ORRI Guidelines for Marine Research in the Black Sea

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REINFORCING
Responsible tErritories and Institutions eNable and Foster Open Research and inClusive Innovation for traNsitions and Governance

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Introduction

The Open Responsible Research and Innovation (ORRI) Guidelines for Marine Research in the Black Sea are more than just a framework—they are a **catalyst for change**. In a world where marine ecosystems are under unprecedented pressure, we have the power to turn research into solutions that drive **sustainability, innovation, and inclusivity**. This document is a guide for researchers, policymakers, industry leaders, and communities to **work together** toward a thriving, resilient Black Sea.

Why This Matters

The Black Sea is a **biodiversity hotspot** and a vital economic resource. However, it faces challenges such as **pollution, overfishing, climate change, and habitat destruction**. Responsible research is not just about producing knowledge—it's about creating real impact. ORRI principles ensure that marine research **engages communities, promotes ethical governance, and fosters innovation** that benefits society and the environment alike.

The Open Responsible Research and Innovation (ORRI) Guidelines for Marine Research in the Black Sea are structured as follows:

1. **Objectives and Methodology (Section 1):** Defines the purpose of the guidelines and the methodology behind their development.
2. **Key Concepts (Section 2):** Introduces the Responsible Research and Innovation (RRI) framework, its dimensions, and core principles.
3. **RRI in the Black Sea Context (Section 3):** Examines region-specific challenges and opportunities, highlighting the lack of academic literature and barriers such as environmental, socio-economic, and geopolitical factors.
4. **ORRI Guidelines (Section 4):** Provides tailored definitions, addresses challenges within each of the six RRI dimensions, and includes self-assessment questions and improvement strategies for stakeholders.
5. **Conclusions and Recommendations (Section 5):** Summarizes key insights and offers guidance on applying ORRI principles effectively in Black Sea marine research.

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1. Objectives of the guidelines and methodology

The document outlines ORRI guidelines specifically tailored for marine research in the Black Sea. These guidelines were developed through an extensive review of existing ORRI frameworks, guidelines, and best practices from other regions and previous ORRI projects. The initial draft, prepared by LOMARTOV in collaboration with NIMRD, was refined through discussions with three focus groups comprising key opinion researchers of the region. This collaborative process ensured further enhancement and relevance to the region. The guidelines include specific examples and tools for the application of each dimension suited to the context of Black Sea marine research context.

2. ORRI key concepts

RRI is a framework that integrates societal actors into innovation solutions, products and processes. Its goal is to ensure societal values, needs, and expectations align in the research and innovation processes and results. Emerging in the early 2000s, the concept gained strength around 2010s from European policy initiatives like Horizon 2020, emphasising inclusivity, reflexivity, anticipation, and responsiveness in research processes [1].

The European Commission contemplates six RRI dimensions to be considered in research and innovation processes [2]:

- **Public engagement**: is defined through activities where citizens and societal actors play a distinct role in research and innovation processes.
- **Gender equality**: is a three-dimensional concept achieved when:
    - women and men are equally represented across all disciplines and hierarchical levels;
    - gendered barriers are eliminated, allowing women and men to develop their potential equally; and
    - the gender dimension is integrated into all research and innovation activities
- **Science education**: refers to activities aimed at deepening citizens' understanding of science, shaping their attitudes towards it, and enhancing their ability to contribute to science and science-related policymaking.
- **Open science**: is the concept of making research results freely accessible for anyone to use and reuse. A key driver is ensuring that publicly funded research is accessible to the general public.

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- **Ethics**: serves as a platform for discussing societal values based on perceptions of right and wrong. These discussions are influenced by cultural norms and aim to inform policymaking.
- **Governance**: encompasses all processes of governing. For science and innovation, governance involves and harmonious allocation and management of resources, as well as the establishment of rules for their use and outcomes.

The concept of Open Responsible Research and Innovation (ORRI) expands the principles of RRI by emphasising openness as a foundational element across all aspects of research and innovation as a driving principle throughout the research lifecycle. The concept has gained traction in recent years, particularly through initiatives like the REINFORCING project, with the aim to integrate openness and responsibility into research and innovation processes, promoting collaborative efforts and knowledge transfer to address societal challenges more effectively. [3]

ORRI considers evolving research practices, reflected in the context of Horizon Europe programme, embedding these key principles [4]:

- **Inclusive research and innovation governance**: anticipatory, adaptive and inclusive governance towards society needs.
- **Integration of societal goals into actions**: including equality, safety and security, diversity and inclusion, social cohesion and sustainability in research and innovation processes and organisations.
- **Promotion of diverse collaboration**: multi-stakeholder commitment and representation
- **Promotion of reflexive innovation strategies**: anticipation of future trends and challenges to foster responsiveness
- **Tackle market deficits for equitable technological progress**: fostering transformative change following Sustainable Development Goals (SDGs) and equal benefit of scientific and technological advancements.
- **Enhance inclusive innovation**: integrate needs and views of vulnerable or marginalised groups
- **Seek institutionalised transformative change**: indicators and procedures to strengthen individual and organisational agency, legitimacy, and accountability.
- **Drive innovation through experimental methods**: learning, co-creation and co-design, adapting to social norms, needs, regulations, and infrastructures.
- **Adopt holistic approach to innovation impact**: interconnect factors influencing development, use and impact of innovation.

