





Promoting Technology Innovation in Environmental Monitoring and Modelling for Assessment of Fish Stock and Non-fish Resources

Deliverable D.T4.1.1

Study on transboundary coordination mechanisms, available organisational and human resources in the area, and their relevance to the planned technological upgrade. Identifying priority issues, set in accordance to the MSFD and DCF.

TIMMOD

Reference No. BSB-1029



| Document ID: | D.T.4.1.1 | | |
|---|--|--|--|
| GA, Act.: | T4: Deliverable DT4.1.1 Study on transboundary coordination mechanisms, available organisational and human resources in the area, and their relevance to the planned technological upgrade. Identifying priority issues, set in accordance to the MSFD and DCF. | | |
| Activity: A.T4.1 Study on mechanisms, available o resources in the area, ar planned technological upg issues, set in accordance to | | transboundary coordination rganisational and human Id their relevance to the grade. Identifying priority the MSFD and DCF. | |
| Author / Project Partner: | Date: | Version: | |
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TABLE OF CONTENTS

| AB | ABBREVIATIONS | | | | |
|----|---|--|--|--|--|
| 1 | INTRODUCTION | | | | |
| 2. | REVIEW ON EXISTING MECHANISMS FOR TRANSBOUNDARY COORDINATION IN ENVIRONMENTAL MONITORING ON FISH AND NON-FISH RESOURCES IN ACCORDANCE TO MSFD, DCF, BLUE GROWTH & BLUE ECONOMY INITIATIVES IN THE BLACK SEA | | | | |
| | 2.1 EU AND INTERNATIONAL SUPPORT OF TRANSBOUNDARY COORDINATION: | | | | |
| | 2.1 REGIONAL COOPERATION INITIATIVES | | | | |
| 3. | NATIONAL PROGRAMS AND STRATEGIES, ORGANIZATIONAL AND HUMAN RESOURCES IN THE BLACK SEA PARTNER COUNTRIES | | | | |
| | 3.1 NATIONAL MONITORING PROGRAMS, STRATEGIES, LONG-TERM PLANS, SHORT TERM PRIORITIES RELEVANT TO TRANSBOUNDARY COORDINATION (INCLUDING RESOURCE PROVISION, AVAILABLE FUNDING MECHANISMS) 16 | | | | |
| | 3.2 Relevant projects carried out in the fields of fisheries, aquaculture, and seafood processing 38 | | | | |
| | 3.3 AVAILABLE ORGANIZATIONS/ INSTITUTIONS AND HUMAN RESOURCES | | | | |
| | 3.4 Status of implementation of the planned measures and the evaluation of achieved results focused on technological issues | | | | |
| 4 | GAP ANALYSIS. BARRIERS AND ENABLERS ON HOW THE TECHNOLOGICAL UPGRADE WILL FAVORABLY INFLUENCE THE CROSS-BORDER INFORMATION EXCHANGE AND THE IMPLEMENTATION OF MSFD AND DCF PROGRAMMES AT BS BASIN SCALE | | | | |
| | 4.1 LEGAL AND OTHER NON-TECHNOLOGICAL BARRIERS | | | | |
| | 4.2 TECHNOLOGICAL BARRIERS | | | | |
| | 4.3 OPPORTUNITIES/ENABLERS | | | | |
| 5 | CONCLUSIONS AND RECOMMENDATIONS ON THE MAIN STEPS AND ACTIONS TO ACHIEVE THE GOALS OF THE FUTURE INNOVATION STRATEGY | | | | |
| • | REFERENCES | | | | |

List of Figures:

| Figure 1. Black Sea basin (Source: Black Sea Strategic Research and innovation Ageda) |
|--|
| Figure 2. Overview of DG MARE's plan 2020-2024 10 |
| Figure 3. Main pillars on which a new set of research and innovation actions can be developed 13 |
| Figure 4. The processes of fishery monitoring, stock assessment, consultations, and advice of STECF to policy and regulation for EC and Parliament |
| Figure 5. Diagram for fishery monitoring, stock assessment, consultations, and advice of STECF to policy and regulation for EC and Parliament |
| Figure 6. Environmental Pollution Monitoring Department Human Resources, NEA Georgia |
| Figure 7. Fisheries, Aquaculture and Water Biodiversity Dept. Human Resources, NEA Georgia 55 |

List of Tables:

| Table 1. SRIA Pillar 3 main activities | 14 |
|---|----|
| Table 2. International Environmental Conventions and Protocols, Georgia | 18 |
| Table 3. Organisations dealing with water monitoring in Moldova | 62 |

ABBREVIATIONS

| AUTh | Aristotle University of Thessaloniki, Greece | | | |
|------------|---|--|--|--|
| BDCA | Black Sea - Danube Association for Research and Development, Bulgaria | | | |
| DDNI | Danube Delta National Institute, Romania | | | |
| IFR | Institute of Fish Resources, Bulgaria | | | |
| NEA (LEPL) | National Environmental Agency (Environmental Pollution Monitoring Department and Fisheries, Aquaculture and Water Biodiversity Department), Georgia | | | |
| RECM | Regional Environmental Centre, Moldova | | | |
| | | | | |
| BSEC | Black Sea Economic Cooperation | | | |
| BSC | Black Sea Commission on the Protection of the Black Sea Against Pollution | | | |
| CFP | Common Fishery Policy (of the EU) | | | |
| CMA | Common Maritime Agenda (for the Black Sea) | | | |
| CMEMS | Copernicus - Marine Environment Monitoring Service | | | |
| DCF | Data Collection Framework | | | |
| EFCA | European Fisheries Control Agency | | | |
| EMSO | The European Multidisciplinary Seafloor and water column Observatory | | | |
| EAFA | Executive Agency of Fisheries and Aquaculture, Bulgaria | | | |
| FAO | Food and Agriculture Organisation | | | |
| GFCM | General Fisheries Commission for the Mediterranean | | | |
| ICF | Indicator to Monitor and Evaluate Connectivity | | | |
| ICT | Information and Communication Technology | | | |
| IHF | Indicator to monitor and evaluate Mesohabitats | | | |
| KPI | Key Performance Indicator | | | |
| MONGOOS | Mediterranean Operational Network for the Global Ocean Observing System | | | |
| MSFD | Marine Strategy Framework Directive of the EU | | | |
| MSP | Maritime Spatial Planning (Directive of the EU) | | | |
| WFD | Water Framework Directive of the EU | | | |

1 INTRODUCTION

This report presents a Study on transboundary coordination mechanisms, available organisational and human resources in the area, and their relevance to the planned technological upgrade, lidentifying priority issues, set in accordance to the MSFD. The report was developed as Deliverable DT4.1.1, within Group Activity A.T4.1, in the period May 2020 - January 2021, following the work plan of the TIMMOD BSB 1029 project within the Black Sea Basin Program 2014-2020.

The report was developed as a collective effort of the 6 TIMMOD partners from the Black Sea region, from Bulgaria, Georgia, Moldova, Romania and Greece, under the coordination of the Group Activity Leader, NEA, in cooperation with the Lead Beneficiary IFR and project partner BDCA. The Study presents transboundary coordination mechanisms, available organisational and human resources in the study area, and their relevance to the planned technological upgrade determine the status of the marine and coastal ecosystems, collection of the information is conducted by the NEA. Apart from bilateral cooperation, cooperation with the other Black Sea countries exists within the framework of the Commission on the Protection of the Black Sea against Pollution and with the EU.

This report aims to provide results of a study carried by TIMMOD partners on transboundary coordination mechanisms, available organisational and human resources in the area, and their relevance to the planned technological upgrade. Identifying priority issues, set in accordance to the Marine Strategy Framework Directive (MSFD and the Data Collection Framewrok (DCF).

The MSFD provides a holistic policy to protect the marine environment of the seas around Europe (including Black Sea), while enabling the sustainable use of marine goods and services. The MSFD has been in force since 2008. It requires Member States to set up national marine strategies to achieve, or maintain where it exists, 'good environmental status' by 2020. Deapite not all of Black Sea states are Member state, the MSFD principles are in general accepted by most of them

The ecosystem-based approach aims to ensure that the cumulative pressures of human activities do not exceed levels that compromise the capacity of ecosystems to remain healthy, clean and productive. By virtue of the MSFD, the ecosystem-based approach became a legally-binding and operational principle for managing the EU's entire marine environment, including in particular the Black Sea environment.

The EU framework for the collection and management of fisheries data is the Data Collection Framework (DCF). Under this framework the Member States (MS) collect, manage and make available a wide range of fisheries data needed for scientific advice. The data is collected on the basis of National Programmes in which the MS indicate which data is collected, the resources they allocate for the collection and how data is collected. MS report annually on the implementation of their National Programmes and the Scientific, Technical and Economic Committee for Fisheries (STECF) evaluates these Annual Reports. A major challenge (addressed also in this report) is how to inegrate the MS National Programmes with those operated in non-member states.

<u>Section 2</u> of this report presents a REVIEW ON EXISTING MECHANISMS FOR TRANSBOUNDARY COORDINATION IN ENVIRONMENTAL MONITORING ON FISH AND NON-FISH RESOURCES IN

ACCORDANCE TO MSFD, DCF, BLUE GROWTH & BLUE ECONOMY INITIATIVES IN THE BLACK SEA. Focus is put on regional cooperatin initiatives in blue economy, supported by the European Commisison.

<u>Section 3</u> provides detailed information on NATIONAL PROGRAMS AND STRATEGIES, ORGANIZATIONAL AND HUMAN RESOURCES IN THE BLACK SEA PARTNER COUNTRIES. The six Project partners provided their detailed input regarding available organisational and institutional resources, national programs and strategies, relevant projects, status of implementation of the planned measures to enhace regional cooperation in marine research, and the evaluation of achieved results focused on technological issues

Based on the above information, a gap analysis is presented in <u>Section 4</u>, for identification of barriers and enablers on HOW THE TECHNOLOGICAL UPGRADE WILL FAVORABLY INFLUENCE THE CROSS-BORDER INFORMATION EXCHANGE AND THE IMPLEMENTATION OF MSFD AND DCF PROGRAMMES AT BS BASIN SCALE.

Finaly, some CONCLUSIONS AND RECOMMENDATIONS are presented in <u>Section 5</u> identifying THE MAIN STEPS AND ACTIONS TO ACHIEVE THE GOALS OF THE TIMMOD INNOVATION STRATEGY.

2. REVIEW ON EXISTING MECHANISMS FOR TRANSBOUNDARY COORDINATION IN ENVIRONMENTAL MONITORING ON FISH AND NON-FISH RESOURCES IN ACCORDANCE TO MSFD, DCF, BLUE GROWTH & BLUE ECONOMY INITIATIVES IN THE BLACK SEA

2.1 EU and international support of transboundary coordination:

The Black Sea region comprises a diversity of cultural, language, ethnic, and religious identities. Heterogeneity is also met in terms of the economic structure, size, and political orientation of Black Sea countries. It is thus, not merely a crossroads of geopolitical significance but also a crossroads of cultures, societies, and markets. The Black Sea basin occupies a territory of 834,719 sq. km., and the wider Black Sea area includes a population of 332 million people living in the territories of the twelve member countries of the Black Sea Economic Cooperation (BSEC). As a region, the Black Sea has an estimated gross domestic product (GDP) of around USD 3.6 trillion, producing 4.3% of global GDP (the year (World Bank, 2014b). Istanbul (13,624,240 inhabitants), Odessa (1,003,705 2012) inhabitants), and Samsun (535,401 inhabitants) are its largest ports. There are about ten cities with at least 215,000 inhabitants. Bounded by Europe, the Caucasus, and Anatolia, it is connected to the Aegean and the Mediterranean seas to the south via the Bosporus Strait and the Sea of Marmara. The Danube is the most important river running into the Black Sea. Apart from the Danube, Europe's third and fourth largest rivers, the Dnieper and Don, flow to the Black Sea.



Figure 1. Black Sea basin (Source: Black Sea Strategic Research and innovation Ageda)

The present chapter argues that regional cooperation today makes sense for the Black Sea; a region characterized by developmental and security challenges that require transnational responses. What is at issue, however, is whether the model of regional cooperation currently applied needs to be revamped and to what degree it needs to be tuned to contemporary needs.

One of the main characteristics of the region is its close interdependence with the European Union with which Black Sea countries are tightly intertwined. Bulgaria, Greece, and Romania are EU members while Turkey has opened EU accession negotiations since 2005. Russia has a Strategic Partnership with the EU, while the remaining Black Sea states have signed Partnership and Cooperation Agreements (PCA). Georgia, Moldova, and Ukraine have further advanced their EU relations with the initialling of Association Agreements (AAs) which contain Deep and Comprehensive Free Trade Agreements (DCFTAs). The interdependencies with the EU go beyond the institutional aspects as the EU constitutes the main trade and investment partner of all Black Sea economies. The need for regional cooperation comes from the multiple EU and International policies. as the practical aspects of such cooperation and coordination of monitoring activities come directly from the MSFD requirements, despite the non-EU Member States, Russia, Ukraine, Georgia, and Turkey, which have 86% of the Black Sea's coastline length, the EU directives are not obligatory. There is an obvious need for a unique approach of collecting, and common data formats to exchange data regarding Qualitative descriptors for determining Good Environmental status.

Prior to the 1990s, little or no action had been taken to protect the Black Sea. Political differences during the Soviet era, coupled with a lack of general knowledge of the environmental situation resulted in an absence of effective response.

In response to the increasing demand for fisheries products, coastal countries are now trying to benefit from their own new opportunities by investing in a contemporary fishing fleet and processing factories. Since the late 1980s, it became evident that fish resources would not be able to keep pace with rapid and, in most cases, uncontrolled exploitation, immediately requiring the introduction of new methods for fisheries management or an ecosystem approach aimed at conserving biological resources and the state of the environment.

Recent initiatives of EU to support transboundary coordination in Black Sea region

To structure the cooperation on maritime affairs, the six coastal countries and the Republic of Moldova were supported by EU to elaborate a <u>Common Maritime Agenda</u> for the Black Sea through the <u>Facility for Blue Growth</u> - an EU-funded assistance mechanism. Since 2018 administrations and stakeholders in the region got support to identify common priorities for cooperation at sea basin level, thus laying the foundation of this common agenda. In the context of the European Maritime Day 2018 (Bulgaria, 30-31 May), Black Sea Ministers expressed their support for closer regional cooperation on maritime affairs, including transport, environment, research and innovation. They endorsed the Burgas Declaration "Towards a Common Maritime Agenda for the Black Sea".

The <u>Annual High-level Stakeholder Conference on Blue economy</u> has turned into an important forum for public administrations, maritime practitioners, entrepreneurs and other interested parties from the region. These conferences help identifying how Black Sea countries can increase their blue growth potential, embrace innovation, get access to funding and sustainably develop coastal areas. Four annual high-level conferences have taken place so far: Bucharest (2014), Sofia (2015), Odessa (2016), Batumi (2017), since the last conference in December 2020 (online).

The support of European Commission through the Directorate General for Maritime Affairs and Fisheries (DG MARE) has a substantial role for supporting regional cooperation for a more sustainable Blue Economy in the Black Sea. DG MARE develops and carries out the Commission's policies on Maritime affairs and fisheries. DG MARE works to ensure that the ocean resources are used sustainably and that coastal communities and the fishing sector have a prosperous future, promote maritime policies and stimulate a sustainable blue economy and promote ocean governance at international level. DG MARE accompanies the process of Common Maritime Agenda of the Black Sea as a full member of the Steering Group, where each of the seven countries is represented, while the political coordination is ensured by Ministerial meetings.



Figure 2. Overview of DG MARE's plan 2020-2024 (source: Strategic plan 2020-2024 - Maritime Affairs and Fisheries)

Funding for Black Sea projects

Marine and maritime-related EU-funded projects can be found across various policy areas and are financed by various EU funds. Especially the Instrument for Pre-accession Assistance (IPA), the Horizon 2020 SME Instrument and the European Neighbourhood Instrument (ENI) provide financial support for actions in this region. The latter finances the Black Sea Basin Joint Operational Programme 2014-20, which aims to contribute to sustainable development of the region, by promoting business and entrepreneurship (incl. tourism) as well as environmental protection and the reduction of marine litter.

Cooperation with the General Fisheries Commission for the Mediterranean

The General Fisheries Commission for the Mediterranean (GFCM), to which the EU and its Black Sea Member States are members, established in 2011 a Working Group to facilitate delivering advice for fisheries management in the Black Sea and to promote regional cooperation in the field of fisheries and environmental issues. Together with the GFCM members Turkey, Bulgaria and Romania, and the non-GFCM cooperating members Ukraine, Russia and Georgia, the EU has been actively participating in discussions related to the state of marine fauna in the Black Sea in 2012 and 2013. GFCM has been invited to participate as an observer in all Scientific, Technical and Economic Committee for Fisheries (STECF) Expert Working groups on Black Sea stock assessments. The GFCM is currently working on the establishment of a new data collection scheme, the Data Collection Reference Framework (DCRF). Harmonisation of GFCM requirements with the currently running EU Data Collection Framework (DCF) and national data collection systems is under consideration and further collaboration towards achieving this goal is anticipated

One of the latest report of GFCM Report, "*The State of Mediterranean and Black Sea Fisheries, 2018*", provides an overview of status and trends, including fishing fleet, capture fishery production, socio-economic variables, bycatch and an analysis of the status of the stocks. The main finding of the report, concerning the Black Sea, is that the there is a slight improvement in terms of the stocks of industrial fish species, however more efforts are necessary to achieve a long-term sustainability of the fish resources.

2.1 Regional cooperation initiatives

The strategy of the European Neighbourhood Partnership Instrument-Cross Border Cooperation Black Sea Basin programme (ENPI-CBC) is intended to enable authorities around the Black Sea region to share experiences and find joint solutions to common challenges. The CBC Black Sea basin Program was officially launched at the end of 2008. Following the first call for proposals, a series of projects began in mid-2011. Following the second call for proposals, 41 new projects were contracted. There are currently almost 60 projects being implemented. Over 60 % of projects are in the area of economic and social development, while the rest cover environmental protection and cultural/education cooperation. The Programme budget has been continuously increased due to the need to cover a growing number of projects, technical assistance needs, and management costs demonstrating the effectiveness of the programme.

<u>Cooperation with Black Sea Economic Cooperation Organisation (BSEC)</u> The EU has been a permanent observer at BSEC since 2007. Since 2009, cooperation between EU and BSEC has been strengthened through enhanced EU participation at BSEC high-level meetings. The Commissioner for maritime affairs and fisheries participated at the BSEC 20th Anniversary Summit in June 2012. The Summit Declaration highlighted the importance of enhanced and mutually beneficial cooperation between the EU and BSEC. The activities of the EU at the bilateral and regional level in the Black Sea contribute in many perspectives to the achievements of the goals set in the BSEC Economic Agenda approved at the Summit. The EU has participated in all of the BSEC Ministerial and Senior Officials meetings. Since 2011, an informal yearly meeting has taken place between the BSEC Open Trilateral and COEST Working Party representatives. Several meetings have taken place - in Brussels and Istanbul - between the BSEC Permanent Secretariat and the EU.

In 1992 the Black Sea countries signed <u>the Bucharest Convention</u> followed closely by the first Black Sea Ministerial Declaration (the Odessa Declaration) in 1993. This inspired the GEF and other donors, particularly the European Union, to provide more than US\$17 million support to the region to help implement the Odessa Declaration and to formulate the longer-term Black Sea Strategic Action Plan (BS SAP).

EU accession to the Bucharest Convention is a short to medium-term priority based on the strategy for the progressive improvement of the EU's status in international organizations and other fora in line with the objectives of the Treaty of Lisbon. The Commission on the Protection of the Black Sea against Pollution (Black Sea Commission or BSC) is the intergovernmental body established in the implementation of the Convention on the Protection of the Black Sea against Pollution (Bucharest Convention). The EU has been an observer at the BSC since 2001. Since the early 1990s, the EU has been providing substantial

technical and financial support for the protection of the Black Sea marine and coastal environment through a variety of projects, notably the project on Environmental Monitoring of the Black Sea Basin (MONINFO). Membership to the Bucharest Convention would enable participation in decision-making which is proportionate to this contribution and, more generally, will provide the EU with a platform to enhance its engagement still further.

<u>The Sofia Ministerial Declaration</u> was signed in Sofia, Bulgaria on 7 June 2018 by the ministers and high-level representatives of Black Sea riparian countries after the High-level Conference on Black Sea fisheries and aquaculture. The Sofia Declaration sets concrete objectives and actions that should help develop comprehensive regional governance in the Black Sea. This should be achieved thanks to greater solidarity and coordination among all riparian countries to fight illegal unreported and unregulated fishing (IUU), improve data collection and science, improve fisheries management, and support sustainable small-scale fisheries and aquaculture. The many threats faced by the Black Sea, a peculiar marine basin with specific environmental conditions and human activities, need indeed to be properly addressed to secure the region's ecological and economic wealth and viable livelihoods for coastal communities.

<u>Cooperation with the General Fisheries Commission for the Mediterranean</u> The General Fisheries Commission for the Mediterranean (GFCM), to which the EU and its Black Sea Member States are members, established in 2011 a Working Group to facilitate delivering advice for fisheries management in the Black Sea and to promote regional cooperation in the field of fisheries and environmental issues. Together with the GFCM members, Turkey, Bulgaria and Romania, and the non-GFCM cooperating members Ukraine, Russia and Georgia, the EU has been actively participating in discussions related to the state of marine fauna in the Black Sea in 2012 and 2013. GFCM has been invited to participate as an observer in all Scientific, Technical and Economic Committee for Fisheries (STECF) Expert Working groups on Black Sea stock assessments. The GFCM is currently working on the establishment of a new data collection scheme, the Data Collection Reference Framework (DCRF). Harmonisation of GFCM requirements with the currently running EU Data Collection Framework (DCF) and national data collection systems is under consideration22 and further collaboration towards achieving this goal is anticipated.

<u>The Common maritime agenda</u> for the Black Sea has officially launched on February 17, 2020, in Sofia. Based on the positive experience of sustainable development initiatives in other sea basins, such as the West Med Initiative, the steering committee decided to schedule a number of regional seminars, stakeholders' events and high-level meetings to raise awareness, facilitate stakeholders' involvement and networking and identify significant projects for the region.

The 7 member countries of the initiative (Bulgaria, Georgia, Moldova, Romania, Russia, Ukraine and Turkey) convened in Sofia for the 1st steering group meeting. Marine litter, protection against pollution of marine resources, green sustainable shipping and digital connectivity were the key issues addressed.

The initiative is supported by key organisations such as the organisation of the Black Sea Economic Cooperation (BSEC), the Commission for the protection of the Black Sea against pollution, the General Fisheries Commission for the Mediterranean (GFCM), the Conference of peripheral and maritime regions and the managing authority of the Joint Operational

Programme for the Black Sea basin. WWF and the Black Sea Trade and Development Bank have also shown their interest in supporting the common maritime agenda.

The Common Maritime Agenda cuts across policies, ministries and levels of government. The participating countries set priorities, take ownership, align policies and funds at the national level, encourage the participation of private investors and provide the relevant resources, based on the countries' capacity. Flagship regional projects - potential joint regional projects and bankable investment national and regional projects - need to be suggested by the countries to guide the implementation of the Agenda and to attract investors.

The Common Maritime Agenda for the Black Sea (CMA) is a sea basin initiative that aims at supporting regional cooperation for a more sustainable blue economy in the Black Sea and it is developed in the broader framework of the Black Sea Strategy. The Republic of Bulgaria, Georgia, Republic of Moldova, Romania, Russian Federation, Republic of Turkey and Ukraine, all BSEC Member States, are the participating countries.

The CMA is a unique framework of regional cooperation on the blue economy and it was endorsed on 21 May 2019 at the Ministerial level. It is complemented by its scientific pillar, the Strategic Research and Innovation Agenda for the Black Sea (SRIA), supported by the Directorate-General for Research and Innovation of the European Commission (DG RTD).

The Initiative has identified four main pillars on which a new set of research and innovation actions can be developed (Figure 3.):

• Addressing fundamental Black Sea research challenges - Black Sea Knowledge Bridge,

• Developing products, solutions, and clusters underpinning Black Sea Blue Growth - Black Sea Blue Economy,

• The building of critical support systems and innovative Infrastructures - Key Joint Infrastructure and Policy Enablers,

• Education and capacity building - Empowered Citizens and Enhanced Blue Workforce.



Figure 3. Main pillars on which a new set of research and innovation actions can be developed Source: <u>http://connect2blacksea.org/the-sria/</u>

This SRIA is also supporting the development of the CMA for the Black Sea. A key output of the SRIA is to help identify national level priorities to contribute to the development of national

Blue Growth agendas. Furthermore, the actions proposed in the SRIA and their implementation will be generating scientific knowledge and promoting technologies.

There will be three overarching considerations throughout the SRIA: First, the pillars support developing and adopting innovative, fit for purpose observation and data sharing systems (combining ecology and social data) building on existing networks. Second, the actions are designed to benefit primarily from co-funding and co-programing mechanisms and bodies at the national, transnational, and international levels. Third, the Black Sea SRIA will be updated regularly in dialogue and close link with relevant national and research stakeholders and further clarifications and revisions will be made as needed.

