WP1.4.2.

2050 Sustainable Blue Economy imaginaries for the Black Sea

Clément DUPONT, Emilie RICLET, Frédérick HERPERS, Pierre-Maël DEFFONTAINES.

SML (Stratégies Mer et Littoral)

contact@strategies-marines.fr

18/12/2024

The activities of the BRIDGE-BS Research and Innovation Actionare funded by the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 101000240.

EXECUTIVE SUMMARY

This report, “2050 Sustainable Blue Economy Imaginaries for the Black Sea”, explores four distinct scenarios for the future of the Black Sea’s Blue Economy, shaped by different governance and innovation pathways. The study aims to illustrate potential trajectories for maritime and coastal sectors, highlighting their evolution under varying environmental, economic, and socio-political conditions.

The report begins by outlining its **methodology**, which builds upon the European Environment Agency (EEA) 2050 imaginaries for a sustainable Europe. These imaginaries have been adapted to (a) the specific sectors of the Blue Economy, (b) the unique characteristics of the Black Sea region, and of (c) the six pilot sites of the BRIDGE-BS project: Bosphorus, Sinop, Batumi, Varna, the Danube Estuary, and Odessa.

The **state of play** section provides a comprehensive diagnosis of the current status of the Black Sea’s Blue Economy sectors and its Maritime and Coastal Capital (MCC). This methodology developed by SML assesses four key dimensions: natural capital (resources, biodiversity), human capital (skills, culture), institutional capital (laws, governance), and technical capital (finance, infrastructure).

The core **results** of the report present four contrasting imaginaries for the Black Sea in 2050, defined by two key variables: the scale of governance (regional, national, or local) and the focus of innovation (from technological to social). These scenarios showcase sectoral trends for the Blue Economy (ranging from growth to decline) and their impacts on Maritime and Coastal Capital, which can either be strengthened or weakened depending on the pathway. First developed at the basin scale (region-wide), these imaginaries are further adapted to each pilot site, demonstrating how local characteristics influence and deviate from the overall regional trends.

An additional focus examines the **impacts of the Ukraine war**, detailing its immediate consequences for Blue Economy sectors and Maritime and Coastal Capital. The war is analyzed as a significant driver of change, potentially pushing the Black Sea region toward one of the four scenarios.

Finally, the **feedback and discussion** section evaluates the scenarios’ probability and desirability, based on two stakeholder surveys conducted during two BRIDGE-BS events, at the regional and local levels. The analysis reveals a clear tension between current trends and stakeholders' aspirations for a sustainable and inclusive future.

By combining robust methodologies, scenario-building, and stakeholder perspectives, this report provides a forward-looking tool to collectively discuss the challenges and opportunities for a sustainable Blue Economy in the Black Sea by 2050.

TABLE OF CONTENT

CHAPTER 1
METHODOLOGICAL FOUNDATIONS

2050 SUSTAINABLE BLUE ECONOMY IMAGINARIES FOR THE BLACK SEA

This document provides 4 foresight imaginaries for the development of a sustainable Blue Economy in the Black Sea region in 2050. It aims, through an explorative approach, to open the field of possibilities for the evolution of Blue Economy and the environment in the Black Sea under possible and contrasting contexts in terms of both innovation and governance patterns.

Why strategic foresight ?

Foresight is “the discipline of exploring, anticipating and shaping the future to help building and using collective intelligence in a structured, and systemic way to anticipate developments”[1]. **As any foresight exercise, it is intended as an instrument to describe possible futures – rather than probable ones.** It focuses on global and systemic approaches taking into account disruptions and uncertainties to better understand the current and future dynamics of a territory. Therefore, these imaginaries are based on qualitative analysis and represents a tool to build a chosen future, following a philosophy of change, and based on intuitions linked to weak signals, retrospective analyses, and the memory of human and ecological past.

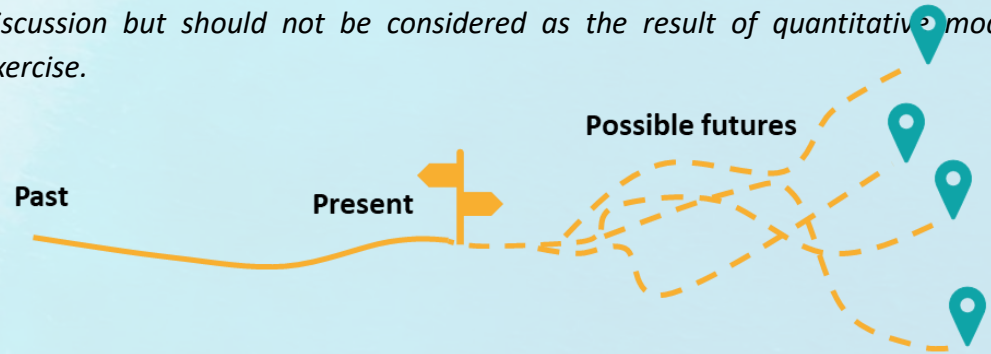
[1] Source: European Commission

The following imaginaries therefore aim at helping public and private stakeholders to build shared visions and collective modes of action, rather than to anticipate an increasingly complex future.

They are also meant to illustrate the plural reality of "sustainability", which could be theoretically achieved by different means, with a strong impact on the way in which societies and their economies operate, particularly in the blue economy.

Based on the work initiated by the European Environnement Agency, ‘Scenarios for a sustainable Europe in 2050’ (SSE 2050), this work provides long term visions for the Black Sea, its maritime and coastal capital (see next slide), and Blue Economy activities depending on it, both regionally and across the BRIDGE-BS project pilot sites.

Disclaimer: This document has a subjective dimension and is therefore only binding on its authors. It is intended to open up the field of possibilities and to stimulate discussion but should not be considered as the result of quantitative modelling exercise.



METHODOLOGICAL FOUNDATIONS

EEA'S SOCIETAL IMAGINARIES FOR 2050

In 2020, the foresight group within the EEA's country network (Eionet) initiated 'Scenarios for a sustainable Europe in 2050' (SSE 2050). This project, developed and implemented jointly with the EEA, aimed to produce a set of imaginaries offering different images of what a sustainable Europe could look like in 2050.

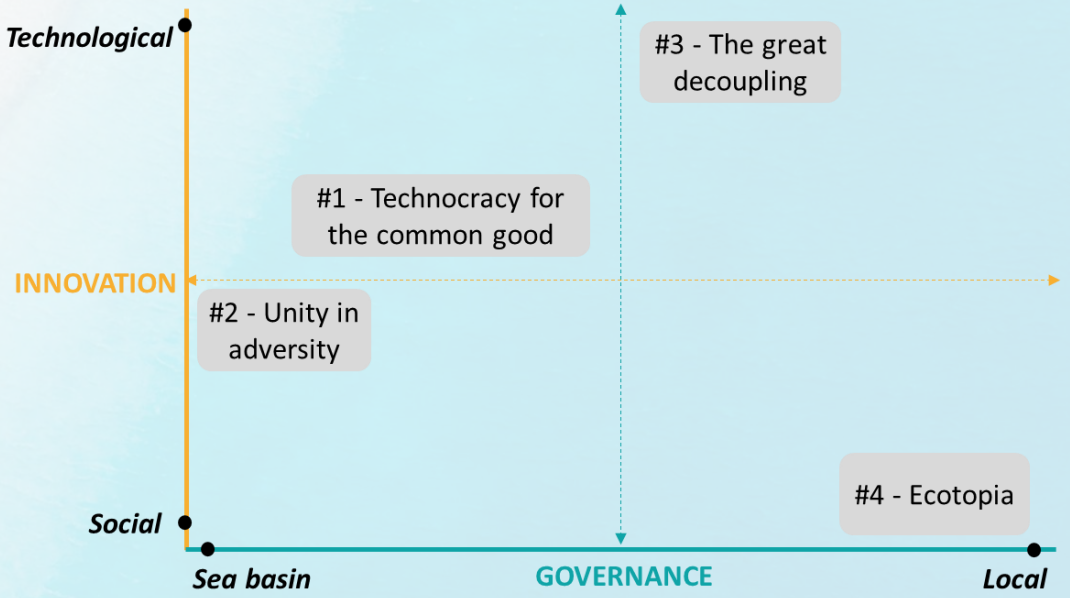
1. **Technocracy for the common good**
2. **Unity in adversity**
3. **The great decoupling**
4. **Ecotopia**

More details on each of the imaginaries are provided in the following slides and the full EEA's narratives are available in the Annexes of this document.

Within a set of common patterns, the four imaginaries are built assuming possible different future trends based on **two major features: the level of governance (local or sea basin scale); and the type of innovation (social or technological)**

Also, all imaginaries have a common foundation by considering the development of 'megatrends' that are fairly certain and as such considered in each BRIDGE-BS scenarios :

- All imaginaries consider **the effects of climate change**, to a lesser or greater extent, sometimes with quite severe impacts across Europe as suggested by the Intergovernmental Panel on Climate Change (IPCC);
- **Digitalisation** and its potential also plays an important but contrasting role in all four imaginaries;
- As normative imaginaries are also directed at addressing **greater sustainability**, all scenarios assume a delivery on the environmental goals of the European Green Deal and **assume that sustainability is achieved in 2050.**



This graph is the result of SML's interpretation of the EEA imaginaries.

METHODOLOGICAL FOUNDATIONS

WORK PROCESS

EEA IMAGINARIES FOR A SUSTAINABLE EUROPE IN 2050

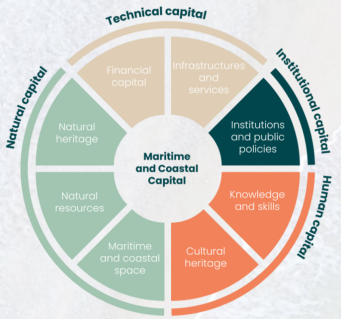
sml

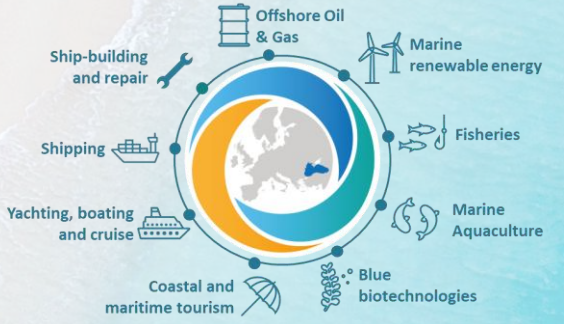
Adaptation to **Blue Economy sectors**

Adaptation to the **Black Sea context**

Adaptation to **BRIDGE-BS pilot sites**

Diagnosis of the Blue Economy and the Maritime and Coastal Capital of the Black Sea





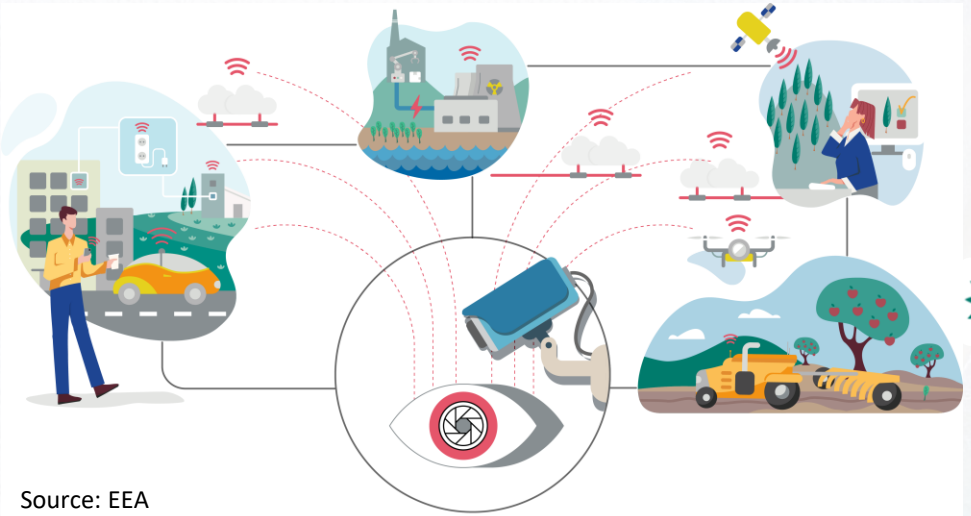
BRIDGE-BS

4 IMAGINARIES FOR A SUSTAINABLE BLUE ECONOMY IN THE BLACK SEA IN 2050

METHODOLOGICAL FOUNDATIONS

EEA'S SOCIETAL IMAGINARIES FOR 2050

TECHNOCRACY FOR THE COMMON GOOD



Source: EEA

- ✓ Sustainability is achieved through **state control**, which **prioritises society's collective interests**.
- ✓ **Digitalisation** enables unprecedented **monitoring** and control **of social and ecological systems**.
- ✓ **Economic activity is centralised** with large businesses under substantial state influence.
- ✓ Strong, like-minded governments leaning towards **deglobalisation** and **protectionism**.

European Environment Agency

UNITY IN ADVERSITY

Source: EEA

- ✓ Faced with **recurrent environmental and climate disasters**, geopolitical insecurity and financial shocks, Europe has become **much more unified**.
- ✓ The EU has a common constitution and uses **stringent, top-down measures to set the boundaries for economic activity** — promoting growth but **prioritising the environment.**
- ✓ **Investments in nature are heavily promoted** as a means of mitigating and adapting to environment- and climate-related problems.

METHODOLOGICAL FOUNDATIONS

EEA'S SOCIETAL IMAGINARIES FOR 2050

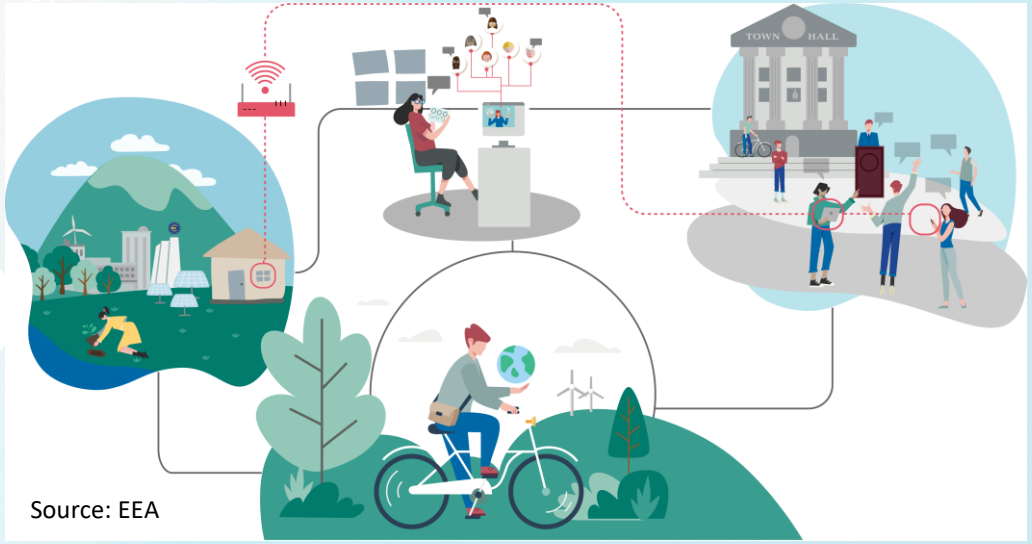
THE GREAT DECOUPLING

Source: EEA

- ✓ **Technological breakthroughs and social innovations have enabled an extraordinary decoupling of GDP growth from adverse environmental impacts.** The bioeconomy is at the core of this transformation.
- ✓ Businesses in **competitive, liberalised markets** have driven **green growth**. Effective government interventions are shaping market incentives and managing the impacts of rapid economic change.
- ✓ Cooperation between EU countries is flexible and pragmatic, focusing on a limited number of areas.

European Environment Agency

ECOTOPIA



Source: EEA

- ✓ The need to **preserve and reconnect to nature and the local community is part of society's 'common sense'. Technology is used sparingly** to enable sustainable lifestyles.
- ✓ **Consumption and resource use are being scaled back**. Reduced economic output is limiting the size of the public sector, implying a **bigger role for civil society** in maintaining welfare.
- ✓ Businesses are managed with the involvement of diverse stakeholders, while **communities play an active role in bottom-up decision-making processes**, including at the European scale.

OUR METHODOLOGICAL APPROACH

Building sustainable imaginaries for the Black Sea in 2050

The EEA imaginaries **are used as a foundation and global frame**, but it is important to consider that they were designed for the European Union context, in a general approach without any blue/maritime aspects.

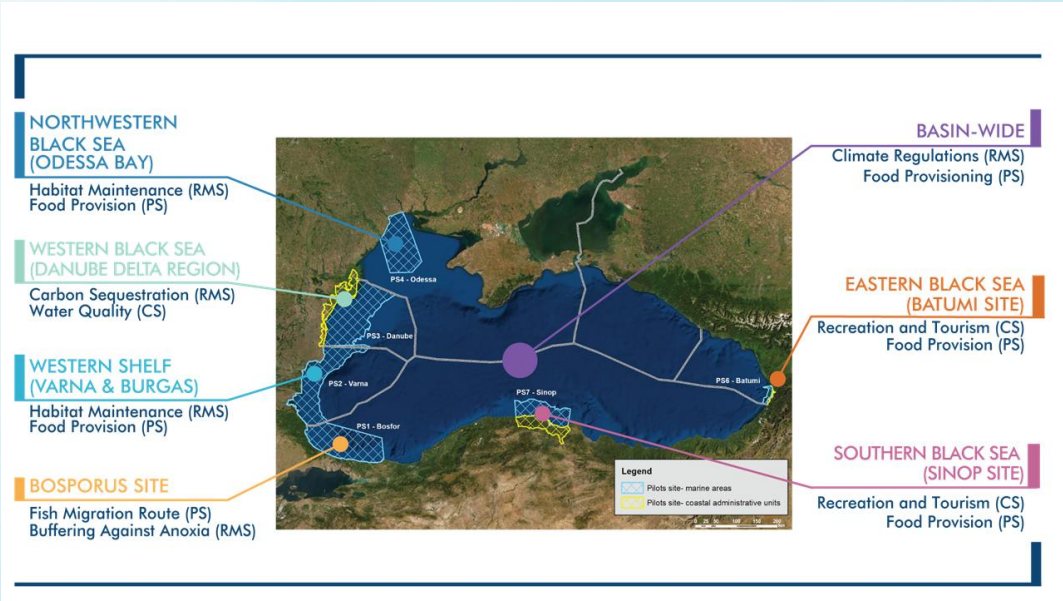
Therefore, for the purposes of the BRIDGE-BS project, the EEA's imaginaries were adapted to the Black Sea Blue Economy by:

1. **Considering the regional specificities (ecosystems, policy context, etc);**
2. **Considering the local specificities (pilot sites characteristics)**
3. **Projecting the trends described above to the maritime and coastal activities of the Blue Economy.**

The imaginaries were developed at regional scale in the first place, on the basis on an extensive diagnosis of the Black Sea 1) Maritime and Coastal Capital and 2) Blue Economy, using the most detailed information from both BRIDGE-BS project and external literature.

They were then adapted at pilot site level for the Bosphorus (PS1), Varna (PS2), Danube (PS3), Odessa (PS4), Batumi (PS6) and Sinop (PS7). Indeed, each of these trends identified at regional scale would manifest differently across the pilot sites depending on their unique characteristics. Factors such as available resources, technological capacities, workforce, and regional integration influence the extent to which each site aligns with or diverges from the broader regional trends. These local characteristic were assessed using BRIDGE documentation (country fiches, blue economy observatory, etc.).

Governance, as one of the two main features, as been considered by the EEA within the cooperation framework between the 27 Member States of the European Union and **needs careful consideration when transposed to the Black Sea context** especially since the war in Ukraine is a major event to be integrated in the trends influencing possible future (see especially the section on the impacts of the war). For the purpose of this work and for the development of the Odessa pilot site specificities, it was considered that the war in Ukraine would be ended by 2050.



OUR METHODOLOGICAL APPROACH

THE MARITIME AND COASTAL CAPITAL

The increasing attention given to the Blue Economy concept in public policies stresses out the importance of the seas and oceans for the future of coastal territories. The Blue Economy aims to **sustainably develop maritime and coastal activities in a given territory, taking advantage of its specificities while controlling related impacts.**

To provide guidance for public and private decision makers involved in Blue Economy, **SML has developed a methodology enabling the assessment of maritime and coastal activities' sustainable development potential**.

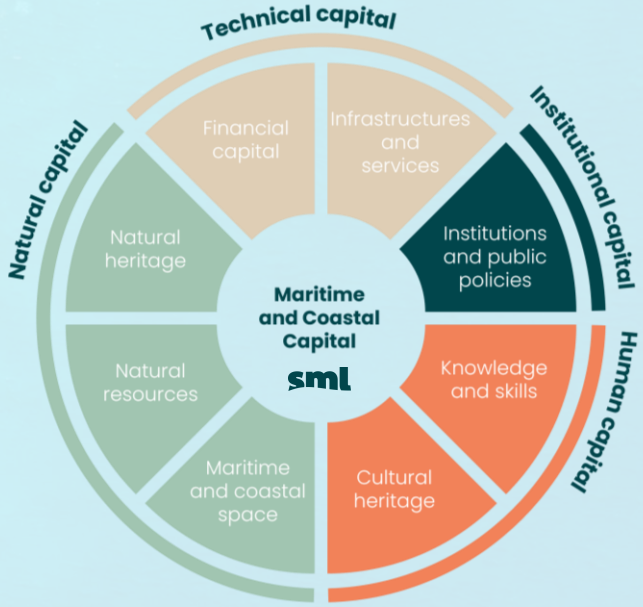
We consider that each coastal territory has a specific and unique **Maritime and Coastal Capital (MCC),** understood as the combination of natural, human, institutional and technical components and sub-components which have historically led to the development of maritime and coastal activities, and which will play a crucial role in shaping these activities' future. In other words, **the combination of these multiple components is the basis that a territory can use for the development of maritime and coastal economic activities** in the context of the BE.

Not all countries are equal as far as MCC is concerned. Some have large ocean areas, with a wealth of natural resources (biodiversity, raw materials) and/or long coastlines suitable to the development of maritime activities.

Some countries are experiencing challenges related to the inadequate understanding of their marine space (particularly offshore areas) and lack of knowledge and skills (scientific and technical) to allow them to manage their natural marine resources and available space for the optimal benefit of their citizens. In other cases, countries with a long maritime history have developed important heritage and valuable traditional knowledge.

Some countries developed an institutional capital in the form of cooperation frameworks (governance) between stakeholders and decision-makers to improve coastal and maritime management, while others struggle to implement regulations and laws. **The specificity of each territory has a tremendous influence on its current and future BE which should be preserved, adapted, increased, or optimised, so that it can be passed to future generations**.

Each component of the MCC – illustrated below - is detailed in Annex 1



MCC components and sub-components (@SML)

OUR METHODOLOGICAL APPROACH

BLUE ECONOMY ACTIVITIES

Every maritime or coastal activity interacts, positively or negatively, with the different types of maritime and coastal capital: natural capital (e.g., fish stocks, offshore wind energy), human capital (e.g., trainings, traditional know-how), technical capital (e.g., port facilities, public investments) in accordance with the institutional capital (e.g., regulations and laws). The way these interactions take place differ and some MCC components are used or developed during these interactions.

Maritime and coastal activities **can only be sustainably and viably developed if the MCC is properly managed and preserved**, including the following fundamental elements:

- The existence of a natural capital providing (i) the ecosystem services for/from living resources and (ii) the non-living resources. The existence/availability of a natural capital requires protection, management and regulation.
- The availability of institutional capital to provide guidance and support/regulate the action of maritime and coastal stakeholders.
- The availability of a strong human capital, to provide the necessary skills and knowledge to support the effective regulation and management maritime and coastal activities. Capacity building may be required to develop this human capital.
- The availability of financial capital and infrastructures to support activities.

For most activities of **the Blue Economy, the development potential is therefore strongly linked to the good state of the marine and coastal environment and natural resources.**

This potential is also linked to the ability to create new jobs and increase added value which is most probable in sectors that are growing, as they require the development of technologies, skills for the workforce and infrastructures. The potential for creating jobs is lower in mature and declining sectors, as they require smaller investments for infrastructure but may need funding for adaptation of skills.

The Blue Economy activities considered in this report are the following ones:

OUR METHODOLOGICAL APPROACH

IN A NUTSHELL

Jan. 2022

Diagnosis of the Black Sea Blue Economy

Diagnosis of the Black Sea Maritime and Coastal Capital

4 foresight imaginaries for the sustainable Blue Economy in the Black Sea in 2050

Adaptation of the imaginaries to the pilot sites

\+ Analysis of the impact of the war on the Black Sea Blue Economy

\+ Pilot sites partners **Survey**

WP8 webinar **Survey**

Jan. 2025

CHAPTER 2

STATE OF PLAY OF THE BLACK SEA'S BLUE ECONOMY AND MARITIME CAPITAL

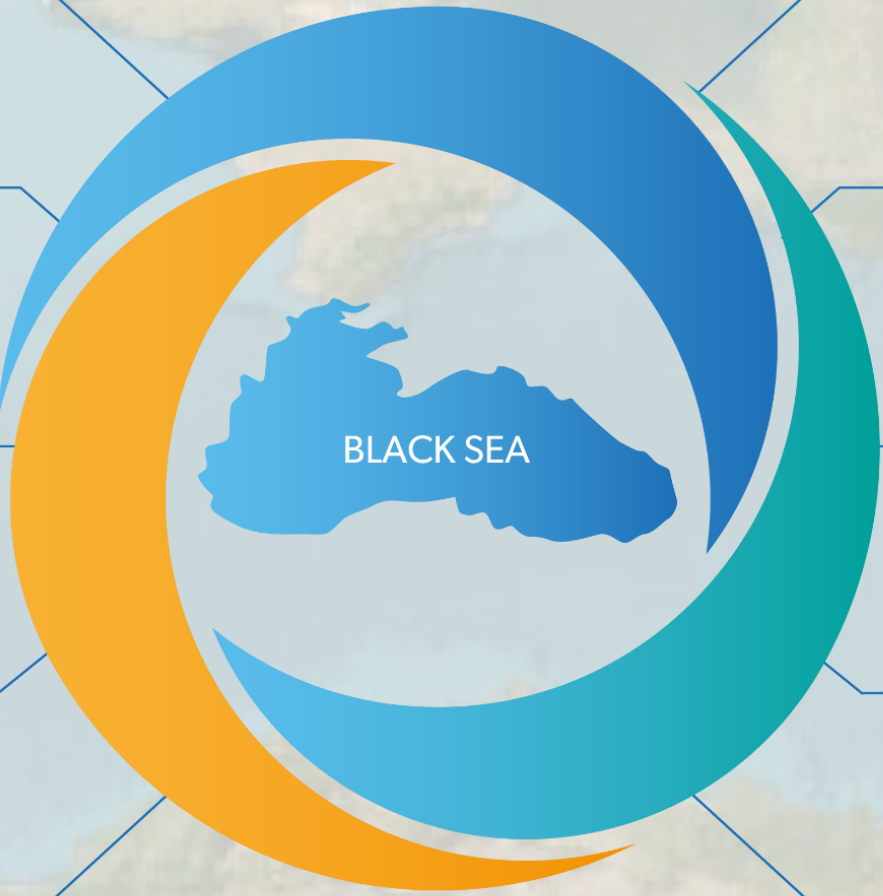
4869 km
of coastline

421 638 km²
Total area

90%
of oxygen free, H_2S-rich volume

160 million
Population of Black Sea coasts and catchment

18
Major sea ports



10 large rivers following to the sea with a total river input exceeding 350 km^3 $year^{-1}$

30 to 8
Reduction in the number of fish species with economical significance

5 ratio of the Black Sea catchment area to the sea's area

Deep Black Sea as the paleoclimate archive of past **5 million years**

Rich in **renewable energy sources** such as waves, currents, and offshore wind

STATE OF THE MARITIME AND COASTAL CAPITAL

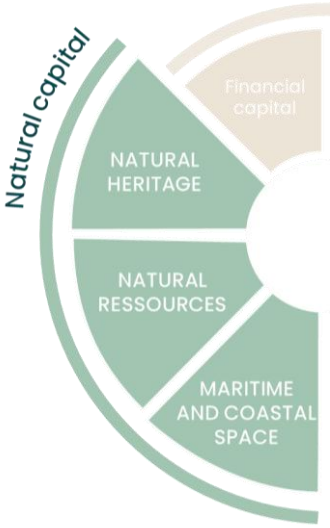
NATURAL CAPITAL

MARITIME AND COASTAL SPACE

The Black Sea is an almost completely **enclosed sea** of 436,402 km2, with a maximum depth of 2 000m. It is **marginally connected to the Mediterranean** and the Marmara sea through the narrow Dardanelles and Bosphorus straits, which are important corridors for the migration of species such as cetaceans. The consequent contributions of organic matter by the rivers feeding the Black Sea, with no other way out, have accumulated in depth during the last millennia, causing an extreme stratification of the basin: **almost 90% of its volume is anoxic**, and only the first 100 to 150m of depth are oxygenated. Most of the Black Sea coasts ascend rapidly, especially in the east and south, while small floodplains are found in the northwestern quarter, below foothills.