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- **Promote openness and collaboration in innovation**: mutual responsiveness calling for open science, innovation and transparency.
- **Emphasise ethical integrity in activities**: integrate all parties and adhere to fundamental ethical standards.
- **Advocate for science education and active citizenship**: informed, open-minded and active science citizens from an early stage

These principles have been considered in the development of this guidelines to promote openness in each of the six dimensions.

3. Particularities of RRI in the Black Sea marine research context

The marine environment poses unique challenges and opportunities for the application of RRI principles. Oceans are critical for biodiversity, climate regulation, and human livelihoods, yet they face threats from overfishing, pollution, and climate change. Marine research, therefore, must address these challenges while balancing ecological preservation with economic and social benefits.

Action 1 of the REINFORSEA project evaluated the current landscape of academic literature on ORRI in the Back Sea region [5]. The study found that academic literature on ORRI in the Black Sea region is notably limited, highlighting broader difficulties in applying ORRI principles to specific regional contexts. This scarcity of research stems primarily from the relatively recent introduction of the RRI framework, which has gained greater prominence in European Union policies and global initiatives. However, its adaptation to the unique environmental, socio-economic, and geopolitical dynamics of the Black Sea remains underdeveloped. Regional priorities often centre on pressing concerns such as pollution, biodiversity loss, and transboundary governance, which can overshadow efforts to implement emerging frameworks like ORRI. Moreover, considering that Black Sea is bordered by only 2 EU member states and other 4 non-EU, makes the adoption of ORRI principles difficult and challenging.

Action 1 of the REINFORSEA project also developed and distributed a survey targeting researchers and academic institutions involved in marine research from the Black Sea riparian countries. The aim of the survey is to collect information about the level of awareness and application of ORRI principles and RRI dimensions.

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A significant portion (60%) of participants demonstrated strong familiarity with ORRI principles. However, only 14% identified as advanced users, and 9% as experts, indicating room for capacity-building. While familiarity with ORRI principles was relatively high, only 52% of respondents had participated in professional activities directly addressing these principles, suggesting the need for broader engagement. ORRI-supporting policies varied among institutions: 37% had informal policies, 36% had formal policies, and 15% either lacked policies or were in the process of developing them. The primary barriers identified were a lack of awareness and training (38%), insufficient funding and resources (37%), and difficulties in engaging with communities (25%). Participants highlighted improved research quality (37%), enhanced community trust and involvement (31%), and broader dissemination and impact (32%) as key benefits of adopting ORRI principles. A majority (66%) of respondents expressed interest in participating in future ORRI workshops or initiatives, with an additional 34% considering participation. To strengthen ORRI adoption, participants recommended international cooperation (35%), training programs for researchers and policymakers (34%), and promoting open access to research findings (31%).

The survey provided valuable insights into the awareness, challenges, and opportunities surrounding ORRI principles in marine research within the Black Sea region.

While the integration of RRI in the Black Sea region is still in its nascent stages, there are significant opportunities for future research and collaboration. By leveraging ongoing projects and fostering inclusive dialogue, the region has the potential to lead in applying RRI principles to address its complex challenges, ultimately promoting more sustainable and responsible innovation. REINFORSEA guidelines are meant to be a support for fostering ORRI principles tailored to the specific environment of the marine research field in the Black Sea.

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4. ORRI Guidelines for marine research in the Black Sea

Public engagement

In the Black Sea marine research context, public engagement refers to actively involving coastal communities, fishery stakeholders, policymakers, and environmental organisations in the research and innovation processes. This includes participatory marine monitoring, citizen science initiatives, and collaborative policy discussions that address regional challenges such as pollution, biodiversity loss, and sustainable fisheries management.

Challenge	Ensuring meaningful public engagement in marine research. Enhancing collaboration between marine researchers, local communities, policymakers, and industries. Building trust and collaboration between marine researchers, local communities (e.g., fishers, coastal communities), NGOs, policymakers, and industries.	
Self-assessment question		**Examples of actions for improvement**
Active engagement	• Are we actively engaging the public in our marine research? • How do we involve stakeholders in our research efforts? • What channels do we use to promote participation in marine science? • Are we using diverse media to reach different audiences? • Are our findings accessible to non-scientific audiences, including fishers and policymakers?	• Create a **Black Sea marine collaborative platform** where scientists, fishers, NGOs, and local authorities exchange information and coordinate applied research projects. • Launch a **Black Sea Marine Watch** social media campaign providing real-time updates on water quality, biodiversity reports, and conservation initiatives. • Create a **YouTube series** featuring interviews with Black Sea scientists, tourism operators, aquaculture farm owners and local fishers on sustainable marine resource management. • Present research findings in **fish markets, tourism hubs, and aquaculture farms** to engage different stakeholder groups directly. • **Share research findings** in short, visual formats (videos, infographics), using clear, non-technical language. • **Organise regular focus-groups** to gather stakeholders' proposals and interest in marine research topics. • Produce **short videos** on marine challenges or local sea-related traditions by incorporating photos and stories from older generations, blending scientific insights with traditional knowledge of life in the Black Sea.