Table 1. SRIA Pillar 3 main activities

| Pillar 3 - Building of critical support systems and research infrastructures for the benefit of Black | | | | | |
|--|--|--|--|--|--|
| Sea communities | | | | | |
| Main goals | Actions: | | | | |
| Main Goal 1 - Developing smart, integrated observing and monitoring systems in support of addressing scientific and socioeconomic challenges of the Black Sea, towards governance for a sustainable ecosystem, mitigation of climate change impacts, and accurate forecasting for adaptive management | Develop and enhance a network of dedicated Marine Research Infrastructures at the Black Sea, building on existing European and international initiatives, ensuring interaction between the ongoing projects and research activities (Short Term); Produce, collect and make available compatible highquality data sets (the FAIR principles and open data access) (Short/Medium Term); Integrate, strengthen and upgrade monitoring, modeling and forecasting capacities to address societal challenges (Short/Medium Term); | | | | |
| Main Goal 2 - Advancing a harmonised set of working methodologies, standards and procedures on all aspects of coastal and marine research | Develop common monitoring standards and research infrastructures for integrated coastal and marine management in support of policy- and decision makers (Medium Term) Establish common methodology and transboundary pilot schemes for marine spatial planning at national and regional levels based on ecosystem approach (Short Term) | | | | |
| Main Goal 3 - Developing new marine based technologies by benefiting from the fourth industrial revolution for the Black Sea to promote safe and sustainable economic growth of the marine and maritime sectors, the conservation and valorisation of marine cultural heritage | Identify and promote key technologies and innovations required for the Black Sea monitoring and research in close interaction with solution providers and best practices (<i>Short/Medium Term</i>) Support the development of coherent basin-scale programmes for the conservation and valorisation of marine cultural heritage (<i>Long Term</i>) | | | | |
| Main Goal 4 - Mechanisms to create, support and promote start- ups oriented towards the circular and blue economy in the Black Sea region | Enable researchers, innovators and entrepreneurs open and easy access to research infrastructures and networks via the establishment of the Open Transnational Service and Access initiatives (e.g. transnational and virtual access)) (Short/Medium/Long Term) Create, integrate and support incubators and techno parks for promoting SMEs, start-ups and innovative businesses for blue economy (Short/Medium/Long Term) | | | | |

The Organization of the Black Sea Economic Cooperation (BSEC) and the Permanent Secretariat of the Commission on the Protection of the Black Sea Against Pollution (BSC) are consultative bodies of the CMA Steering Group, while the Secretariat of the General Fisheries Commission for the Mediterranean (GFCM), the Conference of Peripheral and Maritime Regions (CPMR) and the Managing Authority of the Joint Operational Programme Black Sea Basin are CMA observers.

The Directorate-General for Maritime Affairs and Fisheries of the EU Commission (DG MARE) accompanies the process as a full member of the Steering Group where each of the seven countries is represented, while the political coordination is ensured by Ministerial meetings.

The main challenges to regional cooperation can be considered as follows:

- Reduce eutrophication/nutrient enrichment
- Preserve changes in marine living resources
- Fight Chemical pollution (including oil)

• Preserve Biodiversity/ prevent habitat changes, including alien species introduction

3. NATIONAL PROGRAMS AND STRATEGIES, ORGANIZATIONAL AND HUMAN RESOURCES IN THE BLACK SEA PARTNER COUNTRIES.

3.1 National monitoring programs, strategies, long-term plans, short term priorities relevant to transboundary coordination (including resource provision, available funding mechanisms)

o **Georgia**

In order to improve the marine governance, the Ministry of Environmental Protection and Agriculture of Georgia with the support of the EU-funded project developed a proposal for a National Marine Environment Strategy and Action Programme. Development and adoption of the Strategy and Action Programme are envisaged by the EU-Georgia AA and the Law of Georgia on the Maritime Space. In particular, in 2018, the Georgian Parliament adopted an amendment to the Law of Georgia on the Maritime Space, obliging the Ministry of Environmental Protection and Agriculture of Georgia, together with other State agencies, to develop a National Marine Strategy for the Black Sea Protection and Action Programme for Achievement of a Good Environmental Status of the Marine Waters. The strategic document shall be approved by the government of Georgia no later than 1 September 2022.

Support to developing the draft Strategy and Action Programme was rendered as part of the EU-funded project 'Support to the implementation of the environmental provisions of the EU - Georgia Association Agreement' that started in March 2019. This support included a participative process with Georgian stakeholders and a proposal for the text of the Marine Environment Strategy and its Action Programme.

In the draft document, various actions are included in response to the challenges related to the monitoring of the Black Sea water quality, and Black Sea ecosystem protection. The document is currently under review and stakeholder discussions are planned

The major regional document for protecting the Black Sea is the Bucharest Convention. Georgia is a signatory of numerous international conventions and agreements on fisheries. Apart from the obligations under the above-mentioned agreements, in 1997 the Government of Georgia decided to bring all existing and future legislation in harmony with the EU regulatory framework.

The main law providing the legal environmental framework is the Law on Environmental Protection (1996). However, it needs to be updated in order for it to have a sound legal basis for all sector laws and regulate cross-cutting environmental principles and modern instruments. In addition, various areas are regulated by sector-specific laws and by-laws. Environmental legal drafting is currently intensive due to the EU-Georgia association process. The ratification of the EU-Georgia AA in 2014, provides a long-term perspective for the development of national policy in various fields, including the environment and natural resources. A number of draft laws (i.e. Law on Water Resources Management) and by-laws have already been prepared.

Another important document framing the national environmental policy is the United Nations Sustainable Development Goals (SDGs) which was approved in 2015. The SDGs set 169 targets that are to be achieved by 2030. A number of those targets capture environmental aspects and countries have to adjust their policies to these global targets.

International treaties, to which Georgia is a party play a significant role in the national policy formulating process. Georgia is a party to global and regional Multilateral Environmental Agreements (MEAs), including 18 conventions, a number of their protocols, amendments, and agreements. One of the treaties influencing overall environmental governance at the national level and guiding Georgia towards better environmental democracy is the Convention on Access to Information and the Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention). Safeguarding the environmental rights of the population, the Aarhus Convention provides a strong basis for further improvements in the field of environmental governance.

Table 2. International Environmental Conventions and Protocols, Georgia

| AGREEMENTS | DATE OF RATIFICATION/ ACCESSION |
|---|------------------------------------|
| Convention on the Protection of the Black Sea Against Pollution | 1993 |
| The Black Sea Biodiversity and Landscape Conservation Protocol | 2009 |
| Protocol on Protection of the Black Sea Marine Environment Against Pollution from Land Based Sources | 2009 |
| Protocol on The Protection of the Black Sea Marine Environment Against Pollution by Dumping | 1993 |
| Protocol on Cooperation in Combating Pollution of the Black Sea Marine Environment by Oil and Other Harmful Substances in Emergency Situations | 1993 |
| Convention on Biological Diversity | 1994 |
| Cartagena Protocol on Biosafety to the Convention on Biological Diversity | 2008 |
| United Nations Framework Convention on Climate Change | 1994 |
| Kyoto Protocol to the United Nations Framework Convention on Climate Change | 1999 |
| Convention for the Protection of the Ozone Layer | 2017 |
| Convention for the Protection of the Ozone Layer | 1995 |
| Montreal Protocol on Substances that Deplete the Ozone Layer | 1995 |
| London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer | 2000 |
| Copenhagen Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer | 2000 |
| Copenhagen Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer | 2000 |
| Beijing Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer | 2010 |
| Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) | 1996 |
| Convention on Wetlands of International Importance especially as Waterfowl Habitat | 1996 |
| Convention on Long-range Transboundary Air Pollution | 1999 |
| Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) to the Convention on Long-range Transboundary Air Pollution | 2012 |
| Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal | 1999 |
| United Nations Convention to Combat Desertification | 1999 |
| Convention on the Conservation of Migratory Species of Wild Animals | 2000 |
| Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) | 2001 |
| Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA) | 2001 |
| Agreement Conservation of Bats in Europe | 2001 |
| Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) | 2000 |
| GMO Amendment | 2016 |
| Convention on Persistent Organic Pollutants (POPs) | 2006 |
| Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade | 2006 |
| Convention on the Conservation of European Wildlife and Natural Habitats | 2008 |
| European Landscape Convention | 2010 |
| Agreement Between the Republic of Georgia and the International Atomic Energy Agency for the Application of Safeguards in Connection with Treaty on the Non-Proliferation of Nuclear Weapons (INFCIRC/617) | 2003 |
| Protocol Additional to the Agreement between the Republic of Georgia and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons | 2003 |
| Convention on the Physical Protection of Nuclear Material (INFCIRC/274/Rev.1) | 2006 |
| Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (INFIRC/546) | 2009 |
| Convention on Early Notification of a Nuclear Accident (INFCIRC/335) | 2010 |

Following the EU-Georgia Association Agreement (Articles 336-337) Georgia took the obligation to promote regional cooperation in the Black Sea and relations with relevant Regional Fisheries Management Organizations. Georgia actively cooperates with the GFCM since 2014, attends and participates in meetings, including scientific and administrative ones, submits the available relevant data, and shares experiences with the other Mediterranean and Black sea countries.

Fisheries and aquaculture sectors are critically important for the economies of our country. Enhanced multilateral cooperation among the Black Sea states is an important element of the new dynamics, which promotes sustainable and rational exploitation of living marine resources and the sustainable development of aquaculture. The implementation of regional joint actions will bring the added value needed to promote advancements in fisheries and aquaculture in the Black Sea, to maximize the economic benefits, create new jobs, and ensure the sustainable development of the sector and coastal communities.

Georgia has the new Law on Aquaculture adopted this year based on recommendations of the GFCM. We have also started working on defining the AZAs (Allocated Zones for Aquaculture) in the marine area and hope for further assistance from the GFCM to ensure harmonization with relevant GFCM and EU requirements. Despite the situation with Covid 19, training on issues related to aquaculture is still held by the GFCM using the online meeting tools.

Georgia actively cooperates in regional projects, in particular within the framework of the BlackSea4Fish project. The representative of the Fisheries, Aquaculture and Water Biodiversity Department of the LEPL - National Environmental Agency participated in the experimental survey for Rapa whelk held on 22-26 July 2019 in Trabzon, Turkey. Two beam trawl surveys have been under negotiation to be held in April and September 2020, however, due to the situation with the spread of covid 19, the surveys have been delayed and it has been suggested to conduct the first survey in September-October and the second one in April-May 2021.

The Association Agreement obliges Georgia to cooperate in the fight against illegal, undeclared, and unreported (IUU) fishing.

In December 2019, the Government of Georgia adopted a decree, which sets the requirements for fishing vessels/vessels related to fishing, engaged in fishing and activities related to fishing and flying the flag of Georgia in the territorial sea and exclusive economic zone of foreign countries and high seas. These requirements are in line with the relevant EU regulations. According to the decree, competent authorities shall cooperate with the foreign flag states in matters related to fishing.

There are going consultations with the European Commission's General Directorate for Maritime Affairs and Fisheries on the draft Law on "Amendments to the Administrative Offences Code of Georgia" which will establish administrative liability for the violation of the legislation related to IUU fishing.

It should be noted, that the Ministry initiated negotiations with the GFCM to develop and improve the legislative framework regarding IUU fishing. Namely, technical assistance is requested concerning the training for the staff of the Ministry as well as regarding the information on the Vessel Monitoring System for the vessels operating beyond the territorial waters of Georgia.

Several major laws and numerous sub-legal acts are regulating the protection and management of water resources in Georgia. However, current water-related legislation is inconsistent and does not provide for a clear regulation of such important topics as, pollution prevention tools, ownership, and the possession and use rights related to water bodies, as well as water cadaster. The Water Law (1997) regulating water resources defines the main issues related to the protection and use of water. It defines the main principles of water policy and guarantees the security of state interests in water protection.

However, it does not fully cover all aspects of water management, including the management of groundwater, which is regulated by the 1996 Law on Mineral Resources. nowadays, water abstraction and discharge is regulated only for those activities that are subject to Environmental Impact Assessment (EIA). No permit is needed for water abstraction and discharges for other activities. Although discharge and abstraction standards are set in the by-law on technical environmental regulations (Governmental Resolution #17, 03.01.2014), the absence of permit hampers proper planning and decision-making in water use, as well as complicates compliance monitoring by various water users. No river basin management principles are set by current Georgian legislation. However, the new draft framework law on water resources management fully embraces all aspects of integrated water resources management (IWRM). The law, once adopted, will provide the legal framework for water management on river-basin principles with the MEPA as a central competent authority. The law also will provide for all other aspects of IWRM including the water classification system, water quality objectives, and standards, water use, water resources planning, pollution prevention combined approach, economic tools, public participation, monitoring and enforcement, and flood risk management. The process of developing the river basin management plans has already begun. It should also be noted that the Socio-Economic Development Strategy of Georgia - "Georgia 2020" - defines the overall strategic objectives for the supply and sanitation sector, for instance, to serve the entire population with continuous 24 hours water supply and to rehabilitate the water supply and sanitation systems. The water supply and wastewater sanitation sector-related views are outlined in another national strategic document - Regional Development Program of Georgia 2015-2017- which considers the provision of public services, including water supply and sewage systems to rural areas and addressing wastewater treatment plants as one of the priorities for the upcoming years. International environmental treaties and obligations play a significant role in framing water policy in Georgia. The EU-Georgia AA includes provisions of five EU directives on water and marine-related aspects (except for the flood directive) and the AA implementation Roadmap sets more than 25 actions for the approximation of Georgian legislation in the water sector with EU requirements. Other obligations are taken on by the country via international treaties. Specifically, Georgia is a party to the Bucharest Convention on the Protection of the Black Sea against Pollution and the MARPOL Convention on Prevention of Pollution from Ships (as well as the International Convention on Oil Pollution Preparedness, Response, and Co-operation). Besides, Georgia is a party to the Ballast Water Management Convention and other international treaties concerning Black Sea protection against anthropogenic impacts (for example, the International Convention on Oil Pollution Preparedness, Response, and Cooperation). Georgia has not ratified the Convention on Protection and Use of Transboundary Water Courses and International Lakes and the London Protocol on Water and Health. Neither bilateral agreements exist on Transboundary Rivers. The agreement between Azerbaijan and Georgia has been drafted and is subject to negotiations between the two countries.

The project EMBLAS (EMBLAS I; EMBLAS II, EMBLAS Plus), supported by the United Nations Development Program and the European Union, aimed to improve and strengthen the monitoring of the Black Sea environment. It assists the partner countries of the Black Sea region in solving common environmental problems and monitoring the marine environment. The most important task of the project was to collect new data on the state of the sea and make it available.

In the 2nd and 3rd phases of the project (EMBLAS II, EMBLAS Plus) three joint Georgian-Ukrainian naval expeditions were planned and carried out in May 2016, September 2017, and August 2019,

as a result of which data on the Black Sea were obtained. The study covered the deep layers of the continental shelf in Georgian waters and the exclusive economic zone, where no such thing has been produced for more than 30 years. Also, surveys were conducted at permanent stations on the Georgian coast under the National Pilot Monitoring Program. The project assessed the relevance of marine research methods, studied new ones, and introduced them to many training seminars or workshops organized by the project. The project also exchanged data between Ukrainian and Georgian scientists to introduce a common European methodology.

It is noteworthy that for the first time in many years, large-scale studies were conducted on the Black Sea, covering various areas, including the study of all components of marine biodiversity, starting with microalgae and ending with marine mammals, including new organic pollutants. Solid waste monitoring using new software methodology, Deepwater anoxic layer study, etc.

It is important that the studies showed positive results regarding the ecological status of the coastal waters of Georgia, especially in terms of biodiversity.

EU Project Water Initiative Plus for the Eastern Partnership countries (EUWI plus), The project helps Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine bring their legislation closer to EU policy in the field of water management, with the main focus on the management of trans-boundary river basins. It supports the development and implementation of pilot river basin management plans, building on the improved policy framework and ensuring a strong participation of local stakeholders.

The main objective of the project is to improve the management of water resources, in particular trans-boundary rivers, developing tools to improve the quality of water in the long term, and its availability for all.

More specifically, the project aims to support partner countries in bringing their national policies and strategies into line with the <u>EU Water Framework Directive</u> and other multilateral environmental agreements.

The initiative focuses on specific thematic areas:

- Legislation, policy development, and institutional strengthening, including:
 - The organisation of regular National Policy Dialogues
 - Preparation of analytical work to support policy reforms and implementation of river basins management plans.
 - Preparation of country and regional training plan and organisation of trainings, coaching, and training of trainers
 - Technical support for drafting and reviewing policies and strategies
- **Strengthening of laboratory and monitoring systems**, including rehabilitation of laboratories and equipment, purchase of equipment, and technical support
- Development and implementation of River Basin Management Plans, including:
 - The organisation of joint field surveys in trans-boundary rivers
 - Development and strengthening of national databases on water-related issues
 - \circ Support to river basin management institutions in the implementation of management plans
 - $\circ\,$ Establishing a system for regular monitoring of the implementation of management plans.
- **Public awareness**, communication, and data/information management

In the frames of the EUWI plus project, the laboratories of the LEPL National Environment Agency were provided with high-tech equipment and relevant pieces of training.

The equipment will be used to analyze new pollutants in surface waters, in particular following the EU Water Framework Directive.

o Bulgaria

The national strategies in the Republic of Bulgaria, related to marine monitoring in the Black Sea are connected to the implementation of the **following Directives and Strategies of the European Union**:

• Council Directive No 92/43 / EEC on the conservation of natural habitats and wild fauna and flora;

 \bullet Directive 2009/147 / EC of the European Parliament and the Council on the conservation of wild birds;

• Directive 2001/18 / EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220 / EEC;

• Water Framework Directive 2000/60 / EEC;

• Marine Strategy Directive (2008/56 / EC establishing a framework for Community action in the field of the marine environmental policy);

• Directive on the quality of fresh water in need of protection to support the life of fish (78/659 / EEC), replaced by Directive 2006/44 / EC;

• Directive on waters for the cultivation of shellfish (79/923 / EEC);

• Directive on shellfish (91/492 / EEC), replaced by Directive 97/61 / EC on hygiene standards for the production and placing on the market of live shellfish such as mussels, snails, crabs, shrimps and fishery products.

- The EU Biodiversity Strategy to 2020
- The EU Biodiversity Strategy to 2030

The National strategies of the Republic of Bulgaria related to marine environmental monitoring are:

• Marine strategy of the Republic of Bulgaria

https://www.moew.government.bg/en/water/marine-environment/marine-strategy-ofrepublic-of-bulgaria/

• Biodiversity Strategy in the Republic of Bulgaria https://www.moew.government.bg/bg/priroda/strategicheski-dokumenti/

• National strategy for adaptation to climate change and action plan until 2030.

• The National Strategy for Adaptation to Climate Change and the Action Plan of the Republic of Bulgaria set a framework for actions for adaptation to climate change and priority areas until 2030, <u>https://climate-adapt.eea.europa.eu/countries-regions/countries/bulgaria</u>

• The National Priority Framework for Natura 2000 Action (NRDP), valid until 2023; <u>https://www.moew.government.bg/bg/national-prioritised-action-framework-npaf-for-natura-2000-bulgaria/</u>

• National information and communication strategy for the Natura 2000 network, valid until 2023; <u>https://www.moew.government.bg/bg/priroda/natura-2000/natura-2000-v-bulgariya/informacionna-sistema-za-natura-2000-v-bulgariya/</u>

• National plan for the protection of the most important wetlands in Bulgaria, valid until 2022; bbf.biodiversity.bg

• National strategy for management and development of the water sector, valid until 2037; <u>https://www.moew.government.bg/en/water/strategy-documents/strategic-action-plan-for-the-environmental-protection-and-rehabilitation-of-the-black-sea/</u>

• River Basin Management Plans 2016-2021 (RBMP) <u>https://www.bsbd.org/uk/RBM_mplans.html</u>

Important International conventions:

- CONVENTION ON BIOLOGICAL DIVERSITY Signed in Rio de Janeiro on June 5, 1992. Ratified by the Republic of Bulgaria with a law adopted by the 37th National Assembly on February 29, 1996 - SG, issue 22 of 15.03.1996, promulgated - SG, iss. 19 of March 2, 1999, in force for the Republic of Bulgaria - July 16, 1996
- CONVENTION on Cooperation in the Protection and Sustainable Use of the Danube River (Convention for the Protection of the Danube River) promulgated, SG, iss. 49 / 17.05.2002, amended, issue 53 / 28.05.2002
- CONVENTION for the Protection of the Black Sea against Pollution SG, iss. 49 / 17.06.1994, each Contracting Party shall take into account the adverse effects of pollution of its internal waters on the marine environment of the Black Sea;
- Strategic Action Plan for Environmental Protection and Restoration of the Black Sea, the document is an agreement between the 6 countries bordering the shores of the Black Sea, in order to act in synchrony to support the continued restoration of the Black Sea;
- CONVENTION on wetlands of international importance, in particular as habitats for waterfowl (Ramsar Convention) Bulgaria is represented by 11 wetlands, with a total area of 49,912.43 ha, representing 0.45% of the country's territory .;
- CONVENTION ON THE CONSERVATION OF EUROPEAN WILD FLORA AND NATURAL HABITATS (Berne Convention) the objectives of this Convention are the conservation of wild flora and fauna and their habitats and in particular those species and habitats whose conservation requires the cooperation of several countries, as well as and supporting this cooperation. Special attention is paid to endangered and vulnerable species, incl. and migratory species;

National Monitoring

The National Biodiversity Monitoring System (NBMSB) is a complex mechanism for monitoring and summarizing changes in the biological diversity of the Republic of Bulgaria in the long run. This is done, on the one hand, through targeted and long-term observations of the elements of biodiversity, accompanied by the collection, processing, storage, and transmission of data, and on the other hand - through a system for assessment and analysis of impacts on biodiversity, its state and the measures taken to prevent its loss. The NBMSB is a key tool to assist in making management decisions related to the conservation of biodiversity in Bulgaria at the national level while serving the information needs of the widest possible range of users. Due to the complexity and scope of the tasks, the lack (and in some cases the lack) of scientific data on some areas and components of biodiversity, as well as the insufficient administrative and financial capacity, the NBMSB will be developed in accordance with the "growth model". This means that the NBMSB is a flexible system that can be expanded and changed over time - for example by adding or excluding monitoring objects, as well as analysis at later stages in order to adjust the priorities of the system. The main goal of the National Biodiversity Monitoring System is to provide an information base for the implementation of an effective national nature protection policy. The specific objectives of the National Biodiversity Monitoring System are: Systematic monitoring of the elements of biodiversity and the processes influencing its status, using scientifically reliable and practically applicable methods for data collection and processing; Assessment and analysis of the state of biological diversity and the influence of various factors on its components. Implementation of national legislation and national strategic documents, the country's obligations to the Convention on Biological Diversity, the Habitats Directive (92/43 / EEC), the Birds Directive (2009/147 / EEC), and other international agreements to which Bulgaria has commitments. Warning of processes and trends leading to damage and extinction of species and habitats. Providing information on the state of biodiversity in a form convenient for use by the general public.

Surface water monitoring - Surface water monitoring is part of the National Environmental Monitoring System (NEMS) and covers control and operational monitoring programs. The purpose of monitoring programs is to provide the necessary information to assess the status of waters within the river basin or sub-basin. Operational monitoring programs should identify the status of water bodies at risk and assess changes that have occurred as a result of the implementation of the program of measures. The networks for control and operational monitoring of surface waters and the measured indicators in them are regulated by Order of the Minister of Environment and Water NRD - 182 / 26.02.2013.

The total number of points on the territory of our country is 617 distributed in the four regions of basin management, as follows:

• Danube Region Basin Directorate - 134 points for control monitoring and 54 points for operational monitoring;

• Black Sea Basin Directorate - 108 points for control monitoring, including 20 for monitoring of sea waters, 34 points for operational monitoring;

• East Aegean Basin Directorate - 35 points for control monitoring and 118 points for operational monitoring;

• West Aegean Basin Directorate - 21 points for control monitoring and 113 points for operational monitoring.

The indicators monitored under the Order are divided into three main groups - basic physicochemical, priority substances, and specific pollutants, and their frequency of monitoring is from 4 to 12 times a year. Measured indicators are divided into three groups:

- Basic physicochemical parameters - temperature, pH, insoluble substances, electrical conductivity, nutrients (NH4-N, NO3-N, PO4), dissolved oxygen, oxygen saturation, permanganate oxidizability, BOD, COD, iron, manganese, sulfates, chlorides, etc.;

- Priority substances;

- highly toxic, persistent, and easily bioaccumulative substances. Their number is 33;

- Specific pollutants - organic substances, heavy metals and metalloids, cyanides, phenols, and other specific substances.