NATURAL HERITAGE

Due to its atypical physical characteristics, the Black Sea harbors **less biodiversity than other more open seas**, especially in the higher trophic levels (tertiary consumers). Nonetheless, a survey in 2019 recorded **5680 different species** including plankton (microalgae, crustaceans), zoobenthos (crabs, worms), phytobenthos (seagrasses, fungi), fish and mammals. The Black Sea is home to the **largest field of red algae in the world** (Zernov's Phyllophora field), and to **3 endemic subspecies of dolphins** (Black Sea harbour purpoise, Black Sea common dolphin and Black Sea bottlenose dolphin) of which 2 are flagged as endangered species by the IUCN. Habitats of critical importance for dolphins' reproduction, feeding and migration are located all round the Black Sea, and 11 areas are designated as Important Marine Mammal Area (IMMA). However, like the majority of marine ecosystems worldwide, **the Black Sea biodiversity is subject to intense pressures**, whose impacts are magnified by its enclosed nature. These include in particular **overfishing** and **pollutions** (nutrients, plastic, chemicals, noise, etc.), but also direct collisions, mechanical habitat destruction or invasive species introduction. The Ukrainian war has induced additional pressures, with an increased military activity at sea, and the dispersion of sea mines, to name a few.



At present, very few areas of the Black Sea are designated as Marine Protected Areas (MPAs) most of which are found in Bulgaria and Romania as part of the European Natura 2000 network.

NATURAL RESOURCES

Despite its limited diversity, **the productivity of the Black Sea's biological resources is significant**, especially in the lower trophic levels, from algae (potential resources for macro-algae exploitation is estimated at 1 million tons - see fiche on biotechnologies) to forage fish (anchovies, sprat, etc.). However, the stocks are facing overexploitation (estimated to affect 65 to 75% of the commercial species) in addition to other anthropogenic and climatic pressures.

In terms of abiotic resources, **the Black Sea has significant offshore hydrocarbon deposits** (gas and oil), particularly in the northwestern quarter, of which only a fraction is currently exploited. In addition, the hydrogen sulphide (H_2S) from anoxic zones is being investigated for its potential as an energy source.

The main renewable energy resource in the Black Sea is wind, whose potential is estimated at more than 400GW, mainly concentrated in the northwestern quarter. However, no resources related to currents and tides have been identified (see fiche on MRE).

INSTITUTIONAL CAPITAL

The maritime institutional capital in the Black Sea is extremely uneven from one state to another, although regional cooperation tends to promote harmonized approaches. In particular, Bulgaria and Romania stand out as European Member States, with strong implications both in terms of regulations and financing (see fiche on technical capital).

NATIONAL MARITIME POLICIES AND REGULATIONS

As member states of the European Union, **Bulgaria** and **Romania** are both implementing the **Maritime Strategy Framework Directive** (MSFD), which aims to protect the marine ecosystem and biodiversity, and the **Maritime Spatial Planning Directive** (MSPD), which aims to optimize the spatial and temporal distribution of human activities to achieve ecological, economic and social objectives. In addition, Romania has also developed an **Integrated Coastal Zone Management** policy at national scale.

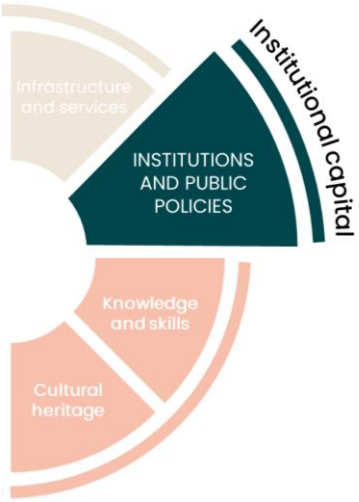
Türkiye has since 2013 set a **Maritime Coordination Commission** chaired by its Ministry of Transport and Infrastructure (MoTI) to ensure **the integrated handling of maritime affairs.** The country also developed an **"Integrated Coastal Zone Plans"** covering 82 percent of its coastal areas in 2017.

In the **other Black Sea countries** maritime activities are managed in a rather sectoral way by different ministries and **integrated maritime strategies are lacking,** hampering regional cooperation initiatives.

REGIONAL COOPERATION

In 1992, with the signing of the Istanbul Summit Declaration and the Bosphorus Statement, the Black Sea Economic Cooperation (BSEC) emerged as a unique and promising model of multilateral political and economic initiative, gathering the territories of the Black Sea coastal States, the Balkans and the Caucasus, with an area of nearly 20 million square kilometers.

The same year saw the adoption of the Convention on the Protection of the Black Sea Against Pollution, and the establishment of its Commission and Activity Centers. In 1996, Black Sea countries also ratified the **Agreement on the Conservation of Cetaceans of the Black Sea**, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS), formalizing their cooperation for the protection of cetaceans.



Most importantly, since 2019, the Common Agenda for the Black Sea (CMA) has become the main cooperation tool at regional level. Gathering the six riparian countries as well as the Republic of Moldova, the CMA aims **to enhance Blue Economy and address common challenges at sea-basin level.** It is completed by the Strategic Research and Innovation Agenda (SRIA) and its newly adopted implementation plan. Although Russia's association in CMA and SRIA has been frozen, other Black Sea countries are still supporting their implementation.

As regards to fisheries management, the Black Sea countries are also contracting parties (BG, RO, TK) or cooperating parties (GE, MO, UA) to the **General Fisheries Commission for the Mediterranean (GFCM)**, which aims to ensure the conservation and the sustainable use of living marine resources in the Mediterranean and Black Sea.

COOPERATION AMONG PRIVATE STAKEHOLDERS

Economic stakeholders of the Black Sea are federated through the various existing Maritime Clusters: Maritime Cluster Bulgaria, Cluj IT Romania, Black Sea Energy Cluster, etc.

NGOs, emanations of the civil society, are federated at sea-basin level through the **Black Sea NGO Forum,** launched in 2008 to boost cooperation and to strengthen their capacity to influence regional and national policies.

TECHNICAL CAPITAL

INFRASTRUCTURES

As a crossroads of Eurasia, the Black Sea is an **important hub for the transport of hydrocarbons and food products, and consequently possesses a substantial infrastructure network**. In terms of facilities, the Black Sea counts 57 commercial ports (including 18 major ports) with a traffic capacity of 700 million tons. Before the war, Ukraine had the largest port activity, followed by Russia, Romania (with Constanta, the biggest port in the basin) and Bulgaria. Fishing ports are spread all around the basin, but their capacities differ widely, and Turkey stands out with 9 of the 10 largest fishing ports (in terms of landed volumes). For yachting and boating, 54 dedicated harbors are mostly spread between Ukraine, Türkiye and Bulgaria. As an **historical player in shipbuilding**, the Black Sea also hosts important shipyards, the main ones being in Bulgaria, Romania and Ukraine (see fiche on shipping). The richness of the Black Sea coastal infrastructure network, however, is not reflected inland, with limited terrestrial connection towards the hinterland in most countries.

MARITIME SERVICES

Services associated with marine **environmental monitoring** are subject to an increasing number of basin-wide cooperations projects, such as the **Black Sea Integrated Monitoring and Assessment Program** (BSIMAP), which aims to collect and sharr data on the state of the Black Sea environment to support decision-making; or the EMBLAS Plus, which aims to support EU-MSFD and WFD implementation beyond EU MS in the Black Sea.

Services related to **maritime surveillance** (including Sea Traffic Management) remains in the hands of the States to meet IMO commitments. Nevertheless, trans-national approaches are promoted by the EU through its **Maritime Safety Agency (EMSA),** which looks beyond EU member states to create conditions for safer, more efficient and environmentally friendly maritime transport in the Black Sea region.

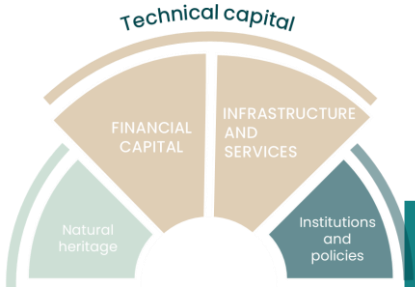
Romania and Bulgaria are also key players in the **digitalization of port services**, such as call management, control procedures, or the optimization of costs and emissions.

FINANCIAL CAPITAL

Public funding related to maritime sectors in the Black Sea comes largely from Europe, through mechanisms such as the European Regional Development Fund (ERDF), the Connecting Europe Facility (CEF), or the European Neighbour Instrument (ENI). The European Maritime, Fisheries and Aquaculture Fund (EMFAF) is also providing financial support and benefited to Bulgaria and Romania, who respectively received €85 million and €162 million for the period 2021-2027. Both countries have also, been supported in their Maritime Spatial Planning development via the MARSPLAN I & II projects. European funds also benefits to the whole basin through the Black Sea Assistance Mechanism, the DOORS project, the BRIDGE-BS project, or the Interreg VI-B NEXT Black Sea funding program, to support the development of a sustainable Blue Economy and the implementation of regional strategies such as the Common Maritime Agenda (CMA).

In addition, international (World Bank/Global Environmental Fund) and regional donors (Black Sea Trade Development Bank) are also supporting Blue Economy development in the Black Sea, with a particular focus on the environment (cf. Blueing the Black Sea) or infrastructure development at national and regional level. At national level, the recovery and reconstruction plan for Ukraine will probably be a key enabler for the Ukrainian Blue Economy, but could also pave the way for a new era with enhanced cooperation with its Black Sea neighbours.

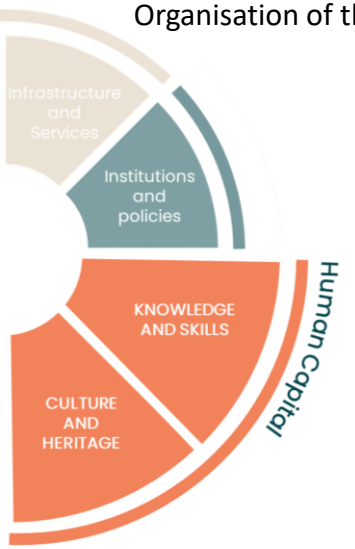
While information on public investment, especially EU/International, can easily be found, information regarding private funds is not as accessible and transparent.



HUMAN CAPITAL

KNOWLEDGE AND SKILLS

Knowledge production and dissemination is ensured in the Black Sea through the activity of a great number of marine research institutes and universities, which are providing maritime education and trainings: in Romania (National Institute for Marine Research and Development, National Institute of Geology and Geo-ecology), Bulgaria (Institute of Fishery Resources, Institute of Oceanology), Türkiye (Istanbul University Institute of Marine Sciences and Management), Georgia (Marine Ecology and Fisheries Research Institute, The National Maritime Academy), Ukraine (Southern Scientific Research Institute of Marine Fisheries and Oceanography) and in the Russian Federation (P.P.Shirshov Institute of Oceanology). Scientific cooperation between these organizations is stimulated via the Black Sea Universities Network (BSUN) and the Black Sea Research Network (BSRN), an action-focused and multidisciplinary network of policy-oriented research institutes. In addition, the International Centre for Black Sea Studies (ICBSS), founded in 1998 as a non-profit organization, plays an important role as an independent research and training institution focusing on the wider Black Sea region, and as a related body of the Organisation of the Black Sea Economic Cooperation (BSEC) and its think-tank.



Overall, despite the large amounts of knowledge produced in and on the Black Sea, data and information sharing remains insufficient, and there is no basin-wide data portal at this time. Initiatives to increase the circulation of knowledge are undergoing within structures such as BSEC(e.g., Virtual Knowledge Center). As an example, in Georgia, the Kutaisi University is involved in the Tempus project, which aims at the creation of transnational network of knowledge centres for the development of cruise tourism in the Black Sea region.

In addition, the basin shows a relative lack of education and training opportunities targeting emerging sectors of the Blue Economy such as marine renewable energies and blue biotechnologies. Within the BRIDGE-BS project, the Virtual Blue career Center is specifically designed to attract young and experienced workers to fill existing skill gaps and increase employability in key Blue Economy services.

CULTURE AND HERITAGE

The Black Sea basin has been at the core of maritime exchanges and benefits from a strategic geographical location. **It carries a rich maritime history that bears witness to the intricate connections between the tribes and nations that have lived on its coasts for millennia**. Historical and archaeological research have shown the existence of a Thracian maritime tradition on the western shore of the Black Sea, long before the Greek colonization. The basin was successively dominated by the Greeks, then the Roman and Ottoman empires. The 18th century marks the dispute between the Ottoman empire and the Russian federation for the control of the Black Sea coasts. At this time, Sebastopol and Odessa were already key ports for the region.

As a result, the Black Sea is home to a **rich maritime cultural heritage,** reflected by the existence of maritime museums (e.g., Black Sea Fleet History Museum in Sebastopol, Istanbul Maritime Museum) and events (e.g., Cabotage Day in Türkiye, Romanian Navy celebrations, Bulgarian Maritime Summit), and the presence of underwater archaeological remains (e.g., Eregli, Samsun and Sinop sites in Türkiye) which are the object of constant research (for example through the HERAS Project "Submarine Archaeological Heritage on the Western Black Sea Shelf").

However, the richness of the Black Sea maritime history and cultural heritage does not yet seem to be recognized and promoted to its true value, both internationally and by the local communities themselves, whose "maritime identity" is not necessarily proclaimed.

MARITIME AND COASTAL CAPITAL

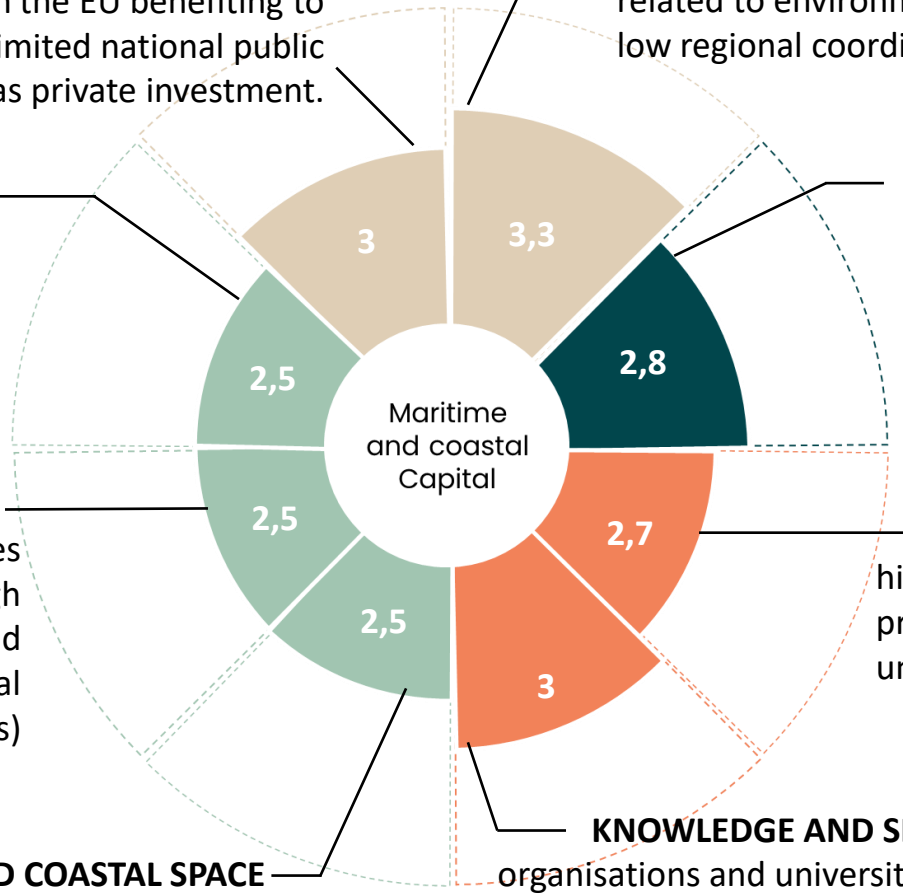
OVERVIEW

FINANCIAL CAPITAL: Public investment from the EU benefiting to the basin and Ukraine reconstruction plan. Limited national public investment as well as private investment.

NATURAL HERITAGE
Unique marine environment with endemic species and numerous habitats, but biodiversity under high anthropic pressures.

NATURAL RESOURCES
Potential for exploitation of some resources (MRE). Some resources are under high pressures (biological resources – fisheries) and others subject to regional competition (mineral resources)

MARITIME AND COASTAL SPACE
Enclosed sea partially connected to the Mediterranean. Peculiar space with limited depth (max 2 000m) and where 90% of its volume is anoxic



INFRASTRUCTURE AND SERVICES: Good level of infrastructure and services especially regarding port activities; increasing services related to environmental monitoring and maritime surveillance; low regional coordination and shared services

INSTITUTIONS AND POLICIES: Good level of regional cooperation within the existing frames and organisations but few integrated maritime policies at national scale (lack of efficient implementation at local level with adhoc governance)

CULTURE AND HERITAGE: Rich maritime history of the sea basin but recognition and promotion could be improved in particular for underwater cultural heritage

KNOWLEDGE AND SKILLS: Great variety of research organisations and universities but lack of education and training in some specific sectors. Data sharing remains insufficient. There is limited innovation especially for emerging sectors of BE

BLUE ECONOMY IN THE BLACK SEA

In this very peculiar environment that is the Black Sea, both biophysically, geographically, and geopolitically, Blue Economy is both an historical and vital component for coastal communities. Traditionally dominated by fishing, transport and shipbuilding activities, then oil exploitation, it is now strongly based on coastal and maritime tourism, and tends to diversify in the field of aquaculture, biotechnology and marine renewable energy. Most sectors have however faced impacts from the geopolitical tensions in the basin since 2014 and furthermore in the last year.

The following section provides a portrait of each of the key sectors of the Black Sea blue economy based on the best available data at the basin or national level (unlike other European sea basins, it is extremely complex to find accurate data aggregated for the Black Sea).

COASTAL & MARITIME TOURISM

The Black Sea region has a permanent population of roughly 17.5 million inhabitants, to which 6–8 million tourists are added each year. **Coastal and maritime tourism in the Black Sea has been a key economic sector for some countries** (e.g., Bulgaria, Russia, Ukraine) **while it remains very limited in some others** (e.g., Georgia, Moldova, Turkey).

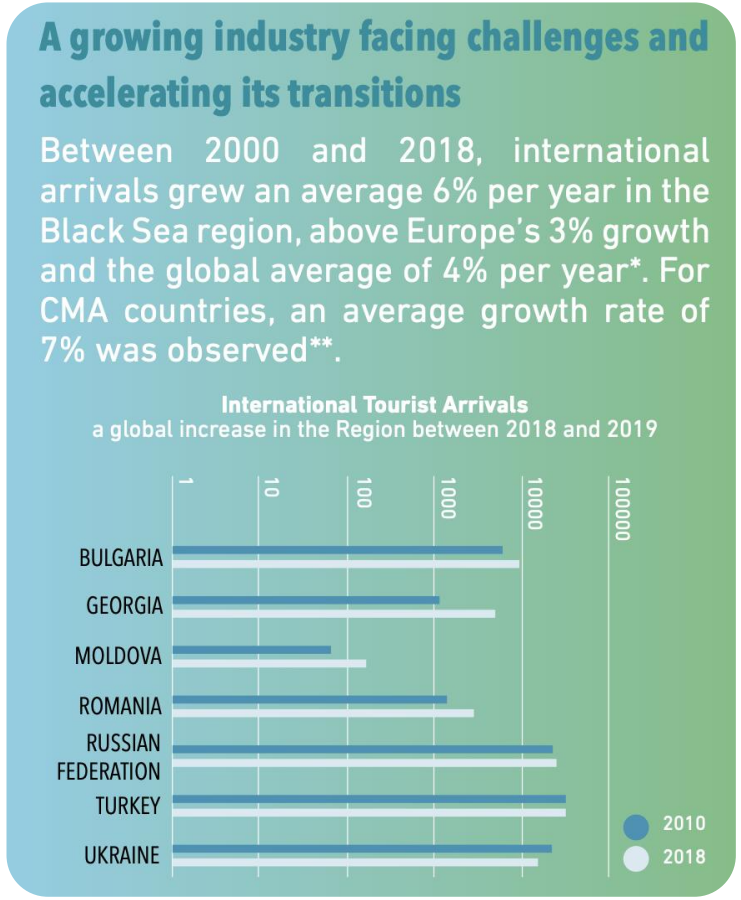
Most of the touristic offer in the Black Sea is still **oriented towards "Sea, sand and sun".** It is therefore subject to a strong **seasonality**, and very dependent on the **willingness of international tourists to visit the region**, which has proven to be extremely sensitive to its geopolitical context. This touristic offer is also based on **massive accommodations infrastructures** along the coastline, which require significant **waste and water treatment capacities**, and might prove highly vulnerable to climate change induced risks.

In addition, a large share of the Black Sea **touristic added-value is captured by international agents** (operators, investors), although costs are often covered by local agents (infrastructures, waste management, security, etc.).

Nevertheless, **opportunities for a more sustainable, resilient and profitable touristic offer are plentiful** in the Black Sea, especially considering the relatively limited promotion of the region's **natural and cultural assets**, as well as the **increasing demand from the domestic clientele** since the COVID crisis.

However, **the sustainability of the sector will inevitably depend on the reduction of its impacts on the environment** (on which it is entirely dependent), notably through the **improvement of water and waste management**, and the **reduction of GHG emissions** associated with tourism infrastructures.

Regional initiatives are actively involved in supporting the sector's adaptation. The **SRIA's pillar 2** focuses on touristic diversification and synergies. The **BS-CMA** has set objectives for 1) the **digitalization and smart specialization of the touristic sector**, and 2) **a better recognition and touristic valorization of the underwater cultural and archaeological heritage** of the basin. Water sports (diving, windsurfing, surfing), could also constitute an interesting development track for tourism and local communities of the Black Sea.



Source: UNWTO – Tourism in the BSEC Region, 2019

Image credits: @Varnacitycard, 2019.

YACHTING, BOATING & CRUISE

YACHTING AND BOATING

Recreational yachting and **boating remains a marginal sector in the Black Sea**, especially in comparison with its neighbor the Mediterranean Sea. The **recreational fleet,** estimated at a **few thousand vessels**, is distributed **in 54 dedicated harbors (technical capital)**, of which most are found in Türkiye, Bulgaria and Ukraine. There are rental offers in some countries such as Romania and Bulgaria.

Country	Recreational harbours
Türkiye	17
Bulgaria	14
Ukraine	12
Romania	4
Russia	4
Georgia	2
Total	54

Number of recreational harbors per Black Sea country
Source: Cruiserswiki, consulted in 2023.

Obviously, the sector has been **strongly impacted by the succession of political and health crises** during the last decade. However, in a widely desired context of geopolitical stability, the sector would present a **significant sustainable development potential**, taking advantage of the Black Sea's **natural assets** while minimizing its impacts on the environment: improvement of waste management in harbors, promotion of **low carbon opportunities** (e.g., sailing).

CRUISE

In the early 2010's, the Black Sea was increasingly **coveted by cruise operators**, attracted to its **atypical landscapes** and to the **investments made by some countries** to develop the activity (e.g., Ukraine, Türkiye). However, **the geopolitical situation of the last decade has had a major negative impact on the sector**. The circuits, initially offering a complete tour of the Black Sea, were since 2014 limited to its western part, and completely stopped since the beginning of the war, all the more since Ukraine hosted major ports.

Before the beginning of the war, and out from the COVID crisis, **Türkiye was becoming a key player** in the basin, with 67 listed calls, and the construction of new infrastructures such as the Amasra Harbor in 2022


Image credits: @IHA Photo, Daily Sabah, 2022.

Although a potential for development might be foreseen in the perspective of a more stable geopolitical context, it is to be noted that **the cruise value chain is most often externalized, meaning that it generate low revenues at local scale**, while requiring for significant local investments. Therefore, more potential might be sought in **small-scale cruising**, less demanding in terms of infrastructures, and more in line with the evolution of the clientele expectations.

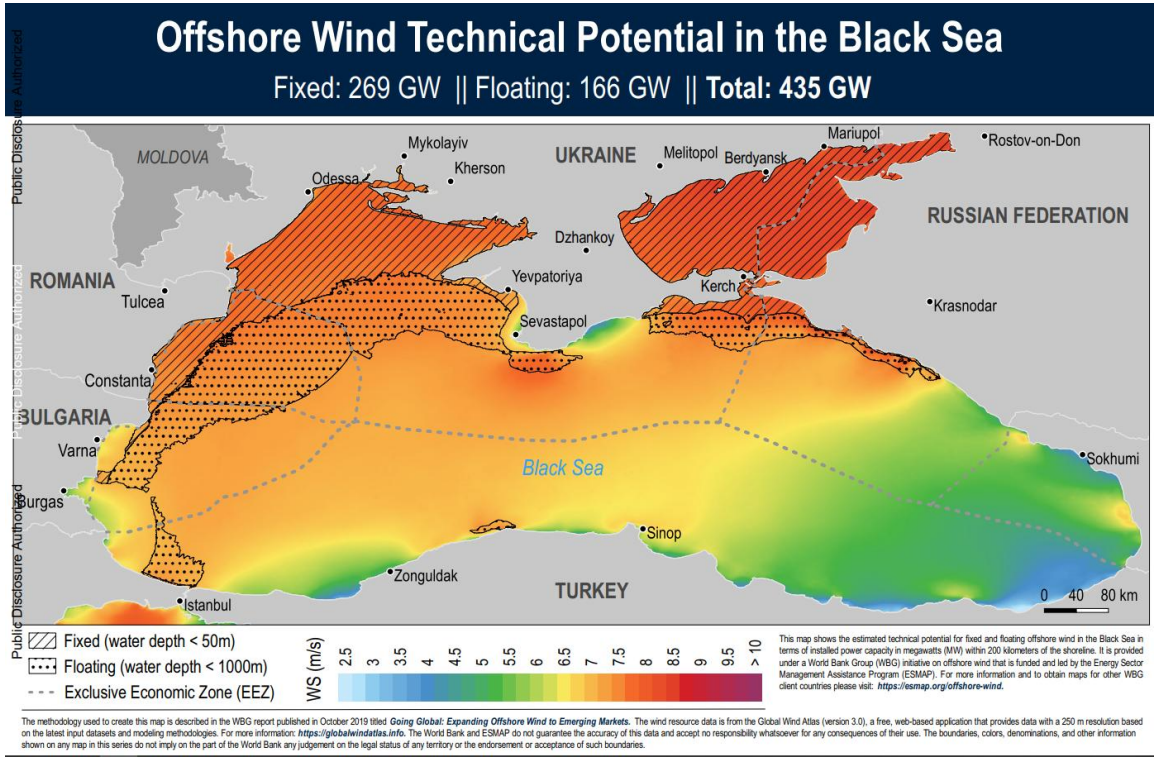

Image credits: @Happytovisit, 2022.

MARINE RENEWABLE ENERGIES

In the last decade, the European Union (EU) has been positioning itself as a world leader in the field of marine renewable energies, and more particularly in offshore wind energy, with a mastery of the complete value chain (design, production, installation, maintenance and dismantling) and very competitive costs. In line with its decarbonation objectives, **the EU has set an offshore wind target of 300GW by 2050**. However, most of its 30GW current capacity is located in the North Sea, Atlantic and Baltic, while the Mediterranean, and more so the Black Sea, are only starting the journey.

Due to its peculiarities, **the Black Sea was initially seen as having limited development potential**, **but recent studies**[1] have dispelled these preconceptions by **estimating the offshore wind resource at approximately 435 GW**, concentrated off the coast of Ukraine, Romania, Bulgaria and Türkiye. As a results, pilot projects are currently emerging, and **the first floating wind turbine is expected to be tested in the coming years in Bulgaria's territorial waters** as part of the EU-funded BLOW project. Regional cooperation on the subject is already taking place in the context of the Common Maritime Agenda for the Black Sea and SRIA, and a **significant commercial development could be foreseen in the next decades**.

The Black Sea might also offer potentials for other marine renewable energies, such as wave energy, although resources would need to be studied in more detail.



[1]*Source: World Bank, 2022*

OFFSHORE OIL & GAS

Although the first dwell dates back to 1975, the exploitation of hydrocarbons in the Black Sea has been relatively delayed compared to other sea basins, especially because Turkey and Russia have for a long time supplied surrounding countries with reasonably priced oil and gas. However, eager to face the declining reliability of Russian supply, **almost all Black Sea countries have supported exploration activities off their coast in the early 2000's**, taking advantage of more affordable modern technologies, and of a growing interest from investors.

The knowledge generated by these numerous exploration activities **leads to consider the western part of the Black Sea as one of the most promising hydrocarbon bearing areas in South-East Europe**, although the exact volumes remain to be confirmed. This has been evidenced by the increasing number of announcements of significant **field discoveries, starting with** a major discovery in Romania in 2012 (The Domino-1 well, estimated at 84 billion cubic meters of gas), followed by fields **over 100 billion cubic meters, whether in Türkiye, Bulgaria, Romania, Ukraine or Georgia**.