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Inclusivity and accessibility in engagement activities	• Are our engagement activities inclusive and accessible to all marine stakeholders? • How do we encourage participation from underrepresented groups? • Do our studies and consultations reflect diverse perspectives?	• Provide **marine research reports** in English, Bulgarian, Romanian, Turkish, Ukrainian, and Georgian to reach broader audiences. • Feature **community representatives** at international marine conferences on Black Sea fisheries, tourism, and aquaculture. • **Train community leaders** on advocating for marine conservation policies at national and EU levels.
Engagement with coastal and local communities	• Are we actively engaging coastal communities in research design and implementation? • Are we incorporating Traditional Ecological Knowledge (TEK) into marine research?	• Partner with small-scale fishers in the Black Sea to document traditional fishing techniques that promote sustainable fish stocks. • Organize **workshops in fishing villages and tourism-dependent communities** to gather local insights on environmental concerns (e.g., coastal erosion, fish stock depletion, sustainable tourism practices). • Work with **mussel and fish farmers** to study plankton population shifts and their impact on aquaculture. • Establish **national focus groups** where local representatives have voting rights on marine protection and sustainable tourism initiatives.
Clarity in stakeholder roles and objectives	• Do stakeholders clearly understand their roles and objectives in marine research? • Have we provided clear statements about expected outcomes?	• Develop community agreements ensuring stakeholders understand benefits, responsibilities, and research contributions. • Create an **interactive GIS map** of key Black Sea marine stakeholders (fishing communities, conservation groups, policymakers, tourism operators, and aquaculture businesses). • Train **local divers and eco-tour guides** on reporting ghost nets, marine debris, and biodiversity changes, clearly defining their role in conservation efforts.
Measuring public engagement impact and outcome	• How do we measure the effectiveness of public engagement efforts? • Are engagement activities enhancing stakeholder knowledge and skills?	• Analyse data from **volunteer-driven monitoring projects** on dolphin and sea-bird populations in the Black Sea, assessing how public involvement improves research outcomes. • Interview **fishery cooperatives, aquaculture operators and tourism businesses** to evaluate how marine research affects their sustainability strategies and economic decisions. • Conduct surveys on **fish and biodiversity populations** with real-time input from fishers, divers, and tourism operators.

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		• Set up a **Community Sea Watch program** where fishers from the region can communicate illegal fishing activities and ecosystem changes.
Solutions for marine conservation challenges	• Are we enabling stakeholders to contribute to marine conservation solutions?	• Support **seagrass restoration** in the northern Black Sea to create vital fish habitats and improve biodiversity. • Partner with **ecotourism operators** to develop sustainable dolphin-watching guidelines. • Host open **forums in Black Sea cities** on the ecological and economic risks and benefits of offshore wind farms in the Black Sea. • Hold **annual marine policy summits** to align scientific research with governmental conservation goals. • Collaborate with **aquaculture businesses** to develop environmentally friendly fish farming practices and reduce habitat degradation

Gender equality

Achieving gender equality in Black Sea marine research requires a commitment to balanced representation, ensuring that both women and men have equal opportunities across all disciplines, leadership roles, and fieldwork. It means breaking down barriers that hinder participation, such as unequal access to funding, training, and professional networks. True progress also demands integrating gender perspectives into research projects, recognizing the contributions of both women and men in coastal economies, marine conservation, and fisheries. By fostering an inclusive and equitable environment, marine science can benefit from diverse perspectives and drive more comprehensive, impactful research and policy decisions.

Challenge	Promoting gender equality in marine research by ensuring fair opportunities in leadership, fieldwork, and decision-making, overcoming stereotypes, and fostering inclusive working conditions. Additionally, integrating gender perspectives into research methodologies, data collection, education, and knowledge dissemination while monitoring equality in institutions and projects.

Self-assessment question		**Examples of actions for improvement**
Gender balance in marine research	• What is the gender balance in our marine research team?	• Assess **gender representation** in Black Sea marine science institutions, including hiring rates, leadership roles, and access to research grants. • Establish a **Black Sea gender equality** in marine research framework outlining clear targets for equal participation in research projects and leadership roles.

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teams and institutions	• Is there a dedicated team responsible for monitoring gender balance in research teams? • Does our institution have a gender equality plan? • Are gender equality strategies integrated into the overall marine research strategy?	• Establish a policy requiring **gender-balanced research teams** for EU-funded Black Sea marine expeditions. • Develop an **open-access database** tracking gender representation in marine research roles across Black Sea institutions. • Ensure that at least 50% of **invited speakers** at Black Sea marine research conferences are women. • Ensure **gender-balanced representation in media interviews** and press releases on Black Sea marine research.
Addressing gender biases and discrimination in marine research	• How do we address gender biases in our research practices? • Are gender stereotypes present in our institution's marine research activities? • How does our research institution address biased attitudes and discrimination?	• Organise **gender in marine science workshops** for Black Sea marine research teams, addressing biases in hiring and leadership opportunities. • Conduct **unconscious Bias in Ocean Science** training in marine research institutions across the Black Sea region. • Standardise **hiring policies** across Black Sea research institutions to remove gender bias from job descriptions.
Equal opportunities and career development	• Does our research institution promote equal opportunities in fieldwork and leadership? • Do career development programs ensure gender balance?	• Implement **UNESCO guidelines** for gender equity in marine STEM education across Black Sea universities. • Ensure **equal participation of women scientists** in fieldwork, including research vessels and diving operations. • Offer **scholarships and funding incentives** for women-led marine conservation projects in the Black Sea. • Create a **Black Sea Marine Science Mentorship Network** pairing early-career women researchers with experienced marine scientists.
Work environment	• Are family-friendly workspaces and policies available in our institution? • Is there transparency and equality in contract conditions for all researchers?	• Offer **childcare support** for researchers participating in marine fieldwork or extended expeditions. • Ensure that the **contractual conditions** are equal and transparent.

