying the procedure of access to public information? Is the course part of training arrangements on national, regional, EU level?

_____

_____

3. What stakeholders are the target audience for your training? ***Please, explain and give examples.***

_____

_____

4. What types/sources of marine pollution with their relevant aspects are addressed in your training course? Please, specify about types and aspects – environmental, technical, legal, economic, social etc.

_____

_____

5. What is the type of your institution – governmental, public, private or receives mixed support? What funding sources are used for institutional support of the training course? – public/governmental, private, business, EU support, mixed (please, explain)

_____

_____

6. What is the duration of the training course? What are the stakeholder groups trained? (Please, explain in more detail) Please explain about the curriculum.

_____

_____

7. What aspects of inclusiveness are there in the training course – e.g. free of charge, availability in both online and physical presence form, ICT use, youth and women involved, other?

_____

_____

8. Does your course provide training to meet global and national standards in the sphere of marine pollution preparedness and response? Is it related to a particular form of legal/regulatory requirements (e.g., international, regional convention, plan, national law, plan, strategy, etc.)? ***Please specify***: Does it deal with early warning systems and elements of marine pollution preparedness and response? Does the training include discussion of case studies? Does the training envisage safety provisions, risk assessment, prediction and forecasting models? Does it consider new sources of pollution (such as the armed conflicts)? Does it provide training on waste recycling models and other innovations (e.g. for merchant shipping waste management, specific onboard solutions etc.? Please specify about other relevant features?

_____

_____

9. Does your training course incorporate data from scientific research and monitoring and from what sources, does it exchange data and results with other training institutions and/or networks, does it rely on update of data, does it demonstrate use of data equipment, does it provide practical emergency and response training at sea, at training facilities?

_____

_____

10. Have representatives of your institution been involved in real life emergency situations involving marine pollution? ***Please, explain about them***.

_____

11. Have you provided any training/learning results of your training course to be included in scientific and other types of publications, or reports? Are they openly available? Can you help us with bibliography, publications etc.?

_____

_____

*12.* Please add any other information you feel is important regarding your institution's role in preventing marine pollution. *Please specify about participation in relevant national, international and EU funded projects and provide links.*

_____

_____

*13.* Can you mention SWOT (strengths, weaknesses, opportunities and threats) characteristics of your training course – strong and weak features, opportunities, and threats? *(optional)*

_____

_____

**B: For representatives of administrations involved in combating pollution and emergencies, involved in training (of their staff), coordinating, or managing emergency situations**

Stakeholder's Institution_____,

Name of stakeholder and position _____

_____

(***Signed consent form is obligatory. The interview should be recorded to be used in analyses and publications, if necessary, as described in the consent form***)

1. What is the type of your Institution – governmental, public, private – and what is its subordination or affiliations on national level?

_____

_____

2. What are your institution's responsibilities regarding the state of the marine environment? ***Please, specify*** about routine, monitoring or emergency responsibilities e.g., related to pollution from shipping, quality of waters, bathing waters quality, pollution from land based and sea-based sources, surveillance of maritime traffic, surveillance of the sea area for pollution from armed conflicts etc.

_____

_____

3. Is your institution involved in trainings to prepare its staff for emergency response and reactions to marine pollution accidents? What members of the staff (positions, responsibilities) are being trained, how often, what is the length of the trainings? What is the subject of training?

_____

_____

4. Has your institution obligations to organize and conduct trainings on emergency response to accidents/disasters, including marine pollution accidents? ***Please, specify***. Is information about the courses/trainings publicly available and where?

_____

_____

5. Does your training plan/curriculum include case studies/descriptions and good practices? ***If yes, please, specify.***

_____

_____

6. Has your institution role/obligations to coordinate activities under emergency real life response to accidents/disasters, including marine pollution accidents? Please, specify. What is the legal framework of those obligations? What is your institution's role in prevention, preparedness, response, protection of the population and the marine environment, mitigation of effects of pollution, clean-up and remedial activities, informing the public etc.?