The hydrobiological monitoring of surface waters is carried out in accordance with the Order of the Minister of Environment and Water N_{\odot} RD - 182 / 26.02.2013. The order provides for hydrobiological monitoring of surface waters from the categories of the river, lake/dam, and coastal waters. The number of hydrobiological monitoring points for the river category is 1490, for the lake/dam category it is 109 and for coastal waters, it is 21. The points provided for

hydrobiological monitoring are not fully inspected every year - the implementation of the programs is distributed in the period 2013-2015. between 500 and 600 points are serviced annually, depending on the capacity of the analytical laboratories and the planned programs by the Basin Directorates.

The biological quality elements used in the hydrobiological monitoring of surface waters are defined in the Water Framework Directive 2000/60 / EC (Art. 8, Annex V) and Ordinance N $_{2}$ 1 on water monitoring (promulgated SG No. 44 of 5.06 .2007): phytoplankton and other aquatic flora (macrophytes and phytobenthos), macroinvertebrates and fish. The minimum frequency for monitoring is once a year, with the exception of phytoplankton monitoring, for which the minimum frequency is twice a year. The following biological quality elements are used in the EEA for the performance of hydrobiological monitoring of surface waters, the category "river": phytobenthos, macrozoobenthos, macrophytes, and fish. The methodologies for these biological elements are approved by Order N $_{2}$ RD-591 / 26.07.2012. of the Minister of Environment and Water and are used in determining the ecological status and ecological potential of surface water bodies of the "river" category. For the lake/dam category, the biological quality element phytoplankton is used, analyzing only chlorophyll according to the BDS ISO: 10260: 2002 standard.

Monitoring related to the Marine Strategy Framework Directive (MSFD) implementation

The Marine Strategy Framework Directive (WFD) requires EU Member States to achieve a good state of the marine environment (GES) in their seas by 2020. The WFD defines the GES as "the state of the environment in marine waters diverse and dynamic oceans and seas that are clean, healthy and productive, using the marine environment to a sustainable degree, thus preserving the potential for use and activities of present and future generations. " In order to assist the Member States in defining the MRLs and setting environmental targets,

The Commission published Decision 2010/477 / EC on criteria and methodological standards for the good environmental status of marine waters (URL: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010D0477 (01), including 11 descriptors composed of biological and physicochemical indicators, indicators of pressure, condition and impact - including hazardous substances, hydrological changes, waste and noise, and biological disturbances. of Decision 2010/477 / EC as well as Annex III of the RDMS.

Achieving the GES is the responsibility of each Member State, as some specific problems and challenges can only be addressed at the national level. The Directive explicitly requires the state of the marine environment to be defined at the level of a marine region (or sub-region), which requires cooperation within the EC and with third countries in order to achieve the main objective of the Directive.

Member States should draw up regionally coordinated monitoring programs in accordance with Art. 5, para. 2 of the RDMS in order to provide a periodic assessment of the state of the marine environment and an assessment of the progress in achieving the GES.

The programs under Art. 11 are developed by descriptors, as the biodiversity monitoring programs are grouped around descriptors 1, 4 and 6.

The monitoring programs have been revised based on the accumulated data and information within the project "Studies of the state of the marine environment and improvement of the monitoring programs developed according to the ISMS (ISMEIMP). They are also in line with the Draft Amendments to Decision 2010/477 / EU and Annex III of the MSFD.

Maritime and Fisheries Programme - Data collection for the sector "Fisheries" in Bulgaria

BIOLOGICAL MONITORING (BIOLOGICAL SAMPLES COLLECTION) OF THE LANDED RAPANA CATCH BY THE BULGARIAN FISHERY FLEET, PROGRAM FOR FISHERY DATA COLLECTION (2020-2021)

The project of the Institute of Fish Resources - Varna, Agricultural Academy (AA), within Contract EAFA-Burgas/ D-199/10.12.2019 focused on the assessment of the quantity and biological parameters of *Rapana venosa* from the landed catch by the Bulgarian fishing fleet in 2020-2021.

SCIENTIFIC RESEARCH ON THE CAUGHT, DISCARDED AND LANDED CATCH AND BIOLOGICAL DATA COLLECTION OF FISH SPECIES AND OTHER MARINE ORGANISMS BY SCIENTIFIC OBSERVATIONS ON BOARD OF BULGARIAN FLEET FISHING VESSELS IN 2020-2021

the Institute of Fish Resources - Varna, Agricultural Academy (AA), within Contract NAFA-Burgas/D-158/16.05.2018, focused on the scientific assessment of the quantities and species composition of the main catch and bycatch in different fishing segments in the Bulgarian Black Sea coastal waters.

The project aims at data collection for the bycatch of marine organisms by different types of fishing activities of the Bulgarian fisheries' fleet. The study was carried out in 2020-2021 and the following types of fishing vessels were observed:

- (1.) turbot fishing with gillnets;
- (2.) pelagic and bottom species fishing with pelagic trawl;
- (3.) Rapana fishing with beam trawl;
- (4.) pelagic and bottom species fishing with polyvalent active and passive gears.

The collected data include the total catch of the target species, composition, and quantities of the bycatches of marine organisms. The dynamics of the main catches and bycatches quantities by months and seasons were estimated, as well as bycatch species composition, bycatch rate, size, sex, and age structure. Collect data for the catches (main catches and bycatches) of marine organisms by different types of fishing activities of the Bulgarian fisheries' fleet.

Bottom trawl surveys In Bulgarian Black Sea area (2020-2021)

The project of the Institute of Fishery Resources (IFR) - Varna, under contract D-156/16.05.2018 with the Executive Agency for Fisheries and Aquaculture (NAFA) - Burgas, for turbot stock assessment in the Bulgarian Black Sea waters during the spring and autumn seasons of 2020-2021.

Pelagic trawl surveys In Bulgarian Black Sea area (2020-2021)

The project of the Institute of Oceanology -Varna, based on the Contract with the National Agency for Fisheries and Aquaculture - Ministry of Agriculture, Food and Forestry, Bulgaria and Institute of Oceanology - BAS, Varna, Bulgaria, focused on the analysis of pelagic species - biomass, abundance, and biological characteristics.

Research on sand (white) mussels and new management suggestions (WHITECLAM) 2020-2022

The project of the Institute of Fish Resources -Varna, with main goals:

• Determining the "hotspots" of white mussels' accumulations off the Bulgarian coast by assessment of the stocks and biological characteristics of the species of the group of white mussels (Chamelea gallina, Donax, Anadara iaequivalvis, etc) and comparison with previous studies.

- Enrichment of information on descriptors D 1 (Biodiversity) and D 3 (Sustainable stocks of species subject to industrial fishing) to the Marine Strategy Framework Directive (MSFD, 2008/56/EC) concerning the studied habitats infra- and sublittoral biocenoses, with dominant white mussel species.
- Proposals for regulatory measures reduction of fishing effort, measures related to maritime spatial planning and marine protected areas, and studies on good practices for conservation and recovery of white mussel stocks in different regions of the World Ocean.

• Greece

The national strategies of marine waters' monitoring in Greece, mostly referring to the Aegean and Ionian Seas and parts of the east-central Mediterranean are legislative statutes deriving from the implementation of certified EU Directives and applied EU Regulations; occasionally strategy formulating Greek law is set to conform with EU Decisions (binding on those to whom it is addressed), EU Recommendations (not binding legal remarks without consequences), and EU Opinions (instruments that allow institutions to make non-binding statements without any legal obligation towards the addressees). Therefore, the same, as aforementioned, Council Directives (e.g., Ne 92/43/EEC, 2009/147/EC, 1999/22/EU, 2001/18/EC, 90/220/EEC, WFD 2000/60/EEC, MSD 2008/56/EC, 2006/44/EC, 79/923/EEC, 97/61/EC) are in effect either as Directives to be embedded in Greek legal system or as officially passed county.

The official EU system for fisheries controls has engaged a Vessel Monitoring System (VMS) which is a satellite-based monitoring system providing at regular intervals data to the fisheries authorities on the location, course, and speed of vessels. VMS is nowadays a standard tool of fisheries monitoring and control worldwide, but it was the EU that led the way, becoming the first part of the world to introduce compulsory VMS tracking for all the larger boats in its fleet. The EU legislation requires that all coastal EU countries should set up systems that are compatible with each other so that countries can share data and the Commission can monitor that the rules are respected. EU funding is available for the Member States to acquire state-of-the-art equipment and to train their people to use it. The VMS systems may involve the processing of personal data (Data Controller: DG MARE/C4 - DMU; Record reference: DPR-EC-00508.1), pursuant to EU Regulation 2018/1725 of the European Parliament and of the Council of 23 October 2018 on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices, and agencies and on the free movement of such data (repealing Regulation No. 45/2001/EC).

New control technologies have become crucial nowadays to ensure effective monitoring and control of fishing fleets and streamlined management of qualitative and reliable fisheries data. The EU legislation and official documents are:

- Corrigendum to Commission Implementing Regulation No. 404/2011/EU laying down detailed rules for the implementation of Council Regulation No. 1224/2009/EC establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy.
- Council Regulation No. 1224/2009/EU establishing a Community control system for ensuring compliance with the rules of the common fisheries policy, amending older EC Regulations.

In Greece, the General Directorate for Fisheries is the administrative department of the Ministry of Rural Development and Food, which manages the collecting fisheries, aquaculture, and marketing-processing of fishery products. The General Directorate for Fisheries has a strategic

goal of promoting the primary sector through the development of collecting fisheries and aquaculture, intending to optimally manage fishery resources, implementing control of activities, and promoting issues within the EU. and International Organizations (article 8, p.d. 97, A '2017).

Analytic division of power in decision/law-making about Fisheries in Greece can be found in the following link: https://portal.cor.europa.eu/divisionpowers/Pages/Greece-Fisheries.aspx.

The Hellenic Integrated Fisheries Information System can be found here: http://www.alieia.minagric.gr/?q=ospa.

The National strategies for Greece are related to the official Research Institutes of the water sector (e.g., the Hellenic Center of Marine Research; HCMR) for marine environmental monitoring. Specifically, the Institute of Marine Biological Resources and Inland Waters of HCMR participates in the implementation of the National Fisheries Data Collection Programme (EPSAD) by conducting field samplings throughout Greece. The implementation of EPSAD is undertaken under the Regulation 199/2008/EU, which dictates that Member States are obliged to submit annually to the General Department of Marine Affairs and Fisheries (DG-MARE) EU, data on the exploitation of fisheries resources and the state of fish stocks and the marine ecosystem in general. During the project, biological and environmental data on fisheries are collected and analyzed from the areas of activity of the Greek fleet, in accordance with a standard protocol.

The goal of the project is to contribute to the formulation of the Common Fisheries Policy that will ensure the sustainability of fishery resources and the conservation of the ecosystem. In addition, the programme provides the necessary information for the preparation of management plans for the Greek fisheries. The EPSAD is funded 50% by the EU and 50% by national economic sources, through the Ministry of Rural Development and Food, and implemented jointly by the Institute of Marine Biological Resources and Inland Waters of HCMR and the Fisheries Research Institute of the Greek Agricultural Organization - Dimitra.

National Monitoring

In terms of monitoring related to the MSFD implementation, the same aspects and requirements apply as stated above within WFD and GES analyses for Bulgaria.

One classic paradigm of funded monitoring activities is the Operational Programme (OP) **Fisheries and Maritime** (www.alieia.gr) with OP budget: $523,406,309 \in$ (with total EU Maritime and Fisheries Fund (EMFF) contribution: $388,777,914 \in$; total national: $134.628.395 \in$). The main objectives of the OP are to support funds absorption from the European Maritime and Fisheries Fund in Greece, which should aim at achieving key national development priorities along with the "Europe 2020" objectives. The OP addresses the general reform of the Common Fisheries Policy (CFP) and fully supports the priorities defined in the EMFF Regulation. The main objectives of the OP aim at enhancing the competitiveness of aquaculture and processing sectors, the viability of the sea fisheries sector, and the sustainable development of traditionally fisheries dependent areas. The Program also addresses the need for protection and rehabilitation of the marine environment and its living resources, the control of fisheries activities, the collection of fisheries data, and the improvement of knowledge on the state of the marine environment. The OP focuses on the following priorities:

• Viability and sustainable development of the Greek fisheries sector as well as at the protection of the fishing/marine resources" (186.2 million € or 35.57% of total OP allocation). The OP foresees investments for the modernization of fishing shelters and landing sites, for better health and safety, for the promotion of innovation and partnerships between fishermen and scientists, for the development of complementary activities /new

forms of income for fishermen and investments allowing fishermen to use and add value in unwanted catches. The creation and the monitoring of artificial reefs have also been planned, aiming at the protection and the restoration of marine biodiversity and the limitation of fisheries' impact on the marine environment. Permanent cessation of fishing activities and on board-investments to increase gear selectivity have also been provided.

- Fostering environmentally sustainable, resource-efficient, innovative and competitive and knowledge-based aquaculture" (89.7 million € or 17.15% of total OP allocation). Under this priority, the EMFF will support productive investments in aquaculture as well as investments aiming at enhancing the competitiveness and viability of the aquaculture sector.
- Promoting the implementation of the Common Fisheries Policy (92 million € or 17.59% of total OP allocation), for the collection and management of data as well as for supporting monitoring, control, and enforcement.
- Promoting the maintenance of the economic and social sustainability of the Greek fisheries and aquaculture areas (54.1 million € or 10.34% of total OP allocation), focusing on the creation of jobs and the diversification within and/or outside fisheries and aquaculture sectors and the sustainable exploitation of related products through the implementation of comprehensive local development strategies.
- Fostering marketing and processing (78.2 million € or 14.96% of total OP allocation).
- Integrated maritime policy aiming at improving knowledge on the marine environment (5.9 million € or 1.13% of total OP allocation), with particular focus on the development of part of CISE (Common Information Sharing Environment).
- Technical assistance (17,037,219 € or 3.26% of total OP allocation) in order to ensure efficient administration of the EU funding, including support to publicity and information measures as well as evaluations.

International Monitoring: The Mediterranean Sea case (neighboring countries to Greece)

The Mediterranean is an area of outstanding ecological diversity. However, one of the region's proud culinary traditions—the prevalence and diversity of fresh fish—is increasingly under threat. The fish stocks of the Mediterranean have come under growing pressure from economic expansion, population growth, and tourism, which have driven rising demand, and from decades of overfishing. Combined with illegal fishing, discards, pollution, and flaws in the way in which relevant data are collected and monitored, this has led to much of the fish stock becoming at risk of depletion and exhaustion.

The gravity of the situation has led to increased attention being paid to the problem at high levels. Following consultations with stakeholders, in late March 2020, the EC announced a pledge, the **"Malta MedFish4Ever Declaration"**, to save the fish stocks of the Mediterranean. In detailed proposals for fisheries policy in the Mediterranean over the next ten years, which the Commission called "ambitious but realistic", the declaration contained several commitments:

- To make sure that by 2020 data are collected and scientifically assessed on all fish stocks in the Mediterranean, with small fishermen to be given a bigger role in data collection;
- the establishment of multi-annual plans for all key fisheries;
- an end to illegal fishing by 2020, making sure that all countries have the capacity to meet their control and inspection responsibilities; and
- streamlining funding schemes to ensure sustainable small-scale fishing and aquaculture. This means fleet upgrades with low-impact techniques, social inclusion, and environmental protection.

There has been a concern for some time regarding the overexploitation of fish stocks in the Mediterranean, and measures have previously been introduced to address the issue. Over ten

years ago a regulation—Mediterranean Regulation EC 1967/2006—was adopted by the EU to improve fisheries management in the region. However, the situation has become quite critical. Of the assessed fish stocks in the Mediterranean, more than 90% are overexploited. For some fish, such as hake, red mullet, black-bellied anglerfish, and blue whiting, current mortality rates are at six times the sustainable level. Over the past 50 years, the Mediterranean has lost 41% of its marine mammals and 34% of the total fish population. An article in Nature Scientific Reports by scientists from the European Commission's Joint Research Centre warns that the pressure on the Mediterranean region might push the ecosystem beyond the point of no return if not addressed.

The levels of overfishing may be even worse than the official numbers suggest. Some have argued that illegal fishing is prevalent and that the total catch could therefore be significantly higher than reported. One study by Daniel Pauly and Dirk Zeller from the Sea Around Us Project finds that between 1950 and 2010 Mediterranean catches were around 50% higher than official Food and Agriculture Organisation (FAO) numbers. Others have insisted that to get back to sustainable levels, a 50-60% reduction in fishing in the region by 2020 will be necessary.

From the EU perspective, finding a way to sustainable, controlled fishing in the Mediterranean has long been complicated by the fact that the waters are shared with many non-EU countries. This was a key consideration for policymakers working towards the Malta MedFish4Ever Declaration, given the need to have signatories from all relevant countries. As well as various EU bodies and the FAO, signatories to the declaration included not only eight EU member states (Spain, France, Italy, Malta, Slovenia, Croatia, Greece, and Cyprus), but also seven third countries (Morocco, Algeria, Tunisia, Egypt, Turkey, Albania, and Montenegro). More broadly, addressing the depletion of fish stocks in the Mediterranean is in line with wider EU commitments, including those under the UN Sustainable Development Goals (SDGs). SDG12, for example, demands that signatories ensure sustainable consumption and production patterns, something that is not currently the case for fishing in the Mediterranean.

Food sustainability in the Mediterranean

Overfishing to the extent that stocks become depleted or exhausted is an excellent example of unsustainable food policy. The Food Sustainability Index (FSI), developed in 2016 by The Economist Intelligence Unit with the Barilla Center for Food and Nutrition, looks at how the global food system could be maintained without depletion or exhaustion of natural resources, and without making compromises on health or nutritional quality. Its three pillars—food loss and waste, the sustainability of food production, and nutritional challenges—are all relevant in the case of fishing in the Mediterranean.

Achieving greater sustainability of fish stocks in the Mediterranean matters for four reasons. First, over 300,000 people are directly employed on fishing vessels in the Mediterranean, with many more jobs linked indirectly, such as in production and distribution. Importantly, fishing in the region is notable for the prevalence of small-scale fishing: although 80% of the vessels are under 10m long, they are responsible for over one-quarter of all the fish caught. If overfishing and the depletion of stocks continues at current rates, the risk to these jobs will be significant.

The second issue is regional security. Areas of the Mediterranean region have seen huge and violent unrest in recent years, partly as a result of high food prices and the instability of supplies. An exacerbation of food security challenges caused by the depletion of fish stocks would add to a long list of problems faced by policymakers in these countries.

Third, food waste—one of the main focuses of the FSI—is a major concern in the Mediterranean. Unwanted fish are often thrown back dead into the sea. This is not only a waste of resources but

is also a threat to the health and stability of marine ecosystems. Reducing or eliminating this waste would help to solve the problem of fish-stock depletion.

Finally, there are clear health implications, another issue identified by the FSI as a key component of food sustainability. As a joint paper by the FAO and the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) highlights, south-east Mediterranean countries face food and nutritional security challenges, including malnutrition and overnutrition as well as diet-related chronic-disease issues. The same paper notes that nutritional issues in the region are in part linked to a decline in adherence to the fabled Mediterranean diet. Given that fish has a central place in the Mediterranean diet, securing a sustainable supply will be crucial to tackling nutritional and health challenges in the coming decades.

• Moldova

According to the EU-Moldova Association Agreement (Articles 71 - 73), Moldova agreed to develop and strengthen cooperation on issues covering fisheries and maritime governance, thereby developing closer bilateral and multilateral cooperation in the fisheries sector. EU and Moldova shall also encourage an integrated approach to fisheries issues and to promote sustainable fisheries development. Moldova took the obligations for joint actions, exchange information, and provide support in order to promote:

(a) good governance and best practices in fisheries management with a view to ensuring conservation and management of fish stocks in a sustainable manner, and based on the ecosystem approach;

(b) responsible fishing and fisheries management consistent with the principles of sustainable development, so as to conserve fish stocks and ecosystems in a healthy state;

(c) cooperation through appropriate regional organisations responsible for management and conservation of living aquatic resources.

According to the AA, Moldova will support initiatives, such as mutual exchange of experience and providing support, in order to ensure the implementation of a sustainable fisheries policy, including:

(a) management of fisheries and aquaculture resources;

(b) inspection and control of fishing activities, as well as the development of corresponding administrative and judicial structures capable of applying appropriate measures;

(c) collection of catch, landing, biological and economic data;

(d) improving the efficiency of the markets, in particular by promoting producer organisations, providing information to consumers, and through marketing standards and traceability;

(e) development of a structural policy for the fisheries sector, with particular attention to the sustainable development of fisheries areas which are defined as an area with lakeshore or including ponds or a river estuary and with a significant level of employment in the fisheries sector.

The EUWI+ project will support the Ministry of Agriculture, Regional Development and Environment (MARDE) efforts for the consultation and integration of the Moldovan Code of Good Agricultural Practices into the national regulation. The Environment Agency is anticipating delivery, installation, and training of the last large laboratory equipment, including the gas chromatograph. Analytical method pieces of training with new laboratory equipment at the EAM

Reference laboratory in Chisinau are planned. In order to improve Ground Water (GW) monitoring network in the Danube-Prut and the Black Sea River district and in coordination with the beneficiary Agency of Geology and Mineral Resources, several new monitoring wells are foreseen to be designed and drilled. The process of collecting remarks and opinions on the Draft RBMP for the Danube-Prut and Black Sea River district to be implemented from 2022 to 2027 is on-going. Besides, support will be initiated for moving towards an e-RBMP in Moldova, including the development of basin and water bodies passports. The procurement of small laboratory equipment and laboratory consumables will be finalized, subject to restrictions due to COVID-19. EUWI+ will also further continue efforts to finalise the delivery and installation of and the required training on two larger pieces of laboratory equipment. It is foreseen the purchasing equipment for hydrobiological monitoring for EAM, organising investigative monitoring in the Ialpug River basin, and obtaining new ISO-17025 accreditation. Regarding improvements to data management, it is planned to progress with the signing of a Letter of Agreement and procurement document for the acquisition of a new server for the Agency "Apele Moldovei" for installing a web data management platform as a step toward a shared Water Information System.

o **Romania**

European Union (EU) environmental policies and legislation protect natural habitats, keep air and water clean, ensure proper waste disposal, improve knowledge about toxic chemicals and help businesses move toward a sustainable economy. European environment policy rests on the principles of precaution, prevention, and rectifying pollution at source, and on the 'polluter pays' principle.

The precautionary principle is a risk management tool that may be invoked when there is scientific uncertainty about a suspected risk to human health or the environment emanating from a certain action or policy. For instance, should doubts arise about the potentially harmful effects of a product, and should – following an objective scientific evaluation – uncertainty persist, instructions may be given to stop the distribution of the product or to remove it from the market. Such measures must be non-discriminatory and proportionate and must be reviewed once more scientific information is available.

In 2001, the EU introduced its **Sustainable Development Strategy** (SDS), thus complementing the earlier Lisbon Strategy for promoting growth and jobs with an environmental dimension. Renewed in 2006 to combine the internal and international dimensions of sustainable development, the <u>revised EU SDS</u> strives for the constant improvement of the quality of life by fostering prosperity, environmental protection, and social cohesion. In line with these goals, the <u>Europe 2020 strategy</u> for growth aims at shaping 'smart, inclusive and sustainable growth'. Under its umbrella, the '<u>flagship initiative for a resource-efficient Europe</u>' points the way towards sustainable growth and supports a shift towards a resource-efficient, low-carbon economy. Furthermore, in 2011 the EU committed itself to halt the loss of biodiversity strategy for 2030 is a comprehensive, ambitious, and long-term plan to protect nature and reverse the degradation of ecosystems. The strategy aims to put Europe's biodiversity on a path to recovery by 2030 and contains specific actions and commitments.

EU environmental law has been built up since the 1970s. Several hundred directives, regulations, and decisions are in force today in this field. However, the effectiveness of EU environmental policy is largely determined by its implementation at national, regional, and local levels, and

deficient application and enforcement remain an important issue. Monitoring is crucial - both of the state of the environment and the level of implementation of EU environmental law

In 1990, the European Environment Agency (<u>EEA</u>), based in Copenhagen, was established to support the development, implementation, and evaluation of environmental policy and to inform the general public on the matter.

The future of fisheries management in the Black Sea is intrinsically linked with the setting of cross-sectoral "Maritime Policy" and "Marine Strategy Framework Directive" which deal with the cumulative impact of human activities.

The EU Strategy for the Danube Region (EUSDR

The EUSDR is a macro-regional strategy adopted by the European Commission in December 2010 and endorsed by the European Council in 2011. The Strategy was jointly developed by the Commission, together with the Danube Region countries and stakeholders, in order to address common challenges together. The Strategy seeks to create synergies and coordination between existing policies and initiatives taking place across the Danube Region.

The Danube Region Strategy addresses a wide range of issues; these are divided among **4 pillars** and **12 priority areas**.

The most important priority axes (PA) for the environment are: PA 4 - Water Quality, PA 5 - Environmental Risks, PA 6 - Biodiversity, Landscapes, and Air & Soil Quality.