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Gender perspective in research and outreach	• Do our research topics, methodologies, and datasets consider gender differences? • Are gender-sensitive approaches included in marine science publications and outreach materials? • How do we integrate gender perspectives into marine research?	• Launch a **Women in Black Sea Science** video series highlighting female researchers in marine biodiversity and sustainable fisheries. • Launch a **Women in Black Sea Science Awareness Week** with storytelling campaigns, panel discussions, and workshops. • Require **marine biodiversity and conservation studies** in the Black Sea to include gender-specific data collection. • Revise Black Sea **marine science textbooks and training materials** to include diverse case studies and female scientists' contributions. • Launch **Gender-sensitive Campaigns** to promote inclusivity and equity in marine science research and outreach.

Science education

Science education in marine research in the Black Sea region is key to fostering a well-informed public, equipped to address pressing issues like climate change, biodiversity loss, sustainable fisheries, and aquaculture. This involves a range of activities, from educational outreach to local communities, promoting sustainable tourism practices, and integrating environmental conservation into curriculum development. To empower the next generation of scientists, there is a critical need for closer collaboration between academic institutions and industry leaders, alongside the integration of cutting-edge research into higher education.

Challenge	Strengthening skills in ORRI and marine science, promoting ocean literacy across diverse groups while integrating research into educational curricula. Encourage societal awareness and engagement in sustainable marine resource management, tourism, aquaculture, and biodiversity conservation. Ensure education reaches all sectors, from policy decision-makers to local communities, through inclusive, accessible programs.
Self-assessment question	**Examples of actions for improvement**
Contribution to science education &	• How do we contribute to science education, ensuring our resources are impactful and engaging?
	• Create a **Black Sea Ocean Literacy Programme** for schools, , highlighting marine ecosystems, biodiversity, sustainable tourism, and pollution challenges. • **Launch a Regional Aquaculture Awareness Campaign** focusing on sustainable practices in marine and freshwater fish farming to preserve ecosystem health.

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impact measurement	• How do we assess the effectiveness of our initiatives in shaping attitudes towards marine sustainability?	• **Partner with universities** in the region to incorporate marine science, biodiversity, and eco-tourism modules into academic curricula (e.g., Odesa National University, Ovidius University Constanța). • Produce a **Documentary Series on Black Sea Marine Science**, showcasing real-world research on microplastics, invasive species, sustainable aquaculture and climate adaptation strategies. • **Translate marine conservation materials into multiple languages** (e.g., English, Bulgarian, Romanian, Turkish, Ukrainian, and Georgian) to make resources accessible to a wider audience.
Stakeholders & marine science education	• How do we ensure young researchers have access to mentorship and materials tailored to their needs? • How do we engage a variety of stakeholders, from local fishermen to tourists, in marine science education? • How do we make complex topics, like marine biodiversity and sustainable aquaculture, digestible for non-experts?	• Launch a **Black Sea Marine Science Mentorship Program**, connecting early-career researchers with senior scientists in marine biodiversity, tourism, and aquaculture sectors. • **Produce simplified marine policy briefs** addressing local issues such as sustainable fisheries management, eco-tourism regulations, and habitat restoration. • **Organise Clean-Up and Education Days** with local schools and community groups, in collaboration with marine conservationists, to raise awareness about marine debris and its impact on biodiversity. • **Host Community Aquaculture Workshops** that educate local fish farmers on sustainable farming practices to reduce environmental impact. • Organize **Co-design Workshops** on Marine Science with community members, actively involving local holders of traditional knowledge as co-trainers to ensure inclusive and culturally grounded collaboration.
Integration of marine research into science education	• How do we integrate marine research into educational programs to inspire participation in conservation efforts? • How do we involve different sectors—such as fisheries, aquaculture, tourism, and biodiversity conservation—in these efforts?	• **Conduct Black Sea Marine Explorer** boat excursions for students to learn about plankton sampling, water quality testing, habitat restoration projects and fish stock monitoring. • **Organise Youth Marine Policy Roundtables**, where high school and university students propose solutions to Black Sea pollution. • **Develop** a **Black Sea Fisheries Stakeholder Role-Play**, where students negotiate sustainable quotas and conservation measures. • **Introduce** a **Virtual Reality Black Sea Tour,** where students explore the impact of overfishing and habitat destruction.

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		• Develop a **Save the Black Sea board game**, where players manage marine resources sustainably.
Encouraging critical thinking & interdisciplinary approaches	• How do we encourage critical thinking about marine issues and promote an interdisciplinary approach? • How do we ensure that marine research is understood from multiple perspectives, including social, environmental, and economic factors?	• Create **Marine Policy Simulation Labs**, where students draft legislation for marine protected areas. • Fund **Black Sea Youth Innovation Challenges**, where students design solutions for marine pollution and habitat restoration. • Develop an **Interactive Black Sea Biodiversity App**, with real-time updates on marine species populations. • Introduce a **Future of Black Sea Marine Technologies** lecture series, analysing the risks and benefits of emerging ocean technologies. • **Collaborate with universities to offer internships** on Black Sea research vessels, providing hands-on experience in marine research and its interdisciplinary applications. • Host **Workshops on Marine Tourism Sustainability** to educate local tour operators about the environmental impact of tourism and best practices for biodiversity conservation.