_____

_____

7. Has your institution taken part in real life accidents/disasters, including marine pollution accidents? ***Please, specify***. Is information about that openly available to the public, where, in what form?

_____

_____

8. Is your institution obliged to provide data and keep records of its trainings and monitoring activities and the results of activities related to protection of the marine environment after accidents, emergencies, disasters? Are they openly available and where? Are they proactively provided to the public, to media and to other institutions and how? Have those results been incorporated in analyses, reports, publications – please specify? Are they available and where?

_____

_____

9. Does your institution use data from scientific research and/or monitoring for training purposes? From what sources and how? Does it use data for emergencies and pollution of the marine environment from armed conflicts? ***Please, specify***.

_____

_____

10. Does your organization have the material and institutional support necessary for response capabilities (including equipment, IT support, etc.) to prevent and minimize pollution of the marine environment under obligations of the national and international law?

_____

_____

*11.* Please add any other information you feel is important regarding your institution's role in preventing marine pollution. *Please specify about participation in relevant national, international and EU funded projects and provide links.*

_____

_____

**C: For representatives of scientific institutes, and others such as agencies, laboratories – mainly involved in monitoring parameters of the environment and marine pollution (regular or in case of emergencies, nature disasters etc.), NGOs (some involved in specific monitoring and awareness activities) and some others**

Stakeholder's Institution_____,

Name of stakeholder and position _____

_____

(***Signed consent form is obligatory. The interview should be recorded to be used in analyses and publications, if necessary, as described in the consent form***)

1. What is the type of your institution – governmental/public, private – and what is its subordination or profile regarding activities related to protection of the marine environment?

_____
_____

2. What are your institution's responsibilities regarding the state of the marine environment? ***Please, specify*** about monitoring and/or emergency responsibilities e.g., related to the state of the marine environment in case of pollution including pollution from armed conflicts etc.

_____
_____

3. What are those obligations (legal framework support)– e.g., national marine strategy, MSFD monitoring programme on national and regional level, other documents? ***If relevant***, please specify involvement in monitoring of the Marine Strategy Framework Directive's (MSFD) descriptors or consider the following ***(if there are no obligations under MSFD)***: monitoring of parameter(s) of the marine environment (e.g. physical, chemical, ecological), monitoring of the state of marine biodiversity and protection of marine biodiversity, prevention of introduction of non-indigenous species, monitoring of the state of commercially exploited fish and shellfish, monitoring of hydrographical conditions and effects of climate change, monitoring and prevention of eutrophication, monitoring of contaminants, incl. in seafood, marine litter prevention and monitoring of marine litter, incl. war conflict military items, prevention or monitoring for underwater noise and other energy inputs (heat, electricity, artificial light, electromagnetic radiation, radio waves or vibrations, etc.)

Is the data openly available and where? Please, specify. Please kindly provide examples, links.

_____

_____

4. What are your institution's obligations for monitoring the state of the marine environment in case of emergencies or pollution from accidents? Especially about pollution from armed conflicts. Please specify. Have you conducted such monitoring? Is the data openly available and where? Please, specify. Please kindly provide examples, links.

_____

_____

5. What is your institution's involvement in education and/or training related to the protection and monitoring of the marine environment? Has any staff member been trainer in course for emergency response, or taken part in preparation of materials and curricula for such a course?

_____

_____

6. Is your institution's staff involved in trainings to prepare them for emergency response and reactions to marine pollution accidents?

_____

_____

7. Has your institution provided information for the public in cases of marine pollution accidents? Please explain how.

_____

_____

8. Has your institution provided data and information from activities related to marine pollution accidents and emergencies for analysis, scientific publications, reports to institutions? Has it exchanged data with regional partners and other institutions in the process of addressing emergencies? Are those publicly available and where? ***Please, specify***.

_____

_____

9. Please add any other information you feel is important regarding your institution's role in preventing marine pollution. *Please specify about participation in relevant national, international and EU funded projects and provide links.*

_____

_____