BSIMAP - <u>Black Sea Integrated Monitoring and Assessment Programme</u>

The Convention on the Protection of the Black Sea **The Convention on the Protection of the Black Sea Against Pollution** was signed in Bucharest in April 1992 and ratified by all six legislative assemblies of the Black Sea countries at the beginning of 1994. Also referred to as the "Bucharest Convention", it is the basic framework of the agreement and three specific Protocols, which are: the control of land-based sources of pollution; dumping of waste; and joint action in the case of accidents (such as oil spills). The implementation of the provisions of the Convention is supported by the Commission on the Protection of the Black Sea Against Pollution (also referred to as the Istanbul Commission), and its Permanent Secretariat, stationed in Istanbul, Turkey. The Black Sea Strategic Action Plan 1996 and the Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea 2009 require a holistic approach to the Black Sea ecosystem. This holistic approach was used by the Black Sea network of intuitions for the development of the Black Sea Integrated Monitoring and Assessment Programme (BSIMAP).

The main activities for the implementation of the BSIMAP carried will be:

1. reaching consensus on common principles for regional monitoring and assessment programmes

2. establishment of an initial affordable program to harmonize assessment methodologies, analytical techniques, reporting formats, etc.

3. harmonization of assessment methodologies on a regional level

4. elaboration of environmental quality criteria/objectives

5. development and establishment of mechanisms of integration scientific results into the assessment process

6. elaboration of mechanisms and procedures for quality assurance quality control

7. elaboration and maintenance of the Black Sea Information System for supporting the decisionmaking process of the Black Sea Commission.

DT4.1.1. Technical report

The Food and Agriculture Organization of the United Nation (FAO) is to contribute effectively and efficiently to *policy and institutional development for the promotion of sustainable capture fisheries and aquaculture* and to actively influence the global capture fisheries and aquaculture agendas.

The **General Fisheries Commission for the Mediterranean** (GFCM) is a regional fisheries management organization of FAO.

The GFCM plays a critical role in fisheries governance in its area of application, having the authority to adopt <u>binding recommendations for fisheries conservation and management and for aquaculture development</u>. These recommendations can relate, among others, to the regulation of fishing methods, fishing gear, and minimum landing size, as well as the establishment of spatial protection measures, fishing effort control, and multiannual management plans for selected fisheries.

The **Common Fisheries Policy (CFP) and research** aim to conserve fish stocks and reduce overfishing in order to provide EU citizens with a long-term stable, secure and healthy food supply.

Research and innovation efforts are needed to implement the CFP and acquire more food from the seas and oceans in a sustainable way, either through novel foods or food via aquaculture or fisheries.

Scientific, Technical and Economic Committee for Fisheries (STECF),

The implementation of the CFP requires the assistance of highly qualified scientific personnel, particularly in the application of marine and fisheries biology, fishing gear technology, fisheries economics, fisheries governance, ecosystem effects of fisheries, aquaculture or similar disciplines, or in the field of collection, management and use of fisheries and aquaculture data. For that purpose, the <u>Scientific, Technical, and Economic Committee for Fisheries (STECF)</u> was established by <u>Commission Decision 93/619/EC</u> and renewed in 2016 by Commission decision C(2016) 1084 of 25/02/2016.

The European Commission should consult STECF in order to develop the CFP policy, where appropriate, on matters pertaining to the conservation and management of living marine resources, including biological, economic, environmental, social, and technical considerations.



Figure 4. The processes of fishery monitoring, stock assessment, consultations, and advice of STECF to policy and regulation for EC and Parliament



Figure 5. Diagram for fishery monitoring, stock assessment, consultations, and advice of STECF to policy and regulation for EC and Parliament

The EU and GFCM are showing increasing concerns about the Mediterranean and the Black Sea stocks, and the Commissions have on several occasions expressed the view that the recovery of Mediterranean and the Black Sea stocks should now be regarded with the highest priority (EC, 2015). Following the 2013 CFP Reform, the gradual establishment of MSY as a management target for all fish stocks (including data-limited stocks) may potentially render EU TAC decision-making increasingly consistent with scientific advice. Since the inception of the 2013 CFP, the EU has strengthened its management objectives (gradual establishment of MSY to all fish stocks) and conservation measures (gradual implementation of discard limitations), raising better prospects for the future sustainability of its fisheries. Another increasingly important aim is to reduce untargeted catches and wasteful practices to the minimum or avoid them altogether, through the gradual introduction of a landing obligation. Finally, the new CFP has overhauled its rules and management structure, with regionalization and more extensive stakeholder consultation (COM 2015).

The EU is funding a variety of projects, which contribute to the implementation of one of the key challenges of the EU CFP - estimating the maximum sustainable yield (MSY).

Romanian National policy and legislation refer to the Black Sea environment and fisheries

Romania generally agrees on Worldwide policy and regulation in the environment and fisheries domain by signing conventions on environment and fisheries. Particularly, as an EU member state, Romania is implementing all EC policies, strategies, and regulation on environmental and fishery in the Black Sea.

Environment convention

- A. Conventions on horizontal issues
- Convention on Environmental Impact Assessment in a Transboundary Context (ESPOO)

• Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (AARHUS)

• Protocol on the Register of Emitted and Transferred Pollutants

B. Conventions in the field of biodiversity protection

- Convention on the Protection of the World Cultural and Natural
- Heritage Convention on Biological Diversity
- Convention on the Protection of Wetlands of International Importance (RAMSAR)

• Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Convention on the Conservation of European Wildlife and Natural Habitats

- Convention on the Conservation of Migratory Species of Wild Animals
- European Landscape Convention
- Agreement on the conservation of bats in Europe
- Agreement on the Conservation of African-Eurasian Migratory Waterbirds

 \cdot Agreement on the conservation of cetaceans in the Black Sea, the Mediterranean, and the contiguous Atlantic

• Agreement on the protection of the environment in the Antarctic Treaty Framework
• Convention for the Protection and Sustainable Development of the Carpathians (Carpathian Convention)

C. Conventions in the field of climate change and ozone protection

United Nations Framework Convention on Climate Change

• Vienna Convention for the Protection of the Ozone Layer

D. Conventions in the field of water management and combating desertification

Convention on the Protection of the Black Sea against Pollution

 \cdot $\,$ Convention on the Protection and Use of Transboundary Watercourses and International Lakes

• Convention on Cooperation for the Protection and Sustainable Use of the Danube River

• United Nations Convention to Combat Desertification in Countries Facing Severe Drought and/or Desertification, especially in Africa

• International Convention on Preparedness, Response, and Cooperation in the Event of Oil Pollution International Convention for the Prevention of Pollution from Ships, 1973, as amended by the Protocol of London of 17 February 1978

E. Conventions in the field of waste management

 \cdot $\:$ Basel Convention on the Control of Transboundary Shipments of Hazardous Wastes and Their Disposal

F. Conventions in the field of air quality

Convention on Long-range Transboundary Air Pollution

G. Conventions in the field of chemical management

• Rotterdam Convention on the Application of the Prior Consent Agreement (CIP) Procedure for Certain Dangerous Chemicals and Pesticides in International Trade

• Convention on Persistent Organic Pollutants (POPs

Bilateral Treaties with Black sea and Lower Danube River countries

• Convention between the Government of Romania and the Government of the Republic of Bulgaria on cooperation in the field of environment

• Agreement between the Romanian Ministry of Environment and Water Management and the Ministry of Environment and Water of the Republic of Bulgaria on cooperation in the field of water management

• Agreement between the Government of Romania and the Government of the Republic of Turkey on cooperation in the field of environmental protection

• Agreement between the Government of Romania and the Government of the Republic of Moldova on cooperation in the field of protection of fishery resources and regulation of fishing in the Prut River and the Stânca-Costești reservoir

 \cdot Memorandum of Understanding between the Ministry of Environment and Forests of Romania and the Ministry of Environment of the Republic of Moldova on cooperation in the field of environmental protection

 \cdot Agreement between the Government of Romania and the Government of Ukraine on cooperation in the field of border water management

• Agreement between the Ministry of Environment and Spatial Planning of the Republic of Moldova, the Ministry of Waters, Forests and Environmental Protection of Romania and the Ministry of Environment and Natural Resources of Ukraine on cooperation in the area formed by the protected areas of the Danube Delta and the Lower Prut

• Agreement between R.P. Romania (today Romania) and R.P.F. Yugoslavia (now the State Union of Serbia and Montenegro) on hydrotechnical problems on hydrotechnical systems and watercourses on the border or intersected by the state border

One important convention is the **Convention concerning fishing in the waters of the Danube**. Signed at Bucharest, on 29 January 1958 Romania, Bulgaria, Yugoslavia And Union Of Soviet Socialist Republics.

The convention state that "the Contracting Parties agree to regulate fishing in the waters of the Danube, in its entirety through the territory of the signatory States, until discharge into the Black Sea, including the Danube Delta, in accordance with the provisions of this Convention".

However, following the dissolution of the Soviet Union, this Convention did not work anymore, despite it not being disagreed with by the member state. The main issue is that Ukraine is now a border country and Russian Federation does not border the Danube River. By annual meeting and report, the Commission agreed on scientific and regulatory issues on Danube fisheries.

3.2 Relevant projects carried out in the fields of fisheries, aquaculture, and seafood processing

o **Georgia**

There are two on-going initiatives funded by the EU covering all Black Sea countries: the project "Improving environmental monitoring in the Black Sea", funded by the EU and by the UNDP, and the project "Towards a Shared Environmental Information System" (SEIS) covering the European Neighbourhood as a whole. This last project will be followed by a project funded in 2014 which will continue SEIS activities in the six Eastern Neighbourhood partner countries.

Improving environmental monitoring in the Black Sea (EMBLAS) The project is managed by the Commission. Its first phase (2013-2014) represented a preparatory action financed under the ENPI Regional Action Plan 2012 with a total budget of EUR 600 000 over a 24 months implementation period. On top of this amount, UNDP as an implementing partner will provide USD 600 000 worth of additional contribution. This initiative was followed by a full-scale project whose implementation started in mid-2014 with a EUR 2.5 million budget. This figure is supplemented by a USD 300 000 contribution by UNDP. The duration of phase II is 3 years. The overall objective of these projects is to set up initiatives that will help improve the protection of the Black Sea environment. More specifically, the project aims to improve (a) availability and quality of data on the chemical and biological status of the Black Sea, in line with expected Marine Strategy Framework Directive (MSFD) and Black Sea Strategic Action Plan needs and (b) partner countries' ability to perform marine environmental monitoring along with the MSFD principles, taking into account the Black Sea Diagnostic Report. Partner countries are Georgia, Russia, and Ukraine.

The Improving Environmental Monitoring in the Black Sea project is also complementary to the Environmental Protection of International River Basins (EPIRB), launched in 2012 for 4 years and a EUR 7.5 million budget. The specific objectives of this project are as follows: a) to improve availability and quality of data on the ecological, chemical, and hydromorphological status of trans-boundary river basins including groundwater, b) to develop River Basin Management Plans

for selected river basins / sub-river basins according to the requirements of the WFD. The project covers the 6 EaP countries, thus including Ukraine, where the project office is based.

MISIS project Alongside the EMBLAS project, the Commission had launched a similar call for proposals that ended with the award of the contract to a consortium led by the Grigore Antipa (Romania) - MISIS project. The EUR 800 000 worth project targets Romania, Bulgaria, and Turkey starting from 2012 and complements the EMBLAS project's geographical scope, thus covering the whole Black Sea region.

Other projects and initiatives:

ENPI-SEIS UNECE is, under SEIS, working with the ENP East countries (and Russia) in charge of the development of a core set of indicators. Indicators and reports have been produced and are available online. A bilateral meeting on cooperation with the Black Sea Commission Permanent Secretariat (BSCPS) was organised in Istanbul on 24-25 May 2012. This meeting was seen as a first step to establish the basis for regular dialogue and future collaboration. Such collaboration, with a view to taking due account of marine and coastal environment, is expected to be strengthened in the follow-up of the ENPI-SEIS project.

MONINFO Among the completed projects, the MONINFO project can be seen as a good example of cooperation between the Black Sea countries in joining efforts and working together towards reduction/elimination of oil pollution in the Black Sea. Even though in the end, the countries couldn't agree on where physically to place the server required to support the system, the twophased project proved that on the technical level there are no obstacles to set up effective information and data exchange mechanisms among competent authorities for the prevention of and response to oil pollution from ships in the Black Sea.

The consortium continues to work on a project proposal to fund the EU HORIZON 2020 program for the second, final stage (direction - Blue Growth, grant competition "BG-11-2020: Towards a productive, healthy, resilient, sustainable and highly-valued Black Sea"). The consortium includes 16 organizations from 7 countries (Norway, Bulgaria, Romania, Turkey, Belgium, Ukraine, Georgia), including the National Environment Agency.

Promoting Technology Innovation in Monitoring & Modeling For Assessment of fish stock and nonfishing resources (TIMMOD). Joint Operational Program", which, in turn, is funded by the European Neighborhood Instrument (ENI) within the European Neighborhood Instrument (ENI). The project will also involve the Department of Fisheries, Aquaculture and Water Biodiversity.

EMODnet - The Georgian Designated National Agency (GeoDNA) was established in the year 2000 at the Tbilisi State University. It works as a national agency responsible for collecting, archiving, processing, and distributing scientific oceanographic data sets. GeoDNA is participating in the International Oceanographic Data Exchange of the IOC system and promoting the international exchange and management of data.

The Food and Agriculture Organization of the United Nations (FAO) and the LEPL - National Agency of the Ministry of Environment Protection and Agriculture of Georgia signed a grant agreement on July 29 this year. Selected Activities of Medium-Term Strategy for Sustainable Fisheries and Introduction of Aquaculture in the Mediterranean and Black Seas within the Project MTF / INT / 943 / MUL - Baby between the National Environment Agency of the Ministry of Defence and Agriculture. ("The Rapa Whelk research survey in the coastal waters of Georgia "within the framework of the GFCM Project "Select activities of the strategies towards the sustainability of fisheries and sustainable aquaculture development implemented in the Mediterranean and the Black Sea" (MTF / INT/943/MUL - Baby 31).

The first stage of the expeditions (autumn) has already been carried out within the framework of the project.

o Bulgaria

BEAM TRAWL SURVEYS FOR BLACK SEA RAPA WHELK

The project of IFR -Varna under the frame of EU project BlackSea4Fish focused on the data collection and analyses of the Rapa whelk abundance and biomass.

Biological activity and functional properties of Black Sea shellfish tissues (*Mytilus galloprovincialis*, *Chamelea gallina*, and *Donax trunculus*) as sources of natural nutraceuticals No. KP-06-OPR03/11 (funded by the National Science Fund of Bulgaria)

The project of the Medical University - Varna and Institute of Fish Resources - Varna, aiming to study the quality and functional potential of the tissues of three species of Black Sea shellfish: the black mussel (*Mytilus galloprovincialis*), striped venus clam (*Chamelea gallina*), and wedge clams (*Donax trunculus*).

TID(Y)UP F(ol)low the Plastic from source to the sea: Tisza-Danube integrated action plan to eliminate plastic pollution of rivers <u>http://www.interreg-danube.eu/approved-projects/tid-y-up</u>

International project INTERREG programme with following main goals: Tid(y)Up project is focusing on the improvement of water quality and reduction of plastic pollution in one of Europe's most heavily contaminated rivers, the Tisza, and investigates plastic pollution and its effect on the Danube and the Black Sea. Currently, there are no standard methods and consistent data available on plastic pollution of rivers in the Danube Basin that would help harmonized actions of water management authorities and allow cooperation with other sectors. In Tid(y)Up, project partners develop and launch a set of integrated actions, consult and provide tools for relevant stakeholders and initiate long term transboundary and intersectoral cooperation with the aim of monitoring and eliminating plastic pollution. The project operates with a list of diverse tools including research activities to standardize methods for estimation of the size of pollution, formulating recommendations toward standardized measurement, and analyzing methods. The partnership of Tid(y)Up will carry out field trips, expeditions, pilot actions to identify and restore polluted areas, as well as education and awareness-raising actions for prevention. The novelty of the project is that it provides tools, data and the assessment of various used methodology for the understanding of the sources, nature, and risks of contamination flows; and delivers practical examples of possible actions and legislative solutions both on the local and transnational level. The key focus is to gather all necessary information, raise awareness of the relevant actors and provide them with practical tools in order to create active, cooperating communities in the fight against plastic waste contamination and contribute to the work of water authorities to improve water quality by providing input for the upcoming revision of DRBMP.

MarCons: Advancing marine conservation in the European and contiguous seas (COST Action 15121) <u>https://www.marcons-cost.eu/</u>

International project: Marine biodiversity in the European Seas is under threat due to the intensity of cumulative human impacts. Despite the high-level goals to halt the loss of biodiversity and ecosystem services by 2020, there are no signs of improved trends in the state of biodiversity. Most services derived from marine and coastal ecosystems are being used unsustainably and therefore marine ecosystems are deteriorating faster than other ecosystems. The challenges of biodiversity conservation and sustainability of ecosystem services are further complicated by climate change, which is expected to decrease the effectiveness of current-

state-of-the-art marine management measures by inducing range shifts and biodiversity reshuffling and favouring biological invasions. This Cost Action will consolidate a network of scientists and stakeholders who are involved in marine conservation in European and contiguous seas, promote collaboration, reduce redundancy of research efforts in conservation science and practice, make significant progress beyond the state-of-the-art by developing and promoting the novel and relevant concepts, methods, and tools, provide support to the related European policies, and enable effective and informed decision-making for the improvement of marine conservation in the European Seas and adjacent regions. By advancing the science of integrated conservation planning, promoting regional coordination and transboundary conservation, proposing specific conservation actions, accounting for climatic change and biological invasions, and providing guidance for assessing governance issues to make marine spatially managed areas more effective, this Cost Action aims to bridge the gap between conservation science and policymakers and substantially contribute to the challenge of halting biodiversity loss in the European Seas by 2020.

Ocean Governance for Sustainability - Challenges, Options and the Role of Science - COST Action CA15217 (2016-2020) <u>https://www.oceangov.eu/</u>

The international project with the following topics: The governance of oceanic systems and coastlines is moving into the center of European strategic and sustainability interests. Yet, it suffers from a high degree of fragmentation and the lack of a cross-scalar approach to addressing prevailing policy shortcomings. The proposed COST Action on "Ocean Governance for Sustainability - Challenges, Options and the Role of Science" comprises a unique, transdisciplinary network of 58 proposers with regional and international outreach. The network aims to establish an integrative vision, and a series of approaches that informs research and future policy directions on crosscutting sustainability-driven issues related to the fragmented governance framework of oceans, seas, and coastlines within regional waters, and the open ocean in areas beyond national jurisdiction. The network differs from thematic predecessors in two distinct ways: While attending to the multiple flows and connectivities between varied marine systems together with land- and sea-based interfaces that are biologically, culturally, politically, and socio-economically entwined, it first renders equal importance to strengthening regional and interdisciplinary dialogue, producing scientific output, crosscutting the natural and social sciences. Synergistic issue-driven working groups will be created at a time when Europe is considering its role in global ocean governance and will continue to evolve well after the COST Action ends. Second, the network creates a distinct multi-scalar and cross-sectoral platform for institutional partners across academia, policymaking, and civil society, presenting inclusive spaces for transdisciplinary dialogue, capacity development, and the advancement of practical toolkits that attend to science-policy gaps inherent within the integrated ocean and coastal governance.

2019-2021 CeNoBS - Support MSFD implementation in the Black Sea through establishing a regional monitoring system of cetaceans (D1) and noise monitoring (D11) for achieving GES https://www.cenobs.eu/

International two-year project activities started in January 2019 to collect baseline data on the distribution/abundance of the Black Sea cetacean populations, bycatch pressure, and to implement effective noise monitoring in the region.

2019-2022 Black Sea CONNECT - Coordination of Marine and Maritime Research and Innovation in the Black Sea <u>https://ims.metu.edu.tr/slider/black-sea-connect</u>

International project: The EU-funded Black Sea CONNECT project will support the development of the blue economy in the Black Sea region through the cooperation of stakeholders from the

scientific, technological, industrial, political and logistic sectors. The project will associate ecological protection, economic growth, infrastructure development, and scientific research.

2018-2020 ANEMONE - Assessing the vulnerability of the Black Sea marine ecosystem to human pressures (CBC program)

http://anemoneproject.eu/?fbclid=IwAR1n1XCVFSBViLRu8FilMHWSXMTnrZO-4Runi0CeTrZtHF-mkmCpBIHF960

This project aims to deliver a common strategy related to the Joint Monitoring of the Black Sea, using the most adequate common agreed assessment criteria and indicators, in order to assess the status of the Black Sea, as a basis for further actions. An improved cross-border collaboration and research capacity in addressing trans-boundary pollution, eutrophication, and biodiversity monitoring as required by the Marine Strategy Framework and the Black Sea Strategic Action Plan2009, represent a basis for comparison between the conclusions of the Black Sea states about the short-term and long-term dynamics of the Sea. The proposed joint monitoring requirements will focus, on parameters that are indicative of the state of the environment, the prevailing anthropogenic pressures and their impacts, and the progress towards the good environmental status (GES) (ecological objectives and targets).

STrengthening REgional cooperation in the Area of fisheries biological data collection in the Mediterranean and Black Sea (STREAM)

Link to final report:

https://datacollection.jrc.ec.europa.eu/docs/regional-

grants?p p id=110 INSTANCE V8yNxE0r0dhy&p p lifecycle=0&p p state=normal&p p mode=view&p p col id=column-2&p p col count=1&_110 INSTANCE V8yNxE0r0dhy_struts_action=%2Fdocument_library_display%2Fview_file_entry&_110_INS TANCE_V8yNxE0r0dhy_redirect=https%3A%2F%2Fdatacollection.jrc.ec.europa.eu%2Fdocs%2Fregionalgrants%3Fp p_id%3D110_INSTANCE_V8yNxE0r0dhy%26p p_lifecycle%3D0%26p p_state%3Dnormal%26p p_mode%3Dview% 26p p_col_id%3Dcolumn-2%26p p_col_count%3D1&_110_INSTANCE_V8yNxE0r0dhy_fileEntryId=1293832

o **Greece**

MARRE (MARine monitoring system of the Hellenic Seas using REmote sensing, satellite data, and in-situ measurements; www.marre.gr) is a project developed by the Marine Remote Sensing Group (MRSG) (Department of Marine Sciences, University of the Aegean), in the framework of the Operational Programme Competitiveness, Entrepreneurship, and Innovation. MARRE is a research proposal for the development and establishment of an integrated open-source GIS system for monitoring the marine environment. The services and products were supplied by satellite remote sensing data combined with field measurements and they are covering a wide range of modern scientific issues from the fields of ecology, fishery management, and physicochemical monitoring of the Greek seas. The project provides fast, accessible, and reliable information that formerly required personal skills and actions for collection, processing, and interpretation. In other words, MARRE contributes to faster decision making, addressing municipality and public issues as well servicing the private and non-profitable sectors. The two main and innovative elements of the project arising from the combination of enterprises and research institutes are: the linking of field data with multiple-scaled remote sensing data (from a few centimeters spatial aerial imagery to terrestrial satellite spatial analysis of tens of meters) and the combination of information extracted from different types of data into an information system for monitoring the quality of the coastal and marine environment.

The proposal was implemented by a company (GET) and a collaborative scheme of 2 research centers (HCMR, University of the Aegean). The role of the participants was: for GET to develop a new innovative product (a geospatial platform for management and dissemination of

information) that will help it in its further development, for HCMR, which is the major Marine Research Centre and data provider in Greece, to provide data which will be used to calculate the new products through their combination with satellite data and, for the Aegean University (Marine Remote Sensing Group (MRSG) of the Department of Marine Science) to develop the calculation algorithms for the new products (e.g., seagrass maps and fishing resources).

The project is financed by the Operational Programme Competitiveness, Entrepreneurship, and Innovation (EPAnEK, $E\Sigma\Pi A$ 2014-2020) of the Ministry of Economy & Development, and co-funded by the EU (European Regional Development Fund) and by national funds.

MARRE project develops innovative products to monitor the status of the marine environment using free satellite observation data. These new products provide information on water quality and are derived from the in-situ measurements of the participating institutions as well as from available data at European repositories. In particular, using high-resolution satellite data such as Sentinel data in combination with in-situ measurements at Greek seas, essential environmental parameters such as chlorophyll concentration and turbidity are assessed, as well as the detection of potential fishing zone areas. The combined use of satellite data and in-situ measurements evaluates and improves existing empirical algorithms. As a result, the derived products are adapted to local conditions and the specific features of the Greek seas. Importance was given to the monitoring of the marine biodiversity by the mapping and the monitoring of the Posidonia oceanica meadows.

The calibration of specialized Chl-a calculating algorithms for the Greek seas contributed to the production of more accurate information and the creation of Chl-a maps. Modernized existing knowledge leads to new products and technologies. Through the MARRE platform, it is possible to externalize these services to the scientific community. Based on the application of the methodology to the areas of interest, the use of the Sentinel - 2 and Sentinel - 3 satellite data present promising results in the maps produced. S2 data show more detailed results in coastal, complex areas with high variability. For lower concentration values the results of the comparison are more correlated. The smallest differences are found in offshore areas with low Total Suspended Matter (TSM) concentration values. The largest differences are found near the coastline and estuaries, where variability is greater. Regarding the use of Landsat-8 satellite imagery, the classification confirmed its ability to generate reliable coverage data on the spatial distribution of Poseidonia meadows for large-scale ecological and conservation studies. The vectors generated are good enough to identify priority conservation sites to help experts develop conservation strategies and design a resilient network of marine protected areas in Greece. A total of 50 Landsat-8 (OLI) images were used, covering the area of the Greek seas with high differences in geomorphology, structure, and area of the seabed. For the first time, Greek waters were mapped for the presence/absence of meadows throughout the spatial field.