Open science

Open science in Black Sea marine research promotes free access to data, research findings, and monitoring reports, ensuring that stakeholders—such as local authorities, NGOs, tourism operators, and aquaculture businesses—are well-informed. Making publicly funded research on marine pollution, biodiversity, climate resilience, and sustainable marine industries accessible fosters regional collaboration, supports evidence-based policymaking, and enhances scientific innovation.

Challenge	Enhance awareness and understanding of Black Sea marine issues by ensuring open access to research data while maintaining ethical, security, and quality standards. Address challenges related to data ownership, transparency, and stakeholder engagement, ensuring that research findings are communicated inclusively and effectively across diverse audiences.
Self-assessment question	**Examples of actions for improvement**

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Open-access policies and institutional commitment	• Does our research project or institution have an open-access policy? • Are open-access principles integrated into our organisation's mission? • Do we effectively communicate open-access policies to all stakeholders?	• **Adopt open-access policies** in Black Sea marine institutes in line with the European Open Science Cloud (EOSC) and UNESCO Open Science Recommendations. • **Ensure Black Sea environmental impact studies** are available in open-access journals like Frontiers in Marine Science. • **Create an Open Science Platform** for Black Sea research, offering free access to datasets on fisheries, aquaculture, biodiversity, and marine tourism. • **Develop an Open Science Training Series** to educate researchers, students, and policymakers on data accessibility and ethical sharing. • **Encourage universities to integrate Open Science principles** into marine research curricula, training future scientists in transparent data sharing and collaboration.
Fair data principles and open data sharing	• Do we follow FAIR (Findable, Accessible, Interoperable, Reusable) principles in marine data sharing? • Have we published our research findings in open-access repositories? • How do we balance open access with data protection needs? • Do we ensure responsible sharing of sensitive marine biodiversity data?	• **Upload Black Sea biodiversity monitoring data** to OBIS (Ocean Biodiversity Information System) to track species distribution changes. • **Share regional oceanographic data with EMODnet** to support climate resilience strategies for Black Sea coastal areas. • **Implement a standard data template** for marine pollution monitoring in cooperation with regional environmental agencies. • **Develop data-sharing protocols** that protect sensitive habitat locations of endangered Black Sea species. • **Establish a restricted-access database** for aquaculture and fisheries research to safeguard commercially sensitive information while promoting collaboration. • **Create an interactive Open Science Dashboard** for tracking research contributions, ensuring transparency in data use and accessibility.
Transparency and acknowledgment in research	• How transparent is the ownership of our research outputs? • Are all contributors fairly acknowledged? Is our research easily traceable and accessible to the public? • Do stakeholders have clear access to information about	• **Clearly state licensing agreements** for data and publications (e.g., Creative Commons licenses). • **Recognise community knowledge holders** in co-authored research on traditional fishing practices. • **Publish case studies** demonstrating how open-access research has influenced Black Sea conservation policies, sustainable fisheries, and eco-tourism practices. • **Ensure funding sources, affiliations, and decision-making structures** are clearly disclosed in all research outputs.

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	funding sources, affiliations, and decision-making structures?	• **Create an Open Research Tracker** to allow stakeholders to follow the progress of marine research projects from data collection to policy impact. • Engage actively in open **peer review platforms** to contribute to transparent and collaborative evaluation processes in marine science.
Knowledge exchange with stakeholders	• With whom do we share the results of marine research? • Are research findings accessible to all relevant actors? • Do we engage in knowledge exchange with policymakers, coastal communities, tourism operators, and the aquaculture sector? • What framework conditions ensure transparency in decision-making?	• **Present Black Sea pollution research findings** at regional government meetings to influence policy. • **Distribute marine biodiversity reports** to local NGOs, marine tourism businesses, and aquaculture enterprises to enhance sustainable practices. • **Publish interactive maps** showing microplastic pollution, marine biodiversity hotspots, and sustainable fishing zones in the Black Sea. • **Develop open-access marine tourism guides** showcasing eco-friendly destinations, responsible diving practices, and biodiversity conservation sites. • **Produce short educational videos** for the public, industry leaders, and policymakers explaining evidence-based climate change effects on Black Sea marine life. • **Organise Open Science Days** in coastal communities to encourage citizen science participation in marine conservation efforts. • **Launch a Black Sea Open Science Podcast** featuring researchers, policymakers, and industry experts discussing the latest marine research and sustainable development initiatives.

Ethics

Ethics in Black Sea marine research provides a foundation for responsible scientific practices, ensuring that ecological conservation aligns with socio-economic needs. Ethical considerations span sustainable fisheries, responsible marine tourism, fair resource distribution, and respect for cultural and geopolitical sensitivities. By integrating ethical frameworks into marine research and policy, we can promote sustainability, equity, and accountability in managing the Black Sea's marine environment.

Challenge	Ensuring ethical marine biodiversity conservation and data collection requires transparent review processes aligned with international frameworks. Ethical marine research must engage diverse stakeholders, balance conservation with economic and social goals, and assess risks to marine ecosystems and coastal communities. The responsible application of research findings is crucial to preventing long-term harm while upholding scientific integrity and trust.