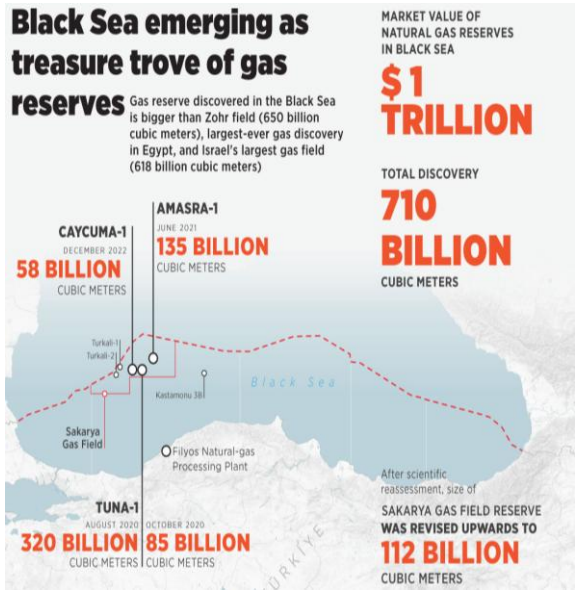
However, since the 2008 oil crisis, the offshore O&G sector has struggled to remain competitive, in the Black Sea as elsewhere, and has therefore experienced a relative decline, particularly in terms of employment.

For the time being, most of the active dwells are found in the **shallow shelves** facing Ukraine, Romania, Bulgaria and **Türkiye** but deep-sea exploitation is also foreseen, with **Türkiye** acting as a flagship. **Ukraine**, which holds a large share of the Black Sea hydrocarbon resources, **was becoming a regional key-player up until the conflict with Russia started to hamper its ability to produce** in several areas, right after the annexation of Crimea in 2014.

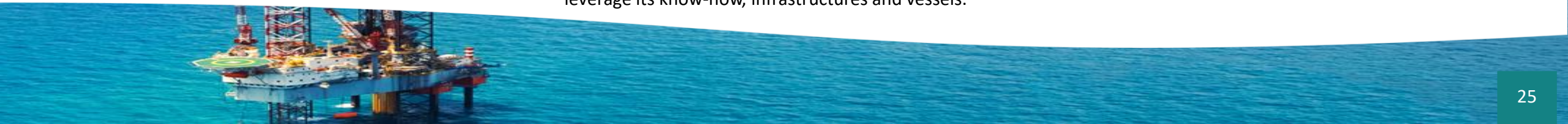
In addition to its resource, the Black Sea region lies at a strategic crossroads of major oil and gas export streams to the Mediterranean and Western Europe and could therefore easily reach a major market. **However, the future of the sector will strongly depend on the worldwide incentive to reduce the use of fossil fuels as to mitigate climate change impacts**.

The expected development of MREs could be seen as a transition opportunity for the sector, which could leverage its know-how, infrastructures and vessels.

The exploitation of other non-living resources (e.g., sans, gravels, metals) from the seabed of the Black Sea is at this stage non-existent, even though countries such as Bulgaria or Georgia have identified possible concessions. No particularly valuable minerals have been identified to date.



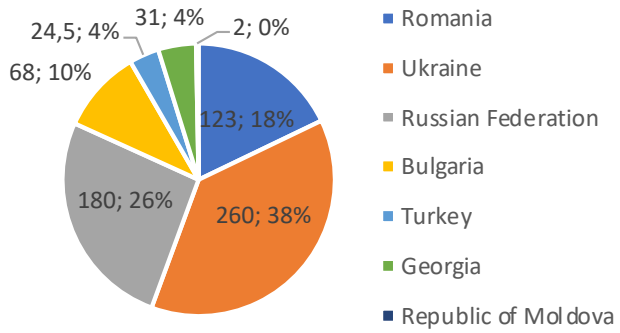
Source: Anadolu Agency from Ministry of Energy and Natural Resources - Turkey, 2022.



SHIPPING

As an inland sea, the Black Sea does not experience as much shipping activity as its neighbor the Mediterranean. However, the sector is far from being anecdotal for the region : **about 5000 merchant vessels are estimated to navigate the Black Sea every year** (over 4% of the worldwide fleet), with a **total displacement capacity of about 53 million Deadweight Tons** (DWT; approx. 2,6% of the world merchant fleet capacity in 2020).

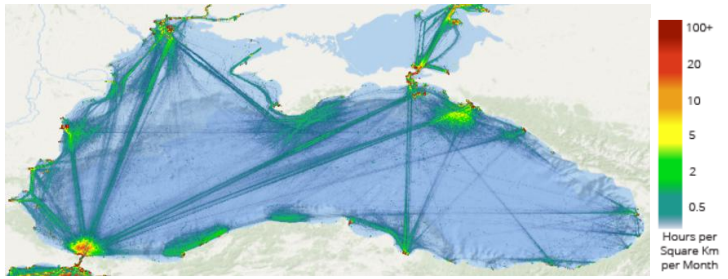
The Black Sea hosts a **total of 57 commercial ports**, for a **traffic capacity of nearly 700 million tons**, mostly **concentrated in 18 major ports**. During the last 15 years, the size of the vessels visiting these major ports grew from 2,500 TEU in 2003 to 10,000 TEU in 2018, reaching the limits of navigational restrictions in the Bosporus strait. Smaller Black Sea ports are called by feeder vessels and the ports of Istanbul, Piraeus, Damietta, Port Said, Gioia Tauro, Malta etc. are used for trans-shipment.



Ports capacities (million tons) per Black Sea country.

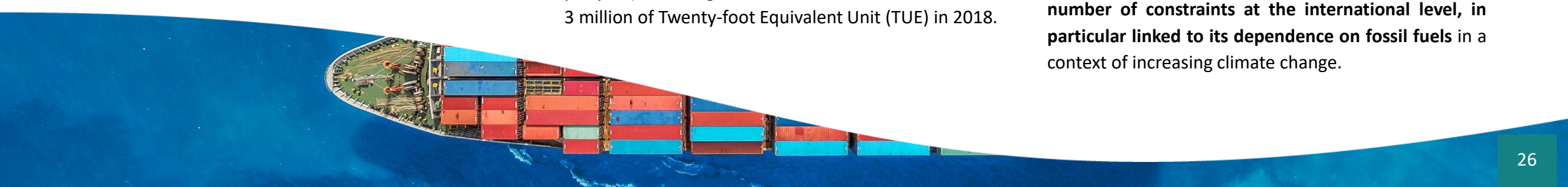
Shipping in the Black Sea has traditionally been specialized in **liquid (hydrocarbons, chemicals) and dry bulk (raw materials), which still account for the majority of transported volumes**. Nonetheless, container transport (food, manufactured goods) has experienced significant growth since the 2000s and the installation of major international operators in the basin (Odessa, Novorossiysk, Constanta, Poti). As a result, **the Black Sea container port system was in 2014 among the world's fastest growing markets** (6% per year), reaching an annual container traffic of about 3 million of Twenty-foot Equivalent Unit (TUE) in 2018.

The particularity of the Black Sea is that **only a few ports are visited directly by shipping companies**, for reasons of profitability in relation to the low volumes transported. **Not all countries have direct lines**, and flows are mainly concentrated in Romania, Ukraine and Russia, then redistributed across the basin by land transport infrastructures. Another peculiarity is that, in general, containers arrive full but leave empty.



Mean traffic density of cargos, tankers and passengers ships between 2017 and 2021. *Source: EMODNet.*

Obviously, **the sector has been strongly impacted by the war**, with a significant reduction of commercial transport as a result of both security and administrative issues. **In addition, the sector faces a number of constraints at the international level, in particular linked to its dependence on fossil fuels** in a context of increasing climate change.



SHIPBUILDING & REPAIR

Shipbuilding and ship repair are historically established in the Black Sea, although the sector was severely hit by the dissolution of the Soviet Union in 1991. **In 2022, the basin accounted for over 30 active shipyards**, the largest ones being located in Romania, Bulgaria and Ukraine. While these shipyards had first specialized in in the building of commercial and military vessels, **repair and maintenance activities have for a decade taken over construction**, especially due to a serious competition with the Asian market.

In **Romania**, which hosts 4 shipyards, shipbuilding and repair is known for its long tradition and high-quality infrastructures, **yearly generating EUR 356 million and 22,300 jobs**. To maintain its construction activities, the Romanian industry is investing in green technologies and innovation capacities.

In **Bulgaria**, which is home to 6 shipyards, shipbuilding was a major activity until the early 2000s, resulting in the launching of more than 1000 large ships. These activities have declined since then, but still generated **EUR 96 million and 5,300 jobs in 2018**.

Before the annexation of Crimea in 2014, **Ukraine** was the key player in the basin, with 4 major shipyards of which one of the oldest and largest of the Black Sea : the ”Black Sea Shipyard” in Mykolaiv. Since then, Ukrainian shipbuilding companies were **estimated to use only 25 to 30 percent of production capacities**, and the **shipbuilding industry had reduced by 10-15 times**.

These strategic infrastructures are believed to have played a role in the recent invasion from **Russia**, which has since then **converted most of the production chain for the construction and repair of military vessels**.

“Black Sea Shipyard” in Mykolaiv, Ukraine.

Finally, **Türkiye** hosts 15 shipyards on the Black Sea, which have **specialized in mega-yacht** and are renowned for their tailored and high-tech approach.

Mega-yacht delivery in Istanbul - @Numarine

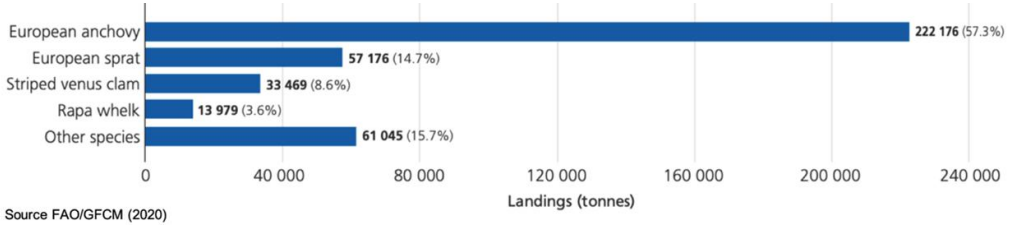
The **resilience** of the Black Sea shipbuilding sector in the coming decades **will depend in part on its ability to be active and innovative** in the areas of **fleet decarbonization** (retrofitting to LNG or H_2) and **digitalization** (AI and autonomous ships), while preserving the balance between wages and labor competition in the EU and beyond.

To this regard, the sector can take advantage of an **excellent research and higher education system**, a **favorable geographical position** and connectivity between the Danube River and the Black Sea.

FISHERIES

Along with maritime transport, **the fishing sector is one of the main drivers of the blue economy in the Black Sea**, having **generated 251 million dollars of income in 2020 according to FAO estimates**. Nearly **90% of the fleet is composed of "artisanal" vessels**, which are distributed throughout the riparian countries of the basin. However, **a majority of the almost 400,000 tons fished each year are caught by the remaining 10% of the fleet, composed of industrial trawlers**. Most of these industrial fishing vessels sail under the Turkish flag and in 2018, **nine of the ten main landing ports of the Black Sea were Turkish**, accounting for more than 30% of the total landings.

Due to its particular chemical composition, **the Black Sea is known to have a high fish productivity, although limited in terms of species diversity**, with a preponderance of low-trophic level species such as anchovies and sprat, accounting for more than 70% of the landings.



Total Black Sea landings per species in 2020 – Source : FAO.

Snapshot of Black Sea Fisheries in 2020– Source : FAO.

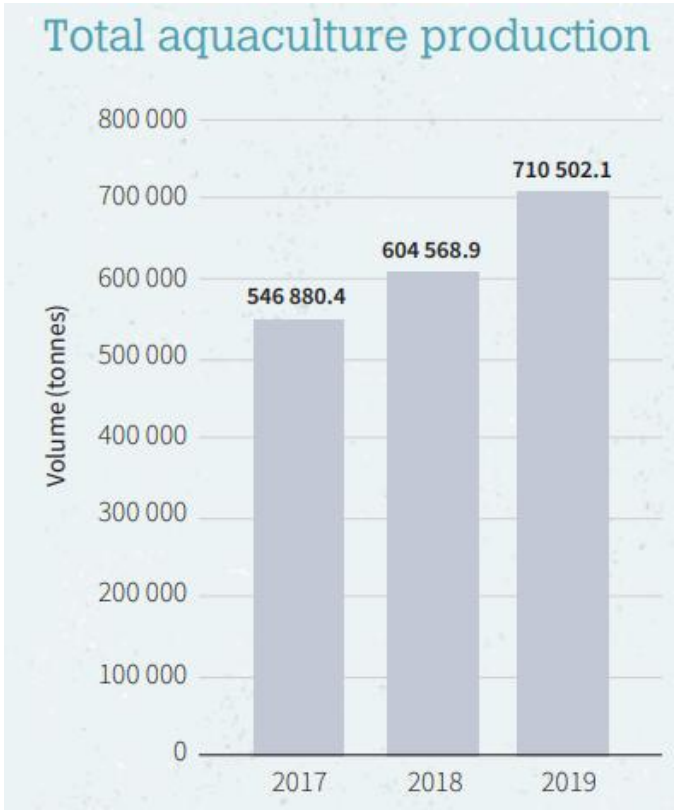
During recent decades however, environmental conditions have significantly deteriorated in the Black Sea, with recurring eutrophication events, jellyfish blooms, etc. Combined with **overfishing**, which was estimated to affect about **65% of commercial species** of the Mediterranean and Black Sea in 2022, this has led to the collapse of several fish stocks and might have **significant consequence for the fisheries sector in the long term**. Some studies suggests an eventual “trophic cascade” which could cause important alterations in the structure and dynamics of the Black Sea ecosystem. In addition, due to their strong **dependance on fossil fuels**, fisheries are directly impacted by the increasing costs of energy, and the sector is likely to undergo major changes in the near future.

MARINE AQUACULTURE

Aquaculture has been anchored in the economy and culture of the Black Sea for several generations. In the last decades, it has experienced a significant growth, and in 2019, **the total production of the basin amounted to more than 700 thousand tons**, including a majority of **salmonids** (225 thousand tons), **carp** (182 thousand tons), seabass (137 thousand tons) and seabream (100 thousand tons) as well as mussels, sturgeon, meagre, tuna, etc. The most important volumes are recorded in decreasing order in Türkiye, Russia, Bulgaria, Ukraine, Romania and Georgia.

However, to date, most of the production comes from land-based farms, which have dominated the Black Sea aquaculture landscape since the 18th century. **As for marine aquaculture, it is still emerging in the basin, although it has experienced significant growth in some countries**. This is particularly the case in **Türkiye**, which has become a regional leader, and where marine production of seabass and seabream now represents 69% of the country's production.

This is also the case for **Bulgaria**, where mariculture has grown to represent 30 percent of total aquaculture production in 2019.



Aquaculture production in the Black Sea
Source: FAO, 2022.

In the other countries of the basin, however, the growth of marine aquaculture has been much more limited so far. Although **the Black Sea aquaculture market is to be promising**, and recent years have shown an increase in production, trade and prices, the impacts of the COVID crisis in 2020 have highlighted the. **sensitivity of the sector to international demand;**

Mariculture, be it of shells or fish, is also known to be **extremely sensitive to the quality of the marine environment** and would therefore only **be able to thrive in a perfectly healthy Black Sea**. At the same time, **sustainability has to remain a priority in the development of projects**, as some could further reinforce environmental disorders such as eutrophication.

In order to ensure the resilience and sustainability of aquaculture as a supplier of blue food, a provider of employment and livelihoods, and an instrument for economic growth, it is necessary to **address these challenges through both research and innovation, and regulation and planning.** To this end, the SRIA is expected to be a key driver of mariculture development in the Black Sea.

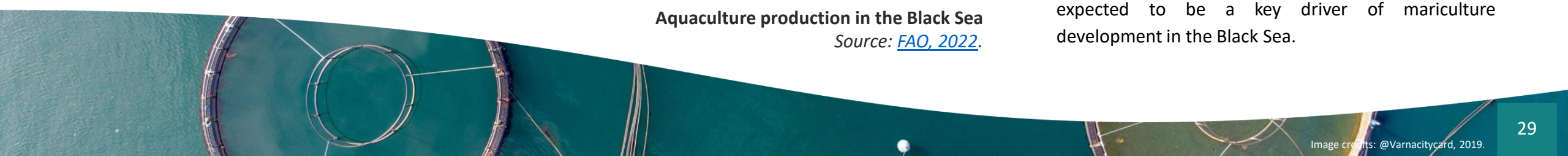


Image credits: @Varnacitycard, 2019.

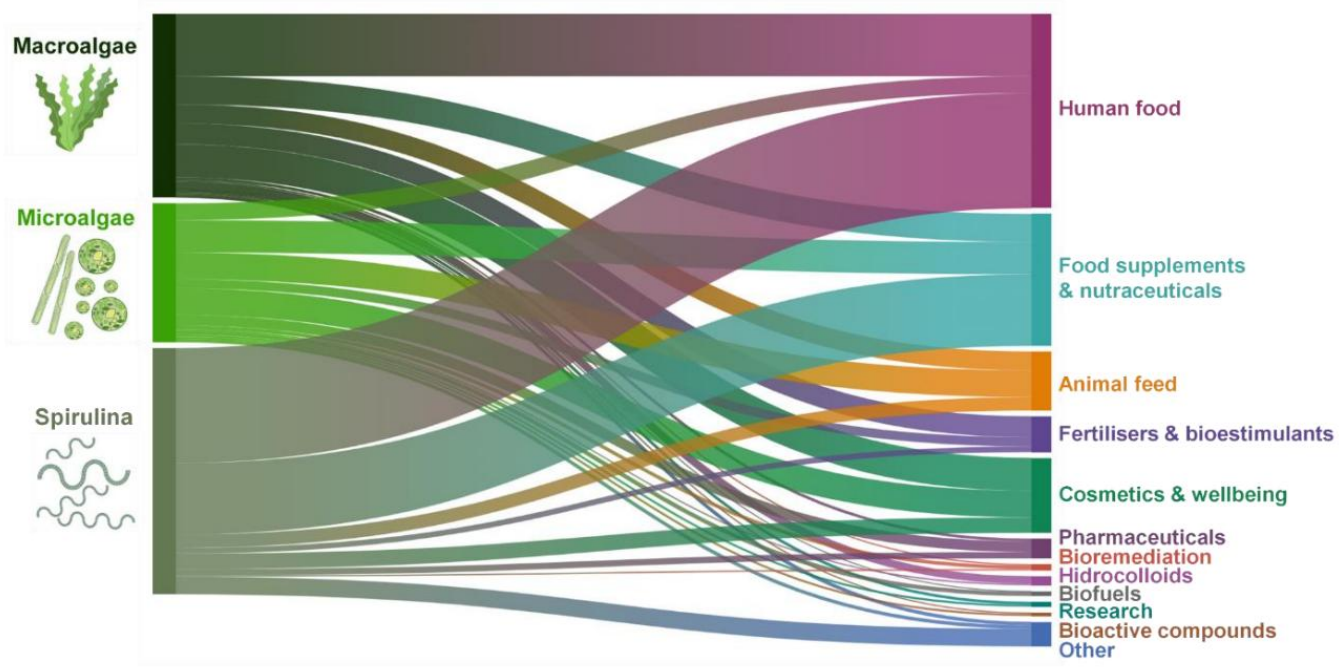
BLUE BIOTECHNOLOGY

Blue biotechnologies are a relatively recent field of activity, highly mediatized for their rapid growth during the last decades, although their precise economic weight remains difficult to evaluate.

Blue Biotechnologies refers to the exploitation of groups of marine organisms not traditionally exploited commercially, such as microorganisms (microalgae, bacteria and fungi), algae and invertebrates (starfish, sea cucumbers, sea urchins, etc.), and their transformation into food, feed, nutraceuticals, pharmaceuticals, cosmetics, energy, packaging, clothing, etc. Examples of applications include the production of biological alternatives to traditional fossil fuels, or compounds for medical purposes (e.g., marine hemoglobin).

Although no concrete examples have yet emerged in the Black Sea, the research capabilities of Romanian, Bulgarian or Turkish laboratories and universities, combined with the diversity of the Black Sea ecosystem, indicate a strong potential for development. In particular, the exploitation of algae is identified as a real opportunity for the Black Sea, whether it is the harvesting of macro-algae, which it is estimated that the resource amounts to 1 million tons, or the cultivation of micro-algae from the basin. These topics are priorities of the SRIA and the CMA.

One of the particularities of this field of activity, which could work to the disadvantage of the Black Sea states, is that the value chain is often completely delocalized as soon as the molecule of interest is identified.



Potential commercial applications of algae in Europe
Source: EU, 2022

Image credits: @Varnacitycard, 2019.

SECTION 1 : REFERENCES

NATURAL CAPITAL

UICN, Preferred places of three threatened dolphin and porpoise species, only found in the Black Sea, named as Important Marine Mammal Areas

The Cousteau Society, The State Of The Black Sea

A. Demirbas (2009) Hydrogen Sulfide from the Black Sea for Hydrogen Production, Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, 31:20

FAO, The State of Mediterranean and Black Sea Fisheries 2022

FAO, The State of Mediterranean and Black Sea Fisheries 2020

TECHNICAL CAPITAL

Common Maritime Agenda Facts, The Black Sea: a maritime space of trade, 2021-2022

HUMAN CAPITAL

Black Sea SCENE database, Marine organisations

Submarine Archaeological Heritage of the Western Black Sea Shelf (HERAS), HERAS Book

Le Dessous des Cartes, Mer Noire, Un Carrefour Euro-Asiatique, 2008

GENERAL

EU Blue Economy report 2022

TOURISM

Tourism in the BSEC Region – UNTWO, 2019

CMA Webinar on underwater cultural heritage and exploration of potential sites in the Black Sea - 2021

CRUISE

Sustainable small-scale cruising/yachting: preliminary analysis – Black Sea Cruise projet, 2021

MRE

Offshore Wind Technical Potential in the Black Sea – World Bank, 2020

Bulgaria's 116 GW offshore wind potential in Black Sea is decarbonization opportunity – Balkan Green Energy News, 2021

BLOW project – pioneering 5 MW floating offshore wind turbine in Black Sea– Balkan Green Energy News, 2023

FISHERIES

The State of Mediterranean and Black Sea Fisheries 2022- FAO, 2022

AQUACULTURE

Aquaculture market in the Black Sea: country profiles – FAO, 2022

O&G

The contribution of Black Sea oil & gas projects to the development of the Romanian economy – Deloitte, 2018

The Narrowing Window of Opportunity – BlackSea Oil & Gas, 2020

CHAPTER 3

2050 SUSTAINABLE IMAGINARIES FOR THE BLACK SEA'S BLUE ECONOMY

IMAGINARY 1

TECHNOCRACY FOR THE COMMON GOOD

By BRIDGE-BS
Blue Growth Incubators | Service Dynamics | Empowered Citizens

Technocracy for the common good

Black Sea 2050

BRIDGE-BS
Blue Growth Incubators | Service Dynamics | Empowered Citizens

sml

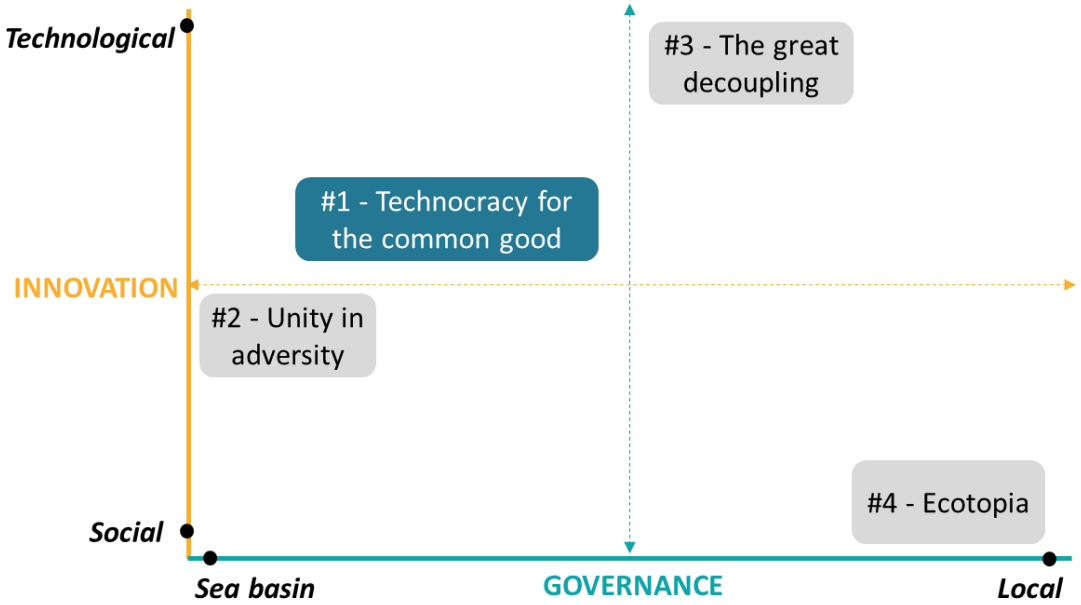
© Fanny Didou

IMAGINARY 1: TECHNOCRACY FOR THE COMMON GOOD

In 2050, Black Sea's Blue Economy has undergone profound changes. States responded to the successive crises of the 2020s (COVID, war in Ukraine, climate change) with economic protectionism, strong policies improving the management of resources and regulations drastically reducing carbon emissions. Public policies and the regulation of the Blue Economy is based on the large collection of data and global digital surveillance.

A reduction in international trade and the renationalization of production

Traditionally international sectors (shipping, tourism) have been faced with a steady decline in demand, and a significant reduction in their capacity as a result of a vast movement back to national production in all the countries of the basin.



Companies that have managed to hold on, in close collaboration with governments, have converted to meet domestic needs, based on certified "sustainable" models (low-carbon, 0 pollution, etc.). Conversely, the sectors providing the food and energy sovereignty of States have seen major development, within acceptable environmental limits. Aquaculture, for example, has taken root in most of the basin's coastal areas. By developing multi-trophic techniques and replacing protein sources traditionally derived from fishing with more sustainable terrestrial solutions (insects, plants), the sector has been able to drastically reduce its environmental impact and is now much more readily accepted by local populations. Similarly, to compensate for the abandonment of fossil fuels, countries with wind power resources (the Western sector) have invested massively in the development of offshore wind farms, occupying a large part of their maritime space and supplying their centralized electricity grids. The association of these farms with aquaculture production in multi-use formats remains limited to coastal farms, due to the associated energy costs. Shipyards have benefited greatly from the development of MREs, positioning themselves as key players in the production and maintenance of parks.

With this reindustrialisation process, albeit constrained by environmental limits, States have invested massively in their infrastructures (shipyards and ports, power grids, offshore parks) and associated services (digitalized management, monitoring, etc.). They have also developed strong planning capacities to ensure an optimized use of their maritime space on the long-term. In the race for technologies to optimize the efficiency of maritime activities, some States have succeeded in setting themselves apart and becoming exporters at basin level.

Precise, utilitarian management of natural resources to optimize yields for current and future generations

In 2050, after countries faced major environmental and climate issues, the use of natural resources has been drastically limited to support only what are considered as “vital activities” for national sovereignty and ensuring the availability of resources for future generations.

The improvement of monitoring and surveillance capacities, in addition to strict environmental regulations, has overall led to an improvement of the state of the environment in the Black Sea, with optimized exploitation, reduced pollutions and circular models to get the most out of every resource. However, the predominantly utilitarian view of natural capital has led to an emphasis on maintaining primary ecosystem services (provisioning, supporting) to the detriment of others (regulating, cultural). While commercial resources are doing better than before, those of no direct interest to the population are being neglected. Biomass in the basin is therefore reaching record levels, but biodiversity remains weakened, impacted in particular by the development of offshore wind farms (destruction of habitats, impacts on avifauna) or by industrial fishing that places little importance on reducing by-catches. The efforts implemented to ensure the minimum protection of biodiversity mainly serves to ensure biomass renewal and remain insufficient.

Minimalist governance, both within States and at basin level

At the national level, governance, while seemingly more fluid and transparent thanks to a range of digital tools facilitating interaction, remains in the hands of the States, the final decision-makers in the name of the common good. At basin level, cooperation tools (SRIA, CMA) are gradually losing their weight, as are regional fisheries management tools (GFCM), and innovation and resource management are being totally renationalized.

Bilateral relations are being established between neighboring countries to ensure concerted practices, but this sometimes leads to conflict.

Maritime culture has radically changed. While it was mainly based on traditional maritime activities, it started to evolve with the decrease of activities such as small-scale fisheries and international tourism. Traditional know-how, strongly rooted in local communities, are in 2050 rather historical practices than part of the living culture: the sea has become less accessible (decline in yachting, diving, fisheries), requiring more technical know-how (instrumentation, robotics, piloting) than real "human" knowledge of the marine element.

States have all strengthen and disseminated common narratives or promoted national maritime culture and references over local peculiarities. In this respect, the population, less concerned and trusting in the tools of the State, rarely expresses opposition to the directions given to maritime development.

Countries that have managed to maintain relations with the EU have a slight advantage thanks to access to complementary financing.

TECHNOCRACY : 2050 BLUE ECONOMY

**Regional intensity: status in 2050 compared to 2023*

Maritime transport

Regional intensity*: **significant decline (--)**

As a result of de-globalization and protectionism, **international trade (hydrocarbons, commodities, foodstuffs) has shrunk considerably, and shipping intensity has declined accordingly**. The remaining international shipping activities are **strictly limited to the essential needs of States** (food, materials, technologies) that have not managed to internalize their production. They are **operated by large state-affiliated companies**, no longer by international corporations. They are mainly **consigned to the Black Sea basin**, as a means of exchange with neighboring countries (ex. Ukrainian cereals), and only a few ships reach the Mediterranean and then the ocean. **By 2050, the fleet will have shrunk significantly, both in number and size**, and will be operating on systems combining wind propulsion and low-emission fuels (methane, hydrogen), with very low cruising speeds and strongly optimized and monitored routes.