The **Potential Fishing Zones (PAZ)** provide information on the possible location of fish populations. They usually consist of Chlorophyll and Surface Marine Temperature distribution data. They have been shown to help increase production by 2-5 times and reduce search time by 30-70%. The methodology is based on an indirect way of locating fish populations: Marine circulation (medium scale formations and fronts), chlorophyll concentration, and Spatial Distribution of Surface Marine Temperature. The purpose is: The creation of a product - service and the model to work for all seasons of the year. Integration with MARRE helps functionality with analysis and design tools and publicity and usability. Finally, in the use of open-source software, with the possibility of modifications.

Fish4Life (https://archipelago.gr/en/fish4life-en/) is a guide for sustainable fish consumption in Greece and other parts of the Mediterranean. It aims to provide the public with easily accessible information about what seafood is sustainable to consume and when. It provides information on

the status of each species (e.g., whether it is illegal, or sustainable to consume) and their breeding season when consumption should be avoided (shown in red months on the calendar). Moreover, it provides information about the minimum legal size within Greece, (the size below which it is illegal to catch or consume each species), as well as the minimum sustainable size (the recommended minimum size for consumption due to reproductive age thus allowing regeneration of species. In many cases this is different from the legal size!). The main commercial fishery practices in Greece are listed below (shown using symbols for each species). Fish4Life was initially created by researchers of Archipelagos Institute of Marine Conservation and developed as an app, by TEDx Thessaloniki in May 2012, currently under redesign.

Founded by the Greek non-profit Archipelagos Institute of Marine Conservation, the Aegean Marine Life Sanctuary (AMLS) will open its doors in 2021. Its mission is:

1. Operate as a first-of-its-kind veterinary clinic and rehabilitation center where sick or injured marine animals (dolphins, sea turtles, monk seals), can receive critical clinical care and rehabilitative treatment in a "teaching marine mammal hospital" in a pristine natural location far from human impacts.

2. Provide a solution-based alternative offering long-term care and refuge for dolphins that are displaced, or at risk from mistreatment or closure of a marine park.

3. Promote biodiversity conservation through innovative habitat enhancement techniques including installation of artificial reefs and experimental replantation of vulnerable seagrass meadows.

The implementors' vision aspires to:

- develop "Animals First" protocols for marine mammal and turtle first aid, rehabilitation, and welfare, serving as a model of a multi-disciplinary teaching facility that focuses on providing solutions-based initiatives towards research, conservation, and accredited care of marine mammals.
- build capacity for a 'unified' Mediterranean Marine Mammal Rescue Network, that works together to aid standards-based rescue and rehabilitation of sick, injured, or 'at-risk' marine animals.

AMLS mission is to rescue marine mammals in distress and provide a quality refuge for their recovery and rehabilitation while building an international research center where dolphins can be studied in a regulated, natural environment.

The sanctuary is powered solely by renewable energy with a minimal plastic footprint (sustainability). The model sanctuary can be globally replicated and scaled to local conditions and different budgets. It is bound to compelling positive change by setting international standards through innovative protocols and practices. Community engagement is secured by its dedication to raising awareness and working with communities to educate and implement conservation solutions.

The project's priorities are to:

- Provide long-term care to dolphins, monk seals, and sea turtles in a natural environment.
- Offer high-quality veterinary care to a variety of native marine species in a region where such care is currently lacking.
- Promote and protect the biodiversity of the Aegean Sea through non-invasive research practices.
- Serve as a building model that can be replicated globally with AMLS' open-source set of protocols and best practices.
- Stand as a center for research and education for local and international students, visitors, scientists, and conservation managers.

• Increase public awareness about dolphin welfare issues and the vital need for efficient marine conservation globally.

Save the Aegean is another initiative of the Archipelagos Institute of Marine Conservation that aims to form an alliance between environmentalists, scientists, businesses, and consumers. The common goal is working towards an effective reduction of environmental footprint caused by our daily life, which is having detrimental repercussions on our planet at its seas. *Save the Aegean* aims to contribute to the protection and preservation of the Aegean Sea's rare biodiversity, through filling in knowledge gaps via research and awareness-raising, as well as through the implementation of effective conservation actions. One aspect of this initiative includes the development and promotion of new products that are truly eco-friendly.

Consumers are given the opportunity to have a greater say towards what products are available to them. By being the demand that triggers the supply, the power to request sustainable and environmentally friendly products lies in the hands of the consumers. Save the Aegean is a platform that further facilitates the ability to reduce personal environmental footprints while having their desire to do so heard by companies and manufacturers.

Companies improve both their products and impact on the environment by offering consumers more eco-friendly alternatives. By doing so they will help promote to the public the need for environmentally conscious decisions to be made when purchasing every-day items. In addition, they will support targeted actions of protection and conservation by donating some of their profits.

Greek Aquaculture is the main focus of Case 12 in the **ClimeFish** global-scale project. It aims to help ensure that the increase in seafood production comes in areas and for species where there is a potential for sustainable growth, given the expected developments in climate, thus contributing to robust employment and sustainable development of rural and coastal communities.

To reach this goal, *ClimeFish* has eight specific objectives:

1. To investigate the effects of climate change on fisheries and aquaculture at a European and regional scale, and to collect and harmonize relevant data which will be made available in the H2020 Open Research Data Pilot.

2. To develop novel forecasting models to simulate and analyse changes in distribution and production in the fisheries and aquaculture sectors.

3. To identify risks and opportunities based on analysis of the market and non-market costs and benefits of affected ecosystem services; propose potential mitigation strategies.

4. To develop early warning methodologies for these risks, including a traffic-light system.

5. In co-creation with stakeholders, develop case-specific Management Plans that mitigate risks and utilize opportunities associated with anticipated effects of climate change on aquatic production, based on ecosystem and results-based management approaches.

6. In co-creation with stakeholders, develop guidelines, good practice recommendations, and a voluntary European standard outlining how to develop this type of Management Plans in the future.

7. In co-creation with stakeholders, develop the ClimeFish Decision Support Framework. This contains the ClimeFish Decision Support System and other decision support resources, such as models, datasets, sample runs, and guidelines.

8. To provide training and dissemination for industry, policymakers, scientists, and other stakeholders; to ensure active utilization of the developed tools and guidelines beyond the

project lifetime in close collaboration with the European Climate Adaptation Platform (Climate-ADAPT).

ClimeFish will analyze three main production sectors: marine aquaculture, marine fisheries, and lake and pond production, and *ClimeFish* forecasting are to be based on 3 specific climate scenarios. It is financed by the EU's Horizon 2020 research and innovation programme under grant agreement No. 677039.

MedSUSHI project refers to the utilization of edible algae Dictyopteris membranacea and Laurencia obtusa in Mediterranean cuisine as a biofunctional food and nutritional supplement (Funding: EPANEK 2014-20120 "RESEARCH-CREATE-INNOVATE", 2018-2021). Subject: The promotion of specific edible algae of the Greek seas as a refined functional food, but also as a raw material for the preparation of nutritional supplements and cosmetics.

MSFD is a project dedicated to: Monitoring and recording the status of the marine sub-regions of Greece / Upgrading and operational updating of the monitoring network - Sampling and analysis of biotic and abiotic parameters of the marine ecosystem (NSRF funding, 2018 - 2023). Subject: Monitoring of the marine environment in the context of the implementation of the Marine Strategy Framework Directive (OPTHS, 2008/56/EU).

The i-Fish project deals with the Application of smart systems for enhanced fish management and welfare in cage aquaculture. The project will develop and implement an operational multisensor system for real-time monitoring of aquaculture sea cages using optical and acoustic systems. (Partners: HCMR (coordinator), Technical Univ. of Crete, UAegean, Kefalonia Fisheries; Funding: European Maritime and Fisheries Fund).

MODIAS project refers to the Assessment of the impacts of biological invasions in the Aegean Sea trophic webs using an ecosystem modeling approach. The research project MODIAS aims to advance our state of knowledge regarding the cumulative impacts of biological invasions, fisheries, and Climate Change in the South Aegean Sea by the development of the first ecosystem models for the study area. These models will be used to assess for the first time the historical effects of these stressors on the study ecosystem and also make predictions under different scenarios regarding the invasion regime, fisheries management, and Climate Change. The results of the project are expected to advance our knowledge regarding the process of biological invasions in the Eastern Mediterranean and also inform fisheries management and systematic planning of marine conservation of the significantly impacted marine ecosystem of the region. (Partners: UAegean (coordinator), Institute of Marine Sciences in Barcelona - Spain (ICM-CSIC), Israel Oceanographic & Limnological Research; Funding: Hellenic Foundation for Research and Innovation, General Secretariat for Research and Technology).

Marine Food Webs project focuses on the *Development of novel methodologies for studying marine food webs*. The project aims to develop new methodologies for the study of the structure and function of coastal hard substrate food webs. Underwater visual surveys will be used for the quantification of food webs, in areas of varying fishing pressure. The project is expected to provide valuable tools for the systematic assessment of the marine ecosystem, in the framework of an ecosystem-based approach (Funding: European Social Fund, Youth Employment Initiative).

o Moldova

Under the Ministry of Environment umbrella, several projects with the aim to improve water monitoring and information management systems were implemented.

1. The Millennium Challenge Account (MCA) Project "Transition to a performed agriculture", (2011-2015) was funded by Millennium Challenge Corporation (MCC). Project had 2 components - 1) transfer of irrigation management, 2) River basin management (RBM). The second component covered the entire territory of Moldova, the purpose being to offer support for RMB improvement. The project contributed to the improvement of the monitoring network through purchasing equipment for real-time water quality monitoring, developing a GIS database, also, there were organized pieces of training for Agency "Apele Moldovei" specialists. The new Law on water (that was adopted in the Parliament of the RM on 23 December 2011) created the legal framework for implementation of the WFD and defined 2 districts - Dniester and Prut/Danube, thus there will be a need to develop 2 RBM Plans. The MCC Project developed a GIS system for Prut/Danube basin selected by the beneficiary.

2) Project funded by the French development agency "Capacity building in data administration for assessing transboundary water resources in the countries of Eastern Europe, Caucasus and Central Asia (EECCA)", (2010-2012). The Dniester River basin was one of the 2 pilot areas of the project, the main aims of which were to support capacity building in data administration and data exchange within the main national and regional authorities concerned in order to develop the production of information necessary to better guide water resource management decisionmaking, on the one hand, and to develop regional tools aiming to identify the available information and to disseminate the results and experience feedbacks obtained in the pilot area, on another hand. The project had 3 components: (1) and (2) aim at developing capacities in data administration and sharing in the pilot transboundary area by using methodologies that could later be applied to other transboundary river basins in countries of Eastern Europe, Caucasus, and Central Asia; (3) the third component regroups the actions planned at the regional level.

3) "Reducing vulnerability to extreme floods and climate change in the Dniester river basin" (2010-2014) as a climate change component of the Dniester III project was implemented under the Environmental and Security initiative (ENVSEC) and UN-Water Convection's program of pilot projects. The project aimed to expand and further strengthen cooperative management in the Dniester river basin to address cross-border management of floods, taking into account both current climate variability and long-term impacts of climate change on flood risks in Ukraine and Moldova. The special website http://enrin.grida.no/dniester/index.cfm has been created. This website presents the resulting spatial/GIS database (including data for download), and map outputs from this database, both interactive (web-gis) and downloadable graphic files. There is a big spectrum of information there:

- ✓ Basic and analytical information on hydrology (river basin districts, sub-catchments, river, lakes, chemical measurements stations, national water discharge)
- ✓ Administrative (marine coastline, international boundaries, sub-national boundary levels, settlements, roads, railroads)
- ✓ Climate (temperature, precipitation)
- ✓ Population
- ✓ Protected areas
- ✓ Seismology
- ✓ Land cover
- ✓ Soil types and proportions
- ✓ Elevation (topography / DEM)

✓ Satellite imagery

o Romania

MARSPLAN - BS and MARSPLAN-BS II Cross-border Maritime Spatial Planning for the Black Sea, Bulgaria, and Romania. The main activities are related to elaboration of the maritime spatial plans in Bulgaria and Romania with updated GIS model and database, based on the results of the first MARSPLAN-BS Project; develop the MSP common strategy for the cross-border area of Bulgaria and Romania, addressing also Land-Sea Interactions (LSI) and Multi-Use (MU) concept; provide effective stakeholder participation in the design of national and cross-border MSP process and sharing of good practices for the Black Sea from Bulgaria and Romania. The main project objectives are:

• To support the coherent, cross-sectoral Maritime Spatial Planning (MSP) in Bulgaria and Romania under the framework of MSP Directive 2014/89/EU and to establish a long-lasting mechanism for the Black Sea Basin cross-border cooperation on MSP.

• To help capacity building and supporting Competent Authorities in Bulgaria and Romania for MSP implementation, as well as developing national marine spatial plans on the basis of results of the first MARSPLAN-BS Project (2015-2018).

ECOAST - New methodologies for an ecosystem approach to spatial and temporal management of fisheries and aquaculture in coastal areas - aims to identify, develop and test new methodologies for spatial and temporal management of fisheries and aquaculture in coastal areas. The overall approach will assess the impact of fisheries and aquaculture on coastal ecosystems, including essential fish habitats and conservation priority habitats, as well as synergies and conflicts between human activities. Building on previous methodologies and experiences the project will evaluate marine spatial planning in seven coastal case study areas having different ecological and socio-economic characteristics: 1)AdriaticSea (ADR), 2)Ionian Sea (ION), 3)Black Sea (BLK), 4)Tyrrhenian Sea (TYR), 5)Baltic Sea (BAL), 6)Norwegian Fjords (NOR) and 7)NE Atlantic Coasts (ATL). The project outcomes produced a case-specific evaluation of the ecological footprints of aquaculture and fisheries in coastal areas, maps of optimal areas for fisheries and aquaculture, evaluation of compatibility between fisheries, aquaculture, and other human activities in coastal areas, as well as the implementation of holistic methods and an operational modeling framework to evaluate and predict stakeholder responses to coastal spatial management options covering the marine cross-sector occupation of space. Several methodologies already exist to assess the impacts on the ecosystem and the socio-economic effects of some spatial management measures, as well as to spatially manage some cross-sector marine activities, but none of them integrate all relevant management aspects for coastal areas. Therefore, the holistic methodology cover in a single system different approaches and management aspects, identifying realistic spatial and temporal potentials and limitations for the integration of fisheries and aquaculture in coastal areas, in order to allow policymakers and stakeholders to evaluate management measures from different points of view and share decisions in a transparent manner on a case-specific basis. ECOAST results support the EU and national policies through the provision of tools and data for an ecosystem-based allocation of space and sustainable use of marine resources in coastal areas on a case-specific basis.

EMSO-Link is a 3-year project underpinning the long-term sustainability of EMSO ERIC, the pan-European distributed Research Infrastructure (RI) composed of fixed point open ocean observatories for the study and monitoring of European seas. EMSO pursues the long-term objective to be part of the upcoming European Ocean Observing System (EOOS), which is

expected to integrate multiple platforms and data systems, including other ERICs, to achieve the first sustained, standardized and permanent observatory network of the European seas. EMSO ERIC coordinates the access to the facilities and supports the management of data streams from EMSO observatories. EMSO-Link will accelerate the establishment of EMSO ERIC governance rules and procedures and will facilitate the coordination of EMSO infrastructure construction, operation, extension, and maintenance. Specifically, EMSO-Link will: 1. Reinforce and expand the EMSO ERIC membership to optimize the inclusion of the whole European Marine technology and research institutions. 2. Progress towards coordinated operations of the infrastructure nodes, interoperability and standardization as well as capacity increase and synchronizing funding of regional nodes. 3. Enhance stakeholders (e.g., marine operators, industry, academia, universities, and marine experts) active engagement through a number of awareness-raising campaigns. 4.Enhance relations with sister marine initiatives and counterpart/complementary RIs through Memoranda of Understanding also in coordination with COOP+ EC Project. 5. Strengthen EMSO ERIC contribution to European economic growth and innovation through the implementation of a powerful marine technologies Innovation Platform serving and cooperating with Industry and SMEs. EMSO-Link contributes to the identification of methodologies for the achievement of Good Environmental Status of the European marine waters by 2020, according to the Marine Strategy Framework Directive.

DANUBIUS-PP was a three-year project to raise DANUBIUS-RI (International Centre for Advanced Studies on River-Sea Systems) to the legal, financial and technical maturity required for successful implementation and development. DANUBIUS-RI is a pan-European distributed research infrastructure (RI) building on existing expertise to support interdisciplinary research on river-sea (RS) systems, spanning the environmental, social, and economic sciences. It will provide access to a range of RS systems, facilities, and expertise, a 'one-stop-shop' for knowledge exchange, access to harmonised data, and a platform for interdisciplinary research, education, and training. DANUBIUS-PP will bring together key stakeholders at different levels, and strengthen the consortium through a process of wide engagement. Individual work packages refine, inter alia, the scientific and innovation agenda, the legal framework, governance and management, and policies for access and data management. The financial requirements of the RI will be refined to assist funding agencies as they consider future spending priorities. Key deliverables of DANUBIUS-PP include the development of the legal and financial agreements for the components of the RI (including Hub, Nodes, and Supersites), their governance, and internal organisation which will be confirmed via a Memorandum of Understanding. This preparatory phase project developed the structures and processes to ensure that the RI strengthens scientific performance by providing a sustainable basis for future operation, delivering key services to the different user communities.

ANEMONE - Assessing the Vulnerability of the Black Sea Marine Ecosystems to Human Pressures aims to deliver, through collaborative efforts among partners, a common strategy related to the Joint Monitoring of the Black Sea, using the most adequate common agreed assessment criteria and indicators, in order to assess the status of the Black Sea, as a basis for further actions.

Monitoring and assessment of the sea and coast, based on scientific knowledge, is the indispensable basis for the management of human activities, in view of promoting their sustainable use and conserving marine ecosystems. The project proposal aims to deliver, through collaborative efforts among partners, a common strategy related to the Joint Monitoring of the Black Sea, using the most adequate common agreed assessment criteria and indicators, in order to assess the status of the Black Sea, as a basis for further actions. The project proposal builds upon the monitoring related provisions of the Black Sea Commission, taking into account existing regional (BSIMAP) and national monitoring programs, the best practices of other Regional Sea

Conventions, and last, but not least, the Marine Strategy Framework Directive (MSFD) principles, aiming to contribute further to the harmonization of methodologies and filling of knowledge gaps identified in the region. The collection of quality controlled and comparable data sets for the Black Sea environmental status assessment, is supported via conducting case studies in selected study areas: coastal and open sea by testing the Black Sea Monitoring and Assessment Guidance: comparative assessment of rivers impact on the Black Sea water quality; response of coastal ecosystems under the influence of human pressures, implementation of the methodology for identification and prioritization of Hot Spots (Hot Black Sea tool); guidance tool on the adaptative environmental impact assessment (EIA) procedures of specific human activities; Joint Scientific Cruise organized having in mind harmonized methodologies, and the need to include in the assessment new/common criteria and indicators related to biodiversity, eutrophication, contamination, marine litter, and also areas beyond the coastal areas in a representative and efficient way; pilot study on the quality of Black Sea seafood, with aim to provide new data on chemical contamination of aquatic organisms and potential risks, thus filling knowledge gaps identified for Black Sea region. The two case studies on beach litter and cetaceans will enhance the milestone of the educational and awareness-raising campaigns. The project will promote innovative technologies, like unmanned aerial vehicle (UAV) for the detection of floating marine litter at river mouths and coastal waters, dolphins surveys in specific locations, remotely operated vehicle (ROV), and sidescan and multibeam for assessing physical pressure on the seafloor from fisheries and its impact on benthic communities, and remote sensing. Data and information gathered through project activities will create a compatible and open pool of data, usable by regional partners, the general public, and relevant stakeholders, thus contributing to improvement and upgrading of the existing Black Sea database, and a better understanding of the human-induced changes.

GOFORIT - The project "Intelligent Oceanographically-Based Short-Term Fishery Forecasting Applications" investigated four economically important fish species from the North and South of Europe: North Sea sandeel, Icelandic capelin, Black Sea anchovy, and Black Sea sprat. These species all can be classified as short-lived fish species.

Fisheries for short-lived species are highly variable because they primarily target a low number of age groups within stocks as well as irregularly recruiting year-classes. As a result, environmental fluctuations (e.g., temperature, food abundance), which cause major changes in fish productivity, can lead to rapid fluctuations in fishing opportunities and stock declines if fishing effort is not reduced accordingly. Such fluctuations are not foreseen or accommodated by management advisory frameworks for short-lived species, which generally assume environmental stability and constant productivity.

The GOFORIT project used climatic and oceanographic process knowledge with the goal to improve short-term fishery forecasts.

3.3 Available organizations/ institutions and human resources

• Georgia

The state organization responsible for assessing the main commercial fish stocks and forecasting the acceptable level of their exploitation in the marine area of Georgia is the LEPL National Environment Agency (NEA) of the Ministry of Environment and Agriculture of Georgia. It would be mentioned that Universities such as Ivane Javakhishvili Tbilisi State University (TSU) and some others are also involved in research activities on the Black Sea.

The state of the main commercial fish species (anchovy, horse mackerel, red mullet) stocks are studied annually based on the results of trawl and pelagic catches using random sampling and the age-long key method, known as the distribution matrix.

To conduct more effective research in the assessment of fish resources and approximation to European standards, the agency works closely with the Food and Agriculture Organization (FAO) and General Fisheries Commission for the Mediterranean (GFCM) and foreign experts, especially in the field of mathematical modeling.

The studies to assess the main commercial fish resources in 2020 was supported by the FAO, under the EU-supported European Neighborhood Programme for Agriculture and Rural Development (ENPARD III), in cooperation with GFCM by providing technical assistance to the National Environmental Agency (NEA) of the Ministry of Environmental Protection and Agriculture of Georgia. The in-depth survey conducted by FAO allowed NEA with the quota-setting in compliance with the EU standards and GFCM requirements for Georgia.

Currently, NEA does not have a specially equipped research vessel and we rent a fishing seiner every year for expeditions to monitor fish resources, we do not have enough modern equipment, for example, there is no CTD, a depth sensor, etc. However, the NEA continues to equip the agency and train staff in modern research methods to improve the assessment of key commercial fish stocks.

NEA has purchased modern equipment echosounder BioSonics. With the support of FAO and GFCM, the launch of the hydro-acoustic survey for anchovy (Engraulis encrasicolus ponticus) in the Georgian Black Sea territorial waters is planned this year.

Regarding the assessment of non-fish resources in the Georgian territorial waters, the studies of the Rapa Whelk have been started in the Georgian maritime space under the auspices of the FAO and GFCM in the framework of the BlackSea4Fish project. The first phase of the study, which was conducted in October 2020, has been successfully completed, and the second is scheduled for the spring of 2021.

During the survey process, we used a Turkish design beam trawl, which was transferred to the agency as part of this project.

In the Georgian Black Sea coast, the beam trawl survey was carried out according to the specifications contained in the document "Beam trawl surveys for Black Sea Rapa Whelk: Guidelines and methodologies" (In Workshop on the harmonization of data collection at landing sites and in scientific surveys-at-sea). The guidelines and methodologies are modified from "draft Technical guidelines for scientific surveys in the Mediterranean and the Black Sea" of GFCM and revised after a test survey participated by experts from five Black Sea countries.

The processing of the samples was carried out in the laboratory, including the determination of the size-age composition and the sex of the rapana. The age of the rapana specimens was determined by the spawning marks. The sex of the species was determined according to Bondarev.

All data were entered into the Raw Data Record Sheets (described in the GUIDELINES), which were then converted into Excel files. The relevant data was also transferred to the MEDITS format (files TA, TB, TC). All data were presented to the project management. Discussion of the results and the second phase of research will continue this year.

The fisheries and aquaculture sectors are very important for the economies of Georgia. Their contributions to achieving social, economic, and environmental goals of sustainable development are set to increase.

Enhanced multilateral cooperation among the Black Sea states is an important element of the new dynamics, which promotes sustainable and rational exploitation of living marine resources and the sustainable development of aquaculture.

A law on aquaculture has been adopted in Georgia based on recommendations of the GFCM and it will come into force on March 1st, 2021. By this time, the NEA is preparing a package of legal documents, such as technical regulations for aquaculture, environmental monitoring program, environmental monitoring rules, and others. The responsible organization for environmental monitoring will be the NEA.

Ministry of Environment Protection and Agriculture of Georgia, according to the obligations under the EU-Georgia Association Agreement, actively cooperates with the Food and Agriculture Organization (FAO) and General Fisheries Commission for the Mediterranean (GFCM). Currently, Georgia is not yet a member of the GFCM, but in the near future, it plans to become a full member of this organization. Within the framework of the above cooperation, the responsible organizations in Georgia (various structural units of the Ministry of Environmental Protection and Agriculture, National Environmental Agency) have begun providing information on fishing processes to GFCM. This process will continue as the system for monitoring fish resources is strengthened and improved.