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Self-assessment question		Examples of actions for improvement
Ethical oversight and accountability	• Do we have a transparent and accountable ethics review process? • Who is responsible for ethical decision-making in marine research? • How do we engage stakeholders in ethical discussions, and how do we ensure responsible use of research findings?	• **Adapt EU Horizon-funded ethics guidelines** to ensure compliance in Black Sea marine research projects. • **Implement an anonymous reporting platform** for researchers and stakeholders to report unethical practices in marine research and resource exploitation. • **Ensure all marine science projects** comply with the European Code of Conduct for Research Integrity and align with UNESCO's marine research ethics standards. • **Develop an Ethical Marine Research Training Program** for universities and research institutions to promote responsible practices.
Stakeholders' ethics inclusion	• How do we incorporate diverse values and interests into marine research? • Are local communities consulted before conducting studies that affect their marine resources? • Do we engage industries such as fisheries, tourism, and aquaculture in ethical decision-making?	• **Develop co-managed marine conservation projects**, where industry actors (e.g., fish farms, offshore energy developers, and tourism operators) collaborate with scientists and local communities to promote sustainability. • **Include coastal communities in marine protected area (MPA) planning** to ensure their concerns and traditional knowledge are respected. • **Facilitate evidence-based conflict-resolution dialogues** between offshore wind energy developers, fisheries, and conservationists to balance economic and ecological priorities and to manage potential conflicts of interests • **Ensure informed consent protocols** when collecting data, oral histories, or traditional ecological knowledge from Black Sea coastal communities. • **Establish an Ethical Marine Tourism Charter**, encouraging operators to adopt environmentally and culturally responsible practices. • **Develop sustainable aquaculture guidelines**, ensuring ethical treatment of marine life and minimising ecological impact.
Societal and environmental impact	• How does our research impact social justice, education, and access to marine resources?	• **Require environmental and social impact assessments** for offshore aquaculture projects to evaluate potential risks to marine biodiversity and water quality. • **Advocate for science-based fishing quotas and seasonal restrictions** to prevent overfishing and ensure long-term sustainability.

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	• Do we consider the long-term effects on marine ecosystems, societies, and economies? • Have we assessed the risks and benefits of research on marine ecosystems and coastal communities?	• **Establish long-term biodiversity monitoring programs** with local universities and marine research institutes to track ecosystem shifts in response to climate change. • **Assess the ethical risks of large-scale marine resource extraction** before permitting deep-sea mining, offshore drilling, or industrial aquaculture.
Transparency and influence	• How transparent is our research process? • How do we engage with stakeholders to address ethical concerns? • Do we ensure that marine research findings influence responsible policy and industry practices? • Do we assess the ethical implications of AI integration in research and implement frameworks to ensure its responsible use in marine science?	• **Publicly release marine pollution data** from academic and government-led studies to support environmental advocacy and policymaking. • **Organise Black Sea Cross-Border Marine Policy Roundtables**, bringing together all riparian countries to discuss shared marine resource management. • **Use citizen science initiatives** to improve transparency in marine research, involving local communities in water quality monitoring, fisheries assessments, and conservation projects. • **Publish marine research findings in multiple languages** (English, Bulgarian, Romanian, Turkish, Ukrainian, and Georgian) to ensure accessibility for all Black Sea stakeholders. • **Encourage ethical corporate responsibility in marine industries**, requiring **companies** in fisheries, aquaculture, and tourism to adhere to ethical environmental and labour standards.

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Governance

Governance in Black Sea marine research requires coordinated efforts between national governments, international organisations, and local stakeholders to ensure sustainable management of marine resources. Effective governance includes establishing transboundary agreements for pollution control, harmonising biodiversity protection policies, and ensuring equitable access to marine research funding and innovation. Strong governance structures must also be adaptable to emerging scientific knowledge, societal needs, and environmental changes.

Challenge	Aligning marine research governance with international and national policies while fostering collaboration between researchers, policymakers, industry, and local communities. This requires developing governance instruments that promote responsible research, ensuring inclusivity, integrating interdisciplinary and indigenous knowledge, adapting policies in response to environmental changes, and maintaining transparency and accountability in decision-making.

Self-assessment questions		**Examples of actions for improvement**
Alignment with policies and governance structures	• Does our research align with international and national marine policies? • How does our institution integrate emerging knowledge, societal needs, and environmental changes into governance structures? • Can our research institution adjust governance practices based on new scientific findings or societal shifts?	• **Revise national marine policies** to align with EU and global marine governance frameworks (e.g., the European Green Deal, FAO's General Fisheries Commission for the Mediterranean - GFCM). • **Develop a Black Sea Marine Governance Monitoring Group** that tracks policy updates based on scientific findings. • **Publish policy briefs and governance guidelines** to help decision-makers incorporate marine research into national legislation. • **Create a Marine Research Transparency Index**, tracking institutional compliance with open science and sustainability policies. • **Establish a Rapid Assessment Task Force** to evaluate the effects of marine heatwaves, biodiversity loss, and coastal tourism impacts. • **Facilitate cross-border coordination mechanisms**, ensuring collaborative responses to pollution, overfishing, and habitat degradation.
Participation and inclusivity in governance	• Are research policies, funding mechanisms, and governance	• **Organise local participatory workshops**, where coastal businesses, conservation NGOs, and researchers co-develop sustainable marine strategies.