Shipbuilding & repair

Regional intensity: **decline (-)**

The significant decline of maritime transport and its associated fleet has led to a **drastic drop-in in shipbuilding activity**. However, by 2050, each Black Sea country still has at least one active shipyard, dedicated to the upgrade, adaptation and maintenance of its national fleet (transport, fishing...), and contributing to the production of parts for Offshore Wind Farms.

Offshore Oil & Gas

Regional intensity: **decline (-)**

By 2050, **fossil fuels exploitation is limited to States which don't benefit from favourable natural conditions to ensure their energy sovereignty with renewable energy. Therefore, the sector is drastically reduced** aiming to maintain specific vital activities and **regulated** with strict CO2 compensation measures. In this context, **some strategic gas deposits might continue to be exploited sparingly, but the overall activity would be minimal**.

TECHNOCRACY : 2050 BLUE ECONOMY

Coastal & maritime tourism

**Regional intensity: status in 2050 compared to 2023*

Regional intensity*: **significant decline (--)**

In 2050, the global touristic sector has undergone a **significant decline in volume**, because of both **de-globalization regulations** (e.g., quotas, taxes) and the overall **lack of low-carbon international mobility options**. In **coastal areas**, this decline has been accentuated by the repeated **damage to infrastructure caused by extreme weather events.** In the Black Sea such as elsewhere, the remaining activity is therefore **reduced to domestic tourism**, whose clientele today is less interested in the classic "sun and parasol" experience than in a return to natural areas that have regained their wild character. At the same time, visits to the modern coastal ruins are attracting new generations eager to understand the nearby past. Remaining **touristic infrastructures have been relocated** further from the sea, or on higher grounds, and have been **upgraded to resist climate events** (flood protection; natural cooling, etc.). With fewer visitors and the implementation of circular economy principles, water and waste management has significantly improved, and local sourcing of food has become standard. In some peculiar places, such as underwater archaeological sites, new technologies have also allowed for the development of virtual visits, which offers foreigners an alternative way of exploring the Black-Sea.

Cruise tourism

Regional intensity: **decline (-)**

Such as Shipping and Tourism, the Cruising activity in the Black Sea has undergone a strong **decline**, although the activity was already in recession in the 20's after successive crisis in the basin (Covid and wars). The remaining activity is **restricted to small-scale**, **wind-powered cruise ships** that mostly operate within **national waters** and are accessible only to the most privileged. Against this backdrop, Türkiye slightly stands out with a more varied offer (Mediterranean + Black Sea) and the up-cycling of their numerous existing infrastructures and ships.

Yachting & boating

Regional intensity: **stable (~)**

In 2050, the yachting sector has undergone a **profound transition**, with the discard of most fuel-based ships, the damages to most exposed harbors, and the decline of tourism overall. However, the activity **has managed to maintain itself with local populations**, who have returned to **sailing** as a complementary subsistence tool and a means of short-distance exchange. Sailing skills are now promoted and taught locally, as they are seen as a necessary part of life. The activity is however strongly regulated and monitored through dedicated surveillance tools, especially at national borders.

TECHNOCRACY : 2050 BLUE ECONOMY

Fisheries

**Regional intensity: status in 2050 compared to 2023*

Regional intensity*: **decline (-)**

In 2050, the Black Sea fishing fleet has been **drastically reduced in numbers**, although **still extracting significant volumes of fish** overall. The activity has been **centralized at national level**, each country having invested in the upgrading of a **handful of industrial fishing vessels**, adapted with **hybrid propulsion** systems (sails, H2, gas), and equipped with all on board **high-tech devices** to locate fish shoals, monitor catches, and overall optimize their efficiency. On the other hand, **small-scale fisheries have almost disappeared**, except in places inaccessible to larger ships. In every Black Sea country, the activity is **strongly regulated** to get the most out of fish stocks while preserving their **sustainable productivity**, firmly applying the principle of Maximum Sustainable Yield (MSY), achieved for all commercial species. Any infringement or illegal activity is instantly identified by the sophisticated surveillance systems in place, and severely punished. To this regard, conflicts often occur between countries over adjacent areas and resources. Although in 2050, no species is overexploited, the utilitarian approach to resources management has allowed for the cumulative fishing pressure to remain high, hampering other ecosystem services considered less essential (e.g., food-web diversity).

Coastal & marine Aquaculture

Regional intensity: **growth (+)**

Eager to internalise protein production, **Black Sea countries have massively invested in marine aquaculture** production units (coastal ones have proven too sensitive to climate events). **Large-scale farms**, operated by **State-related** companies, are now part of the Black Sea landscape. Using the most recent technologies and innovations, these farm produce **high-yielding fish species**, which enable the **local market** to be supplied at lower cost. The development of insect-based feeds and vegetable flour has reduced the sector's dependence on fishing and farming-densities have been optimized to reduce pollutions (drugs, nutrients, diseases). Remote park monitoring (cameras and other sensors), and the automation and robotization of a large part of the process, along with the implementation of renewable energy production units within the farms, have significantly reduced maintenance and production costs (fewer ship trips).

TECHNOCRACY : 2050 BLUE ECONOMY

Blue Biotechnologies

**Regional intensity: status in 2050 compared to 2023*

Regional intensity*: **growth (+)**

In 2050, Blue Biotechnologies **have grown to some extent to support the development of aquaculture** (feed supplements, sanitary products, processing of co-products and waste), but **remain limited overall**.

Marine Renewable Energies (MREs)

Regional intensity: **significant growth (++)**

Eager to internalize their energy production capacities, most Black Sea countries have strongly invested in MREs, especially in the most mature and productive technology (offshore wind). In this process, EU Member States (Bulgaria, Romania) were largely supported both financially and technologically by the European Union. **Large-scale wind farms**, operated by **state-related** companies, are now part of the Black Sea landscape, along with aquaculture ones. However, production is not optimal in some countries, due to lacking wind resource.

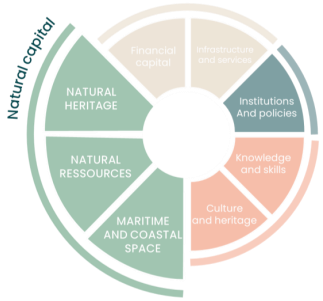
> OVERVIEW

Shipping	Shipbuilding	O&G	Tourism	Cruise	Boating	Fisheries	Aquaculture	Biotechnologies	MREs
--	-	-	--	-	~	-	+	+	++

Regional intensity: status in 2050 compared to 2023 significant decline (--) decline (--) stable (~) growth (+) significant growth (++)

TECHNOCRACY : 2050 MARITIME & COASTAL CAPITAL

NATURAL CAPITAL



Natural heritage

Status*: **stable (~)**

Provisioning and supporting ecosystem services are highly valued, **primarily for their capacity to serve human interests**. Their protection is targeted in national maritime and environmental strategies. **Marine biological diversity is maintained and restored** through strictly protected MPAs – excluding all human activities – that are designated only where marine ecosystems are the most "valuable" and to ensure the renewal of biomass stocks. But these MPAs remain sparsely, and their creation relies on national willingness. Also, these ecosystems are still **affected by land-based activities** such as large scale and intensive agriculture (which still uses fertilisers and pesticides) and **marine based activities** (e.g., large scale OWF).

Natural resources

Status: **increased (+)**

The **preservation of natural resources for future generations** has become a priority for most of Black Sea countries, ensured by high level and long-term planning). Natural resources extraction is highly monitored by States who are implementing **strict management measures** in order to ensure their sustainable use (MSY for fisheries). Development of the **circular blue economy** is highly supported by State incentives or through national programs enabling effective and maximised use of marine resources. The implementation of circular economy principles is high in the fishery and aquaculture sector, as well as shipbuilding and repair, creating new employment opportunities in these sectors.

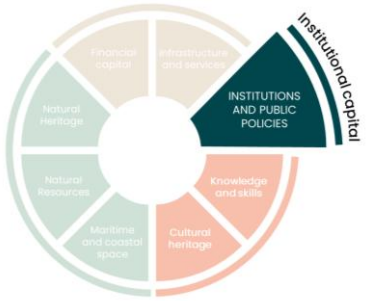
Maritime and coastal space

Status: **increased (+)**

Coastal areas are suffering the consequences of a rapid climate change leading to extreme weather and frequent calamities on the coasts. Therefore, **important spatial management and protection measures towards adaptation** are implemented. With the decrease of some activities (e.g., maritime transport, tourism), both **coastal and maritime space are less overcrowded**. To reduce remaining spatial impacts from activities, multi-use of sea space is highly encouraged by States, and especially driven by offshore wind production (e.g., included in national calls and licensing procedures).

**MCC Status of 2050 compared to 2023*

TECHNOCRACY : 2050 MARITIME & COASTAL CAPITAL



INSTITUTIONAL CAPITAL

Institutions and policies

Status*: **increased (+)**

Public policies have been strengthened at national level all around the sea basin. **Intensive planning at sea and on the coast through MSP and ICZM were deployed and implemented by States**. Marine protection is reinforced based on a high level of surveillance and management of maritime activities impacts, along with strong regulations on pollution and. Black Sea States are working together on specific domains leading to a lack of coherence at the sea basin scale (e.g., climate target defined at national level only). Therefore, cooperation mechanisms such as CMA are gutted. A high level of participation to maritime and coastal governance is ensured through digital tools which are enabling broader consultation on national strategies and measures. Maritime professional organisations are closely linked to governments and operate primarily as extensions of government influence. Nevertheless, States wary of public participation which is seen as a formal step more than a valuable contribution.

TECHNICAL CAPITAL

Infrastructure and services

Status: **increased (+)**

The level of coastal and marine infrastructure is highly developed due to (i) the **renewable energy production**, centralised by States who developed large-scale infrastructures and (ii) **the need for climate change adaptation** led to new type of infrastructure. Maritime surveillance as highly increased since 2023 and **is exclusively organised by States** both for maritime and coastal activities and the environment. Sensor's are deployed on permanent infrastructure and mobile activities are required to provide AIS data to support planning and monitoring. Services related to port activities (flow optimization, goods control, monetary exchanges) are internalized by States and fully implement digital tools (crypto-currencies, drones, etc.).

Financial capital

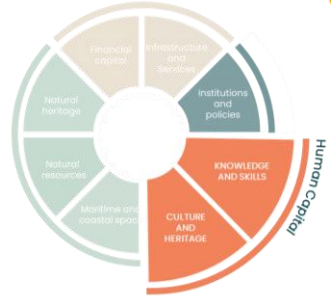
Status: **stable (~)**

States have introduced **new taxes on activities based on marine resources extraction** (biological and non-biological) and to some extent on renewable energy activities, in order to invest in surveillance and monitoring. To limit imports, governments impose **heavy taxes on foreign products and resources**. International and European funds have drastically decreased, due to the lack of cooperation in the Region. Private investment is largely channeled through government departments towards national needs.

**MCC Status of 2050 compared to 2023*

TECHNOCRACY : 2050 MARITIME & COASTAL CAPITAL

HUMAN CAPITAL



Knowledge and skills

Status*: **stable (~)**

There is a good level of knowledge on the state of the environment, maritime and coastal activities, and their impacts thanks to **intensive monitoring undertaken by States**. Decision-making is based on broad data collection supporting **data intensive planning** and enabling the management of maritime and coastal activities (e.g., coastal tourism). States are highly investing in education and research to support innovation for the low carbon adaptation of vital activities. Information and knowledge are mainly concentrated by State agencies, which strongly control their dissemination through digital tools. Research and innovation is strongly supported by States which has led to the development of numerous and diverse patents.

Culture and heritage

Status: **stable (~)**

Collective values are at the core of 2050, maritime culture and national maritime heritage and history is emphasised over local particularities, creating **a common narrative**, strongly disseminated by States. Cultural heritage is preserved, protected, and valorised through strong policies (e.g., domestic tourism, underwater cultural heritage). Consumption is highly oriented through personalised apps and targeted communication to **encourage pro-environmental lifestyles** (e.g., promotion of products with low use of resources, apps indicating local shops and producers of seafood products) with a **preference for domestic products** (decrease of imports). Maritime culture and traditional know-how which were mainly based on traditional maritime activities become historical practices rather than a "living" culture.

> OVERVIEW

*MCC Status of 2050 compared to 2023

Natural heritage	Natural resources	Space	Institutions & policies	Infrastructure & services	Financial capital	Knowledge & skills	Culture & heritage
~	+	+	+	+	~	~	~

***Status: MCC Status of 2050 compared to 2023**

decreased (-) stable (~) increased (+)

PILOT SITE ADAPTATION – S1 TECHNOCRACY FOR THE COMMON GOOD

The local variations of imaginary 1 offers relatively balanced developments between pilot sites. In this imaginary, the general decline of maritime sectors related to the shrink of natural resource in the Black Sea region is evident (fisheries, oil and gas – see regional imaginary), but the variability between pilot sites reveals distinct local dynamics.

The Bosphorus (PS1) manages to maintain residual activity (shipping, shipping, aquaculture) thanks to its strategic position and the support of the Turkish State. Varna (PS2), once major hub, is experiencing a significant decline in several sectors (shipping, yachting). It however manages to redeploy partly thanks to its transition to low-carbon technologies and offshore wind energy. Odessa (PS4) is showing a degree of resilience compared to the regional trends thanks to its cereal exports and the continued exploitation of hydrocarbons for post-war reconstruction.

	Regional trend	PS1 **Bosphorus**	PS2 **Varna**	PS3 **Danube**	PS4 **Odessa**	PS6 **Batumi**	PS7 **Sinop**
Shipping	- -	- -	- - -	- -	-	-	-
Shipbuilding	-	-	~	~	-	-	-
O&G	-	~	-	-	~	-	-
Tourism	- -	-	- -	-	~	- -	- -
Cruise	-	~	-	-	-	-	-
Yachting	~	~	-	~	~	~	~
Fisheries	-	- -	-	~	-	~	-
Aquaculture	+	~	+ +	+ +	+	~	+ +
Biotechnologies	+	+	+	+	~	~	+
MREs	+ +	+	+ +	+ +	+ +	+	+

**See regional imaginaries* Negative deviation Positive deviation

The Danube (PS3), meanwhile, stands out for its stability in sectors such as river shipping, traditional fishing and eco-tourism, benefiting from its inland positioning and sustainable practices. Sinop (PS7) and Batumi (PS6) are less impacted by the global decline and maintain some level of stability in sectors such as aquaculture and fishing.

PILOT SITE ADAPTATION – S1 TECHNOCRACY FOR THE COMMON GOOD

The **shipping** activity sees a strong decline across the basin due to renationalisation and increased taxation of imports. However, minimal activity is maintained for vital imports, managed by large semi-public companies. The impact is particularly severe in sites which experienced significant international shipping, such as Bosphorus (PS1), but strikes more especially Varna (PS2). Bosphorus (PS1), thanks to its strategic position, manages to sustain a residual level of shipping activity. Odessa (PS4) experiences a slightly less severe decline due to its critical role in cereal exports, vital for Black Sea countries. Batumi (PS6) and Sinop (PS7), where shipping was already limited, face less drastic impacts.

The **shipbuilding** industry declines at the regional level, with a shift towards offshore wind (OFW) construction and low-carbon technologies in Varna (PS2) and the Danube (PS3) region. This transition allows these areas to maintain some level of shipbuilding activity. In contrast, all the other pilot sites see their shipbuilding industries decline in line with regional trends in shipping and fisheries. Nevertheless, all sites retain at least one active shipyard, focused on the upgrade, adaptation, and maintenance of national fleets.

The **oil and gas** sector generally declines across the region, with the exception of Bosphorus (PS1) and Odessa (PS4). These sites continue to exploit strategic deposits out of necessity — Bosphorus (PS1) to compensate for a lack of renewable energy resources, and Odessa to support post-war rebuilding efforts.

Coastal tourism sees a strong decline throughout the region, particularly in industrialised or mass tourism areas, like Varna (PS2), where oversized and obsolete infrastructure becomes a liability. However, the decline is less pronounced in Bosphorus (PS1), where the Turkish State promotes regional tourism flows between the Mediterranean and the Black Sea. Odessa (PS4) manages to maintain a stable level of tourism activity by focusing on national customers and the Danube (PS3) still remains at the cutting edge of eco-tourism.

The **cruise industry** experiences a broad decline, with remaining activities restricted to small-scale, wind-powered cruise ships operating mostly within national waters and catering to the elite. The Bosphorus (PS1) stands out slightly due to a more varied offer, capitalising on its connection to both the Mediterranean and Black Sea, and by up-cycling its existing infrastructure and ships.

PILOT SITE ADAPTATION – S1 TECHNOCRACY FOR THE COMMON GOOD

Yachting activity remains relatively stable overall, as local populations return to sailing as a complementary subsistence tool and a means of short-distance exchange. Varna (PS2) , however, experiences a more significant decline due to its previous reliance on international customers, which has left the sector more vulnerable to the downturn.

Fisheries across the region decline to meet Maximum Sustainable Yield (MSY) targets, with fleets becoming predominantly industrial for easier monitoring and management. This trend is particularly evident in Bosphorus (PS1), where existing industrial fisheries have been nationalized. The Danube (PS3) stands out by maintaining stable fisheries, thanks to its low-impact traditional practices, such as shellfish farming. In Batumi (PS6), fisheries remain relatively stable, as the activity was already near MSY.

In Bosphorus (PS1) and Batumi (PS6) **aquaculture** remains stable, constrained by the limited availability of suitable marine space. Varna (PS2) and Sinop (PS7), with their technological capacities and available marine space, stand out as key players in the sector. The Danube (PS3) also sees an increase in aquaculture activity, leveraging its existing shellfish harvesting operations, which have transitioned into shellfish culture.

Biotechnology activities increase across the sea basin, particularly in regions with the financial resources and research capacities to support development. Odessa (PS4) and Batumi (PS6), however, struggle to keep up due to their lack of sufficient resources and capacities.

The **Marine Renewable Energies (MREs)** sector experiences strong growth at the regional level, with Varna (PS2) , the Danube (PS3), and Odessa (PS4) capitalising on their high potential for offshore wind energy. In contrast, Bosphorus (PS1), Batumi (PS6), and Sinop (PS7) are less successful due to the lack of natural resources, such as wind, and available space. However, Batumi (PS6) and Sinop (PS7) make modest investments in wave and tidal energy technologies, recognising their limited but viable potential.

IMAGINARY 2

UNITY IN ADVERSITY

By BRIDGE-BS
Blue Growth Incubators | Service Dynamics | Empowered Citizens

Unity in adversity

Black Sea 2050

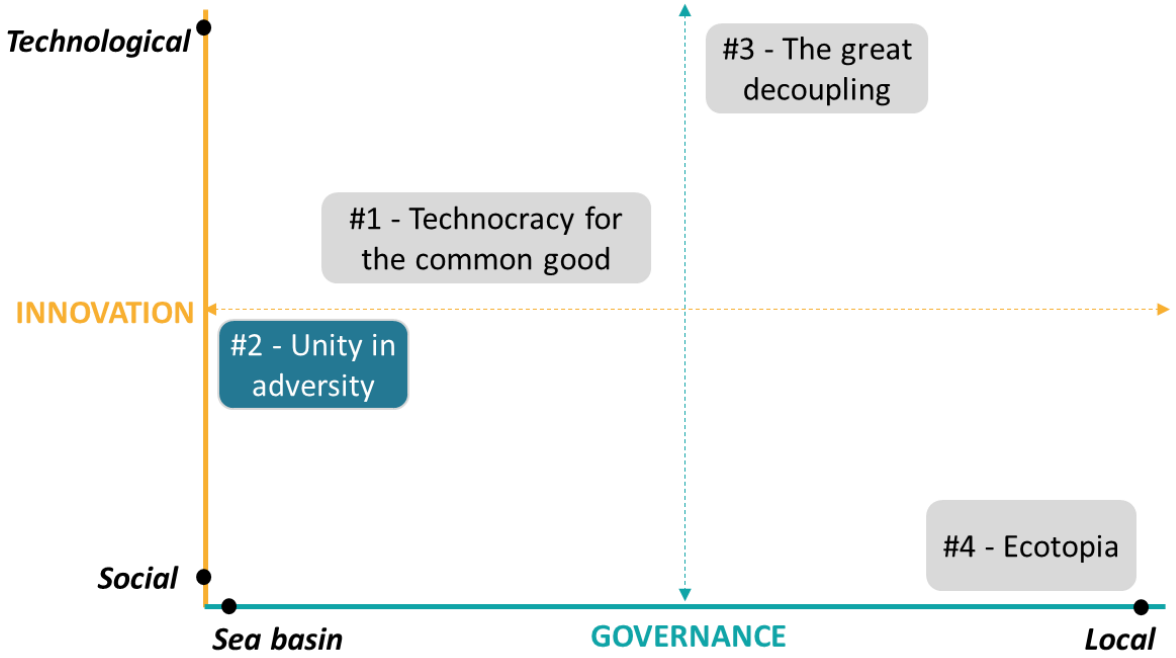
© Fanny Didou

IMAGINARY 2: UNITY IN ADVERSITY

After the several crisis of the 2020s (COVID, war in Ukraine), Black Sea countries have decided to join their forces to face climate-related events which have been increasingly brutal since the 2030s.

Stronger together: a resilient and smart-specialized Black Sea

Through cooperation, Black Sea countries have found a way to be economically, socially and environmentally stronger, and to address their common challenges together. Following their commitment to a strong regional cooperation and the elaboration of common policies, the management of maritime and coastal activities is now part of a regional maritime spatial planning process. Smart specialization strategies were designed to capitalize on the strengths of each Black Sea country. Maritime activities are distributed along the coastline where their potential is the highest. Each country is a component of the Blue Economy puzzle: Romania for its skills in advanced eco-conception of ships, Türkiye for the quality of its aquaculture products, etc.



The development of marine renewable energies supported energy transition, and the reduction of carbon emission was accelerated for all sectors after the Black Sea suffered from severe consequences of climate change in the 2030's. Activities like fishing, boating, cruising and yachting, some of which have significantly decreased, had to adapt, to reduce their fuel consumption by using alternative energies, especially marine renewable energy. The decline in certain activities is largely related to this new "Black Sea spirit" which limits international trade and favors the basin above all. Nevertheless, Black Sea countries continue to export their products.

Citizens are interacting with each other better than they used to, encouraged by the regional authorities to travel, work and study across the sea basin. The Black Sea is not only economically stronger, it became a genuine cultural identity, much of which is based on a common maritime heritage.

Nevertheless, following the strike of climate change coastal population has significantly dropped. In 2035 a big campaign was launched by the Black Sea Commission to displace key infrastructure inland (e.g., ports) and to de-urbanise the coastline where risks of erosion and submersion were the highest.

A centralised governance at sea basin scale

The greater cooperation between Black Sea countries has directly resulted in strengthening the pre-existing frameworks which are now driving public policies in the region. Top-down measures are adopted through common policies: the Strategic Research and Innovation Agenda, the Common Maritime Agenda, which became the key maritime policy for the whole Black Sea, are supported by the Black Sea Maritime Fund established in the 2030's. The former Black Sea Commission Advisory Groups were extended and are working as Directorates General. They elaborate maritime policies based on the contribution of the Activity Centers which are organizing public consultation in each of the Black Sea countries.

Maritime and coastal stakeholders are represented in the Black Sea Commission alongside government representatives and regional authorities. The Blue Economy workers are sitting in BS Commission through their professional organizations defending workers interests and ensuring equitable work conditions all around the sea basin. NGOs are also represented in regional commissions, providing scientific support and expertise assisting decision makers. Progressively from the 2025's the European Union has become less and less influent in the Black Sea, outshined by the Black Sea cooperation.

Ecosystem services at the core of the Black Sea political action

The increasingly severe environmental and climate pressures of recent decades have shaped management of nature in the region and States have accelerated the transition toward sustainability since the 2030.

By 2050 investments in nature (e.g., nature-based solutions) and biodiversity (e.g., carbon storage) are heavily promoted as a means of mitigating and adapting to environment and climate-related problems. Cumulative impacts assessments of maritime activities are integrated in the elaboration of the regional maritime spatial plan, and ecosystem-based management has become the basis of each policy.

The Black Sea is seen as one ecosystem and is managed as such by regional authorities. The Black Sea Commission has heavily supported research in ecosystems connectivity to support management measures but also to better know how climate change has affected species behavior and habitats. The several Specially Protected Areas of Black Sea Importance established in the 2030's were used as laboratories to monitor changes and implement restoration measures.

Regulations on environmental liability were strengthened to force companies to limit environmental risks and accidental pollutions.

This has, for example, led to a generalisation of risk management approaches, as well the adoption of the "Avoid, reduce, compensate" approach.

In 2035 Black Sea countries, gathered in the Black Sea Commission, signed a memorandum on oil and gas exploitation, which embodies the strong cooperation on reducing fossil resources exploitation.

Well-being and health are highly prioritised over GDP which is no longer a social and economic indicator anymore. The seaside is at the core of this wellness society where the "blue health" concept was largely embraced by citizens. In coastal areas that were restored and re-natured, seaside resort were established where possible, providing health programmes for all the Black Sea citizens after researchers in the 2030's established a link between benefits of the sea for physical and mental health. In this context, marine component are highly used in pharmaceuticals.

UNITY: 2050 BLUE ECONOMY

Maritime transport

**Regional intensity: status in 2050 compared to 2023*

Regional intensity*: **stable (~)**

In 2050, **shipping remains an important activity at basin scale**, as the most efficient means of transport (Co2/kg transported), although in much **smaller volumes than in 2020**. Innovations have allowed to reduce fuel consumption (in addition to reduced cruising speeds), and associated emissions, but a significant share of the fleet is still directly or indirectly dependent on fossil fuels, and carbon-neutrality is mostly attained through compensation. The sector is indeed considered as an "essential" mean of exchange at basin scale: food, minerals, wood, etc. Passenger transport has also increased to replace an almost-obsolete air transport and has allowed to maintain relations between the inhabitants of the various Black Sea countries. In addition, some commercial ships have been converted to be used in MREs installation and maintenance. All ships follow precisely delimited routes designed to minimize their impacts on the environment, avoiding MPAs and other designated areas. Shipping fleets are owned and operated by a handful of private companies working at basin-scale.

Shipbuilding & repair

Regional intensity: **stable (~)**

Thanks to the relative stability of the shipping activity, **the major Black Sea shipyards, located on the western half of the basin, have managed to maintain activities by focusing on**: 1) **repair and recycling** of the remaining vessels, benefiting from the relocation of ships to the Black Sea and the consequent removal of the international competition that previously governed this market; 2) **Upgrading** the remaining vessels to the new emissions' standards and environmental requirements, seizing on the new know-how and technologies associated with new propulsion and co-propulsion systems (e.g. TWOT – Romania) 3) **Adapting** the fleet to new uses, such as aquaculture production and MREs implementation and maintenance; and finally 4) **Producing parts for Offshore Wind Farms**. As a result, the sector has managed to remain relatively stable. Cooperation has allowed to boost innovation for more sustainable ships.

Offshore Oil & Gas

Regional intensity: **significant decline (--)**

By 2050, **the use of fossil fuels is drastically reduced and regulated**, limited to specific vital activities, and strictly compensated. In this context, **some strategic gas deposits might continue to be exploited sparingly, but the overall activity would be minimal**. The 2035 memorandum on offshore oil and gas in the Black Sea has led to the complete withdrawal of the activity in the basin in 2050, considered as too risky for the environment.

UNITY: 2050 BLUE ECONOMY

Coastal & maritime tourism

**Regional intensity: status in 2050 compared to 2023*

Regional intensity*: **decline (-)**

After the collapse of tourism in the Black Sea in the 2020's, resulting from the geopolitical and health crises that marked the decade, the sector has progressively managed to reconfigure itself, maintaining a decent level of activity, albeit lower than at the beginning of the century. This trend was mainly driven by the **upswing of regional tourism** in the late 30's, in response to citizens' need to understand and interact with the Black Sea and its communities, and thanks to affordable maritime transport options. Drawing lessons from the **damage to coastal infrastructure caused by extreme weather events, touristic infrastructures have been relocated** further from the sea, or on higher grounds, and have been **upgraded to resist climate events** (flood protection; natural cooling, etc.). These are mostly large-scale infrastructures (hotels, spas and balneotherapy), operated by private companies, and carefully applying environmental standards (water and waste management, energy consumption, etc.). They are located close to so-called "Blue Spaces", segments of coastline that were previously urbanized, but which have been renatured, and where visitor numbers and practices are strictly controlled to guarantee respect for the environment and the serenity of visitors.

Cruise tourism

Regional intensity: **decline (-)**

In 2050, **cruise ships still ply the Black Sea**. A handful of **large wind-powered vessels**, operated by the *Black Sea Cruise Company* (created in the 30's), offer sea-basin tours at affordable costs, that attract thousands of travelers every year. Non-invasive moorings have been installed within areas of interest and MPAs to avoid impacts on the environment. Each country is equipped with at least one dedicated dock or harbor.