NEA cooperates and shares data with experts from the Black Sea countries in the framework of the Black Sea Commission and different international projects.

To improve monitoring and assessment of fish and non-fish resources and data exchange between Black Sea countries, it is necessary to strengthen the scientific and technical potential of responsible organizations in Georgia.

TSU scientists are involved in important international scientific projects and implements more than 200 research projects;

- According to Scopus, more than 2,500 publications were published in 2015-2019;
- More than 500 articles are published annually in high-ranking scientific publications;
- Joint Publications Published in Over 150 International Partners (Scopus)
- Up to 3,000 foreign scientists are involved in joint research;
- The University has published over 100 publications (Scopus) in collaboration with industry;
- TSU serves modern learning spaces for scientists and students 16 research institutes, up to 85 teaching laboratories. Including Fablab, SMART | Lab, SMART | AtmoSim-Lab, Bloomberg Laboratory, Physics and Chemistry Laboratories modernized by the University of San Diego; High-precision modern ball magnetic resonance (BMR) spectrometer (400 MHz); TSU Knowledge and Innovation Transfer Center; Multimedia Center, Archaeological Field Base on Graclian Hill, Fine Arts Studio, etc.

TSU was one of the partner organisations in the EU-UNDP project "Improving of the Black Sea Environmental Monitoring" (EMBLAS). In the frames of the project, TSU coordinated and implemented marine litter monitoring activities in the Black Sea Georgian Coastal Zone.

The National Environmental Agency was established based on several institutions, such as the National Hydrometeorological State Department, the Department of Environmental Pollution Monitoring, Geological Department, Coastline Defence Service, Spatial Department, and Fishery Research Institute. The NEA represents a separate organization from other state governmental

bodies, which operates independently under the state control. NEA, as the legal successor of NMHS of Georgia, has more than 160 years of history, and the latter's name at the beginning was the Tbilisi Physical Observatory and afterward, the State Hydrometeorological Department. NEA owns and maintains several datasets characterizing environmental conditions in Georgia as well as databases related to water quality and quantity. Nowadays in NEA is approximatly 329 persons are employed.

Goals, Objects and Functions, and Structure of NEA

The goals, objects, and functions of the NEA are established by the Regulation approved by the Minister of Environment Protection and Agriculture of Georgia

The main goals of the NEA are as follows:

- Prepare information regarding existing and expected hydro-meteorological and geodynamic processes, assessed geo-ecological and environment conditions on the territory of Georgia, in river basins, water reservoirs, in territorial waters of the Black Sea, on the continental shelf, and in the special economic zone;
- Carry out hydrological, meteorological, geological, the Black Sea hydro and litho dynamical, environmental (air, surface, and the Black Sea water, soil) pollution, and biodiversity monitoring. Establish systems and their proper functioning;
- Assessment of actual conditions of the existing hydrometeorological, geological and environmental quality on the territory of Georgia, preparation and dissemination of relevant informational product;
- Preparation of relevant warnings, in case of the forecast of hazardous hydrometeorological, geodynamic processes and extremely high level of environmental pollution and delivering to state and local authorities, Ministries, organizations, and means of mass media immediately following established rules;
- Development of preventive measures against damages from natural and anthropogenic disasters (desertification and land degradation caused by hydrometeorological, geological, and anthropogenic factors among them) and coordination of their implementation etc.

As well as Geo-ecological assessment of anthropogenic changes in the geological environment on the territory of Georgia.

Participation in engineer-geological, geotechnical, hydrogeological, and ecological studies on all stages of design of various objects.

Assessment of anthropogenic impact on the environment, the arrangement of engineergeological and hydrogeological consultations for assessment of conditions of homestead plots and residential houses.

Provide customers with services in hydro-meteorological, geological, and environmental pollution monitoring spheres in the frames of its competence.

Ichthyological research and monitoring of the Georgian Black Sea coast, territorial waters. Assessment and commercial forecast of fish and other bioresources in the maritime space and inland waters of Georgia. Assessment of the environmental status of the Black Sea continental shelf, its coastal ecosystems, rivers, and inland waters, and implementation of biological monitoring to predict expected changes.

Department of Environmental Pollution Monitoring

The monitoring and assessment of environmental pollution on the territory of Georgia were and continue to be the main tasks of the NEA during the whole functioning history. Based on monitoring results NEA produces the monthly bulletin about the State of Environment in Georgia. NEA holds a unique environmental database that consists of long period datasets from the 60th of the last century. NEA carries out regular monitoring of air, water, and soil pollution which consists of sampling and biological and chemical analyses (inorganic and organic compounds including POPs).

The Department itself consists of 3 divisions: Atmospheric air, water, and soil analyses laboratory- Branch in Kutaisi and Branch in Batumi, Division of Technojenical impact assessment on the environment and technical support, Ambient Air Quality Monitoring and Maintenance Division.

The Department has well-equipped Laboratories in Tbilisi and its Branches in regions for chemical, microbiological, and biological monitoring and studies. The Department has extensive experience in environmental monitoring including sampling and laboratory analyses.

The scope of activities performed by the Department is providing quality analytical services to a variety of clients including industry, local Government, and Community organizations Attention to details ensures accuracy and reliability. The laboratory is accredited by the ISO 17025 standards. The laboratory carries out testing in the field of analysis pollutants in environmental matrices. The activities are mostly focused but not limited to performing test analysis of surface water, drinking water, groundwater, wastewater, and sediments in those samples. Department participates in international co-operation, research work, and scientific meetings at national and international levels as well as in different international projects on environmental monitoring issues.



Figure 6. Environmental Pollution Monitoring Department Human Resources, NEA Georgia

31 persons, including 2 PhDChemists -15

DT4.1.1. Technical report

• Biologists - 3.

The rests are physicists and ecologists.

Department of the Fisheries, Aquaculture and Water Biodiversity Department

The field of fisheries and aquaculture in Georgia has been served for many years by the Marine Ecology and Fisheries Research Institute (MEFRI), founded in 1931 under the Ministry of Environment. Recognition of Georgia's independence helped the institute to enter the international arena, in particular, in 1993 it became an active participant in the Black Sea Environmental Program BSEP, in 1994 the Black Sea Biodiversity Conservation Canter was established at the Institute, and later the National Fisheries Center. The Institute also began working closely with the Black Sea Commission on fisheries, biodiversity, and marine pollution in the 1990s. The institute became a member-performer of many international programs, equipped with modern scientific equipment for that period.

As a result of the reorganization of the structural units of the Ministry in 2006, the Research Institute joined the National Environment Agency and today is represented as one of the departments - the Department of Fisheries, Aquaculture and Aquatic Biodiversity.

One of the main activities of the Department is the assessment and commercial forecasting of the resources of the main commercial fish and other hydrobionts in the Black Sea coast and inland waters of Georgia.



Figure 7. Fisheries, Aquaculture and Water Biodiversity Dept. Human Resources, NEA Georgia

14 persons, including 5 PhD

Fisheries and Aquaculture Division:4 ichthyologists, including 2 PhD

Water Biodiversity Division:

• Phytoplankton Specialist - 1;

DT4.1.1. Technical report

- Zooplankton Specialists 2, including 1 Ph.D.;
- Macrozoobenthos Specialists 2, including 2 Ph.D.;
- Macrophytes Specialist 1;
- Marine Mammals Specialist 1;
- Microbiologist 1.

The Core Functions

Fisheries and Aquaculture Division

- Ichthyological research and monitoring of the Georgian Black Sea coast and territorial waters;
- Assessment and commercial forecast of fish and other bioresources in the maritime space and inland water of Georgia;
- Ichthyological research and monitoring of Georgian inland reservoirs (lagoons, estuaries, lakes, reservoirs, rivers, etc.);
- Participation and promotion of the establishment and development of the Ecosystem Approach to Fisheries (EAF);
- Promotion of introduction and development of the concept of responsible aquaculture, mariculture, and sustainable fisheries;
- Development and implementation of biotechnologies for the cultivation of the traditional and new objects of aquaculture and mariculture;
- Providing scientific assistance for commercial aquaculture.

Water Biodiversity Division

- Assessment of the environmental status of the Black Sea continental shelf, its coastal ecosystems, rivers, and inland waters, and implementation of biological monitoring to predict expected changes;
- Research and monitoring of important communities of aquatic ecosystems (bacterioplankton, phytoplankton, mesozooplankton, macro-zooplankton, ichthyoplankton, macrozoobenthos, macrophytes, marine mammals, etc.);
- Study of alien (invasive) species inhabiting the Black Sea, their impact on coastal water ecosystems of Georgia, prediction of the expected disruption of the natural balance;
- Monitoring of marine mammals stranding on the Black Sea coast of Georgia.
- Participation in the fulfillment of Georgia's international obligations in the field of biodiversity monitoring;
- Development of programs and their implementation;
- Cooperation with foreign partners, international organizations.
- status of implementation of the planned measures and the evaluation of achieved results focused on technological issues.

Additionally, some institutions are responsible for research and education in the field of water monitoring, water biodiversity research, fisheries, aquaculture:

Ilia State University

The School of Natural Sciences and Medicine and some research institutes operate based on the university.

- The Institute of Ecology ;
- The Institute of Zoology;
- The Botanical Institute;
- The Institute of Biophysics;
- The Institute of Earth Sciences;
- Institute of Chemical Biology and others.

Shota Rustaveli State University

Faculty of Natural Sciences and Health Care

- Department of Biology
- Department of Chemistry
- Department of Clinical Medicine
- Department of Dentistry
- Department of Geography
- Department of Public Health and Evidence-based Medicine

Some research institutes are dealing with problems of ecology and biodiversity, based at the university.

- The Institute of Phytopathology and Biodiversity;
- The Institute of Agrarian and Membrane Technologies

o **Bulgaria**

The National System for Environmental Monitoring (NSEM) is established and operated in accordance with Article 1, Clause 7 of the Environmental Protection Act (EPA) <u>http://eea.government.bg/en/nsmos/index.html</u>. The system is organized in accordance with Chapter Eight of the EPA and includes the National monitoring networks for air, water, land and soils, forests and protected areas, biodiversity, noise, and non-ionizing and ionizing radiation. The Control and Information Systems on emissions from harmful substances in the ambient air, wastewater emissions in water bodies, waste information system, earth bowels protection information system are also included in the framework of NASEM.

The system is managed by the Minister of Environment and Water (MoEW) through the Executive Environment Agency (ExEA). ExEA administers the National Automated System for Environmental Monitoring (NASEM) on the whole country, providing material-technical, methodological, and software-information resources necessary for its operation and development. In the ExEA, the hydrobiological monitoring is carried out by 10 laboratories. The results of the monitoring are sent to the ExEA and the Basin Directorates. All measurements and observations are carried out by the structures of the ExEA in common, unified methods for sampling and analysis in accordance with the procedures ensuring the quality of measurements and data. All ExEA laboratories are accredited under the BS EN ISO/IEC 17025-General requirements for competence in testing and calibration from EA BAS. ExEA maintains various databases at the national and regional levels. Databases at the national and regional level are structured in components of the environment and using common nomenclatures.

Assessments of the state of environmental components and reporting of the data at the national level are carried out by ExEA while the assessments are done at the regional level - by RIEW, and assessment and reporting of water resources at basin level - by the four Basin Directorates.

The National Catalogue of Environmental data sources might be found at the following web page - <u>http://eea.government.bg/en/cds/water.html</u>. The list with main organisations, responsible

for the maintenance of the National Catalogue of Environmental data sources is presented at the web page: <u>http://eea.government.bg/en/cds/Org_main.htm</u>

Detailed information about the Black Sea monitoring, carried out by the Black Sea Basin Directorate is shown at http://eea.government.bg/en/cds/BD_Varna/vn.htm

The hydrobiological monitoring of the coastal sea waters (related to the implementation of the Marine Strategy Framework Directive (2008/56/EC) and Water Framework Directive (2000/60/EC)) is carried out by the Institute of Oceanology at the Bulgarian Academy of Sciences through a targeted budget subsidy for financing the implementation. The results of the monitoring are sent to the Black Sea Basin Directorate and the ExEA.

The Institute of Fish Resources - Varna carried out the activities related to the National Program for Data Collection and Management in the Fisheries Sector in Bulgaria.

o Greece

Archipelagos - Institute of Marine Conservation is a Greek non-profit, non-governmental organization combining multidisciplinary scientific research and efficient conservation work with the active participation of local communities since 1998. This cooperation creates a strategic foundation that enables and strengthens the activities of Archipelagos at the local, national, and European levels, allowing us to protect aquatic and terrestrial life against ever-increasing human factors. Archipelagos focus on marine mammal conservation, marine ecosystem conservation, laboratory research with marine conservation applications, terrestrial wildlife conservation, education programs, community engagement and awareness activities, and the creation of the Aegean Marine Life Sanctuary. They use the produced scientific knowledge to cooperate with local communities and authorities, to develop and apply pilot management and conservation projects aimed at protecting habitats and species of the Aegean Sea. These projects can later be applied to other parts of Greece and the northeastern Mediterranean. The NGO works directly to stop destructive human behavior, such as illegal fishing practices, explosions at sea, waste dumping, maritime pollution, erosive overgrazing, and other threats to biodiversity. They also focus on launching environmental actions and awareness campaigns at local, national, and EU levels through the use of social media, video, animation, and printed media in order to inform the public on how to better preserve and actively protect its natural resources.

The Hellenic Aquaculture Producers Organization (HAPO) was established in 2016, when the first 21 Members united their resources to forge a collective, national identity for Greek aquaculture fish, to successfully promote them in selected domestic and foreign markets. Today, HAPO counts 23 Members whose overall production represents 80% of Greek aquaculture. Beyond its sophisticated promotional network, HAPO also provides active support and a wide range of benefits to its Members, from mutual collaboration and networking to development, consulting, training, liaising with the authorities, and more. The organization's mission is to firmly establish the Greek identity and highlight the exceptional characteristics and competitive advantages of fresh, Greek farmed fish branded FISH FROM GREECE, which is raised with the utmost care and expertise by its Members, at ideal locations along the country's unspoiled coastline.

HAPO places great value on the lawful collection, process, use, security, and protection of your personal data, in any way you come into contact or cooperate with the Organization. The Organization is responsible for the processing of data during your navigation on this website (https://fishfromgreece.com/) and remains at your disposal for any clarification.

HCMR's Institute of Marine Biology, Biotechnology, and Aquaculture (IMBBC) are one of the three institutes of the HCMR, based on the premises of HCMR in Crete (Thalassokosmos) and also having facilities in the areas of Aghios Kosmas (Attica) and Souda (Crete). The institute was created by the merging of the Institute for Aquaculture (IA) with the Institute for Marine Biology and Genetics (IMBG) in 2012. As a consequence, its main research activities arose from those of its constituent institutions that not only subsist but are further enriched by the potential of joining forces, synergies, complementarity, and harmonized effects.

The National Agricultural Research Foundation (NAGREF) has set up the **Fisheries Research Institute (FRI)** in Greece, related to research, education, policy/planning, environmental monitoring, technology for environmental applications, conservation & protection, etc.

Its main sectors of research are: coastal ecology; population genetics & evolution; systematics & taxonomy; living resources [e.g. fisheries, aquaculture]; biotechnology; hydrological processes; water quality & pollution; environmental monitoring [physical: CTD profiles, ADCP; chemical: nutrients and heavy metals in water and sediments]; modelling [2-D and 3-D hydrodynamic and water quality, larval and eggs transport, water column dynamics and phytoplankton models, biogeochemical budget models].

The FRI belongs now to the Hellenic Agricultural Organization - DEMETER (ELGO - DEMETER), which is supervised by the Ministry of Rural Development and Food. The Institute is based in Nea Peramos, Kavala, and has been operating since 1995 in main research areas, such as: fisheries, the aquatic environment (coastal, transitional, and inland waters), fishery exploitation, and aquaculture. The Institute's specialized research and technical staff participate and implement a number of research projects and studies, acts as a consultant in the country's fisheries and environmental policy, provides services to public services and private bodies, while contributing significantly to graduate and postgraduate education, as well as fisheries and aquaculture professionals.

The **LIFEWATCH** EU-Greek Network for fisheries also incorporates the following institutions, facilities, and organizations:

- HCMR
 - Institute of Marine Biology, Biotechnology, and Aquaculture
 - Institute of Oceanography
 - Institute of Marine Biological Resources and Inland Waters
- National and Kapodistrian University of Athens
 - Faculty of Biology
 - Zoological Museum
 - Botanical Museum
 - Faculty of Pharmacy
- University of Crete
 - Biology Department
 - Natural History Museum Crete
 - School of Medicine
 - Botanical Garden
- Aristotle University of Thessaloniki
 - School of Biology
 - School of Veterinary Medicine
 - School of Agriculture

- School of Pharmacy
- Faculty of Agriculture, Forestry and Natural Environment
- University of Patras
 - Department of Biology
 - Department of Environmental and Natural Resources Management
- University of Ioannina
 - Department of Biological Applications & Technologies
- University of the Aegean
 - Department of Marine Sciences
 - Department of Environment
 - Department of Geography
- Democritus University of Thrace
 - Department of Primary Education
 - Department of Forestry, Environment and Natural Resources
- University of Thessaly
 - School of Agricultural Sciences Department of Ichthyology & Aquatic Environment
 - Department of Biochemistry & Biotechnology
 - Department of Agriculture, Crop Production and Rural Environment
 - Agricultural University of Athens
 - Plant Breeding and Biometry Laboratory
- University of Piraeus
 - Department of Maritime Studies
- Panteion University
 - \circ European Centre for Environmental Research and Training
 - \circ $\;$ Biomedical Research Foundation of the Academy of Athens
 - Laboratory of Atmospheric Environment
- Foundation of Research and Technology Hellas
- Institute of Computer Science
- The Goulandris Natural History Museum
- Greek Biotope Wetland Center
- Technological Education Institute of Crete
 - School of Agricultural Technology & Food Technology
- Alexander Technological Educational Institute of Thessaloniki
 - School of Agricultural Technology
 - Department of Fisheries & Aquaculture Technology
 - Technological Education Institute of Messolonghi
 - Dept of Aquaculture and Fisheries
- National Agricultural Research Foundation
 - Plant Protection Institute of Heraklion
 - Institute of Viticulture, Floriculture and Vegetable Crops of Heraklion
- Forest Research Institute

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- Agricultural Research Center of Northern Greece
- Fisheries Research Institute
- Mediterranean Agronomic Institute of Chania
- Benaki Phytopathological Institute
- Management Agency of the National Marine Park of Zakynthos
- Centre for Research & Technology Hellas (CERTH)

• Chemical Process & Energy Resources Institute

o Moldova

In the Republic of Moldova, there are no separate institutions responsible for Black Sea monitoring and assessment. In the Republic of Moldova, the national system responsible for the elaboration and implementation of policies in the field of aquatic resources and fish resources is divided into:

- monitoring functions,
- control functions,
- management functions,
- research functions.

The monitoring functions of surface waters and fishery resources are assigned to the following institutions:

- > State Hydrometeorological Service (SHS),
- > Environmental Agency.
- > State Fisheries Service

The control functions for surface waters and fishery resources are assigned to the following institutions:

- Moldovan Waters Agency,
- State Ecological Inspectorate,
- Environmental agency,
- State Fisheries Service.

The functions of water and fisheries management are assigned to:

- Moldovan Waters Agency
- State Fisheries Service

The research functions of water resources and fishery resources are assigned to:

- Institute of Geography and Ecology,
- > Center for Research on Aquatic Genetic Resources "ACVAGENRESURS",
- Institute of Zoology,
- ➤ universities,
- Civil Society (NGO)

Different state bodies and institutions have different responsibilities relating to the administration of the fishery and aquaculture sector of the Republic of Moldova.

In 2018, after Government restructures the Ministry of Environment, it was merged with few ministries, and The Ministry of Agriculture, Regional Development and Environment (MARDE) was established.

The Department of Environment (DoE) of MARDE is the central public authority responsible for the development of the legal and regulatory framework in the field of environmental protection, rational use of natural resources, including management of air, waste, water resources, water supply, and sewerage system, fishery, ensuring compatibility of the legal framework with Multilateral Environmental Agreements (MEA) of which Moldova is party, etc. In its task also are included the establishment of an information management system, development of databases in its fields of competence, development of national records system on the state of impact on water, atmospheric air, air pollution monitoring, waste monitoring, etc. Some of the DoE functions and competencies for water are implemented by specialized bodies in its subordination: State Hydrometeorological Service (SHS), Agency "Apele Moldovei", Agency for Geology and Mineral Resources (AGMR), and State Ecological Inspection (SEI).

There are 5 organisations dealing with water monitoring in Moldova. All of them are subordinated to the DoE of MARDE. The table below presents a short overview of the main monitoring functions of these institutions.

| Name of organization | Monitoring function |
|---|--|
| State Hydrometeorological Service (SHS) | Water availability and surface water quality |
| | Hydrology and hydrochemistry |
| State Ecological Inspection (SEI) | Water discharge and water pollution from |
| | economic actors (within permitting system) |
| Agency for Geology and Mineral Resources | Groundwater quality and regime |
| (AGMR) | |
| The State Service of Public Health (SSPH) | Drinking water quality, chemical and |
| | microbiological water pollution, bathing water |
| | quality |
| The Agency "Apele Moldovei" | Water use and water discharge by economic |
| | actors |

Table 3. Organisations dealing with water monitoring in Moldova

State Hydrometeorological Service (SHS)

SHS is an institution subordinated to the DoE, which is functioning according to the Law on hydrometeorological activity in the Republic of Moldova, No. 401 from 3 April 2003, adopted by the Government of the Republic of Moldova. SHS task is to lead the environmental quality monitoring, especially of surface water, atmospheric air, environmental radiological state, and soil quality. Also, SHS is responsible to provide population, central and local public administration bodies, economic entities with hydro-meteorological and environmental quality information. The national environmental monitoring system was established in 1980, the main focus being on monitoring environmental quality and determining pollution levels, detecting high pollution of surface water, air and soil, preventing and mitigating the anthropogenic impact on the environment and population, and informing systematically the public on environmental quality.

Environmental Quality Monitoring Department (EQMD)

EQMD in the frame of SHS performs systematic ecological monitoring of the environmental components (surface water, air, soil, γ -radiation, etc.) on the basis of the monitoring network established throughout the entire territory of the Republic of Moldova. The Department holds an Accreditation Certificate SNA MD CAECP LÎ 01 220 from 23 February 2010, according to international

standard ISO/CEI 17025. The EQMD has 7 subdivisions:

1. Expedition Group (EG);

- 2. Surface Water Quality Monitoring Centre (SWQMC);
- 3. Soil Quality Monitoring Centre (SQMC);
- 4. Ambient Air Quality Monitoring and Radioactive Background Level Centre (AAQMRBLC);
- 5. Ambient Air Quality Monitoring Division Balți city (AAQMD);
- 6. Physical-Chemical Analysis Center (PCAC);
- 7. Center on Integrated Ecological Monitoring and Informational Management (CIEMIM).

State Ecological Inspection (SEI)

SEI is responsible for the protection of natural resources, the focus being on the water, air, and waste through issuing permits for special water use, water discharge, and air pollution for economic actors. The SEI has 4 Environmental Agencies in Chisinau, Balti, Cahul. TAU Gagauzia and 31 territorial environmental inspections, located in each district of the country. The total number of SEI's employers being 326 persons, of which 59 works in the central office and 267 in territorial offices.

The State Service of Public Health (SSPH)

SSPH is an agency subordinated to the Ministry of Health (MH) of the Republic of Moldova and represents the main organization responsible for the maintenance of state sanitary and epidemiological supervision system. Drinking water monitoring SSPH is responsible for maintenance of state sanitary and epidemiological supervision system., including monitoring of drinking water quality and pollution, carrying out regular inspections to ensure compliance to s

Agency "Apele Moldovei" "Apele Moldovei"

Agency is a subdivision of DoE. It is a public authority responsible for the development and implementation of water resources management policy, hydro-amelioration, water supply, and sewage system services in Moldova. The Agency is setting up the water-use limits based on technological needs. The "Apele Moldovei" Agency has 29 employees that work in two divisions.

Agency for Geology and Mineral Resources (AGMR)

AGMR's main responsibility is to ensure the rational use and protection of mineral resources and underground waters in Moldova. AGMR has 24 employees in two divisions and one section.

AGMR should ensure management and monitoring of underground resources in Moldova, in order to make estimations of groundwater reserves, as well as monitoring of groundwater quality and regime. AGMR monitors physical-chemical parameters of underground waters and activates according to the requirements of the Subsoil Code (2009). The existing scheme for monitoring and assessment of groundwater resources was established in 1968.

Additionally, 2 institutions are responsible for research and education in the field of water and water monitoring:

Institute of Ecology and Geography (IEG)

Another organization involved in this process, under the DoE supervision is the Institute of Ecology and

Geography (IEG). IEG is in charge of the study of the dynamics and trends in geo-and ecosystems components under the influence of natural and anthropogenic factors, evaluation of factors which

determine the occurrence of unfavorable geo-ecological situations and establishing the integrated

information base for monitoring.