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	strategies accessible to all stakeholders? • Who is involved in setting the marine research agenda (e.g., advisory boards, funding bodies, policymakers, communities)? • How do governance structures ensure research priorities align with societal and environmental needs?	• **Develop citizen science initiatives**, enabling small-scale fishers and divers to provide real-time fish stock data to marine research institutes. • **Launch a Black Sea Marine Research Policy Network**, connecting scientists, policymakers, and industry leaders to streamline governance discussions. • **Create university-government joint research programs**, focusing on sustainable marine resource governance and policymaking. • **Ensure fair representation of women and minority groups** in Black Sea marine governance forums.
Accountability and ethical governance	• Do governance structures ensure accountability in marine research decision-making? • Are researchers and policymakers trained in ethical and participatory governance? • How can governance training improve transparency and accountability?	• **Develop governance and ethics training for marine researchers**, ensuring responsible policy engagement and compliance with open science principles. • **Create online training modules for policymakers**, covering ethical decision-making, marine biodiversity governance, and sustainable fisheries policies. • **Ensure public access to marine governance decisions**, including funding allocations, conservation strategies, and marine resource management plans. • **Promote co-authorship between researchers and policymakers**, ensuring that scientific research influences governance structures directly. • **Host annual marine governance evaluations**, where stakeholders assess transparency, accountability, and progress toward sustainability goals.
Incentives and capacity building	• Are incentive systems in place to encourage researchers to engage with governance processes? • Does our institution provide training on governance-related aspects of responsible marine research?	• **Recognise scientists contributing to governance with annual Marine Policy Impact Awards.** • **Develop cross-border research exchanges**, where Black Sea policymakers learn from governance models in the Mediterranean and Baltic Seas. • **Host a Black Sea Blue Economy Forum**, where scientists, industry leaders, and policymakers discuss sustainable marine resource use. • **Offer governance training grants**, funding researchers to participate in policy development and marine governance workshops. • **Create career pathways for researchers to transition into marine governance roles**, ensuring continuity between science and policy. • **Support early-career marine scientists with policy mentorship programs**, connecting them with governance institutions.

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Responsive and data-driven governance	• How do governance structures incorporate stakeholder feedback to ensure adaptability? • Can our research institution adjust governance practices based on new scientific findings or societal shifts?	• **Use real-time data platforms**, allowing fishers and marine scientists to report ecological changes affecting governance decisions. • **Establish rapid response mechanisms** for addressing marine oil spills, coastal erosion, and pollution threats in Black Sea coastal areas. • **Develop adaptive marine governance policies**, adjusting management strategies based on new scientific evidence. • **Involve small-scale fishers in mapping historic fish spawning areas**, using this data to improve marine protected area (MPA) planning. • **Set up an MPA Governance Board**, where local conservation NGOs, scientists, and policymakers co-manage protected marine habitats.

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5. ORRI marine research best practices

This chapter is dedicated to showcasing actionable best practices in key dimensions of marine research. Two impactful examples are presented for each critical area: Public Engagement, Gender, Science Education, Open Science, Ethics, and Governance. These best practices have been carefully selected from both the Black Sea region and global initiatives, offering valuable insights for researchers to implement and adapt in their own work. Whether you're aiming to engage the public in marine conservation, advance gender equality in marine sciences, or integrate open science into your research, these examples serve as practical guides for fostering meaningful, responsible, and sustainable marine research. Let these proven strategies inspire you to take action, drive positive change, and contribute to the long-term health of our oceans.

Public Engagement

1. Mare Nostrum NGO – Black Sea Coastal Conservation (Romania, Black Sea)

Description: A Romanian NGO working on marine conservation, beach clean-ups, and environmental education projects along the Black Sea coast. They engage local schools and volunteers in coastal monitoring and marine biodiversity projects.
Why It's a Best Practice: Encourages public participation in marine science and conservation through hands-on activities.

📌 *Example from the Black Sea:* Mare Nostrum

2. The Big Microplastic Survey (Global – Black Sea Adaptable)

Description: A citizen science initiative where volunteers worldwide collect microplastic samples from coastlines, rivers, and marine environments, contributing to a global database.
Why It's a Best Practice: Empowers local communities to actively participate in microplastic research, increasing awareness and providing valuable data.

📌 *Example from the World:* Big Microplastic Survey

Gender

3. Empowering Women in Fisheries (Mediterranean & Black Sea – FAO)

Description: A FAO-led initiative that promotes gender-inclusive policies in fisheries, providing training and financial support for women in marine-related sectors.

Why It's a Best Practice:

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Recognizes women's contributions to fisheries and marine research, helping to close gender gaps.

📌 *Example from the Mediterranean & Black Sea:* FAO Gender & Fisheries

4. Baltic Gender Project

Description: The Baltic Gender project, coordinated by the GEOMAR Helmholtz Centre for Ocean Research Kiel, aims to reduce gender inequalities in marine sciences across eight partner institutions in the Baltic Sea region. The project focuses on developing strategies to support career opportunities for women in marine sciences and technology.

Why It's a Best Practice: By implementing Gender Equality Plans, establishing grassroots networks, and promoting family-friendly policies, the project fosters an inclusive environment that supports women's advancement in marine research.