Yachting & boating

Regional intensity: **stable (~)**

In 2050, **the yachting sector has managed to keep its head above water**, thanks to the **revival of regional tourism**, strongly encouraged by Black-Sea countries, and the development of electric propulsion for small units. Nonetheless, the sector has **undergone significant adaptation** : weather events severely impacted dedicated port infrastructures, as well as a large part of the fleet, leaving the sector with no choice but to work with a reduced number of boats. As a result, the sector **has moved from an ownership model to a rental one**, with companies providing boats and skippers to both tourists and local communities. **Sailing has become the most popular activity**, although electric boats are often found very close to shore and in canals. Most ships are taken out of the water during the storm season (winter), with newly created storage infrastructures. New schools and teaching programs encourage the younger generations to take up sailing and explore "their" Black Sea.

UNITY: 2050 BLUE ECONOMY

Fisheries

**Regional intensity: status in 2050 compared to 2023*

Regional intensity*: **stable (~)**

In 2050, **fisheries are still very active** in the Black Sea, mostly thanks to the **immense progress made in the management of stocks at regional level** through the **General Fisheries Commission for the Black Sea** (GFCBS), a dedicated commission that separated from the Mediterranean one in the 2030's. The GFCBS is now responsible for the assessment of stocks and the definition and distribution of **quotas**. These are set in a precautionary approach, not only to **ensure the respect of MSY principles**, but also to **take into account cumulative impacts**, and to **preserve non-commercial species and other ecosystem services**. At the same time, practices considered as too harmful for the environment have been banned (e.g., trawling), and **fishing has been prohibited within most MPAS** and other designated areas (nurseries, no-take zone, SPABSI, etc.). The fishing fleet is mostly made of hybrid small-scale units (wind + electricity) operating in coastal waters, although some larger wind-powered ships also operate further offshore. Monitoring and surveillance are insufficient to totally prevent illegal activities, but they remain marginal in a well-managed and productive ecosystem. Invasive species have become quite common and constitute a significant share of catches. As a result of the reduction of imports (deglobalization), the local demand and associated prices have increased.

Coastal & marine Aquaculture

Regional intensity: **stable (~)**

By 2050, **aquaculture is still quite marginal** in the Black Sea, and has not seen the development that some had predicted or even hoped for. Indeed, the regional **management of fisheries has allowed for significant and stable wild fish production**, which supplies the local market with affordable, quality products, leaving **no room for aquaculture products**. In addition, a sanitary crisis emerged in aquaculture farms in the 30's, associated with toxic algal blooms, which nullified consumer interest. However, some countries with existing infrastructures (Turkiye, Romania, Ukraine) have managed to keep them in business by focusing on exotic and rare species, for which the demand is still high in the face of an overall deglobalization.

UNITY: 2050 BLUE ECONOMY

**Regional intensity: status in 2050 compared to 2023*

Blue Biotechnologies

Regional intensity*: **growth (+)**

By 2050, the **Blue Biotechnology sector has grown** in the Black Sea, **thanks to a dedicated regional research program under the SRIA**. The best-equipped universities (both human and material) in the basin have carried out an **unprecedented inventory of the genomic resources** of the basin's marine ecosystems, with a particular focus on algae, which has led to interesting **results for the health sector**. All the discoveries have been **openly licensed** throughout the Black Sea, and some have even led to the creation of new protected areas.

Marine Renewable Energies (MREs)

Regional intensity: **growth (+)**

Smart-specialization at basin-scale has allowed for an **optimal development of offshore wind** in the Black Sea, with major parks being built in areas **where the resource is abundant and easily exploitable** (i.e., the western half of the basin). All the basin states have contributed to the financing of these infrastructures through the dedicated regional energy agency, in return for setting up power exchange lines towards the less advantaged areas.

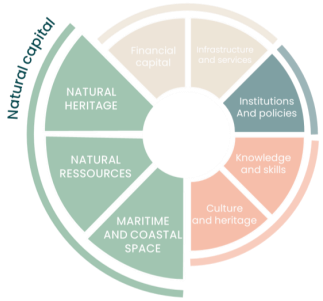
> OVERVIEW

Shipping	Shipbuilding	O&G	Tourism	Cruise	Boating	Fisheries	Aquaculture	Biotechnologies	MREs
~	~	--	-	-	~	~	~	+	+

Regional intensity: status in 2050 compared to 2023 significant decline (--) decline (--) stable (~) growth (+) significant growth (++)

UNITY: 2050 MARITIME & COASTAL CAPITAL

NATURAL CAPITAL



Natural heritage

Status*: **increased (+)**

Since 2030 countries have progressively adopted a **common sea basin scale approach regarding nature management** due to the global character of climate change. The Black Sea is seen as one marine ecosystem that needs systemic management. **Transboundary MPAs were developed to support strong connectivity** between ecosystems and several **Specially Protected Areas of Black Sea Importance were created** in the 2030's. A regional list of coastal spaces to be restored was established after the severe impacts of climate change on the Black Sea coast. Regional institutions have highly invested in regulating ecosystem services (e.g., carbon storage) to help countries being more resilient to climate change.

Natural resources

Status*: **increased (+)**

The management of natural resources is decided at regional level through cooperation mechanisms. Extracting activities, which are emitting CO2 the most (e.g., oil and gas), have been considerably reduced. Black Sea oil and gas stocks are only exploited when necessary and to compensate for renewable energy. The **General Fisheries Commission for the Black Sea**, established in the 2030's, is managing and monitoring biological resources in the sea basin and scaled down the Maximum Sustainable Yield based on the evolutions related to climate change and to ensure the levels of available resources.

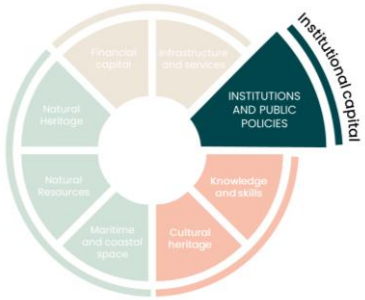
Maritime and coastal space

Status*: **stable (~)**

Due to strong impacts of climate change (floods, erosion, submersion) the Black Sea coastline has changed in 2050 and some internal and inland migrations within States have **highly decrease pressure on the coasts mainly due to a drop in coastal populations**. A specialization of activities is implemented at the sea basin scale in order to develop activities in the most suitable location. In the 2040's the CMA organization has made compulsory for all Black Sea States to develop both MSP and ICZM to consider this new distribution of activities.

**MCC Status of 2050 compared to 2023*

UNITY: 2050 MARITIME & COASTAL CAPITAL



INSTITUTIONAL CAPITAL

Institutions and policies

Status*: **increased (+)**

Black Sea countries have reached a **high level of cooperation and the existing Common Maritime Agenda has become a structuring framework for the region**. Despite the influence from the European Union, the Black Sea is a stronger and well working partnership, achieving great progresses in environmental protection and management through the adoption of binding measures between States. Regional maritime spatial planning is implemented by the CMA authority, enabling a cross-border management of activities at sea. **Top-down regulations are implemented at national level**, progressively outshining the EU in the region. Cooperation with the EU remains quite important in the field of foreign and security policy, especially due to the important population displacement linked to climate change. This basin-wide management has led certain countries to specialise in specific activities. Regional workers organisations are represented in the CMA which enable a continuous dialogue with decision-makers.

TECHNICAL CAPITAL

Infrastructure and services

Status*: **decreased (-)**

Big regional port infrastructure are maintained in key locations (e.g., Odessa, Constanta, Batumi) and developed to adapt new technologies and support decarbonization of maritime activities. Infrastructure and services related to marine renewable energies have also increased. These "**Black Sea maritime hubs" are concentrating the best technologies and services**. This is being done at the expense of some countries whose infrastructures are being abandoned or repurposed. **Specific competences are still in the hands of national governments**, such as infrastructure related to climate change adaptation. Overall, much more resilient infrastructure were build following the climate change strike – or were adapted (e.g., retreat inland).

Financial capital

Status*: **stable (~)**

Financial support is channelled and decided at regional level through cooperation structures which have developed financial tools, such as the **Black Sea Maritime Fund (BSMF), and which highly encouraged investment in nature.** Some countries are critical of this management, considering it should remain a State prerogative. Taxation is still based on individuals and companies, but **new taxations were introduced in the 2040, especially on imported products** to support the regional economy. Tax revenues are shared between countries to support balanced economic development between states.

**MCC Status of 2050 compared to 2023*

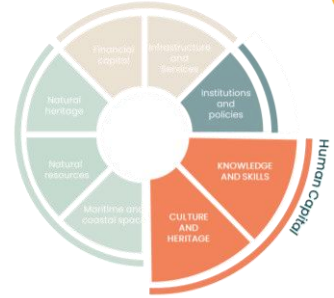
UNITY: 2050 MARITIME & COASTAL CAPITAL

HUMAN CAPITAL

Knowledge and skills

Status*: **increased (+)**

Knowledge development and sharing between country is based on the **Strategic Innovation and Research Agenda (SRIA) which has become a key framework** in the Black Sea. Wide **transnational research network** have been created and **university exchanges** between Black Sea countries are encouraged through the common Blue Economy education programme implemented in the Region. Patent and discoveries are shared between countries as they are considered as common interest. **A specialization strategy was developed for each countries to exploit their best assets**. Therefore, each country has developed and is **recognized for its specific know-hows** establishing the reputation of the Black Sea in Europe and beyond.



Culture and heritage

Status*: **stable (~)**

As the coast is less populated, more space was given for renaturation as well as nature protection. These now called "**blue spaces**" have become ideal to develop social wellness and are no longer seen as suited for water sports and consumption anymore. Several countries have introduced **'blue health' holidays**, entitling citizens with heath issues and diseases to take one week a year dedicated to wellbeing on the coastline. **Most of the build heritage, such as lighthouses, were destroyed by coastal erosion and floods** in the 2030's. Some of these remains were scanned by drones before they were destroyed and can be visited through virtual reality in most maritime museums. The **International Black Sea Day** every 31st of October remains and celebrates every year the common maritime history of the sea basin. This history is transmitted generation after generation by Black sea ambassadors who have become popular citizens, beyond the Black Sea.

> OVERVIEW

**MCC Status of 2050 compared to 2023*

Natural heritage	Natural resources	Space	Institutions & policies	Infrastructure & services	Financial capital	Knowledge & skills	Culture & heritage
+	+	~	+	-	~	+	~

Status: MCC Status of 2050 compared to 2023

decreased (-) stable (~) increased (+)

PILOT SITE ADAPTATION – S2 UNITY IN ADVERSITY

In a context of regionalization and specialisation the imaginary offers contrasted developments for the pilot sites. Each of them leverages its specific strengths to adapt to global trends.

Odessa (PS4) stands out for its resilience and dynamism, particularly due to its strategic position for post-war agricultural exports and a gradual yet notable transition from industrial activities to more sustainable sectors. Varna (PS2) emerge as hubs of innovation for low-carbon shipbuilding, MRE and biotechnologies, benefiting from existing infrastructure and proximity to Europe. The Bosphorus (PS1), even though advanced as well in shipbuilding innovations, is less advantage by this imaginary. In contrast Sinop (PS7) shows relative stability, with limited but specialized activities, especially in tourism and cruise. Batumi (PS6) stands out in sectors related to coastal tourism, including cruise. However, PS1, PS7 and PS6 show limited developments in MRE and biotechnologies due to a lack of research potential and natural resources.

	Regional trend	PS1 **Bosphorus**	PS2 **Varna**	PS3 **Danube**	PS4 **Odessa**	PS6 **Batumi**	PS7 **Sinop**
Shipping	~	~	~	-	+	~	~
Shipbuilding	~	+	+	~	~	~	~
O&G	- -	- -	- -	- -	-	- -	- -
Tourism	-	-	- -	+	+	+	-
Cruise	-	-	-	~	-	+	~
Yachting	~	~	-	+	~	~	~
Fisheries	~	-	~	~	+	~	~
Aquaculture	~	-	~	~	~	~	+
Biotechnologies	+	~	+ +	+ +	+ +	~	+
MREs	+	~	+ +	~	+ +	~	+

**See regional imaginaries* Negative deviation Positive deviation

The Danube (PS3) maintains a balance through strong practices in eco-tourism and sustainable fishing, although its energy transition is constrained by the need to preserve natural habitats.

PILOT SITE ADAPTATION – S2 UNITY IN ADVERSITY

Shipping activities are now limited to the Black Sea region which was converted into an “essential” mean of exchange. Despite this context Bosphorus (PS1) and Varna (PS2) have succeeded in maintaining a stable activity. However, there is a notable decline in the Danube (PS3) due to new protection measures in the area (Specially Protected Areas of Black Sea Importance). In contrast, Odessa (PS4) sees a significant increase in shipping activities as it regains its role as a Black Sea hub after the war, particularly driven by agricultural exports.

The **shipbuilding** industry has undergone significant transformation. Western basin shipyards were able to transition towards low-carbon technologies and Bosphorus (PS1) and Varna (PS2), emerge as central players in this specialised field, due to existing workforce and infrastructure. Meanwhile the other pilot sites maintain limited but relatively stable activities, with potential for further specialization.

While the transition away from **oil and gas** is slower in Odessa (PS4) , by 2050, the industry has been abandoned across the region, due to the signature of a memorandum by the Black Sea Commission in 2035.

Coastal tourism experiences a general decline, though some areas stand out. The Danube (PS3) sustains its tourism sector through strong eco-tourism practices. In Odessa (PS4) , tourism begins to recover post-war, and Batumi (PS6) regains its status as an attractive destination. Varna (PS2), which touristic activity was based on mass and international tourism faces more difficulties considering the changes in coastal tourism dynamics.

The **cruise industry** follows a similar pattern to tourism, with a general downturn but with the Danube (PS3) and Batumi (PS6) emerging as exceptions. The Danube’s (PS3) eco-tourism approach and Batumi’s (PS6) renewed appeal drive their resilience in this sector.

PILOT SITE ADAPTATION – S2 UNITY IN ADVERSITY

The **yachting** fleet has decreased in size but has undergone significant transformation, including electrification and a shift towards rental systems. There is strong regional demand, and climate change has led to the construction of hangars for winter storage. Varna (PS2) experiences a decline due to the challenges of this transition, while the Danube (PS3) sees an increase due to environmental interest.

The fisheries sector remain relatively stable across the basin, though there is a decline in Bosphorus (PS1) due to over-industrialization. In Odessa (PS4), the spillover benefits from the adjacent marine protected areas enhance fishing activities.

Aquaculture sees limited development across the region thanks to productive fisheries. Countries with the highest potential and existing infrastructure manage to maintain their activities at a relatively stable state: Varna (PS2), Danube (PS3), and Odessa (PS4). Sinop (PS7) stands out by managing to slightly develop its aquaculture sectors by focusing on exotic and rare species, for which the demand remains high despite the trend of deglobalisation. Batumi (PS6) the sector remains limited overall.

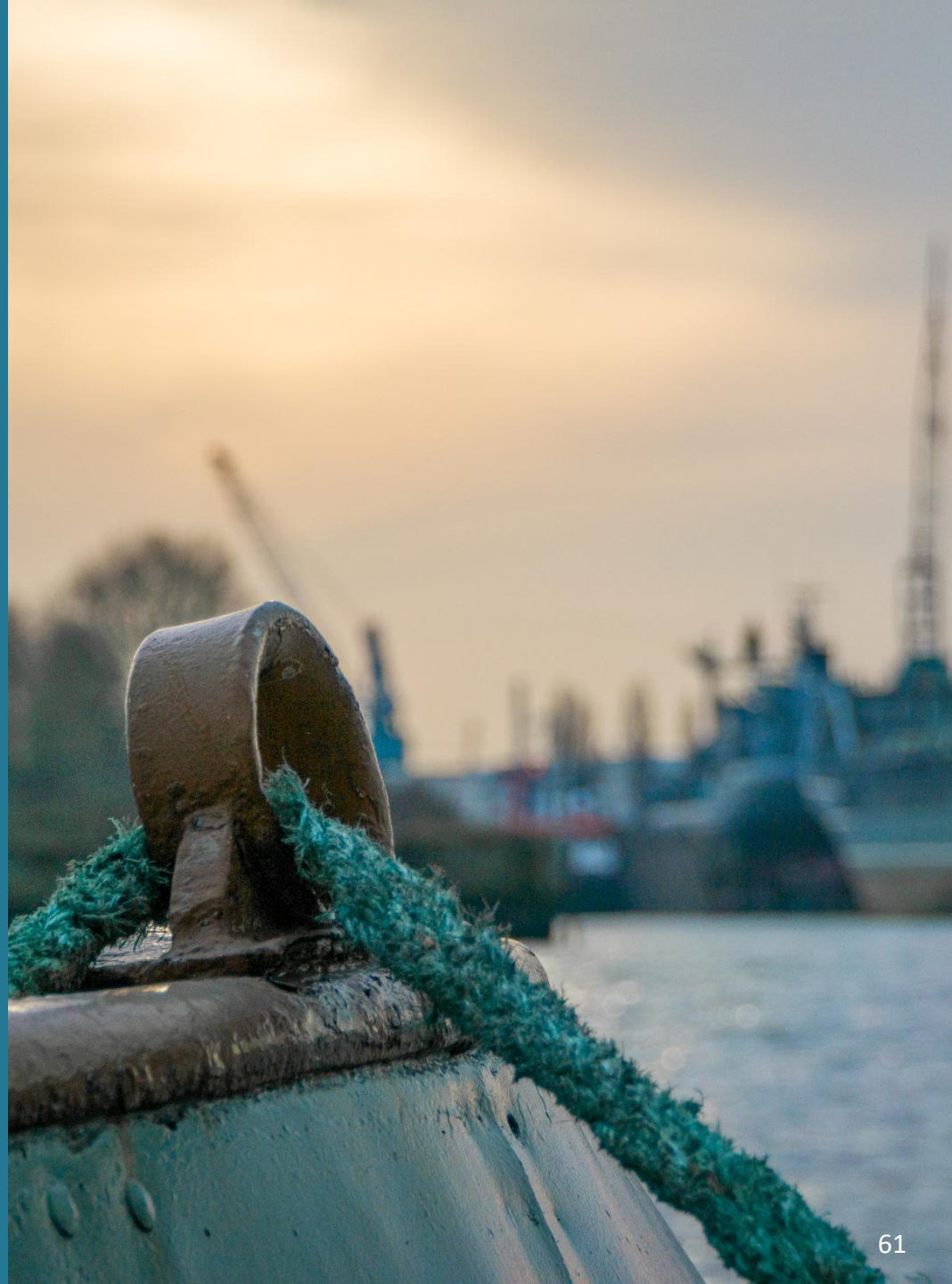
The Danube (PS3) and Varna (PS2) emerge as major research Odessa (PS4) for **biotechnologies**, particularly thanks to their former connection with the EU and European research initiatives. Odessa (PS4) plays a crucial role in supplying raw materials, notably algae, used in many pharmaceuticals.

There is significant development of **Marine Renewable Energy (MRE)** in Varna (PS2) and Odessa (PS4) , facilitated by abundant resources and compatibility with algae protection efforts. These pilot sites are providing renewable energy to the rest of the basin through a common grid. The Danube (PS3) is avoided to protect migratory bird populations, while Batumi (PS6) has no resources for MREs. Sinop (PS7) stands out from the other sites as key stakeholder for wave energy.

IMAGINARY 3

THE GREAT DECOUPLING

By BRIDGE-BS



The Great Decoupling

Black Sea 2050

© Fanny Didou

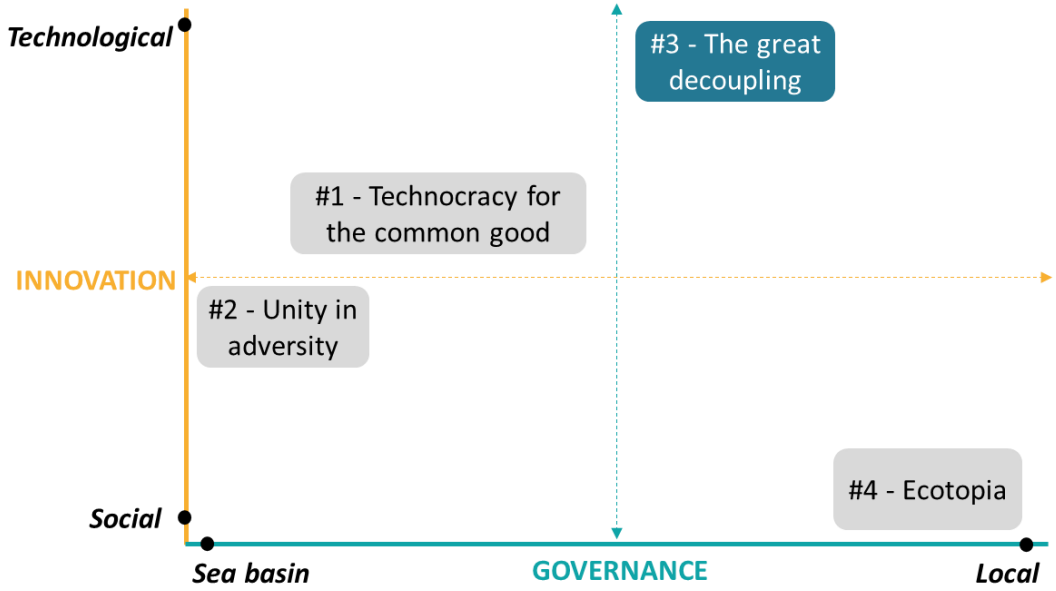
IMAGINARY 3: THE GREAT DECOUPLING

The Black Sea has known unprecedent technological breakthrough in the 2030's enabling the development and spread of innovation in the whole sea basin, transforming the Blue Economy.

Technological breakthrough and the era of Blue Biotechnologies

The technological breakthrough which benefited to all Black Sea countries has allowed for energy-abundant societies, boosting especially the renewable energy sector. Alongside the development of nuclear power plants, a diversity of marine renewable energies were developed across the Black Sea: offshore wind farms, tidal turbines, solar panels on the sea surface, etc. These innovations were implemented with both large-scale infrastructure led by big energy companies and small local installations developed by SMEs.

The most spectacular advances were made in the field of biotechnology, which relies heavily on marine, or "blue" biotechnologies. Macro algae cultivation is the leading aquaculture activity in the Black Sea, providing a wide range of natural components used in the manufacturing of all kind of products: bioplastics, fertilisers, food, etc.



The health sector has considerably expanded and is primarily based on marine products. This massive use of algae also provided the necessary biomass to support the transition to biofuels for the majority of maritime sectors. "Marine biofuel" has become the main energy source supplying for maritime activities (boats for shipping, fisheries, aquaculture, etc). It is used alongside electricity and hydrogen, mainly produced from offshore wind farms. The algae sector represents and important share of the overall blue economy and is mainly constituted of small family businesses evolving in a quite competitive economic environment

Overall, the economic sphere is driven by a vibrant and dynamic mix of companies, very diverse in size and types. SMEs and startups have flourished in the 2040's supported by States and benefiting from regional and European fundings. The European Union especially had a great influence in the spread of technological innovation for the sustainable Blue Economy in the Region.

Liberalized exploitation of marine resources: energy, genetics, biomass

To be able to achieve this technological revolution marine resources have been largely used during the 2030's until overexploitation.

Overall, not much regulation was adopted on resources management, leading to (i) the situation of resource scarcity and (ii) a fragmented management (at national and sometime local levels) providing for immediate economic needs. The context has also led to the progressive exploitation of Black Sea gas hydrates by private businesses with few national regulations. Facing the progressive lack of resources, companies have started to implement a high level of circularity in their practices and activities, strongly encouraged by governments.

The race for resources to provide for the needs of technological development has led to weaken environmental protection with limited regulation. States have considered unnecessary and too expensive to implement real protection and conservation measures considering the new possibilities offered by technology and biotechnology to remediate any impact on the environment.

Therefore, the good environmental status of the marine and coastal environment is maintained thanks to technological innovations and geo-engineering approaches.

If concerns were raised from the civil society about the potential unknown and long-term effects of these solutions, States see these as a compromise to fulfil both economic and environmental requirements at the same time.

A competitive Black Sea, with concurrence between countries for resources and technologies

In the 2030's, to address the rapid technological advances, States and regional authorities have highly invested in research and innovation. The European Union, providing great support for its two Member States, Romania and Bulgaria, has gained considerable influence using innovation as a new "soft power" and funding many research projects in the Black Sea. The EU has become an influent entity in the region and throughout the years, several Black Sea countries, already candidate to become Member States in the 2020's, progressively integrated the European Union.

However, if the new EU composition has caused a major reshuffle in the Black Sea geopolitical context, the primary motivation of the new Member States remains very pragmatic and focused on the benefits offered by the EU, particularly in terms of knowledge transfer and fundings. Therefore, the competition between States in the Black Sea remains fierce, not only from an economic perspective.

For example, training capacities, education and research have become significant in attracting qualified workers, providing for the blue economy businesses.

Space, on the coast and at sea, as become another major driver for competition in the Black Sea. A competition between States, which sometimes challenge territorial boundaries at sea in order to expand their Economic Exclusive Zones; and a competition between private companies to develop their activities.

DECOUPLING: 2050 BLUE ECONOMY

**Regional intensity: status in 2050 compared to 2023*

Maritime transport

Regional intensity*: **stable (~)**

The activity remains stable in the sea basin, but changes in the sector's dynamics were observed: in an extremely competitive blue economy and liberalized market, big shipping companies have stopped their activities in the Black Sea due to the proliferation of shipowners. The advances of blue biotechnologies have enabled a shift from fossil-fuel to renewable energy and a reduction of the sector's carbon emissions. Technological advances and research in shipbuilding and design supported the reduction of underwater noise, with the creation of new boat propeller blades. The advent of autonomous ships changed sailing practices and knowledge, with a need for new skills related to computing, data processing, etc.

Shipbuilding & repair

Regional intensity: **growth (+)**

Due to the energy transition of maritime sectors and the emergence of new technologies, an exponential need for transforming, adapting and creating new equipment have emerged: new generations of ships powered with biofuel, electricity and hydrogen, adaptation of the existing fleet, use of new materials in ship design, etc. Therefore, SMEs have flourished all around the black sea, providing for maritime sectors to achieve their transition. In countries where the sector was already well developed the activity has increased, driven by technological innovation: use of robotics, automation, etc. enabling productivity gains. Beyond innovation, the sector development was based on the diversification of capacities and skills.

Offshore Oil & Gas

Regional intensity: **significant decline (--)**

The development of biotechnologies and alternative energy sources has allowed Black Sea societies to get totally rid of their dependence on fossil fuels. There is no more extractions in the sea basin and former oils and gas platforms were decommissioned and used by other activities (e.g., offshore terminal for shipping).

DECOUPLING: 2050 BLUE ECONOMY

Coastal & maritime tourism

**Regional intensity: status in 2050 compared to 2023*

Regional intensity*: **growth (+)**

The sector has continuously grown, even after the severe impacts of climate change, thanks to the development of green infrastructures and new technologies ensuring water supply and improved waste management. The new forms of decarbonised mobility allow the international clientele to come to the Black Sea. Due to an overcrowded maritime and coastal space, synergistic approaches were sought between tourism and other activities (e.g., diving and aquaculture, pesca-tourism, etc.). In addition to the traditional tourist activities, a new segment has emerged and quickly developed, industrial tourism, attracting thousands of tourists in Black Sea countries to visit offshore renewable energy installations. Based on local assets, the competition between countries is fierce to attract visitors.

Cruise tourism

Regional intensity: **growth (+)**

With the transformations of the Black Sea fleet to fossil-fuel free technologies, the cruising sector was able to maintain and increase its activities. The existing cruising fleet has been adapted to new energies, especially biofuels and new boats have benefited from a high level of innovation. The sector addresses the expanding demand from the touristic sector. Even if new solutions have considerably reduced chemical and noise pollution, the lack of regulation has however led to over frequentation of some natural sites, and occasional damage to important natural habitats (anchorage, turbidity)

Yachting & boating

Regional intensity: **stable (~)**

As for the other sectors of the blue economy, new technologies have supported the development of sustainable yachting options, powered with low carbon energy sources. Sailing solutions were pushed in the 2030's but quickly abandoned due to increasing low carbon propulsion systems, requiring less navigation skills than sailing and therefore more accessible. However, maritime space was largely devoted to aquaculture and MREs and few space is left for yachting and boating, which has become an expensive business. By 2050 only few people can afford to sail: wealthy people owning their boat are benefiting from privileged services in the few marinas of the Black Sea. Rental services of small electric boat were also developed to maintain the attractivity of the sector.

DECOUPLING: 2050 BLUE ECONOMY

**Regional intensity: status in 2050 compared to 2023*

Fisheries

Regional intensity*: **decline (-)**

The fishing fleet has become very diversified and competing with both industrial and artisanal fisheries, but the overall demand and prices have decreased to aquaculture substitution. Consumers have turned to aquaculture products, as wild fish is considered more prone to pollution (chemicals, plastics) and new technologies have enables the development of low-impact fish-farming. The overall catches have therefore decreased. Fishing still exists, but with the lack of national regulations and the affordable abundant energy, illegal fishing has grown, leading fishermen to ensure the surveillance and monitoring of catches themselves, encouraging mutual surveillance within the fishery community. The remaining fleet is competing for low-value fishes, which are turned into fish meal and oil to supply aquaculture farms.