Institute of Zoology of the Academy of Science of Moldova

The Institute of Zoology is a prestigious scientific and methodical center, which coordinates and conducts fundamental and applied researches, as well as training highly qualified research staff in zoology, entomology, parasitology, helminthology, hydrobiology, ichthyology, and ecology. The institute is one of the leading research bodies of the country in the field of conservation of wildlife biodiversity, working out the scientific basis for the development of aquaculture and fish culture in Moldova.

o **Romania**

Monitoring of Environment especially for water is distributed at top-level government policy by different ministries like the Ministry of Environment, the Ministry of Water and Forest, and the Ministry of Transport. Monitoring of fisheries resources is coordinated by the Ministry of Agriculture and Rural Development. Research related to water that needs monitoring of environment and fisheries resources is coordinated by the Ministry of Education and Research. At the operational level, monitoring of environment and fisheries resources is done by National Agencies or Authorities and at the research level by Universities and National Research Institutes.

Galati Lower Danube River Administration (AFDJ)

Lower Danube River Administration (https://www.afdj.ro/en) functions as autonomous state control and is the waterways authority for the Romanian sector of the Danube from the borderline - km 1,075 to the river mouth in the Black Sea, on Sulina branch, in Sulina roadstead, on the shipping branches of the Danube, Borcea, Bala, Macin, Valciu, Caleia, on Chilia branch with its secondary branches, on Sfantu Gheorghe channel with the rectifications channels and the secondary branches of the Sulina Channel, named the Old Danube.

The main task of the Autonomous State Control "River Administration of the Lower Danube" is the assurance of navigation conditions on the Danube by means of dredging works, topohydrographical survey, coast and floating signalization, piloting on the maritime Danube sector between Sulina roadstead and Braila and in the Danube maritime ports, special transport on the river and the maritime Danube, internal and international tugging, etc.

National Institute of Hydrology and Water Management (INHGA)

The main objective of the National Institute of Hydrology and Water Management (INHGA), <u>http://www.inhga.ro</u>, is to provide services in the field of hydrology and water resources management to support activities and decisions related to the efficient management of water resources, both in situations of special hydrological events (floods, droughts), as well as in normal situations, by the decisional factors in the field: the National Administration "Romanian Waters" and the Ministry of Environment, Waters, and Forests.

Romanian Water National Administration (Romanian Waters)

The National Administration "Romanian Waters" is the National Authority, under the coordination of the central public authority in the field of water, which administers the goods in the public domain of the state of the nature of those provided in the Romanian Constitution, <u>http://www.rowater.ro/default.aspx</u>. Romanian Waters apply the national strategy and policy in the field of quantitative and qualitative management of water resources.

Danube Delta Biosphere Reserve Authority (ARBDD)

The Danube Delta Biosphere Reserve Authority was created in 1990 to administrate the natural heritage of national interest from the Danube Delta Biosphere Reserve (RBDD).

The main objectives of the ARBDD for the management of the Biosphere Reserve are: 1) Conservation and protection of the existing natural heritage; 2) Encouragement of sustainable use of the natural resources; 3) Provision of support, based on the results of research, for management, education, training, and services.

Evaluates the status of *natural resources and their level of exploitation* (fish and other renewable resources) following their potential for regeneration and ecosystem support capacity. However, renewable resources estimation is externalized to Research institutes or academic entities, but DDBRA implements and regulates sustainable management of them.

The DDBRA performs an integrated monitoring program including the following domains: 1. climate and air quality; 2. hydrology; 3. hydrobiology; 4. water quality; 5. soil quality; 6. biodiversity; 7. natural resources; 8. economic activities; 9. human population. The conceptual model of the integrated monitoring system involves 2 main components: a data obtaining system (some from third-party) and a data management system. For every one of these domains, key-parameters were identified and monitored to allow gathering information with maximum efficiency.

The "physics-chemistry" domain criteria include parameters describing ecosystem structure and reflect its possible evolution. "Biology" criteria indicate the levels of environmental productivity and the "social-economic" criteria indicate the level of human pressure.

Danube Delta Institute for Research and Development (INCDDD)

The Danube Delta National Institute for Research and Development (DDNI), was established in 1970 and its main objective is to conduct fundamental and applied research for scientific support of the management of the Danube Delta and other wetland areas of national and international interest, with particular focus on biodiversity conservation and sustainable use.

The research activities of the Danube Delta National Institute are oriented towards: 1) assessment of the physical-chemical parameter; 2) biological parameters (biodiversity & natural resources); and 3) the elaboration of biodiversity conservation measures through sustainable use of ecosystem services. There were envisaged hydrological and ecological models for harmonising socio-economic interest with the concept of conservation of natural capital.

National Institute for Marine Research and Development "Grigore Antipa" (INCDM)

National Institute for Marine Research and Development "Grigore Antipa" Constanta, has as main activity scope conducting fundamental, applied and technological development research in oceanography, marine and coastal engineering, marine ecology and environmental protection and management of living resources in the Black Sea and other marine areas of interest.

Attributes of the INCDM are: 1) National Oceanographic and Environmental Data Center; 2) Early warning and mitigation tsunami system for Northwest Atlantic, the Mediterranean, and the connected seas (IOC); 3) National operator of integrated physical, chemical, and biological monitoring system of the marine environment; 4) National scientific responsible for the implementation of the Marine Strategy Framework Directive (MSFD); 5) Focal Points within the

Black Sea Commission for: Biodiversity, Pollution, Land-based sources pollution, ICZM, Fisheries, and other marine living resources; ACCOBAMS focal point; 6) Regional activity center for environmental aspects of fisheries and other marine living resources management;

7) National scientific responsibilities for fisheries data collection and marine living resources stock assessment; 8) National scientific responsible for the General Fisheries Commission for the Mediterranean (GFCM); 9) Coordinator of the International South-Eastern Europe Secretariat of the Balkan Environmental Association (B.E.N.A.);

The National Institute for Research and Development on Marine Geology and Geoecology (Geo-Eco-Mar)

Geo-Eco-Mar represents the focal point of national excellence in research and consultancy on the marine, coastal, river, and lacustrine geology, geophysics, and geoecology, as well as a reference center for Marine and Earth Sciences.

The main area of interest is knowledge of structure and functions of ecosystems characteristics for macro-geosystem Danube River-Danube Delta-Black Sea for modelling and forecast of ecological evolution of the system. Another activity refers to the study of global changes, especially climatic, at sea level and of the impact of these changes on the environment.

National Agency for Fishing and Aquaculture (ANPA)

The Ministry of Agriculture and Rural Development is responsible for defining and implementing the policy regarding the conservation and management of living aquatic resources existing in natural fish habitats, aquaculture, processing and organization of fishery products, fisheries, and aquaculture structures, through the National Agency for Fishing and Aquaculture (ANPA).

ANPA elaborates on the national strategy and of the regulations regarding the conservation and management of the living aquatic resources existing in the natural fish habitats, aquaculture, the organization of the fishery products market, the fishing and aquaculture structures, as well as the implementation and control of the application and their compliance.

Manages the living aquatic resources from the natural fish habitats of Romania, except for those, from the "Danube Delta" Biosphere Reserve, which are managed by the "Danube Delta" Biosphere Reserve Administration, under the law.

3.4 Status of implementation of the planned measures and the evaluation of achieved results focused on technological issues.

• Georgia

The AA sets obligations for Georgia on the approximation of its legislation with the EU Water Framework Directive (WFD) and other water quality-related regulations. Although the draft Water Law and some draft secondary legislation, reflecting EU approaches, is in place, further efforts are needed to, first of all, adopt these pieces of legislation and second, ensure their effective implementation (e.g., THIRD NATIONAL ENVIRONMENTAL ACTION PROGRAMME OF GEORGIA setting the proper institutional scheme for achieving integrated river basin management). Therefore, the development of a water resources management system is one of the priorities in the coming years. The reduction of water pollution from the point and diffuse sources and securing the number of water resources for balanced water consumption is another priority. Untreated urban wastewater discharge in water bodies, diffuse pollution from agricultural activities and industrial pollution, as well as oil pollution from ships in the Black Sea, can cause deterioration of water quality, while water abstraction for irrigation purposes and non-consumptive use of water resources may lead to changes in the hydrological regime of rivers which in turn, will negatively affect water bodies in the long run. Therefore, in that case, measures should be taken towards lessening the pollution load and minimizing risks. Finally, for better planning and achieving the improvement/maintenance of the qualitative and quantitative status of water bodies, it is essential to have a robust database that can be obtained only through the comprehensive monitoring network. This is particularly important in light of the expected increased demand for water resources, especially for irrigation and energy generation purposes. Although the trend of monitoring network extension has been well-noticed in recent years, additional efforts are needed. The establishment of a reporting, data management, and use system is also crucial for planning and implementing these adequate measures. Considering the above-mentioned data, the following long-term goal (2030) and three five-year targets have been identified in water resources management.

GOAL: To ensure the good qualitative and quantitative status of surface and groundwater bodies as well as coastal waters for human health and aquatic ecosystems

TARGETS:

Target 1. Development of an effective system of water resources management;

Target 2. Reduction of water pollution from the point and diffuse sources and ensuring sustainable use of water resources;

Target 3. Improvement of the water quality and quantity monitoring and assessment systems.

o **Bulgaria**

During the years a significant improvement in the implementation of the different plans, strategies, and measures related to water and marine environmental conditions has been observed. The full adoption of both the MFD and the WFD and their implementation are further backed up by the development of the management plans of all the Natura 2000 sites, which eventually will outlay the management of the protected territories through the protection of the endangered species and by regulating the specific status of the sites. In addition, the Natura 2000 management plans should list specific bans on particular activities on the territories, such as the fishing ban of endangered species. The Natura 2000 management plans are to be fully adopted in 2021. Concerning the River Basin Management Plans, the implementation of the measures as of 2020 is rather low, however, with the next cycle of the plans, it is expected that more measures will be executed to achieve the GES target by 2027. This will have a huge impact on both the freshwater and marine environment. The implementation of the program of measures within the Marine Strategy of Bulgaria is ongoing. The progress of the implementation of the program is slow, however, it is worth noting that all the qualitative descriptors have been reviewed and are to be addressed in the next few years.

Based on the current status of implementation of the marine-related policies in Bulgaria, it is obvious that there is a need to make use of new innovative monitoring technologies, such as remote sensing imagery and underwater drones. At the same time, it is necessary to have a review on the existing practices and utilize them in the Bulgarian part of the Black Sea.

o Greece

We are now in the 7th year of the implementation of the reformed EU Common Fisheries Policy. To satisfy the legal reporting obligation set out in Regulation 1380/2013, and to assess the progress made towards the achievement of its main objective, notably sustainability, the Commission adopts this Communication every year. The Communication reports on this by looking at:

• progress made in the exploitation and state of the stocks;

- the balance between the capacity of the EU fleet and the available fishing opportunities;
- the socio-economic performance of the EU fleet; and
- the implementation of the landing obligation.

Ensuring that the exploitation of living marine biological resources restores and maintains populations of harvested species above levels that can produce the maximum sustainable yield (MSY), is the key objective of the CFP. This also contributes to achieving good environmental status in European seas in 2020.

In 2018, the economic performance of the EU fleet continued to be very good with a net profit of around ≤ 1.4 billion and an average net profit margin of 18%. This level of profitability represents a great improvement, given that the EU fleet was only marginally profitable in 2008. Continued improvements in performance were mainly the result of some important stocks improving, average fish prices being high (more value for fewer fish landed) and fuel prices remaining low.

While similar economic performance is expected to be confirmed for 2019, the projections for 2020 remain highly uncertain due to the impact of the coronavirus health crisis. In addition, significant differences across the EU fishing regions persist, with the Baltic, the Mediterranean, and the Black Seas having lower profitability levels. A positive economic trend was observed for a number of fleets targeting sustainably exploited stocks (such as anglerfish and megrim in the Irish Sea; sole in the western English Channel and megrim in the North Sea), which tended to improve their profitability and salaries. Conversely, fleets targeting overexploited stocks (eastern Baltic cod, Celtic Sea cod) tended to register a poorer economic performance.

Each year the Commission tables the so-called Total Allowable Catches (TACs) to be applied the following year to most commercial stocks in EU waters except the Mediterranean Sea. The proposed amounts are based on biological advice and economic analysis from independent bodies. Later in the year, the Council composed of the Fisheries Ministers of each Member State makes a final decision on these TACs. Once fixed, the amounts are divided up among the Member States according to pre-agreed shares, the so-called quotas. Member States manage the national quotas and allocate them among the fishing industry, as a right to fish and land a certain amount of fish within the calendar year.

With regard to the Mediterranean, according to the multi-annual plan for the Western Mediterranean, for 2021 the Council shall set further effort reduction targets based on scientific advice, against the background of the MAP's objective of achieving Fmsy by 2025 at the latest. This is how fishing opportunities are set in EU waters. For fishing opportunities agreed under the Regional Fisheries Management Organisations (RFMOs), the Commission negotiates conservation and management issues, including fishing opportunities, for the species managed under the authority of these organisations. The measures adopted by RFMOs and in particular, any fishing opportunities for the EU, are incorporated in the Fishing Opportunities Regulations. The timeline for this incorporation follows the calendar of the meetings of these organisations.

In the EU, fishers and national administrations provide data on their catches and fishing activity, which are used by fisheries scientists who then assess the state of the stocks. The scientists also use samples from commercial landings and discards, and they use research vessels to sample the amounts of fish in the sea in different sites and at different times of the year, independently from the fishing activity. They determine the state of the stock and then calculate how much should be fished the following year to ensure sustainability. This work is done through the International Council for the Exploration of the Sea (ICES), an independent body that provides the Commission with scientific advice. In some cases, such as the Mediterranean Sea basin, other advisory bodies, such as the Scientific, Technical, and Economic Committee for Fisheries (STECF), are consulted.

The EU's CFP sets the objective of reaching maximum sustainable yield (MSY) by 2020 at the latest. MSY translates into the delivery of the highest possible long-term catches. At the same time, it contributes to the sustainable conservation of the stocks and allows for the maximisation of fish supply from fishing. The fishing opportunities are set with a view to ensuring MSY. As of January 2019, fishermen are not permitted to throw the fish back to the sea once it has been caught. The landing obligation applies to all catches of regulated species unless an exemption has been agreed in line with the rules in place. Regulated species are those that fall under catch limits or, in the Mediterranean, species which are subject to minimum sizes. Undersized fish cannot be marketed for direct human consumption purposes whilst prohibited species (e.g. basking shark) cannot be retained on board and must be returned to the sea. The discarding of prohibited species should be recorded in the logbook and forms an important part of the science base for the monitoring of these species. This change (i.e. the requirement to land all fish) has implications for the levels of relevant fishing opportunities, which can be adjusted according to biological advice to take into account that previously discarded fish is now landed.

In the Mediterranean and the Black Seas, most stocks are still overfished. This is largely due to the multispecies nature of fisheries, the fact that several fish stocks are shared with third countries and the low number of fish stocks assessed yearly by scientific bodies. Further efforts are required, in particular in the context of the General Fisheries Commission for the Mediterranean (GFCM) Strategy, in line with the 2017 MedFish4Ever and the 2018 Sofia Ministerial Declarations. For its part, the Commission will continue to work closely with all the stakeholders for the prompt implementation of the Western Mediterranean Multiannual plan.

The EU has continued working, including with its international partners, on improving the situation of stocks in the Mediterranean and Black Seas. At the EU level, 2020 is the first year of full implementation of the MAP for demersal stocks in the Western Mediterranean with the first effort reduction and the setting of fisheries closures for the protection of juveniles. This year will also be the second year that a specific fishing opportunities regulation for the Mediterranean and the Black Seas will be adopted, based on this first MAP for the Mediterranean.

At the international level, considering the shared nature of most fish stocks, the EU has continued to promote multilateral cooperation in the competent RFMOs, including at the General Fisheries Commission for the Mediterranean (GFCM) and the International Commission for the Conservation of Atlantic Tuna (ICCAT). With the adoption of the MedFish4Ever (March 2017) and the Sofia (June 2018) Declarations, there is a detailed work plan to rebuild Mediterranean fish stocks, in close collaboration with the Barcelona Convention, and Black Sea fish stocks, to protect the region's ecological and economic wealth and boost the sustainable development of aquaculture over the next 10 years. This is complemented by regional plans of action against illegal, unregulated, and unreported (IUU) fishing (2017) and for sustainable small-scale fisheries (2018).

In 2019, the GFCM adopted a record 15 measures, proposed by the EU, some of them groundbreaking, e.g. the multi-annual plan for demersal stocks in the Adriatic. 2020 will be the first year of its implementation, with the first effort at the reduction of 12% over 2020-2021, the establishment of closures, a minimum conservation size, and a pilot inspection scheme. Additional progress in 2020 will need to be decided in light of the disruption brought about by the coronavirus crisis. One milestone to consolidate the momentum of reforming fisheries governance in the Mediterranean will be the adoption of the next five-year GFCM strategy. The EC's evaluation of the EU's Common Fisheries Policy can be found here: <u>https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_1071</u>

Vlachopoulou et al. (2013) refer to the disconnects in EU and Greek fishery policies and practices in the eastern Aegean Sea and impacts on Posidonia oceanica meadows. Destructive fishing practices are having significant impacts on the seagrass meadows throughout the eastern Aegean Sea, i.e., Posidonia oceanica. Most of the local population in Greece are artisanal fishermen who rely on seagrass beds for their fisheries' catches. The European Union supports the protection of Posidonia oceanica meadows through marine protected areas under the Habitats Directive and through the Common Fisheries Policy (CFP). The CFP defines destructive fishing practices (e.g., trawling within 1.5 nautical miles of member state shorelines) formally as Illegal, Unreported, and Unregulated (IUU) fishing practices. While destructive impacts of trawling on seagrass habitats are well documented, this fishing method poses a problem throughout the Mediterranean and elsewhere. Based on a case study of artisanal fishing communities in the Aegean Sea, this research examines the problem of destructive and illegal fishing in seagrass beds from both ecological and policy management perspectives, including analyses of EU and Greek national fisheries legislation and a case study of two fishing communities in Greece, involving stakeholder interviews and habitat maps of fishery practices. Findings highlight disconnects in the application of fishing legislation between EU and Greek laws, socio-economic and institutional barriers to fisheries enforcement, and a lack of habitat baseline information. Recommendations focus on seagrass conservation through direct engagement of artisanal fishing communities in the management of local fisheries protection areas (FPAs) to support the long-term survival of seagrass ecosystems which sustain local fishing livelihoods today and for the future.

Specifically focusing on Greece, Moutopoulos et al. (2016) state that illegal fishing has been recognized as a global problem in achieving fisheries sustainability. They studied fisheries violations and fines/penalties imposed per fishery, recorded by the Ministry of Marine Mercantile, were for the Greek waters during 1999-2013. Spatio-temporal patterns identified were related to: (a) easy access operating illegal fishery, (b) fishing effort/species abundance spatial distribution, (c) area topography, (d) local restrictions, and (e) fleet structure. There need to be further improvements to the implementation of the fishing control that involve the identification of high-risk areas prone to illegal fishing, the rationalisation of the fisheries legislation, the harmonization of proportionate administrative fines, and the increase of transparency in the decision-making process. These might increase the efficiency of the fisheries control which in turn will enhance the credibility of the EU's Common Fisheries Policy in the Aegean and Ionian Seas.

Economou et al. (2016) conducted a wide-ranging river fish survey that was executed in the summer of 2009 as part of the preparatory actions for the establishment of a monitoring programme for the EU Water Framework Directive (WFD). This was the first extensive electrofishing campaign for WFD standardised bioassessment in Greece and the experience and insights gained are used here to provide a review of fish-based assessment conditions and requirements in this country. The survey sampled 85 sites on 25 rivers throughout mainland Greece, collecting 70 species of freshwater fish. Quantitative site-based assemblage data is used for taxonomic and ordination analyses revealing a strong biogeographic regionalisation in the distribution of the ichthyofauna. The structural and spatial organisation of the fish fauna using species-level and community-level data analyses is explored in three ecoregions where data was deemed sufficient. Transitions in community taxonomic composition among ecoregions were abrupt and concordant with geographical barriers, reflecting the influence of historical biogeographic processes. The community-based analysis revealed a substantial degree of variation in quantitative attributes of the fish assemblages among ecoregions. Key conclusions of

DT4.1.1. Technical report

this work are: (a) the fish-based bioassessment system must be regionalised to reflect biogeographic variation; (b) high faunal heterogeneity among ecoregions (taxonomic, structural), and to a lower degree among basins, constrains the transferability of bioassessment metrics and indices created for explicit regions to other regional frameworks; (c) faunal depauperation in most of the study areas reduces the utility of functional bioassessment metrics and also limits the utilisation of rare species and the applicability of the classical form of the "Index of Biotic Integrity" concept.

According to Tzanatos et al. (2020), small-scale fisheries in Greece are characterised by many fishers and vessels scattered along an extensive coastline, a variety of fishing gears and target species, and intense heterogeneity. There are various definitions of small-scale fisheries; in general, they comprise all gears except for trawls and purse seines. Despite having little direct economic value, small-scale fisheries do have significant social importance, especially for remote rural and insular areas. Small-scale fisheries are structured around the family; contemporary fishers are relatively old, tend to inhabit their place of birth, have a low educational level, and diverse levels of dependence on the profession. The fisheries are mainly located in the coastal zone and managed through control measures regulating effort, gear types, and gear used in terms of space and time. In general, small-scale fisheries have characteristics associated with sustainability, although there are cases with adverse effects on the marine ecosystem. In past decades, due to several management practices (e.g., vessel modernisation and replacement), Greek small-scale fisheries have, however, lost their traditional advantages of "cost-effect" relationship and morphed into "small-becoming-big-scale fisheries" with high costs, low profits, increased fishing effort and pressure on fish resources. In addition, the complex and outdated legal framework regarding professional fisheries and the individualistic character of the profession act as obstacles to collective action and complicate management.

Kyvellou and learapetritis (2020) investigated the potentials and challenges in Greece about fisheries sustainability through soft multi-use maritime spatial planning and local development co-management. Small-scale fisheries in the Mediterranean represent a significant part of the fisheries

industry and their substantial social, economic, and place attachment-related role have always been acknowledged in the region. Even though this usually family-based endeavour has a vast economic impact on coastal and island communities of the sea-basin, data and insights on the Mediterranean artisanal fisheries continue to be inadequately developed and poorly integrated into the local development strategies. Thus, the aim of this research is two-fold. Firstly, it presents some data and facts on the fisheries sector in the region and secondly, it explores the options of their survival, prosperity, and sustainability, approaching the combination of fisheries and tourism as a small-scale and soft "multi-use" in the marine space. Greece, with a huge potential in both the fisheries and the tourism sector, was used as a focus area where a codevelopment process was designed aiming to identify advantages/potentials and challenges/disadvantages of the co-existence of artisanal fisheries and tourism, as perceived by a series of stakeholders including the co-management schemes (Fisheries Local Action Groups, FLAGs) in the country. The key conclusion is that sustainable livelihood from small-scale fisheries depends on the correlation between fisheries and other marine activities. Despite some limitations, this can boost sustainable local development and be a unique pattern of a "win-win" and soft multi-use marine spatial planning (MSP), with economic, environmental, social, cultural, and governance-related benefits for the coastal communities.

o Moldova

Actually, there is no information management system established in Moldova. The system that is acting now is implemented sporadically and based on the responsibility of the Republic of

Moldova under MEA, national legislation (Law on hydrometeorology, other), but no clear established information system exists.

Considering identical status of non-EU-member states of Moldova and Georgia, it could be concluded that most of what is proposed for Georgia is applicable for Moldova as well.

o **Romania**

In Romania, in recent years, several new sectors generating jobs in maritime fields have been incorporated by regional and supra-national policies, such as the EU Blue Growth Strategy, and new necessities to accommodate multiple views, needs, and stakeholders through new planning and policy approaches like MSP.

In the context of the Ecosystem Approach, the harmonization of ICZM and Maritime Spatial Planning (MSP)/Marine Protected Areas (MPA) processes would be the manifestation of the principle of integration of terrestrial and marine domains.

The MSP development has been started and the Directive 2014/89/EU was transposed in the national legislation by: a) Government Ordinance No. 18/2016 on the maritime spatial planning; and b) Law No. 88/2017 related to the approval of the Government Ordinance No. 18/2016 on the maritime spatial planning. In Romania, MSP will be developed under the MSP Methodology which was approved by Government Decision, according to Art. 14, par. (3), of the Government Ordinance No. 18/2016 on MSP. The national plan is currently in a preparation development phase and is foreseen to be finalised and approved until 31 March 2021. It will be developed with the involvement of stakeholder consultations and will be reviewed at least once every 10 years.

However, the future for MSP in Romania looks promising due to the high expertise of academia involved in the national committee, but resolutions taken by this committee could fail without political will. Moreover, further steps and efforts are required to simulate and foresee marine systems dynamics and create scenarios through modelling, together with participatory actions.