📌 *Example from the World:* Baltic Gender Project

Science Education

5. Blue Schools Network (Europe – Adaptable to Black Sea)

Description: A network of schools that incorporate ocean literacy and marine science into their curriculum, involving students in hands-on research and conservation projects.
Why It's a Best Practice: Strengthens marine science education and raises awareness among young students.

📌 *Example from Europe:* Blue Schools

6. European Marine Science Educators Association (EMSEA) (Europe – Black Sea Inclusive)

Description: A network of educators, researchers, and policymakers promoting marine science education through interactive teaching tools, citizen science projects, and ocean literacy programs.
Why It's a Best Practice: Enhances marine science education using innovative teaching methods and outreach activities.

📌 *Example from Europe:* EMSEA

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Open Science

7. European Marine Observation and Data Network (EMODnet) (Europe – Black Sea Included)

Description: A centralized open-access database providing marine environmental and human activity data across European seas, including the Black Sea.
Why It's a Best Practice: Supports evidence-based policymaking by ensuring free and open access to marine data.

📌 *Example from Europe & Black Sea:* EMODnet

8. Black Sea Scientific Database for Fisheries Research

Description: Launched by the General Fisheries Commission for the Mediterranean (GFCM) in July 2023, this comprehensive database serves as a research hub for scientists, students, administrators, and the public interested in Black Sea fisheries. It consolidates contributions from over 100 researchers across six Black Sea countries, offering access to a fisheries experts database, a publications repository, and a species reference database with biological indicators.

Why It's a Best Practice: By providing open access to diverse datasets, this platform fosters collaboration among stakeholders, enhances research capabilities, and supports sustainable fisheries management in the Black Sea region.

📌 *Example from Europe & Black Sea:* GFCM Black Sea Scientific Database

Ethics

9. Fair Fish – Ethical & Sustainable Fishing Certification (Global – Black Sea Applications)

Description: A non-governmental initiative that works directly with small-scale fishers to ensure ethical fishing practices and fair-trade seafood. It could be expanded to Black Sea fisheries.
Why It's a Best Practice: Promotes sustainable and ethical fishing while supporting small-scale fisheries.

📌 *Example from the World:* Fair Fish

10. FAO Code of Conduct for Responsible Fisheries (Global – Black Sea Inclusive)

Description: A voluntary international framework guiding sustainable and ethical fisheries management.

Why It's a Best Practice: Provides

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ethical guidelines for fisheries, helping Black Sea countries implement sustainable fishing practices.

📌 *Example from the World:* FAO Code of Conduct

Governance

11. Black Sea NGO Network – Marine Policy Advocacy (Bulgaria, Romania, Georgia, Ukraine, Turkey)

Description: A network of environmental NGOs working to improve marine governance, strengthen policies, and advocate for sustainable development in the Black Sea.

Why It's a Best Practice: Facilitates cooperation between civil society and policymakers on marine governance.

📌 *Example from the Black Sea:* Black Sea NGO Network

12. The Black Sea Commission (BSC) (Black Sea Region)

Description: A regional intergovernmental body coordinating marine environmental protection efforts across Black Sea countries.

Why It's a Best Practice: Promotes regional cooperation in marine governance and policy development.

📌 *Example from the Black Sea:* Black Sea Commission

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7. Conclusions and recommendations

The findings from the REINFORSEA project indicate that while awareness of ORRI principles among researchers in the Black Sea region is relatively high, actual implementation remains limited due to barriers such as lack of training, funding constraints, and engagement difficulties. However, there is strong interest in furthering ORRI adoption through international cooperation, training programs, and open access initiatives.

The Black Sea stands at a crossroads—will we continue on a path of **declining biodiversity and resource depletion**, or will we embrace **open, responsible research and innovation** to protect and restore it?

ORRI principles offer us a roadmap for **science that serves society, conserves nature, and fuels sustainable development**. The time for action is now. **Researchers, policymakers, industry leaders, and communities must come together to create a Black Sea that is healthier, more resilient, and more innovative than ever before.**

The unique challenges posed by marine research, including biodiversity loss, pollution, and transboundary governance, necessitate a tailored approach to ORRI. The guidelines ensure that research efforts are conducted in alignment with societal values, environmental sustainability, and governance frameworks, thereby fostering a culture of responsible and impactful innovation.

Recommendations for researchers:

- Integrate ORRI principles into research methodologies to ensure ethical, sustainable, and socially relevant outcomes.
- Prioritise open science and cross-disciplinary collaborations to address complex marine challenges.
- Engage in public science communication by making research findings accessible to a wider audience through outreach programmes and digital platforms.

Recommendations for policymakers:

- Develop and enforce policies that support sustainable aquaculture, fisheries, and marine conservation efforts.
- Promote funding and capacity-building programmes to ensure ORRI-aligned research receives adequate support.

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- Facilitate regional and international cooperation to ensure coherent governance of Black Sea resources.

Recommendations for the public:

- Get involved in citizen science initiatives to contribute to marine biodiversity monitoring and conservation efforts.
- Support sustainable seafood choices by prioritising responsibly farmed or fished products.
- Advocate for transparent and responsible marine policies by engaging with local and national decision-makers.

The future of the Black Sea depends on us all. Let's make it a beacon of responsible research and innovation.

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