Coastal & marine Aquaculture

Regional intensity: **significant growth (++)**

Algae harvesting and farming have become the major aquaculture activity in the Black Sea. The sector has considerably expanded with the breakthrough of blue biotechnologies and the important demand of algae to produce biofuels. Fish farming is the second largest activity within the aquaculture sector. After several years of crisis during the 2020's, food security has become a major challenge worldwide and in the Black Sea, providing great opportunities for investors in this sector. Innovations (e.g., insect-based feed) and new technologies (e.g., sensors) supported the emergence of a low-impact fish farming sector, implementing the latest technologies to automatise the production, monitor the environmental status and climate change effects on fish. To optimise and diversify the production, integrated multitrophic aquaculture was developed to address the pressures and limited access to space at sea, often combining algae cultivation, shellfish and fish farming. Overall, the aquaculture production is a very diverse but tense market, providing a wide range of products: biofuels, food, feeding, new raw materials, etc.

DECOUPLING: 2050 BLUE ECONOMY

Blue Biotechnologies

**Regional intensity: status in 2050 compared to 2023*

Regional intensity*: **significant growth (++)**

The blue biotechnologies are thriving in the 2050 Black Sea. The technological breakthrough and innovations have led to its extreme development. It provides biomaterials, remediation solutions against pollution and health products; supports the production of green hydrogen and biofuels; algae are also exploited by researchers for innovative compounds (e.g., biomimetics). The scientific exploration of the Black Sea is led and financed by the sector, in search for new species and compounds. The sector is very dynamic and composed of big industries, SMEs and start ups, engaged in a fierce struggle for the discovery of new revolutionary compounds. This competition within the private sector is also felt between national public authorities which intend to attract the best researchers and workers to file as many patents as possible.

Marine Renewable Energies (MREs)

Regional intensity: **significant growth (++)**

The production of marine renewable energy is possible through the implementation of diverse technologies based on wind, waves, currents, sun, etc. The production is made both at local level, with small scale infrastructure providing energy to local communities, to large-scale production units. Offshore wind farms are systematically associated with other activities, using the multi-use approach, especially in the western part of the Black Sea where offshore wind infrastructure are predominant. In the southern part, SWAC technologies are implemented. To strengthen the development of such technologies, companies established at local scale often offer the possibility to local communities to invest in offshore renewable in order to reinforce social acceptability.

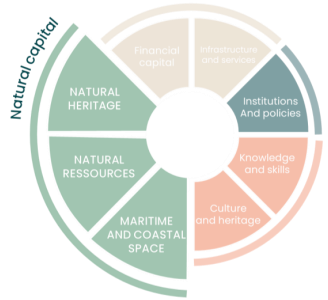
> OVERVIEW

Shipping	Shipbuilding	O&G	Tourism	Cruise	Boating	Fisheries	Aquaculture	Biotechnologies	MREs
~	+	--	+	+	~	-	++	++	++

Regional intensity: status in 2050 compared to 2023

significant decline (--) | decline (--) | stable (~) | growth (+) | significant growth (++)

DECOUPLING: 2050 MARITIME & COASTAL CAPITAL



NATURAL CAPITAL

Natural heritage

Status*: **stable (~)**

After the impacts of climate change, restoration measures were undertaken by States mainly using biotechnologies. Polluted marine spaces were restored thanks to the implementation of marine geoengineering principles. Plastic pollution is now almost inexistant after researchers discovered a marine bacteria able to digest plastic components and largely introduced it in the Black Sea. During pollution event, phytoremediation has become the solution to overcome environmental damages. The coasts are reinforced against erosion thank innovative infrastructures which stabilise the coastline. Marine protected areas were designated by States, but marine activities being not excluded from these areas, they have proven to be ineffective in protecting biodiversity and known for being “paper” MPAs.

Natural resources

Status: **decline (-)**

In 2050 the consumption of natural resources has drastically decreased mainly due to their decline. Indeed, in the 2030’s the race for new technologies has pushed the exploitation of deep seas resources (cobalt, nickel, lithium, iron). In 2050 after to the boom of blue biotechnologies, and the development of large-scale aquaculture, algae natural resources have decreased and are now highly monitored and regulated to avoid their overexploitation. Due to climate change and after years of overexploitation, Black Sea fish stocks are at very low level. To face the scarcity of resources, companies, supported by States have implemented high level of circularity and efficient use of resources.

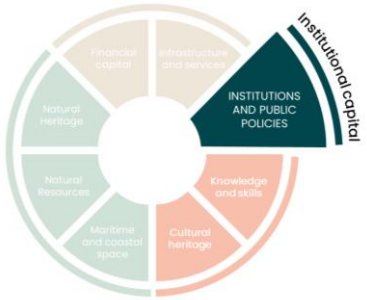
Maritime and coastal space

Status: **stable (~)**

In 2050, maritime and coastal spaces are saturated. Large scale activities are developed on the coastal (aquaculture) and maritime (MRE) space. Innovation has enabled the development of highly integrated multi-use at sea leading to an effective use of space. There is a high level of competition between States over maritime space especially in transboundary areas. Also, the increasing number of activities at sea has led to saturation of ports which need to be adapted to the diversity of practices (from artisanal algae farming, MRE maintenance operators, etc.).

**MCC Status of 2050 compared to 2023*

DECOUPLING: 2050 MARITIME & COASTAL CAPITAL



INSTITUTIONAL CAPITAL

Institutions and policies

Status*: **stable (~)**

In the 2030's Black Sea countries have all engaged in boosting businesses in the blue economy. To this purpose the competition between countries have highly increased, each country trying to attract investors and skilled workers in the blue economy through facilitated licensing procedures and tax incentives. Bulgaria and Romania have highly been advantaged supported by the EU research programmes and funds. As a consequence, most of Black Sea countries, encouraged by the opportunities offered by the EU, have progressively become EU Member States. Nevertheless, cooperation between countries is very limited and opportunistic, rather contributing to maintain good diplomatic relationships than implementing real policy cooperation. Companies, including small businesses and multinationals, are well represented and have a strong voice in the decision-making process. Civil society organisations are trying to balance the weight of these companies in decision-making bodies. Regional frameworks such as CMA and SRIA have lost inertia in the face of competitions, both between States and companies.

TECHNICAL CAPITAL

Infrastructure and services

Status: **increased (+)**

The number of infrastructure have highly increased at sea due to the strong development of marine renewable energy in countries where resources are available. The majority of ports have adapted to new technologies dominating the shipping sectors and are electrified to reach the low carbon emission objectives. Some ports are less advanced on these issues, and face regional competition. Thanks to the technological breakthrough, private companies have collected large sets of data on maritime activities and the environment based and sell these information to public authorities. Therefore, maritime surveillance is ensured by the private sector on behalf of governments.

Financial capital

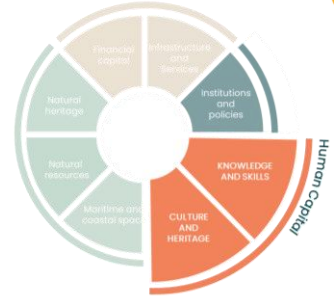
Status: **increased (+)**

The private sector has highly invested in the Blue Economy with the support of the Black Sea countries. Regional funding is mainly provided by the EU for the countries that have joined it as Member States. The dynamic economic and innovative environment of the region has attracted international private investment and multinationals. Taxes are mainly based on consumption.

**MCC Status of 2050 compared to 2023*

DECOUPLING: 2050 MARITIME & COASTAL CAPITAL

HUMAN CAPITAL



Knowledge and skills

Status: **increased (+)**

To boost innovation, Black Sea countries have invested in research and the development of new skills in the early 2030's to support the technological development and needs for the blue biotechnology and marine renewable energy sectors in particular. High level trainings and education opportunities can be found in most Black Sea countries (source of competition between states) with blue biotechnical and blue biomedical fields attracting students and researchers. A vast majority of workers from fisheries sector have retrained for sectors such as marine aquaculture (e.g., fish cages, algae, etc.), or marine renewable energies (e.g., transporting workers to offshore infrastructure). Knowledge on the marine environment is motivated by the possible exploitation that could benefit to private companies. Knowledge and data are privatised, including data on activities which are mostly produced by private stakeholders themselves to defend their interests.

Culture and heritage

Status: **stable (~)**

Due to the push for food security in the Black Sea countries, supported by the regional organisations and strategies, the priority for accessing coastal areas has been given to aquaculture operations or MRE developments in most suitable locations, at the expense of leisure activities now concentrated in specific sites. "Blue products" have become a dominant consumption products in 2050's everyday life and have flourished with since the increase of blue biotechnologies and the implementation of circular economy principles: bio-plastics made from fish skins, decorative items made of shells, bio luminescent paintings from algae, cosmetics and food complements based on marine components. Traditional maritime knowledge and culture has progressively been replaced by a culture based on the use of technologies.

**MCC Status of 2050 compared to 2023*

> OVERVIEW

Natural heritage	Natural resources	Space	Institutions & policies	Infrastructure & services	Financial capital	Knowledge & skills	Culture & heritage
~	-	~	~	+	+	+	~

Status: MCC Status of 2050 compared to 2023

decreased (-) stable (~) increased (+)

PILOT SITE ADAPTATION – S3 THE GREAT DECOUPLING

In this imaginary, the transition to a decarbonized economy clearly benefits certain pilot sites over others.

The Bosphorus (PS1), Varna (PS2), and the Danube (PS3) significantly gain from this transition due to their connections to Europe and existing infrastructure, facilitating the shift to low-carbon technologies. Varna (PS2), in particular, positions itself as a major player with substantial investments in green infrastructure, supported by European subsidies. Odessa (PS4) and Batumi (PS6) follow the general trend but with less dynamism, while Sinop (PS7) emerges as a new tourist destination thanks to its infrastructural development. Conversely, sites like the Bosphorus (PS1), despite its international connectivity, are more impacted by the decline of traditional sectors like industrial fishing. There is therefore strong variability between the sites, with those better connected to Europe or with solid infrastructure faring better, while those with less adaptable industrial bases experience more pronounced setbacks.

	Regional trend*	PS1 **Bosphorus**	PS2 **Varna**	PS3 **Danube**	PS4 **Odessa**	PS6 **Batumi**	PS7 **Sinop**
Shipping	~	+	~	~	~	+	~
Shipbuilding	+	+ +	+ +	+ +	+	+	~
O&G	- -	- -	- -	- -	- -	- -	- -
Tourism	+	+	+ +	+	+	+	+ +
Cruise	+	+ +	+	+ +	+	+	+
Yachting	+	+ +	~	+	+	~	+
Fisheries	-	- -	-	~	-	-	~
Aquaculture	+ +	+	+ + +	+	+ + +	+	+ + +
Biotechnologies	+ +	+	+ + +	+ + +	+ + +	+	+ +
MREs	+ +	+	+ + +	+ +	+ +	+	+ +

**See regional imaginaries* Negative deviation Positive deviation

PILOT SITE ADAPTATION – S3 THE GREAT DECOUPLING

Shipping activities remain stable across the basin thanks to zero-carbon technologies. Two pilot sites, Bosphorus (PS1) and Batumi (PS6), stand out due to their strategic connections. Bosphorus (PS1) benefits from its link to the Mediterranean, while Batumi (PS6) serves as a key gateway to the Caspian Sea through land connections, making them the primary entry and exit points of the Black Sea.

The **shipbuilding** industry undergoes significant technological transformation towards zero-carbon vessels. Countries with pre-existing infrastructure and strong ties to Europe benefit the most, receiving innovation funding. Bosphorus (PS1), Varna (PS2), and the Danube (PS3) region experience substantial growth in this sector. Odessa (PS4) and Batumi (PS6) follow the general trend but are less prominent, while Sinop (PS7) struggles to compete due to limited resources.

The **oil and gas** industry is completely phased out by 2050.

Although the Danube (PS3) was an early leader in eco-**tourism**, it faces increasing competition. Varna (PS2) sees significant investment in green infrastructure, supported by European subsidies, leveraging its existing airport and facilities. It also develops industrial tourism focused on its wind energy facilities. Sinop (PS7) emerges as a major tourist destination, capitalizing on its existing infrastructure and becoming a trendy spot. Varna (PS2).

The **cruise** industry expands in countries with pre-existing infrastructure. The Bosphorus (PS1) sees growth, especially due to its Mediterranean connection. The Danube (PS3) attracts river cruises, and there is renewed interest in Black Sea cruises benefiting several sites, including Sinop (PS7) (which leverages Türkiye's broader cruise sector), Batumi (PS6), Odessa (PS4) and Varna (PS2).

PILOT SITE ADAPTATION – S3 THE GREAT DECOUPLING

Yachting experiences growth across the basin, with a focus on low-carbon yachts, mostly catering to the wealthy. Bosphorus (PS1) excels in this sector, specializing in mega-yachts. Varna (PS2) and Batumi (PS6) remain stable, as they do not heavily invest in yachting.

Fisheries in Bosphorus (PS1) decline significantly due to past over-industrialization, with Turkish aquaculture becoming the major source of fish. Varna (PS2), Odessa (PS4), and Batumi (PS6) see a general decline in their fisheries, following a broader regional trend. The Danube (PS3) maintains stable fisheries due to its low-impact traditional practices, and Sinop (PS7) remains stable, focusing on forage fish for aquaculture (despite a reduced fish meal ratio in feed).

Three countries stand out in **aquaculture**: Varna (PS2) and Odessa (PS4), which benefit from resource potential and financial capital to invest in infrastructure, and Sinop (PS7), which leverages its experience and expertise in the field. Bosphorus (PS1), the Danube (PS3), and Batumi (PS6) see some development in aquaculture but remain less competitive overall.

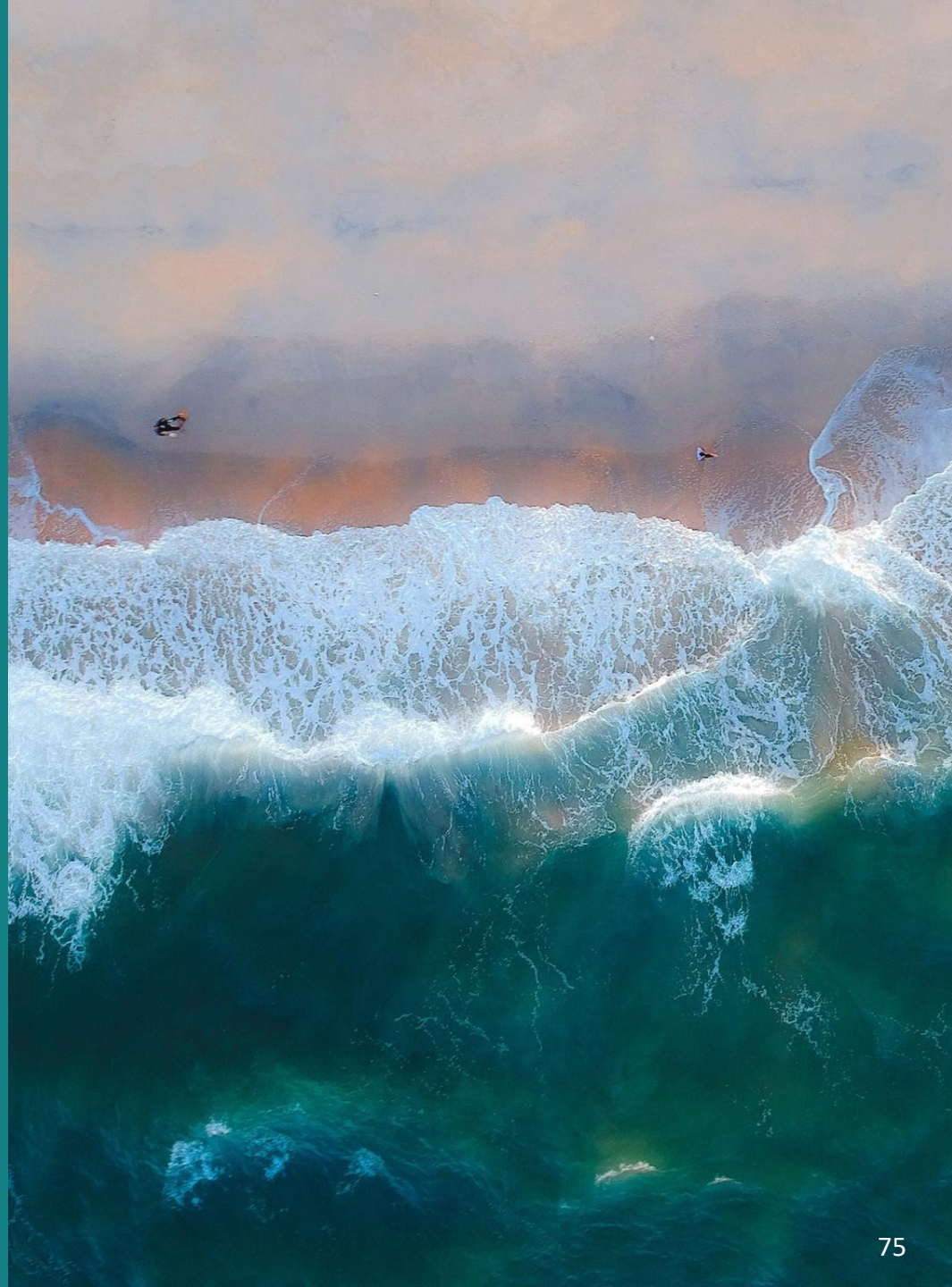
Varna (PS2) and the Danube (PS3) lead in **biotechnologies**, benefiting from long-term European Union support in this sector. Odessa also thrives due to its abundant natural resources, especially in the Red Algae Field. Sinop develops its biotechnology sector in tandem with its aquaculture growth. In contrast, Bosphorus (PS1) and Batumi (PS6) remain less competitive in this field.

There is significant **Marine Renewable Energy** development across the region. Most of it is driven by offshore wind energy, where Varna (PS2), appears as a key player, followed by Danube (PS3) and Odessa (PS4). In Sinop (PS7) there is a strong development of wave energy technologies. Bosphorus (PS1) and Batumi (PS6) show less development than other sites due to the lack of resources (wind and wave) and less suitable conditions (space, bathymetry).

IMAGINARY 4

ECOTOPIA

By BRIDGE-BS



Ecotopia

Black Sea 2050

© Fanny Didou

IMAGINARY 4: ECOTOPIA

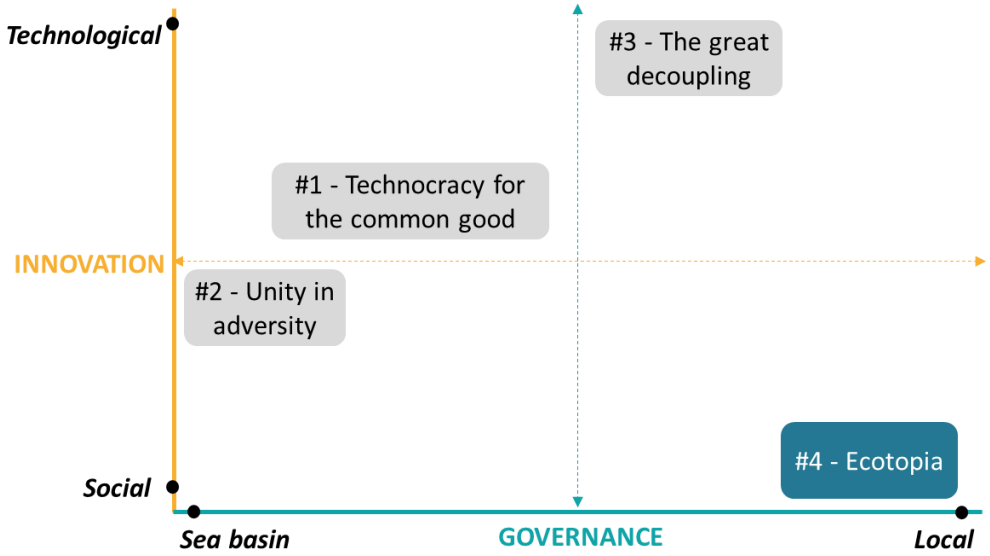
Faced with a climax of environmental disasters (biodiversity loss, extreme climatic events) in the 30's, Black Sea communities have, like many others, tightened up at local level, with the aim of achieving maximum self-sufficiency (energy, food) and a form of symbiosis with their environment.

Living with nature

By 2050, after two decades of disastrous climatic events, Black Sea societies have undergone a profound socio-political and economic shift, reversing some of the trends of past centuries: living in harmony with the environment has become a universal priority.

By necessity and by choice, lifestyles have become much more frugal: consuming only locally, systematically repairing and recycling, making little use of technology and significantly reducing energy dependency.

Employment in primary production (agriculture, fishing, construction) has increased tenfold, accompanying the shift from industrial practices towards more traditional ones (less machinery, less energy, less impact).



As a result, levels of resource use have fallen dramatically, finally enabling to comply with the environmental boundaries that had been exceeded every year for the last few decades.

At the same time, nature has once again become a source of spiritual inspiration. No longer seen as a reservoir of resources, the environment is considered as a complex and fragile foundation providing the basis for life (human life, but not only!). Both venerated and feared, nature is the subject of local cosmogonies that foster the link between people and their environment and set up implicit rules of management – which are applied with an almost religious rigour (any deviation from them being severely punished within the communities themselves). As the protection of all the life forms that make up ecosystems has become a self-evident necessity, many areas of the Black Sea have been completely sanctuarised.

The results of such a shift of paradigm are becoming clearly visible in 2050, with healthier ecosystems and populations, more resilient to climatic disasters that continue to sweep the planet, but also more cohesive communities, sharing the same value : living with nature.

The strengthening of local communities

In a world of multiple constraints, communities around the globe are turning in on themselves. Criticised by some as an inward-looking trend, this development reflects the need for autonomy that has emerged at local level, after too many shortages of all kinds, which demonstrated the extreme sensitivity of international supply circuits to climatic and political hazards.

In this deglobalised world, the communities of the Black Sea are no exception: sustainability in 2050 must be conceived collectively, and on the ground. From sourcing food and basic materials to generating electricity and rebuilding homes, everything is designed around local resources (physical, but also human: skills, manpower).

As a result, local communities have gradually taken over the management of their space and resources, and most decision-making power has been transferred to their level, leaving States with less power (international relations and national security, common core of education, health and vital infrastructure, and mediation in case of conflicts between communities). This has been accompanied by major social innovations: citizen-based decision making, intergenerational solidarity, systematic sharing of equipment and tools, etc.

This localized approach recognizes the nuanced challenges of each community and allows for tailored solutions that align with their unique ecological, social, and economic contexts.

In some areas, the use of local currencies facilitates exchanges within the same community or with neighboring communities, while bartering is common practice.

A community size blue economy

In coastal areas of the Black Sea, the population has shrunk as waves of people have migrated inland to escape recurrent storms and flooding. The remaining coastal communities are concentrated in the most sheltered areas of the coastline (mountains and hills), and still strongly rely on the sea for their self-sufficiency.

The Blue Economy has therefore entirely mutated. The sectors of the industrial era have fallen apart (shipping, O&G, Cruise), and those that were promised to be the way to salvation at the beginning of the century (fish farming, marine renewable energy, biotechnologies) are now in a state of disarray, being too dependent on the availability of external resources (materials, energy).

The dominant sectors are now those necessary for local subsistence : fishing, shellfish farming, short-distance transport, and indirectly shipbuilding and repair. Operating at a much smaller scale than in the past, these activities strongly rely on artisanal know-how and local knowledge, which is preciously transmitted between generations within communities.

Each community has a repair and maintenance workshop for its vessels (all of which are sail-powered) and associated equipment.

In coastal communities, these sectors employ a large share of the workers, and regularly involve the community as a whole in particular participatory actions (renovation, launch of the boats, pulling up of the nets, etc.). As a result, they play an enormous role in the local culture.

Such as on land, the management of maritime space and its resources is dealt with at local scale within communities, and sometimes in interaction with neighboring ones.

ECOTOPIA: 2050 BLUE ECONOMY

Maritime transport

**Regional intensity: status in 2050 compared to 2023*

Regional intensity*: **significant decline (--)**

In 2050, the sector has radically changed compared to the 2020's, in parallel with the drastic decline in trade and consumption: the fleet is down to just a few hundred small, sail-powered vessels, which ensure vital exchanges (food products and materials) between Black Sea coastal communities. Operating at very low cost, they concentrate in coastal waters for the most part, navigating between neighboring communities (intranational or cross-border) and replacing obsolete road networks. A small part of the fleet is dedicated to longer-distance transport, navigating from one end of the Black Sea to the other. In all cases, transport is optimized, and ships' holds are filled on both the outward and return journeys. Most ships are equipped with small wind turbines and/or solar panels, which power vital functions such as lights and radio. On the other hand, digital navigation aids (GPS, AIS beacons, radar) are extremely rare, and sailors rely mainly on old-fashioned positioning and detection methods (i.e., manual and visual).

Shipbuilding & repair

Regional intensity: **decline (-)**

All major shipyards in the Black Sea have closed, but every port in the basin still has a repair and/or shipbuiding workshop, providing for all local communities. The construction of new ships is rare and only concerns sailing cargos, and the sector is mainly focused on repairing and recycling the existing fleet, implementing the circular-economy principles. Wood has regained an important place for shipbuilding and has progressively replaced resin-based materials derived from petroleum. Following the discard of chemical products used for anti-fouling purposes, each workshops include a dedicated team for cleaning and maintaining ships. The managers of these small workshops are key players in each coastal communities which are employing a decent number of people.

Offshore Oil & Gas

Regional intensity: **significant decline (--)**

The activity has completely disappeared in 2050. The remains of offshore platform are sometimes used as fishing docks and are regularly visited by young tourists curious to see these remnants of the industrial world.

ECOTOPIA: 2050 BLUE ECONOMY

**Regional intensity: status in 2050 compared to 2023*

Coastal & maritime tourism

Regional intensity*: **stable (~)**

The sector as we knew it in the 2020s has totally disappeared. Tourism in 2050 is defined by the strong willingness to travel and visit a place to share knowledge and for cultural exchange. The way tourism is done has radically changed: tourists are travelling on foot or by bike, a lot less infrastructure are in place and travelers are hosted in small hostels and can enjoy a shared canteens, in each villages. Woofing, the principle of being hosted and fed in exchange for small tasks in organic farms, was strongly developed and expanded to several maritime sectors: fishing, shipbuilding, etc. The 2040's saw the development of "meaningful" tourism, both in terms of culture and skills. People living inland regularly visit the coast to learn to sail and to develop their maritime skills in the Black Sea.

Cruise tourism

Regional intensity: **significant decline (--)**

The activity has completely disappeared in 2050 as it was considered too energy consuming. The business has shift to boating.

Yachting & boating

Regional intensity: **stable (~)**

In the 2040's, leisure activities at sea experienced a revival, especially among coastal populations, who combine business with pleasure by hauling in a few fish in their sailboats, and sometimes by visiting neighboring communities by sea. Few travelers are sailing across the Black Sea and sometimes even to the Mediterranean. All coastal populations have a high level of maritime knowledge and skills, and all know how to sail. Every coastal community has few sailing boats which are shared among the population.

ECOTOPIA: 2050 BLUE ECONOMY

**Regional intensity: status in 2050 compared to 2023*

Fisheries

Regional intensity*: **decline (-)**

The sectors is entirely dedicated to local consumption and no exports are made in or out of the Black Sea. In each community, a few fishermen are providing for the local communities, owning only sailing vessels and using traditional fishing techniques dominated by passive gear (e.g., longlines, traps). All species are fished, including invasive species and all kind of local species are consumed. Fish is not only valued economically, but also is also used as mean of trade with inland communities. Overall, the fishing activity has gained in attractivity and highly relies on the sharing of knowledge between generations. Fishermen from each community take part in an inter-community forum aiming to discuss local resources management.

Coastal & marine Aquaculture

Regional intensity: **stable (~)**

Shellfish farming is maintained and/or developed in suitable areas and on a small-scale basis to meet the local demand in food products. Fish farming no longer exists as such, but fishponds have been re-implemented. Small scale macro-algae cultivation was also developed locally.

ECOTOPIA: 2050 BLUE ECONOMY

Blue Biotechnologies

**Regional intensity: status in 2050 compared to 2023*

Regional intensity*: **stable (~)**

The sector is very limited, reduces to few uses derived from algae cultivation, mainly dedicated to medicinal purposes and with limited levels of processing.

Marine Renewable Energies (MREs)

Regional intensity: **stable (~)**

All communities are equipped with small-scale terrestrial renewable energy production systems (e.g., individual wind turbines, solar panels, solar water heaters) enabling them to be energy self-sufficient. Sparingly, some coastal communities benefit from the installation of a small number of marine wind turbines very close to the coast, but maintenance is rather complex without the old carbon-based machines. Air conditioning systems are put in place via low-tech SWAC (Sea Water Air Conditioning).