The strategic framework for maritime spatial planning in Romania and Bulgaria aims to develop a common development vision, common principles, and common objectives for all maritime spatial areas in Romania and Bulgaria (territorial sea and the coastal area - adjacent localities - LAU2). The common strategic framework developed an action plan which will ensure the coherence between the activities from maritime space, on one hand, and between activities on the sea and the coastal area. This strategic framework will represent an important starting point for the national spatial plan of the maritime areas for both countries, to be realized afterwards within the implementation of the MSP Directive. (* MARSPLAN Synthesis Report, 2019)
4 GAP ANALYSIS. BARRIERS AND ENABLERS ON HOW THE TECHNOLOGICAL UPGRADE WILL FAVORABLY INFLUENCE THE CROSS-BORDER INFORMATION EXCHANGE AND THE IMPLEMENTATION OF MSFD AND DCF PROGRAMMES AT BS BASIN SCALE

4.1 Legal and other non-technological barriers

The MSFD states that regional sea conventions (in this scase Convention for the Protection of the Black Sea against Pollution -Bucharest Convention, to which the EU is still trying to accede) can constitute the vehicle for such cooperation. In general, during the last decade, the regional sea conventions (i) became, in most cases, good platforms for implementing the MSFD where contracting parties collaborated and shared approaches, in close collaboration with the MSFD common implementation strategy; (ii) supported the cooperation and agreement on actions and objectives with non-EU countries; (iii) received significant EU technical and financial input to develop their work programmes.

For the non-EU Member States, Russian Federation, Ukraine, Georgia and Turkey, which have 86% of the Black Sea's coastline length, the EU directives are not obligatory, which is a potential threat for the integrated regional monitoring activities. The lack of integrated monitoring could generate difficulties in identifying the most adequate cause/effect relationships and formulation of proper management options.

In spite of accomplished standardizations in data collection, analysis and assessment methods and representativeness of different water bodies of the Black Sea, a serious deficiency in spatial and temporal resolutions in the areas monitored is apparent.

Poor geographical coverage: measures do not reflect all monitoring activities being carried out by the six countries (Bulgaria, Romania, Ukraine, Russia, Georgia, Turkey) surrounding the Black Sea. All countries have their own national programmes concerning monitoring of particular biodiversity.

The monitoring activities are not planned to cover all seabed and water column habitats of the region especially for the non-EU waters and the Sea of Marmara.

The regional programmes do not adequately address pressures except for nitrogen, phosphorus and organic matter enrichment and there is poor simultaneous monitoring of pressures within monitoring programmes.

Although, monitoring data are used in Ukrainian legislation for the designation of MPAs for integrated coastal zone management, the data are poorly used in legislation regarding the identification of operational objectives and development of measures for marine management. The Ukrainian marine policy is currently being reformed in line with MFSD.

In general, there is insufficient financial support of monitoring and poor coordination between responsible authorities.

Despite the Black Sea regional initiatives such as Black Sea GOOS (ARGO floats and other drifters in the Black Sea), as well as participation in the MyOcean program, the bio-ecological operational oceanography is still poorly developed.

All the above claims for further efforts to improve the coordination of marine research activities and improving of regional cooperation in environmental monitoring for assessment of fish stock and non-fish living resources.

An example from Georgia

GeoInconsistencies within the water-related legislation are the main challenge for taking the proper steps towards the establishment of a modern water management system at the national level. The AA sets obligations for Georgia on the approximation of its legislation with the EU

Water Framework Directive (WFD) and other water quality-related regulations. Although the draft Water Law and some draft secondary legislation, reflecting EU approaches, is in place, further efforts are needed to, first of all, adopt these pieces of legislation and second, ensure their effective implementation (e.g. THIRD NATIONAL ENVIRONMENTAL ACTION PROGRAMME OF GEORGIA setting the proper institutional scheme for achieving integrated river basin management). Therefore, the development of a water resources management system is one of the priorities in the coming years.

Although as mentioned above the trend of monitoring network extension has been well-noticed in recent years, additional efforts are needed. The establishment of a reporting, data management, and use system is also crucial for planning and implementing these adequate measures. Considering the above-mentioned data the following long-term goal (2030) and three five-year targets have been identified in water resources management.

A Mediterranean example

On Tuesday, June 9, 2020, a set of agreements have been signed between Greece and Italy. The major and most significant agreement is regarding the delimitation of maritime zones between the two states. This is the first agreement signed by our country regarding the Exclusive Economic Zone (EEZ) and has been concluded under UNCLOS (United Nations Convention on the Law of the Sea). Therefore, the Agreement confirms the right of the islands to maritime zones. It also confirms the median line of the 1977 agreement on the delimitation of the continental shelf between Greece and Italy as a borderline between the Greek-Italian EEZ. Consequently, that median line will also apply to the superjacent waters of the continental shelf. This is an extremely important agreement, a development of historical significance for Greek country. A Joint Declaration of Greece and Italy on the Resources of the Mediterranean was also signed. With this declaration, the two states express their commitment to the balanced and sustainable management of these resources and agree to hold consultations to assess the impact of various factors on the existing practices of fishermen of the two states (i.e., sustainable management). Finally, a Joint Notification was signed, addressed to the European Commission, requesting the amendment of the regulation on common fisheries policy so that, when Greece decides to expand its maritime zone to 12 nm, the existing fishing activity of Italian fishermen in the area between 6 and 12 n.m., which is now within international waters, will be maintained. What is of paramount importance is the reference, within the Agreement, of the right to expand everywhere our territorial sea. The existing fishing rights of Italian fishermen are described restrictively, both in terms of the number of vessels and the species they can fish, which are excluded from the species Greek fishermen can fish. This story can be used as a positive example of transboundary coordination in isheries, that can be replicated in Black Sea.

4.2 Technological barriers

Significant challenges for water resource planning and management. Rapid global change is seeing significant changes to the pressures on the water resources of large basins, exacerbating the challenge of sustainable water management. Diverse technologies have long supported water resource planning and development, from data collection, analytics, simulation, to decision-making, and real-time operations. In the last two decades, however, a rapid increase in the range, capability, and accessibility of new technologies, which is the main challenge for the water monitoring sector.

Infrastructure improvements and effective introduction of less applied approaches (such as remote sensing, underwater video surveys, Continuous Plankton Recorders, side-scan sonar

techniques for habitat mapping, Ship of opportunity / FerryBox system) should be considered as overarching and critical issues for implementation of the MSFD.

- Lack of a fixed network of sampling stations with regular and long-term observations.
- Lack of efficient data exchange and integrated outputs (intercalibration between different networks) stands as an obstacle for data management and quality issues in intergovernmental levels.

4.3 Opportunities/enablers

There are a number of positive trends in the region that need to be mentioned. The major enabler in the Black Sea monitoring is the regional cooperation of all six countries. At Regional Sea level in the framework of the Bucharest Convention (Convention on the Protection of the Black Sea Against Pollution, Black Sea Commission), there is the regional monitoring programme BSIMAP (Black Sea Integrated Monitoring and Assessment for years 2017-2022) based on national monitoring programmes and financed by the Black Sea States. Joint monitoring relevant to fish stock assessment is expected to be boosted by the Sofia Ministerial Declaration (2018).

- Most of the marine monitoring activities are based on EU/NATO/UNDP funded projects.
- Five of the national programmes monitor three or more biodiversity components simultaneously.
- The descriptor Biological diversity is monitored in all areas by eight programmes, and EU Black Sea waters is the most monitored area.
- Among the biodiversity components, phytoplankton, zooplankton and benthic invertebrates are monitored in all areas, being monitored by 4 (EU waters), 3 (non-EU waters) and 3 (Sea of Marmara) programmes.
- Nitrogen, phosphorus and organic matter enrichment are the pressures covered by highest proportion of monitoring networks in the region.
- Monitoring programmes in the EU Black Sea waters address the most types of habitats: 11 seabed habitats and three water column habitats.
- Manuals on sampling and analysis, including guidelines on equipment, site selection, abundance, biomass, blooms and taxonomic identification have been developed and used for soft-bottom macrozoobenthos (Todorova & Konsulova, 2005), zooplankton (Korshenko & Alexandrov, 2006) and phytoplankton (Moncheva, 2010; Moncheva & Parr, 2010).

There has been significant recent progress in compiling monitoring manuals for meiobenthos and microzooplankton (not finalized), for harmonization of assessment methodologies, analytical techniques, reporting formats, application of unified set of indicators (protocol of 17th Meeting of Advisory group for Biodiversity Conservation).

- Several inter-comparison exercises have been organized and collaboration within recent WFD/MSFD supporting projects (SESAME, PERSEUS, CoCoNet, MISIS, EMBLAS, EMBLAS-II, EMBLAS Plus) contribute to generating new data and advance application of harmonized approaches and indicators.
- A regional database (known as Mnemiopsis) hosted by the Black Sea Commission was developed in 2008 (BlackSeaScene infrastructure Project) but needs further updating. An interoperable GIS enabled Regional Pollution Data Base, hosted by Regional Activity Centre (RAC) Pollution Monitoring Assessment (PMA) is being developed in the framework of Baltic2Black (BSC and HELCOM) Project. A common tool for assessment of eutrophication (BEAST) has been adopted (Baltic2Black Project).

The descriptors catalogue provides evidence for various sampling frequencies within the Black Sea monitoring networks. This leads to the necessity to address scales (temporal and spatial) as a crucial issue for adequate monitoring efforts.

- The descriptors catalogue assesses the gaps of existing QA/QC procedures and thus provides opportunities to further addressing the issue towards improving the reliability of the assessments.
- Among the six Black Sea countries, only Bulgaria and Romania are EU Member States. Turkey, with almost 35% of coastline length coverage, is a candidate state and proceeds efforts to reorganize its monitoring activities to be integrated with the EU directives.
- There is increasing cooperation between the Black Sea countries and progress on the integration of monitoring with EU directives. This opportunity enhances the state-of-art of monitoring in the region.
- The Sea of Marmara, although not an EU Regional Sea, is the connection between the Mediterranean and Black Sea (EU seas). Integrating the local ongoing monitoring programmes within the regional networks will improve the MSFD implementation in the neighbour regional seas.

Broader regional cooperation

The <u>Black Sea Synergy</u> is an EU initiative for regional cooperation with and between the countries surrounding the Black Sea. In 2015, together with the European External Action Service, the European Commission issued a <u>Joint Staff Working Document</u> on the Implementation of the Black Sea Synergy from 2009 to 2014. It offers a snapshot of progress in the main fields of cooperation in the Black Sea region, including maritime policy.

The EU also enjoys observer status in two regional organisations:

<u>The Black Sea Economic Cooperation (BSEC)</u> <u>The Commission for the Protection of the Black Sea Against Pollution (BSC, Bucharest</u> Convention).

Regarding the new initiatives, it should be mentioned that the annual high-level stakeholder conference on the blue economy has turned into an important forum for public administrations, maritime practitioners, entrepreneurs, and other interested parties from the region. These conferences help to identify how Black Sea countries can increase their blue growth potential, embrace innovation, get access to funding and sustainably develop coastal areas. Four annual high-level conferences have taken place so far: <u>Bucharest</u> (2014), <u>Sofia</u> (2015), <u>Odessa</u> (2016), and <u>Batumi</u> (2017).

To structure the cooperation on maritime affairs, the six coastal countries and the Republic of Moldova elaborate a common maritime agenda for the Black Sea by 2019. Through the "Facility for Blue Growth" - an EU-funded assistance mechanism - administrations and stakeholders in the region get support to identify common priorities for cooperation at sea basin level, thus laying the foundation of this common agenda.

In the context of the European Maritime Day 2018 (Bulgaria, 30-31 May), Black Sea Ministers expressed their support for closer regional cooperation on maritime affairs, including transport, environment, research, and innovation. They endorsed the Burgas Declaration <u>"Towards a</u> Common Maritime Agenda for the Black Sea".

The European Commission supports marine researchers and policymakers from all Black Sea coastal countries to define strategic priorities for Blue Growth research and innovation.

Over the last 5 years, the Commission has ordered a series of studies to identify areas for enhanced cooperation at the sea-basin level and to explore the potential for maritime clusters. The results are published and can be found on the Maritime forum webpage (see below). Open calls for proposals covering the Black Sea are regularly published on the <u>webpage</u>.

Funding for Black Sea projects

Marine and maritime-related <u>EU-funded projects</u> can be found across various policy areas and are financed by various EU funds. Especially the <u>Instrument for Pre-accession Assistance</u> (IPA), the <u>Horizon 2020 SME Instrument</u>, and the <u>European Neighbourhood Instrument</u> (ENI) provides financial support for actions in this region. The latter finances the Black Sea Basin Joint Operational Programme 2014-20, which aims to contribute to the sustainable development of the region, by promoting business and entrepreneurship (incl. tourism) as well as environmental protection and the reduction of marine litter.

In 2017, an Initiative was launched and supported by the European Commission (EC) to develop a joint research and innovation agenda and guide national and EU-level policymakers named, 'The Blue Growth Initiative for Research and Innovation in the Black Sea'. As highlighted in the Burgas Vision Paper, this expert working group consisting of experts from Black Sea coastal countries, (Republic of Bulgaria, Georgia, Romania, the Russian Federation, the Republic of Turkey and Ukraine, as well as the Republic of Moldova), in cooperation with marine experts from leading European marine institutes and organisations, with the support of the European Commission. They produced the Burgas Vision Paper the key framework document for a shared vision of a productive, healthy, resilient, sustainable, and better-valued Black Sea by 2030. The paper was launched during the European Maritime Day 2018 in Burgas, Bulgaria (May 2018). It addresses the key pillars on which a new Strategic Research and Innovation Agenda (SRIA) can be built on. This process was further supported by the Ministerial Declaration towards a Common Maritime Agenda (2018) for the Black Sea, endorsed by the same Black Sea countries.

A Blue Growth Initiative for Research and Innovation in the Black Sea aims to advance a shared vision for a productive, healthy, resilient, sustainable, and better valued the Black Sea by 2030. The initiative will help to deeper connect Black Sea societies through a bridge of new knowledge, technologies, and services. The initiative aims to foster human and infrastructure capacity building in coastal, marine, and maritime sectors unlocking unique opportunities for sustainable and environmentally friendly blue growth in the Black Sea.

Eight workshops were held by the experts joining the Blue Growth Initiative for Research and Innovation in the Black Sea with the support of the European Commission (EC). Initially, information on both national and international marine research projects was collected and analysed. Secondly, gaps and research and innovation opportunities together with the necessary justification and drivers from each Black Sea country were collated. Thirdly, regional and national boundary and framework conditions for the Research and Innovation needs and opportunities for successful implementation of an SRIA were identified. Based on the data generated and outcomes of these workshops, the experts of the Initiative drafted: i) common vision, ii) challenges, iii) goals of the SRIA. These results were presented in the Burgas Vision Paper.

The matrixes and past project information were analysed and collated into summary graphs to identify needs and gaps. For this, sets of pre-defined area keywords were delivered to the expert group and they were asked to map national/international projects. As a result of this exercise, the different focus of national-funded and EU-funded projects was revealed. For instance, while the national projects mostly focused on biodiversity, pollution, observing, and management projects, EU- funded projects targeting the Black Sea prioritised more crosscutting frontier areas such as socioeconomics, training, climate change, and multiple stressors.

After the launch of the Burgas Vision paper in May 2018, the efforts of the Black Sea Blue Growth Initiative were focused on developing the SRIA goals and actions. The structure of the SRIA was set to pave the path for effective and realistic implementation of the SRIA, which includes a clear definition of goals, challenges, targets, and main actors.

5 CONCLUSIONS AND RECOMMENDATIONS ON THE MAIN STEPS AND ACTIONS TO ACHIEVE THE GOALS OF THE FUTURE INNOVATION STRATEGY

The consideration presented in this report, and the relevant findings of the analysis carried out by the TIMMOD team, confirmed once again that in the Black Sea there is (probably more than elsewhere), a strong interdependence between fish abundance, eutrophication, marine litter, habitat changes and invasive species. Considering the impact of Climate change, the most significant threats for Black Sea fish and non-fish species remain:

- Marine litter, either originating from the vessels or from the shores or rivers, which is a "visible" pollution problem along the coasts of the Black Sea and has strong negative impact on all marine living resources
- Abnormalities in water temperature, mass stratification, circulation, and acidification, provoked by the climate changes, create negative impacts, which will further increase with the time
- Overfishing (considering the drastic drop of total landings during the past years), as well as the Illegal and unregulated fisheries which is a general issue in all BS countries
- Lack in regional cooperation in monitoring, data exchange and statistics on fish and nonfish abundances, and their interdependence on the status of Black Sea marine environment

In accordance to the considerations and analyses presented here above in this report the following main conclusions can be drawn:

- Marine fish and non-fish populations are common natural resources for the Black Sea countries. These resources were the most affected species by the dramatic changes produced last decades in the Black Sea ecosystem. Assessment of fish and non-fish abundance, and providing relevant data and statistics at basin scales to stakeholders and decision makers becomes an important factor for sustainable management of Black Sea resources. In the meantime, it is concluded that a number of gaps persist, such as:
 - Fragmented and irregular monitoring activities at national level. Lack of annual assessment of Black Sea fish stocks and other non-fish resources
 - Fish stocks assessment practically missing for all species, excepting the most spread (shared) and migratory species
 - Incompatible and incomparable data and methodologies for assessment purpose.
 - In some cases, lack of modern monitoring equipment and modern ICT tools to provide relevant platforms for data exchange.
- The transboundary character of the living resources of the Black Sea imposes the necessity for coordinated efforts at regional level for their exploiting and protection. Considering that the majority of fish species with commercial value are shared or migratory species, the problem of <u>transboundary cooperation on common approaches</u> and in sharing data about fish and non-fish resources becomes of primary importance.
- The marine ecosystem of the Black Sea is seriously affected by dynamic changes directly related to fishing, along with climate change and pollution. At Black Sea scales, catches

and fishing effort increase beyond the natural recovery capacity of stocks in spite of evident decline of stocks, in particular in the case of threatened species as sturgeons, turbot, bonito, etc. Fisheries statistics, fish stock assessment and monitoring activities are fragmented and irregular at both national and regional levels. Some data and methodologies are not compatible for regional purposes.

 There is an obvious need for more accurate analytical and scientific research coordinated at national and regional level to preserve and improve fisheries resources and ecosystems in the Black Sea basin. This requires <u>continuous scientific analysis of the state of fish stocks and non-fish resources</u>, and a stable, longterm system of observation and monitoring, where all the Black Sea states need to participate in this process.

Based on the findings of the present report and on the above conclusions, the following recommendations are suggested for the main steps and actions for modernization of environmental monitoring and assessment of fish and non-fish resources, and support achieveing the goals of the forthcoming Innovation Strategy suggested by TIMMOD project :

- Aiming at obtaining the competitive and comparable data it is necessary to encourage dialogue and cooperation between EU Member States and third countries bordering the Black Sea, to achieve mutual understanding on the standardization at regional level, and in conformity with the MSFD and the international practice of using compatible methods, equipment and ICT tools for sampling, processing, analysing and interpreting the data and information regarding quality of marine waters and assessment of fish stock and non-fish resources.
- Such an Agrreement could be eventually incorporated in Common Maritime Agenda / SRIA programs, and can include:
 - the development and adoption of <u>uniform guidelines on methods</u>, procedures, equipment, numerical model and GIS tools
 - Creation of a specialized regional <u>data base gathering</u> available information
 - Development of <u>specific indicators</u> for the Black Sea in order to monitor and assess the status of key marine living resources, in particular fish stock and non-fish species abundance.
- Within Group Activity T1 of this project, two reports with recommendations have been elaborated:
 - Situational analysis of the Monitoring and Assessment of Black Sea Fish and Non-fish Living Resources and recommendations to increase the efficiency of use of available methods and tools, and
 - Inventory on Technology Innovations in marine environmental monitoring and assessment of fish stock and non-fishing recourses

The proposed innovative technologies and methods in the above reports can contribute to the unification of the monitoring approaches of Black Sea countries, and the development and adoption of uniform guidelines on methods, procedures, equipment, numerical model and GIS tools

- The Black Sea countries need to support the coordination of joint research projects to ensure the link between science and industry, to develop appropriate methods for measuring, monitoring and processing data, in accordance with the modern methods of catching fish and non-fish species, and taking into account possible impact of disturbing fishing methods (e.g. trawling on the seabed)
- It can be strongly recommended to undertake joint training of staff involved in data collection (researchers, surveyours), on the use of modern monitoring equipment and advanced ICT tools. A possible instrument that can facilitate such multilateral training activities could be the Black Sea Basin program (or other EU or regional programs supporting research and innovations).

In order to achieve the measures and actions presented here above, the TIMMOD team suggests some specific recommendations to the Black Sea countries participating in this project:

Georgia

- Strengthen monitoring and activities to meet the requirements of the EU Marine Strategy Framework Directive and Water Framework Directive;
- Improve the waste management proper effort and resources for the abatement of marine litter pollution in the region in whole and the Black Sea;
- Strengthen intergovernmental institutional arrangements consolidating the Black Sea regional activities on marine litter and other types of marine pollution;
- Develop regional and national marine litter monitoring and assessment schemes based on a common research approach, methodology, evaluation criteria, and reporting requirements;
- Raise public awareness and promote public education on marine pollution issues;
- Improve professional skills and knowledge of responsible authorities involved in the management of marine issues;
- Stimulate information exchange on marine monitoring issues to share the best experiences and innovative technologies amongst the Black Sea countries;
- Improvement of the monitoring system on the Black Sea coast of Georgia following MSFD and WFD;
- Enhancement of research towards the assessment of fish and non-fish resources;
- Introduction of modern methods for assessing the state of fish resources;
- Improvement of the monitoring equipment, including laboratory and field instruments.

Bulgaria

- The lack of data is in some cases due to a genuine knowledge gap. Still significant lack of knowledge about fishing pressure and reproductive capacity.

- To get information that is comparable across project membres. To establish robust methodologies.

- Further improvement is needed for all fish stocks to reach maximum sustainable yield fishing mortality levels, in accordance with the common fisheries policy objectives.

- Further action is needed, depending on the availability and quality of marine information, the commitment to implement scientific advice and an adequate uptake of management measures. Many stocks remain overfished and/or outside safe biological limits. Efforts will need to be intensified to ensure that stocks are managed sustainably.

- Additional action to reach the objective to better protect and preserve seabed habitats and reduce by-catch from fishing activities.

- Widespread oxygen-depleted areas are observed in the Black Sea as a result of eutrophication, natural conditions and climate change impacts. Although eutrophication is a relatively well-studied process, the harmonisation of monitoring methods (across countries, between coastal and open sea areas, and between MSFD and Water Framework Directive approaches) remains an issue.

- The MSFD information about trends and environmental status with respect to hydrographical conditions is, however, too scarce and scattered to allow for a suitable assessment on a large scale. The criteria and methods used are not harmonised.

Greece

In general, in Greece, there is an EU-based regulated system for monitoring and assessing fish resources with HCMR, FRI, and other research organizations responsible for the collection, validation, and reporting of data, accounting to the Agricultural and Food Industry Ministry, and official state Environmental Agencies.

Greece possesses enough modern equipment to assess fish stocks (sensors, instruments, and platforms) but lacks efficient country-scale ICT tools to help easily disseminate relevant information to the public and the fishing industry.

Assessment of non-fish living resources is made (mostly shellfish, mussel, clam, etc.) with several methodologies and relevant equipment for monitoring by EU-/GR-funded research institutes.

Cooperation between riparian countries of the Mediterranean is still in an immature state regarding knowledge and data sharing, yet there are agreements and common practices with neighboring countries (e.g., Italy) on the monitoring, control on the use, and management of fishery resources. Cross-border issues still reside with Turkey, concerning oceanographic monitoring and assessment.

Greece is obliged to share data on marine living resources with other EU-member and peripheral states, such as Black Sea countries. Legal barriers are overcome by EU legislation policies, yet the efficiency still resides in local implementation.

Greek institutions, NGOs, and local authorities currently participate actively in several international and cross-border projects, thus after 2020, Greece is expected to be able to provide comparable data in conformity with the international practice and standards.

Moldova

In order to introduce efficient management of integrated environmental monitoring and a shared environmental information system in Moldova, assistance is required for the following issues:

✓ Development and improvement of methodologies for setting-up of statistical and environmental indicators, their processing, data collection, sharing of data, databases development

- ✓ Approximation of national legal framework to EU requirements for the priority sectors
- ✓ Capacity-building support (training) for specialists in water and water-related ecosystems, especially for the development of statistical and environmental indicators, processing of information, data collection, use of modern softs as GIS, ARC VIEW, development of databases, development, and implementation of the integrated RBM approach, development of State of Environment reports in accordance with UN ECE indicators list
- \checkmark Assistance for accessing and using new software for data, collection, processing, accession, and reporting
- ✓ Support for using and integration of E-Governance Centre in development of SEIS in Moldova
- ✓ Making compatible the environmental standards for SEIS development
- ✓ Identification of gaps and needs in the information exchange process between different organizations at the national and international level.

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