> OVERVIEW

Shipping	Shipbuilding	O&G	Tourism	Cruise	Boating	Fisheries	Aquaculture	Biotechnologies	MREs
--	-	--	~	--	~	-	~	~	~

Regional intensity: status in 2050 compared to 2023

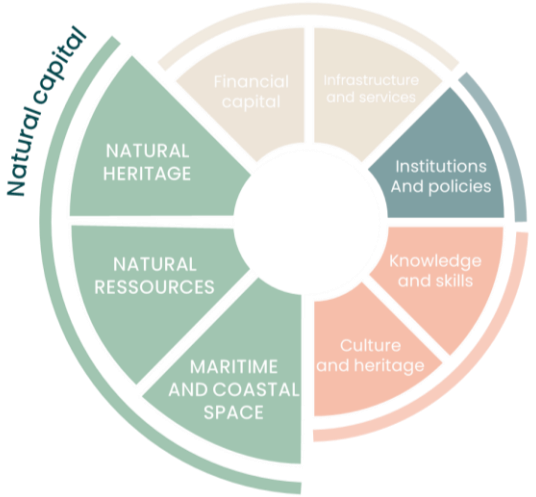
significant decline (--) | decline (--) | stable (~) | growth (+) | significant growth (++)

ECOTOPIA: 2050 MARITIME & COASTAL CAPITAL

Natural heritage

Status: **increased (+)**

In 2050, natural heritage is at the heart of every Black Sea community and its protection has become a universal priority. In coastal areas, the sea and its inhabitants have acquired a divine dimension, and many areas and species are fully sanctuarised (mainly by the very existence of the myths that surround them). No longer seen as a reservoir of resources, the environment is considered as a complex, integrated and fragile foundation providing the basis for life. Former urban areas, such as seaside resort, partially damaged because of coastal erosion and submersion, were abandoned to let nature thrive (renaturation). Most sources of pollution were eliminated, and phytoremediation (including algae) is used to clean and restore the most polluted coastal areas. Due to the progressive return to sailing, underwater noise was also eliminated, supporting the protection of Black Sea mammals in particular. The results of such a shift of paradigm are becoming clearly visible in 2050, with healthier ecosystems overall.



NATURAL CAPITAL

Natural resources

Status: **increased (+)**

Both on the coast and at sea, levels of resource use have fallen significantly, finally enabling to comply with the environmental boundaries that had been exceeded every year for the last few decades. In addition to a common sense on the principle of providing only what is necessary, it is also and above all the reduction in operating capacity (ships, machinery) that has enabled such progress. For instance, while the management of fish stocks is much less regulated than in the past, the low yields of small-scale fishing techniques are not even sufficient to achieve the historic Sustainable Maximum Yield (SMY).

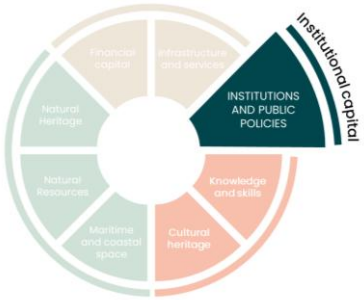
Maritime and coastal space

Status: **increased (+)**

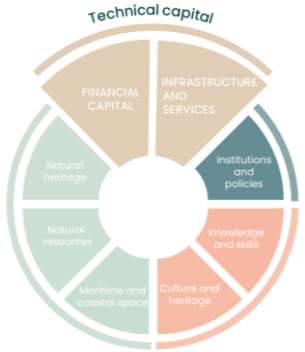
Overall, the maritime and coastal areas of the Black Sea are much less intensively used than in the past. At sea, most activities take place in the immediate vicinity of the shore, and few vessels venture further than a few miles, apart from sailing vessels, a few tourists and the more adventurous fishermen. Nonetheless, conflicts do occasionally arise over the use of riparian zones. On the coast, many of the former urban and tourist areas have been completely abandoned, and communities have settled in areas sheltered from the wrath of the sea. Completely returned to nature, some of these areas have become inaccessible.

*****MCC Status of 2050 compared to 2023*

ECOTOPIA: 2050 MARITIME & COASTAL CAPITAL



INSTITUTIONAL CAPITAL



TECHNICAL CAPITAL

Institutions and policies

*MCC Status of 2050 compared to 2023

Status: **decline (-)**

By 2050, a profound shift in governance dynamics has transformed coastal regions, placing local communities at the forefront of managing their spaces and resources and reflecting a commitment to sustainability, resilience, and community-driven solutions. This evolution has reshaped the balance of power, with decision-making authority gradually transferred from centralized states to the local level. Consequently, States retain a diminished role, focusing primarily on international relations and national security. This decentralization has given rise to a spectrum of social innovations, fostering citizen-based decision-making processes. Along the Black Sea coast, small maritime parliaments have blossomed, fostering a culture of inter-community cooperation and decision-making, and allowing to navigate challenges that transcends individual communities (e.g. climate change) and conflicts that may arise in the absence of a centralized authority.

Infrastructure and services

Status: **decline (-)**

Most of the coastal infrastructure from the turn of the century has been abandoned. In preserved ports, facilities are limited to small repair workshops, collectively owned by the communities, and only a few communities have reinvested in larger yards for the production of sailing vessels. Surveillance infrastructure and systems have also been progressively abandoned, with surveillance now relegated to non-technological surveillance between neighbours or between communities. On land, water treatment is essentially based on phytodepuration, although some treatment plants are still in partial working order. Waste management is handled locally, and composting and recycling almost entirely eliminates the need for landfill.

Financial capital

Status: **decline (-)**

With the Black Sea communities now almost entirely self-sufficient in food and energy, financial exchanges are much rarer than in the past. Within and between communities, the main means of exchange is barter, and some also use local currencies. The wealthiest communities (in environmental terms) are still able to export part of their production inland, generating income that is reinvested in their means of production. States have far fewer resources at their disposal than before, due to the general absence of taxation, apart from the annual contribution that communities have agreed to pay towards the running of vital services.

ECOTOPIA: 2050 MARITIME & COASTAL CAPITAL

Knowledge and skills

Status: **increased (+)**

Knowledge of the marine environment, as well as the know-how directly or indirectly associated with its use, are at the heart of the functioning of Black Sea coastal communities in 2050. Preciously passed on to new generations through stories and practical application during participatory workcamps, they form a common foundation that everyone must master. Evolving from one activity to another according to the needs of the community, the workers are all skilled in several areas simultaneously, as specialisation is considered to be less resilient. The withdrawal of thermal machines and many of the associated technological tools has led to the rediscovery of many of the ancestral skills (sailing, wooden construction, angling). However, this knowledge remains mostly local and the global picture is often unavailable (lack of aggregation).

Culture and heritage

Status: **increased (+)**

In 2050, the coastal communities of the Black Sea have developed a strong maritime identity. Reconnected to their immediate environment through work (a return to primary sector occupations), but also through modern ecological mythology, citizens feel both proud of and responsible for "their" coastal and marine ecosystems. People are reconnecting with the sea notably through food: local markets are thriving all along the coastline. Grandma's recipes for making the most of products in their entirety, as well as seafood-based remedies (fish scales, seaweed) are also an integral part of this culture. There are variations depending on the geographical area and the ecosystems that make up the area, but there is nevertheless a common base at basin level, conveyed through exchanges between communities (meaningful tourism, inter-community parliaments, etc.). The cultural vestiges of the past (archaeological sites, monuments) have often been damaged by climatic disasters, but those that have remained standing are carefully preserved. Every year, inter-community festivals (music, races, culinary events) are organised in different communities to share their culture.

HUMAN CAPITAL

> OVERVIEW

*MCC Status of 2050 compared to 2023

Natural heritage	Natural resources	Space	Institutions & policies	Infrastructure & services	Financial capital	Knowledge & skills	Culture & heritage
+	+	+	-	-	-	+	+

***Status: MCC Status of 2050 compared to 2023**

Decreased (-) stable (~) increased (+)

ECOTOPIA 2050 : VARIATIONS ACROSS PILOT SITES

This imaginary illustrates a widespread decline in maritime activities across the Black Sea basin, but the variability between pilot sites remains significant due to their initial conditions.

The Bosphorus (PS1) and Varna (PS2), once industrial and maritime hubs, experience the greatest losses, with a forced return to more traditional practices like wooden shipbuilding and artisanal fishing. Odessa (PS4), while affected by the decline, manages to maintain some activity thanks to post-war reconstruction and vital agricultural exports. The Danube (PS3), with its sustainable practices and well-established eco-tourism, remains relatively stable, demonstrating that sites less dependent on large maritime industries adapt better to the changes. Sinop (PS7) and Batumi (PS6), with initially modest maritime activities, feel less impact from the overall decline and maintain some stability through local practices and a low dependence on international flows. This imaginary highlights that the most industrialized sites and those reliant on international trade are the most vulnerable, while those with more localized and diversified economies show better resilience.

	Regional trend*	PS1 **Bosphorus**	PS2 **Varna**	PS3 **Danube**	PS4 **Odessa**	PS6 **Batumi**	PS7 **Sinop**
Shipping	- -	-	- -	-	- -	- -	- -
Shipbuilding	-	- -	- -	-	-	-	-
O&G	- -	- -	- -	- -	- - -	- -	- -
Tourism	~	-	-	+	+	~	~
Cruise	- -	- - -	- -	- -	- -	- -	- -
Yachting	~	-	-	~	~	~	~
Fisheries	-	- -	- -	~	-	-	-
Aquaculture	~	~	-	~	~	~	-
Biotechnologies	~	~	~	~	~	~	~
MREs	~	~	~	~	~	~	~

**See regional imaginaries* Negative deviation Positive deviation

PILOT SITE ADAPTATION – S4 ECOTOPIA

Shipping activity experiences a sharp decline across the basin. However, Bosphorus (PS1) manages to maintain a reduced level of activity due to its strategic importance, although the transported volumes have drastically decreased. The Danube (PS3) also sustains its shipping connections, primarily due to its inland waterways. In contrast, other pilot sites see significant reductions in shipping activity, reflecting broader economic contractions.

The **shipbuilding** industry collapses in regions where it was previously strong, particularly in Bosphorus (PS1) and Varna (PS2). These areas see a reallocation of the workforce towards traditional material production, such as wood, for transportation and fishing. Despite this downturn, every pilot site maintains at least a small workshop that help sustain a minimal level of shipbuilding activity.

The **oil and gas** sector experiences total decline across the region, with the greatest impact felt in Türkiye (Bosphorus - PS1) where exploitation was once significant.

Coastal tourism remains relatively stable across the basin but shifts towards local eco-tourism. The Danube (PS3) sees good development in eco-tourism due to its strong environmental practices, while Odessa (PS4) focuses on solidarity tourism, driven by its recent history. In contrast, Bosphorus (PS1) and Varna (PS2), previously industrial hubs, experience a decline in tourism. Sites like Batumi (PS6) and Sinop (PS7), where tourism was less prominent, remain relatively stable, with their minimal pre-existing infrastructure allowing them to weather the downturn.

The **cruise industry** sees a general decline, with the most significant impact felt in Bosphorus (PS1) , where cruise activity had been relatively strong until now.

PILOT SITE ADAPTATION – S4 ECOTOPIA

Yachting remains stable at the basin level but declines in regions where the activity was more industrialized, particularly in Bosphorus (PS1) and Varna (PS2). There is a notable shift back to wooden, sail-powered, and low-tech vessels, reflecting a broader move away from high-tech yachting.

Fisheries experience a general decline, with the most severe drops in regions where the industry was heavily industrialized and dependent on fossil fuels, such as Bosphorus (PS1) and Varna (PS2) . However, fisheries in the Danube (PS3) remain relatively stable, with traditional coastal practices.

Aquaculture sees little development across the basin, with a slight decline in areas where the activity was previously established, such as Varna (PS2) and Sinop (PS7).

In this imaginary, there is no development in **biotechnologies** or **Marine Renewable Energies (MRE)**, with no significant variability between sites. This reflects a broader regional stagnation and lack of investment in advanced sectors.

2050 SUSTAINABLE IMAGINARIES

OVERVIEW

BLACK SEA 2050 – BLUE ECONOMY OVERVIEW

Shipping	Shipbuilding	O&G	Tourism	Cruise	Boating	Fisheries	Aquaculture	Biotech	MREs

**Regional intensity: status in 2050 compared to 2023* significant decline (--) decline (--) stable (~) growth (+) significant growth (++)

S1 – Technocracy for the common good

--	-	-	--	-	~	-	+	+	++

S2 – Unity in adversity

~	~	--	-	-	~	~	~	+	+

S3 – The great decoupling

~	+	--	+	+	~	-	++	++	++

S4 - Ecotopia

--	-	--	~	--	~	-	~	~	~

BLACK SEA 2050 – MARITIME & COASTAL OVERVIEW


Natural heritage


Natural resources


Space


Institutions & policies


Infrastructure & services


Financial capital


Knowledge & skills


Culture & heritage

***Status: MCC Status of 2050 compared to 2023** Decreased (-) stable (~) increased (+)

S1 – Technocracy for the common good

~	+	+	+	+	~	~	~

S2 – Unity in adversity

+	+	~	+	-	~	+	~

S3 – The great decoupling

~	-	~	~	+	+	+	~

S4 - Ecotopia

+	+	+	-	-	-	+	+

CHAPTER 4

IMPACTS OF THE WAR IN THE BLACK SEA AND FUTURE IMPLICATIONS

HOW DOES THE RUSSO-UKRAINIAN WAR AFFECTS THE BLACK SEA BLUE ECONOMY ?

Conflict recontextualization and implications for the blue economy

The Russo-Ukrainian conflict is deeply rooted : after the collapse of the Soviet Union, Ukraine, formerly a Soviet republic, gained its independence and moved closer to western countries by developing economic and political ties with the European Union and NATO. Russia, for its part, showed dissatisfaction with NATO's possible expansion on its borders and firmly expressed its opposition to this rapprochement and its willingness to defend its territorial integrity.

The current phase of the conflict started in 2014, when pro-E.U protests broke out in Ukraine, leading to the impeachment of pro-Russian President Viktor Yanukovych. This led, as a response, to the Russian annexation of Crimea from Ukraine (a predominantly Russian-speaking region), and the support to pro-Russian separatists in a related conflict against Ukrainian forces, the Donbas war. The conflict then escalated and intensified in February 2022 when Russia launched an invasion of Ukraine.

The multiples interdependencies induced by globalization had a widening effect on, what could at first be described, as regional conflict. It contributed to geographically extend the consequences of the conflict and globalize its effects.

This is particularly visible in the energy sector, Russia being one of the main providers of gas, coal, and oil for the E.U, as well as in the food industry, Ukraine and Russia representing a significant part of worldwide wheat exports. The conflict therefore contributed to an energy crisis in the E.U and paved the way for a possible global food crisis linked to cereal scarcity.

Under this light, we can easily understand that the ongoing conflict is also having numerous effects regionally at the Black Sea scale and globally affects its environment and its economy, notably when it comes to maritime related activities (blue economy).

The following slides are structured as follow :

- Slide 113 to 115: Most significant cross-cutting trends and implications of the conflict on the Black Sea blue economy overall;
- Slide 116 to 118: Synthesis of the impacts of the conflict for each blue economy sector individually ;
- Slide 119: Upcoming evolutions of the governance and innovation dynamics and links with the four imaginaries.

Devastating impacts on the natural heritage

The important maritime heritage in the Black Sea has been under threat for a long time and especially since the collapse of the Soviet Union, with poor water qualities mainly due to agriculture fertilizers. But the ongoing conflict is putting even more pressure on this natural heritage: floating mines, artillery pollution, submarine mines explosions, military ship noise and low frequency sonars, are some of the numerous elements that bring significant damages to the health of the Black Sea maritime ecosystems. The impact of the war on natural heritage is felt globally throughout the Black Sea and notably affects some emblematic species such as dolphins that are being put at risk.

Such impacts are obviously more heavily felt in Ukraine because of the important presence of chemical industries in the country: their localization near bodies of water puts aquatic biodiversity at risk and creates important pollutions with every damages war brings to those facilities.

Additionally, the constant shelling negatively impacts the Dnipro River that provides most of the drinkable water for the country, and the destruction of the Kakhovka Dam also contributed to greatly increase pollutions.

Biodiversity hotspots for bird species or coastal fish species such as the sea of Azov, the Danube Delta and the Gulf of Odessa are also heavily endangered because of the war.

The disruption of key sectors

The conflict is heavily disrupting the operation of key sectors that are of capital importance for the Black Sea blue economy. First, maritime transport is freefalling : the Black Sea historically provides strategic corridors for maritime transport and trade between Europe and Asia, but the conflict has disrupted those dynamics, as shipping companies have suspended their service to the major Russian ports, such as Novorossiïsk, and must rethink their routes to avoid tense areas, military forces at sea, floating mines, etc. Countries are consequently forced to find regionally-thought solutions such as setting up alternative routes to crossing the Black Sea through a secured maritime corridor (joint agreement on Ukrainian maritime grain corridor), the opening of new routes, such as the Danube River routes or the re-development of road-rail transport (piggybacking) throughout the Region.

The fishing sector is equally disrupted. Some parts of the Black Sea are no longer navigable or suitable for fishing and many fishing fleets have decided to significantly reduce their activity due to the increase in the cost of fuels, the inability or difficulty to navigate in some areas most impacted by the conflict (as described above), the decrease in fishing stock due to the shelling and the pollution linked to bombings.

The tourism sector is also undergoing a significant decline in some territories most touched by war, especially in Crimea. But this decline also expands to some Black Sea territories geographically distant from the conflict such as Bulgarian beaches, indirectly affected by the adverse effects of the war as tourists (both at regional and international scale) are avoiding this area of tension.

Strategic need for energy autonomy

For many Black sea countries, the conflict underlines the need for a new energy policy pathway turned towards independence from fossil fuel imports as Russia, one of the main provider, is implicated in a conflict. Offshore oil and gas platforms are still being developed and becoming operational around the Black Sea despite the threats of war, notably in Romania, as they represents a key advantage in times of war (energy supply, prominent importance of electrical power and fuels, etc.).

The sector of Marine Renewable Energies is also developing, as we can see with the creation of the Black Sea Offshore Wind Energy Federation, as well as the Black Sea Renewable Energy Coalition. This emerging sector is of great importance to the region and the strong potential of offshore wind in the Black Sea, especially in the Ukrainian maritime space but not limited to it, represents a great hope for the future development of the sector.

An emerging renewed geopolitical landscape …

In terms of geopolitics, the conflict has implications both inside and outside the Black Sea region.

On a worldwide scale, the conflict marks a return to an opposition between two blocks, western countries mainly supporting Ukraine on one hand, and Russia largely supported by China on the other hand. Sometimes perceived as a battle between autocracy and democracy, the conflict indirectly exacerbates tensions between China and the U.S, but also between Russia and the Western countries and especially the E.U.

At regional scale, the conflict repositions NATO as a relevant reading grid as three Nato countries – Romania (also E.U), Bulgaria (also E.U) and Türkiye - surround the Black Sea. Countries such as Poland, the Baltic States (Lithuania, Latvia, Estonia), Romania and Bulgaria have reinforced their collaboration with NATO. Russia on its part aims at controlling the entire northern part of the Black Sea, developing a dominant position there and prohibiting ships from NATO member countries from sailing within the area.

There is also a movement from some Black Sea countries towards the E.U (and conversely), as seen with the expression of interest in joining the EU (Moldavia, Ukraine, Georgia), or the sending of European funds for Ukrainian Recovery and Reconstruction .

Türkiye on its side has sought to maintain a delicate balance between its relations with NATO and its economic interests with Russia and plays a mediating role in the region. This key role of intermediary was especially visible with the closure of the Bosphorus and Dardanelles straits to warships of both belligerent countries under the Montreux Convention, which allows it to prevent military vessels from passing through wartime. Türkiye has also been a major player in the negotiation on the agreement on Ukrainian cereals.

... that reconfigures institutional capital and basin-level governance

Most blue economy sectors are evolving in the same direction in terms of governance : facing the adversities of war and this regionally new uncertain geopolitical landscape, most sectors are turning to more centralized approaches both at national and sea basin level to protect and strengthen the sectors, while reinforcing their economic potential.

This re-centralization is mostly undergone at national level, which can be explained by the necessity for countries to retrench and refocus on their national resources in order to protect their assets in a conflictual context.

Relevant examples of such trajectories can be found for example in the offshore oil and gas sector. As this sector is of national interest, it currently is and will remain highly centralized at the state level. The extraction of offshore oil and gas resources is typically conducted by large companies who often operate in close collaboration with the governments of the countries. The extraction of such resources also represents a key advantage in times of war (energy supply, prominent importance of electrical power and fuels, etc.).

But this re-configuration of blue economy sectors towards a more nationally-based level can also be found at regional level. This is especially the case for the Marine Renewable Energy sector, whose development requires collaboration and coordination among countries, making it more likely and efficient to be a sea basin effort. As stated previously, the creation of new intergovernmental institutions regulating this sector advocates for a more regional approach to this activity, with knowledge exchange and collaboration in the deployment of infrastructures.

More globally in terms of institutional governance of the blue economy, new forms of cooperation are being developed at sea basin level and pre-existing transnational institutions are being strengthen and playing a significant role: Black Sea Economic Cooperation (BSEC), Black Sea Advisory Council, Black Sea Trade and Development Bank, Black Sea Commision, etc., as well as frameworks of cooperation such as the Common Maritime Agenda (CMA) for the Black Sea. The reaffirmation of the role and importance of such institutions, especially in times of war, is another signal for a shift of decision-making processes towards national and sea basin levels.

SYNTHESIS OF THE CURRENT IMPACTS OF THE CONFLICT FOR EACH BLUE ECONOMY SECTOR

**Regional impact: status in 2023 compared to before the war*

Maritime transport

Regional impact*: **significantly impacted**

As previously mentioned, this key sector is heavily affected by the conflict. The whole logistic chain is disrupted, and the adverse effects of the war have significantly reduced port exchanges and maritime transport in the Black Sea.

Shipbuilding & repair

Regional impact: **moderately impacted**

In terms of military shipbuilding, shipyards are obviously key targets to destroy for both belligerents and several bombings have been reported for each side, which may have undermined to shipbuilding sector of Ukraine and Russia. They are more globally strategic for fighting countries to control and possibly repurpose for military activities in the case of civil shipyards.

Offshore Oil & Gas

Regional impact: **moderately impacted**

Offshore gas and oil platforms represent strategic points for both countries at war, as they offer very valuable resources that can be used in the conflict. Reports of combats taking place around such platforms are numerous. It appears that offshore platforms are still being developed and becoming operational around the Black Sea despite the threats of war, notably in Romania.

Coastal & maritime tourism

Regional impact: **significantly impacted**

Tourism is declining in some territories most touched by war, especially in Crimea, but this decline also expands to some Black Sea territories geographically distant from the conflict such as Bulgarian beaches, indirectly affected by the adverse effects of the war.

SYNTHESIS OF THE CURRENT IMPACTS OF THE CONFLICT FOR EACH SECTOR

Cruise tourism

**Regional impact: status in 2023 compared to before the war*

Regional impact*: **significantly impacted**

A sharp drop in cruise tourism has been observed throughout the Black Sea, notably around Turkish popular coastal destinations.

Yachting & boating

Regional impact: **moderately impacted**

The yachting and boating sector is only marginally affected by the conflict, and the more notable effects are mainly felt on the Russian market. Such effects are linked to the EU sanctions against Russia and the fact that some items are no longer exported from the EU to Russia, such as sailboats, motorboats, and other recreational watercrafts. Moreover, Russia and Ukraine both announced that all ships sailing in the Black Sea could be inspected to search for military equipment, which threatens the freedom of navigation and puts a dent in the yachting and boating sector in the Black Sea.

Fisheries

Regional impact: **significantly impacted**

The war has deeply worsened the well-being of this sector, as some parts of the Black Sea are no longer navigable or suitable for fishing. Many fishing fleets have decided to significantly reduce their activity. The sector faces hard backlash linked to the war: increase in the cost of fuels, inability or difficulty to navigate in some areas most impacted by the conflict (presence of floating mines for example), decrease in fishing stock due to the shelling and the pollution linked to bombings, etc.

Coastal & marine Aquaculture

Regional impact: **moderately impacted**

The aquaculture sector has known some concerning difficulties facing the conflict. The processing industry and the disruption of its supply chain have put more pressure on the activity and created a price-increase loop.

SYNTHESIS OF THE CURRENT IMPACTS OF THE CONFLICT FOR EACH SECTOR

Blue Biotechnologies

**Regional impact: status in 2023 compared to before the war*

Regional impact*: **moderately impacted**

This sector is relatively new in the Black Sea and still emerging. Data therefore remains very limited. However, the global impact of war on research and innovation is very negative, especially in Ukraine where a lot of facilities have been destroyed or damaged and funding significantly reduced.

Marine Renewable Energies (MREs)

Regional impact: **lightly impacted**

As seen previously, political willingness to develop this emerging sector is strong throughout the Black Sea. The war had some adverse effects on the sector, especially in Ukraine where the infrastructures have been altered by the conflict and most wind projects put on hold or damaged by the conflict. However, the strong potential of offshore wind in the Black Sea, especially in the Ukrainian maritime space but not limited to it represents a great hope for the future development of the sector and marks out the path for a new energy policy pathway turned towards independence from fossil fuel imports.

> OVERVIEW

Shipping	Shipbuilding	O&G	Tourism	Cruise	Boating	Fisheries	Aquaculture	Biotechnologies	MREs
-	~	~	-	-	~	-	~	~	+

Regional impact: status in 2023 compared to before the war

Significantly impacted **Moderately impacted** **Lightly impacted**

WHAT'S NEXT FOR THE BLUE ECONOMY IN THE BLACK SEA ?

A PROJECTION TOWARDS 2050

A reshaping of blue economy governance at national and regional level

As we've seen previously, blue economy sectors are globally shifting towards national and even regional dynamics of governance. In the case of a lasting conflict, and based on our analysis, we deem probable that by 2050, this centralization process will continue and possibly evolve symmetrically with the intensity of the conflict. To back up this statement, we can argue that Black Sea countries have become fully aware that blue economy is now a fundamental part of power at regional and national level and must be protected and dealt with centrally. This maritime power becomes even more necessary in times of war, as it covers many aspects such as the supply of key resources (offshore oil and gas platforms, marine renewable energies), food sovereignty (fishing, aquaculture), economic benefits (coastal, maritime, cruise tourism), commercial strength (maritime transport), and research outreach (blue biotechnologies).

The potential for an increased level of innovation in blue economy sectors

Innovation in the context of a war is hardly a priority and the global impact of war on research and innovation by 2050 will undoubtably be negative, notably due to facilities destroyed or damaged and funding significantly reduced. However, the innovation dynamic of key blue economy sectors in the Black Sea could continue to evolve positively by 2050, as the need for a higher level of innovation, development, regulation and monitoring over maritime resources and activities is even more necessary at times of war.
Moreover, Blue economy sectors often represent key drivers of economic growth, important basis for resources and possibilities of development. In this regard, whether it be at technical or social level, we can assess that by 2050, the level of innovation in blue economy sectors will continue to go upwards, to counter the negative effects of the war, get stronger and more resilient as well as more cost-effective.

imaginaries towards 2050

This cross-analysis of the evolution of our variables (innovation and governance) allows us to consider the proximity between our analysis and the 4 imaginaries. A mix of "Technocracy for the common good" and "Unity in adversity" appears as the closest to our study: sectors facing the adversity of war and its consequences will continue to move towards a higher level of cooperation and will push innovation. The Great decoupling imaginary appears less conceivable in terms of innovation as the context of a post-war recovery is not a fertile enough ground for an extremely high level of innovation. Finaly, Ecotopia hardly fits our analysis as it implies a very locally-based level of decision-making, with a diminished role for State and regional dynamics of governance.

As a conclusion, we deem probable that this crossed dynamic of a more centralized and more innovative blue economy throughout the Black Sea will keep on going by 2050 as these dynamics are now a given : Black Sea countries, both at national and regional level, are creating a strong momentum to better centralize, protect, modernize, develop and strengthen this economy.

CHAPTER 5

2050 SUSTAINABLE IMAGINARIES FEEDBACKS & DISCUSSION

DISCUSSION

#1 – TECHNOCRACY FOR THE COMMON GOOD

The ‘Technocracy for the Common Good’ imaginary of the future is closely aligned with contemporary trends. It sketches out a landscape **characterised by massive digitalisation and widespread surveillance**, favouring a **utilitarian and anthropocentric approach to sustainability**. From this perspective, the **centralised management of resources and the quest for autonomy,** whether in terms of energy or food, are paramount. This vision, although tinged with a laudable intention to promote sustainability, bears similarities to an Orwellian dystopia. In this respect, the implementation of such a policy could come up against a lack of acceptability among the population, due to **overly top-down policies and centralised management** that could potentially be perceived as oppressive. A notable divergence from current trends, is the proposal to **nationalise the main economic sectors,** an approach that runs counter to the liberal dynamics that emerged in the former communist bloc. Furthermore, the initial imaginary of the EEA, from which the imaginary is derived, seems **to neglect the potential implications of digital technologies on the environment.** Massive use of these technologies could call into question the very sustainability of the system envisaged, due to the often underestimated ecological impacts. For example, the production and management of electronic waste, the growing energy consumption associated with digital technologies, and the environmental risks associated with the extraction of the rare metals needed to manufacture these devices, could be crucial factors affecting the long-term viability of such an approach."

#2 – UNITY IN ADVERSITY

The "Unity in Adversity" imaginary also outlines a vision that is in line with contemporary trends, both in terms of innovation (non-disruptive) and governance (international cooperation). Initially conceived on the scale of the European Union, characterised by an already high level of regionalisation with directives and a common currency, this imaginary seems to distance itself from the current dynamics in the Black Sea. More particularly, **in the context of the ongoing war, calling into question the feasibility of total unity at basin level.** However, **cooperation frameworks and bodies already exist at basin level (**CMA, SRIA, etc.) and could provide fertile ground for the realisation of this imaginary, at least partially. The major advantage of this imaginary lies in its ability to capitalise on the advantages of each country or area, thereby e**nabling activities to be optimised** by identifying the most productive areas. This model also promotes an overall improvement in the state of the environment by reducing pressure in ecologically important or less productive areas. However, implementing this imaginary would **require a significant shift in the economic paradigm**, with the adoption of new 'wealth' indicators that go beyond traditional measures. In addition, it would involve **substantial investment in renaturation and biodiversity restoration** to ensure the long-term sustainability of the system.

DISCUSSION

#3 - THE GREAT DECOUPLING

"The Great Decoupling" imaginary depicts a somewhat unrealistic perspective, highlighting **the discovery of a "miracle" solution which promises record economic growth while remaining within environmental limits**. This vision seems to neglect the inevitable constraints linked to production and consumption. For instance, the failure to take account of competition between energy (biofuels) and food production **raises questions about the viability and real effectiveness of this imaginary,** pointing to possible conflicts of interest and unexpected consequences for food security. However, this imaginary is probably the most desired and hoped for in our societies. As such, **it is already driving intense research, attracting substantial funding**, with a view to a major technological revolution that will reconcile liberalism and ecology. However, excessive focus on a miraculous solution risks obscuring the real implications for the environment and compromising long-term sustainability. A more in-depth analysis of the interactions between bioenergy and food, as well as a more realistic understanding of physical limits, are needed to assess the feasibility and consequences of this vision more rigorously.

#4 - ECOTOPIA

The 'Ecotopia' imaginary relies on **widespread awareness among the population,** which is a major challenge given the current trend towards consumerism. While the imaginary developed by the EEA included a considerable amount of technology, we decided to push the cursors more drastically in order to obtain a imaginary that was both more contrasted (**none of the other imaginary envisaged a reduction in the use of technology**) and more coherent (the local approach and environmental constraints argue in favour of the use of low-techs). Therefore, this imaginary relies on **the mobilisation of already existing traditional knowledge, enhancing cooperation systems and promoting local added value.** Another central aspect of this imaginary is the **promotion of participatory democracy,** in line with the current trend towards more inclusive governance. This approach reflects the desire to give citizens an active role in the decisions that affect their environment and way of life. As a result, **social innovation appears to be an essential factor in achieving this imaginary**, and we took the liberty of including a spiritual dimension to it, which could play a crucial role in transforming mentalities. In short, 'Ecotopia' seeks to **transform society by encouraging a paradigm shift, not only environmentally, but also socially and politically.**

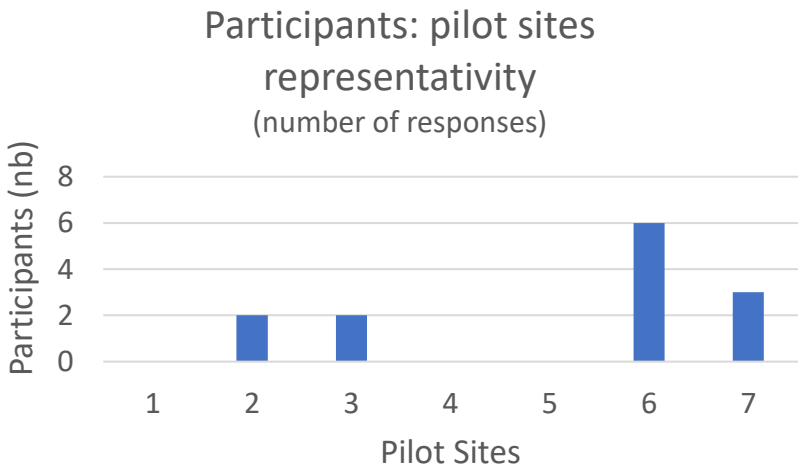
SURVEY ½ - FEEDBACKS FROM PILOT SITES PARTNERS

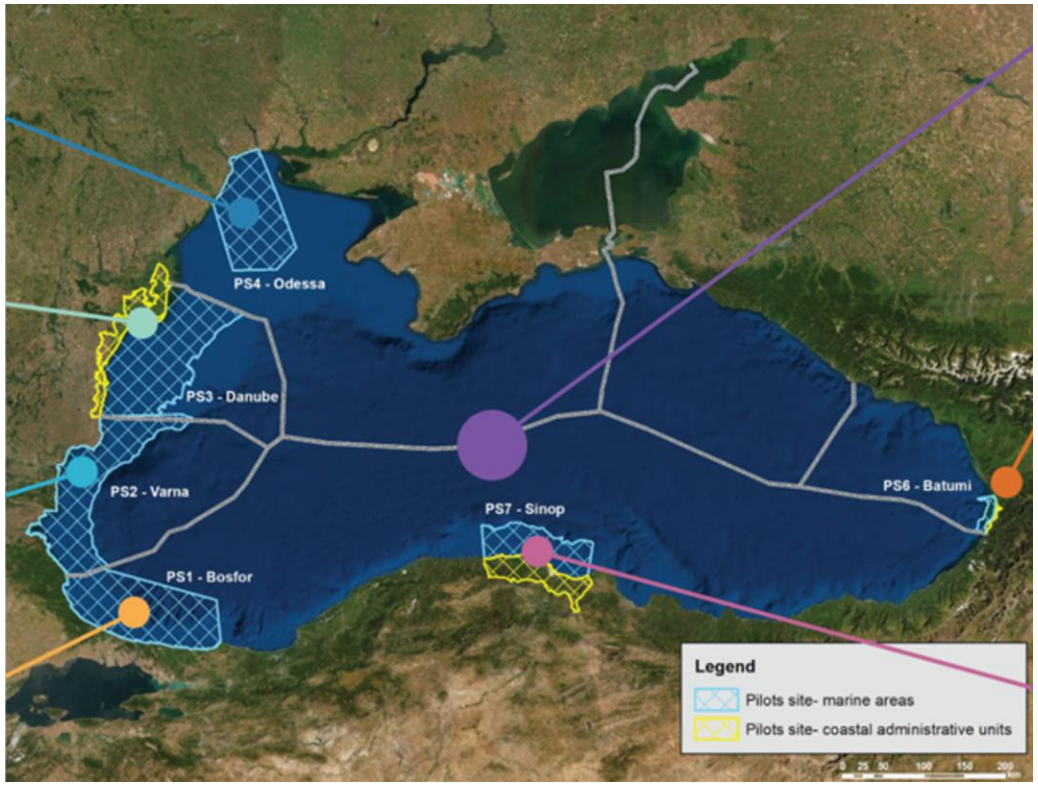
In February 2024, during the Resilience Workshop organized by WP3/WP6, pilot sites teams and project partners were invited to react on the WP1.4 Sustainable Blue Economy imaginaries for 2050. In particular, they were asked **to rate each imaginary in terms of :**

- **Probability**: likeliness to happen according to current trends and context.
- **Desirability**: subjective view on a preferred trajectory.
- **Sustainability**: potential of the trajectory to answer environmental, social and economical challenges.

In total, 14 partners took part in the exercise. Pilot sites 2, 3, 6 and 7 were represented, along with one contribution at sea-basin scale.

⚠ A significantly higher participation from PS6 is to be highlighted, with potential implications on the representativity of the survey's results.





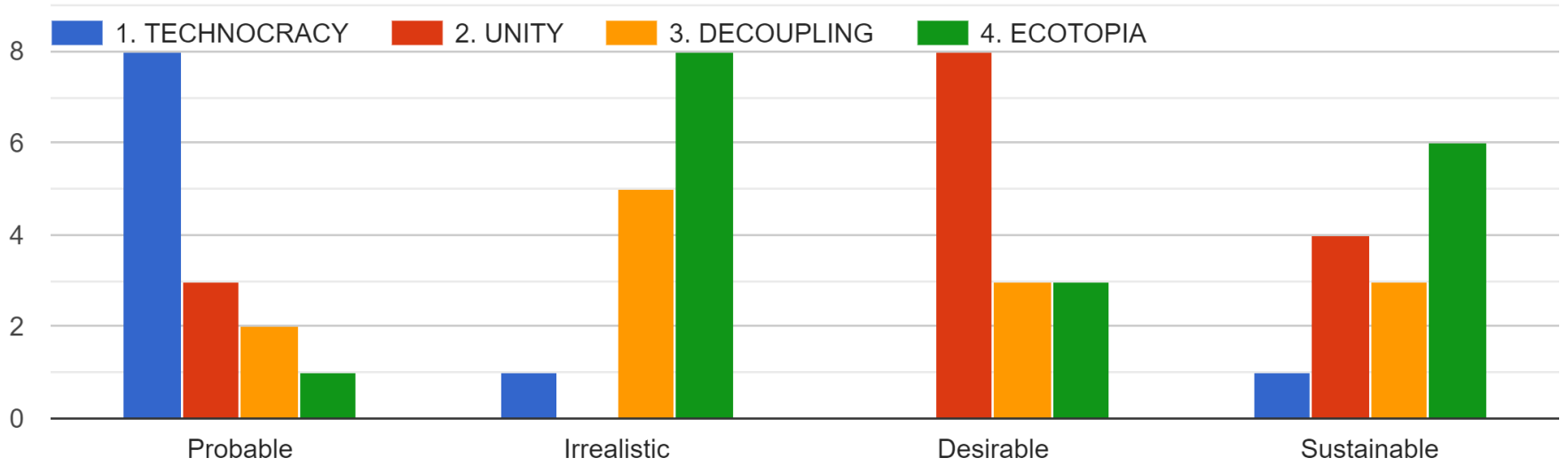
PROBABILITY VS. DESIRABILITY

To the question: which imaginary world do you find most 1) probable, 2) unrealistic, 3) desirable and 4) sustainable, the participants gave a more homogeneous response than anticipated.

To them, **Technocracy for the Common Good clearly appeared as the most probable scenario based on the current context**, although 6 participants out of 14 chose one of the other 3 imaginaries as the most probable. On the other side of the spectrum, when asked about the most unrealistic imaginary, results are symmetrical, with **Ecotopia ranked as the most unrealistic** (too far from the current trends). However, none considered Unity in Adversity as unrealistic (a positive sign in the current context).

In terms of desirability, a clear majority jointly voted for Unity in Adversity, probably touched by this federative and cooperative vision of the Black Sea. Nonetheless, both The Great Decoupling (technological breakthrough) and Ecotopia (degrowth) were selected by 3 participants each. Surprisingly, Technocracy for the Common Good, although considered as the most probable imaginary, was not selected as desirable by any of the participants.

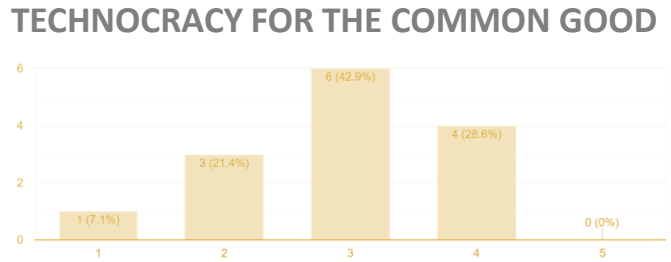
Finally, **Ecotopia, although identified as the most unrealistic, was also considered as the most sustainable overall**. Answers to this question on sustainability are more contrasted, with Unity in Adversity receiving 4 votes.

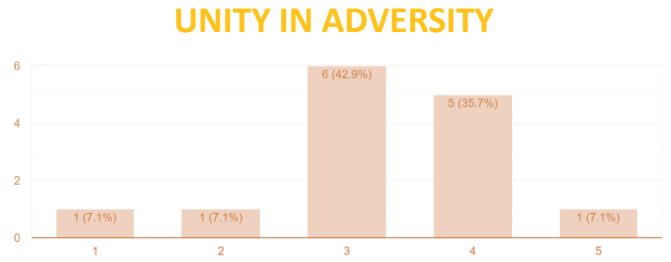


SUSTAINABILITY

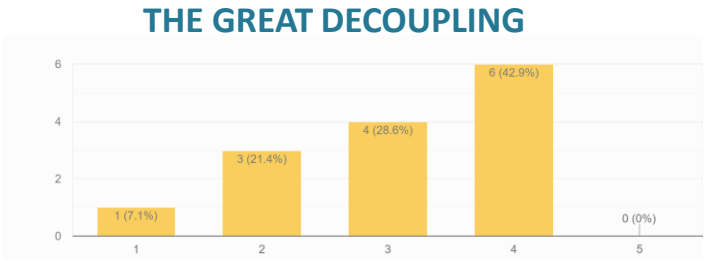
When questioning the actual sustainability of each imaginary individually (*How sustainable do you consider this trajectory*? From 1- *unsustainable* to 5- *very sustainable*), responses appeared as impressively spread across all options. And yet sustainability was the starting point of the imaginaries, initially developed by the EEA, and adapted here to the Black Sea Blue Economy. **This is a clear confirmation that "sustainability" is in many ways a very subjective concept**, some considering it more from an economic and social perspective, others more from an environmental one. Across the imaginaries, 3 trends stand out:

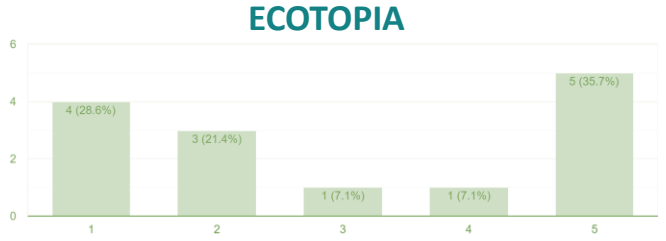
- For both Technocracy for the Common Good and Unity in Adversity, results follow a Gaussian curve: most participants (6/14) voting for the intermediate response (*almost sustainable*), others spreading across both sides of the spectrum.





- For The Great Decoupling, the curve appears linear, with a majority (10/14) ranking 3/5 (almost sustainable) and 4/5 (sustainable). A slightly better result than the two previous ones, although such as for Technocracy for the Common Good, no participant voted for the highest value.
- For Ecotopia, the results surprisingly draw an inverted gaussian curve, with overly represented extremes (*unsustainable* or *very sustainable)* and few intermediate notes. While most ranks are below average (8 answers ≤3/5), it is also the only imaginary with so many 5/5 ranks (5 answers). Discussions with the participant tend to highlight an influence of generational parameters in this specific case.



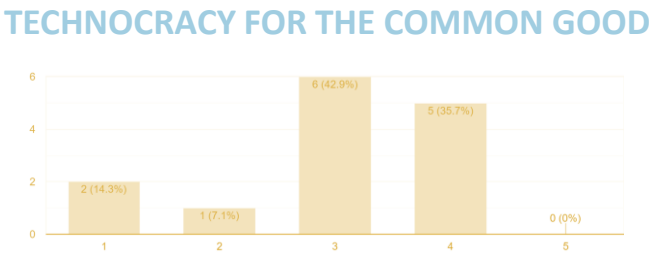


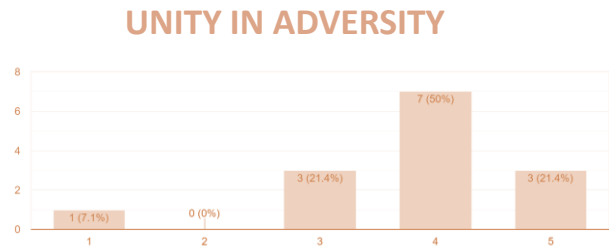
DESIRABILITY

When questioning the desirability of each imaginary individually (*Do you consider this trajectory desirable?* From 1-*not at all* to 5- *very much*), responses are more nuanced than in the overview, where Unity in Adversity was considered as the most desirable.

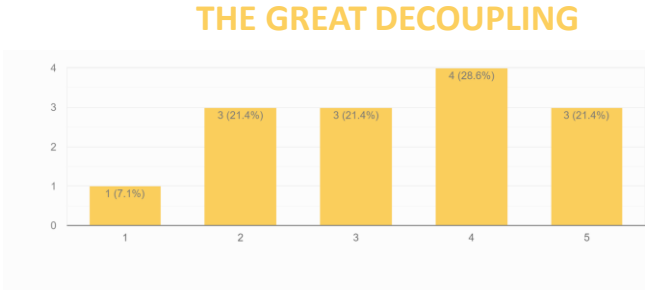
Here, the diversity of point of views is obvious: each imaginary receives at least 4 distinct answers.

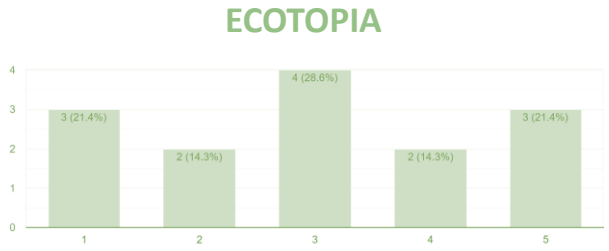
- For both Technocracy for the Common Good and Unity in Adversity, results follow again a Gaussian curve, although less sharp than previously. For Technocracy for the Common Good, the mean value is 3/5 (*almost desirable*), but 11 out of the 14 participants ranked ≥3/5. In comparison, Unity in Adversity appears slightly more desirable overall, with a mean value of 4/5 (*desirable*), and 13 participants ranking ≥3/5.





- For The Great Decoupling, the curve appears flatter, with answers almost evenly spread across the whole spectrum, although with a gravity center slightly on the desirable side.
- For Ecotopia, a total symmetry appears across the desirability scale, with an equally significant number of participants voted for the 2 extreme answers: *not desirable at all* (3/14) or *very desirable* (3/14).



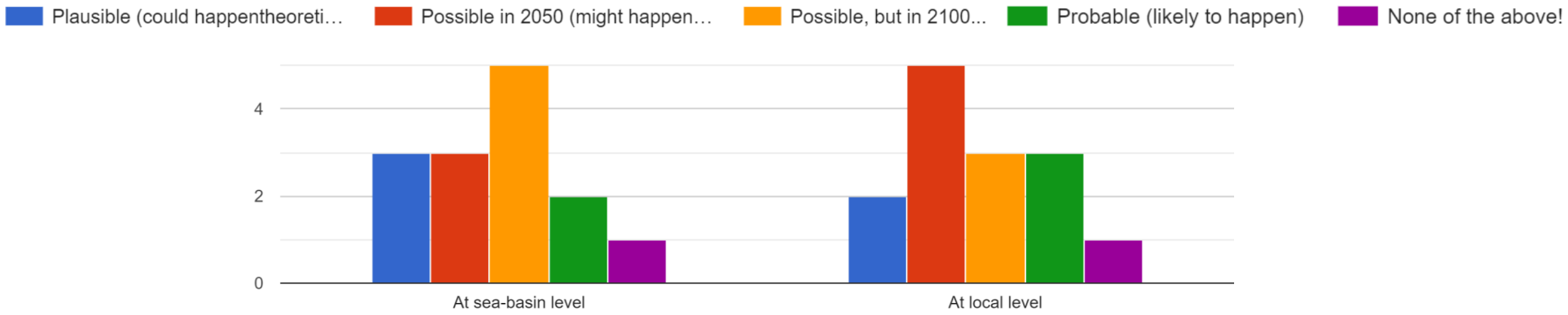


TECHNOCRACY FOR THE COMMON GOOD

When questioning the probability of each imaginary individually (*How probable do you think this trajectory is?),* responses are more nuanced than in the overview, where Technocracy for the Common Good was identified as the most probable.

Having a closer look, responses vary a lot. While some find it only theoretically plausible, others see it as possible, either in 2050 or in 2100, some even as probable, while 1 participants considered it fitted none of these propositions.

A majority (10/14) tend to think the imaginary is possible or probable, by 2050 at local levels, but by 2100 at sea-basin level.



The occurrence of this imaginary seems to be considered more complex at basin level (different legislation, strategies, conflict of interests, inertia) than at national level, where a strong political will could be decisive.

"The current technological development would allow the societal advancement. However, the technology would reach its full maturity much later. The regional context would drive the local development as well."

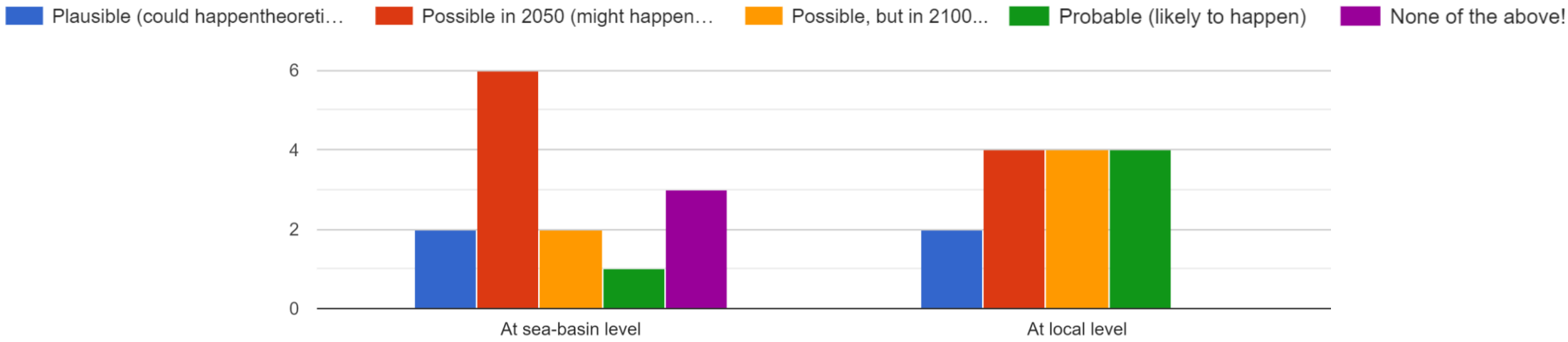
"Coastal & marine Aquaculture intensification, growing of Blue Biotechnologies and renewable energy and decreasing of fishing is most important statement for me, but I can't imagine how is practically possible to organize on a national level restructuring without shipping, as main source of row materials for the different sectors. A decline in tourism could affect the Black Sea countries. Tourism is one of the main sources of income for countries, for example, Georgia."

UNITY IN ADVERSITY

When questioning the probability of each imaginary individually (*How probable do you think this trajectory is?),* responses are more nuanced than in the overview, where Technocracy for the Common Good was identified as the most probable.

Having a closer look, Unity in Adversity also appears as very much possible by 2050 according to participants, although 3 seem to consider it unrealistic.

At local level, answer are more evenly distributed, but a majority (12/14) tend to think the imaginary is possible or probable.



Commenting on their results, participants highlighted the existing trends towards this imaginary, including cooperation experiences (EUSBR, EUSAIR, CMA, SRIA) as well as a strong will from young generations. On the other hand, the issue of countries wanting to maintain their sovereignty was identified as a limiting factor.

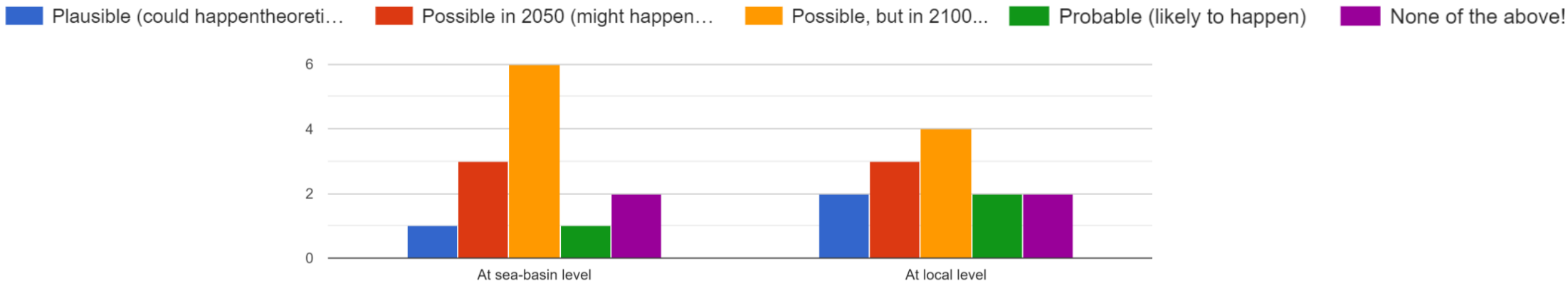
The current war context most certainly has a strong influence on the opinion of participants towards this unified and pacific imaginary.

« *Looks like more stable but difficult for realization* »

THE GREAT DECOUPLING

When questioning the probability of each imaginary individually (How probable do you think this trajectory is?), responses are more nuanced than in the overview, where Technocracy for the Common Good was identified as the most probable.

Having a closer look at the Great Decoupling, responses vary a lot. While 10 out of 14 participants find it either possible or probable, most think it could only occur in 2100. On the other hand, two find it unrealistic at both levels.



Commenting on their results, participants highlighted the fact that demographic evolution could have a significant impact on the occurrence of this imaginary, as well as other crisis (war, environmental disaster, resource crisis, etc.). It was also perceived by some as too libertarian, with a too powerful private sector.

« *In my opinion it 's most sustainable scenario, because of boosting especially the renewable energy sector and significant growth of biotechnology. Coastal & marine Aquaculture significant growth is most important to decrease fishing. Sea transport is indispensable in the Black Sea. It is stable and the advances of blue biotechnologies have enabled a shift from fossil fuel to renewable energy and a reduction of the sector's carbon emissions.* »

ECOTOPIA

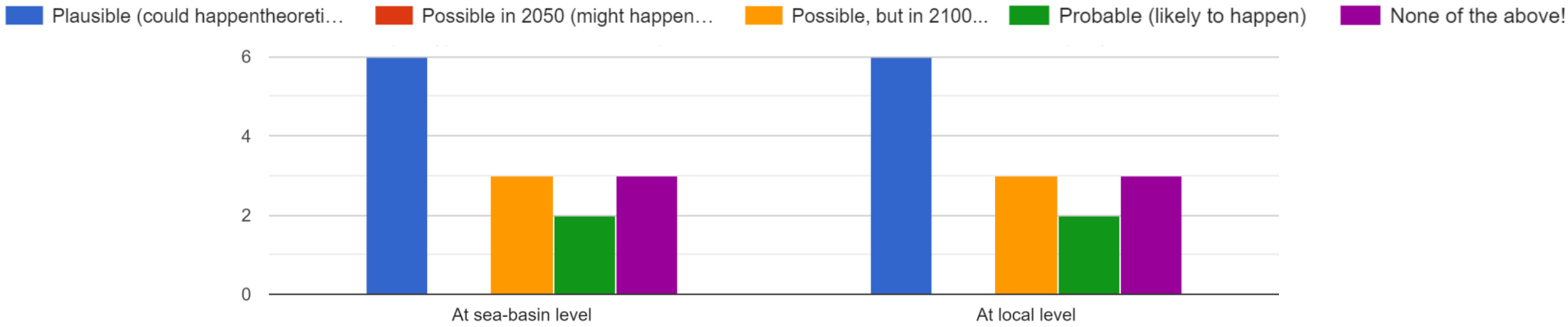
When questioning the probability of each imaginary individually (*How probable do you think this trajectory is*?), responses are more nuanced than in the overview, where Technocracy for the Common Good was identified as the most probable.

Having a closer look at Ecotopia, answers are significantly different compared to the 3 other imaginaries.

First, results are identical at sea basin and local level.

A majority (9/14) tend to think that this imaginary is only plausible in theory (but not in practice) or unrealistic.

However, 5 participants found it possible or even probable by 2100.



Commenting on their results, participants qualified it as "*too romantic*", "*not feasible*", "*fictional*".

However, a minority tend to see it the other way: "*This is inevitable. That's the way things are going*"; "*Technocracy could ultimately lead to this in the far future*". Some also think that new generation could be very motivated by this more sustainable future.

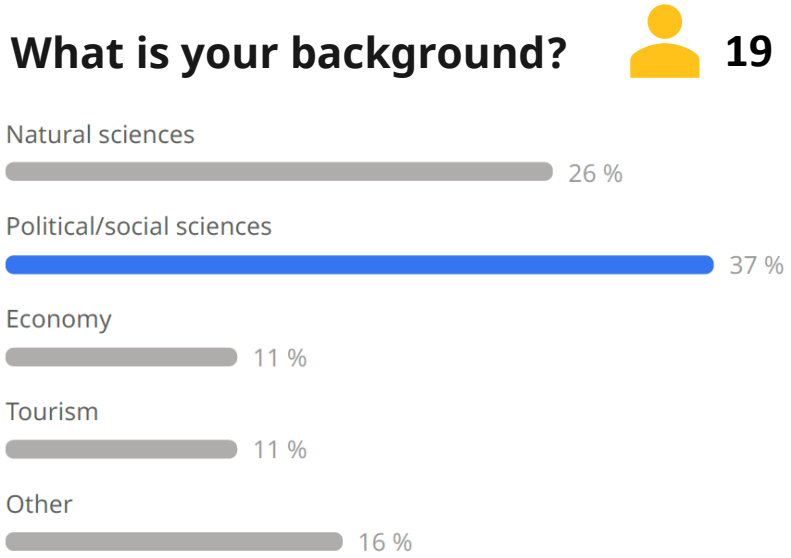
"*In theory, both nature and human being would benefit from this scenario*"

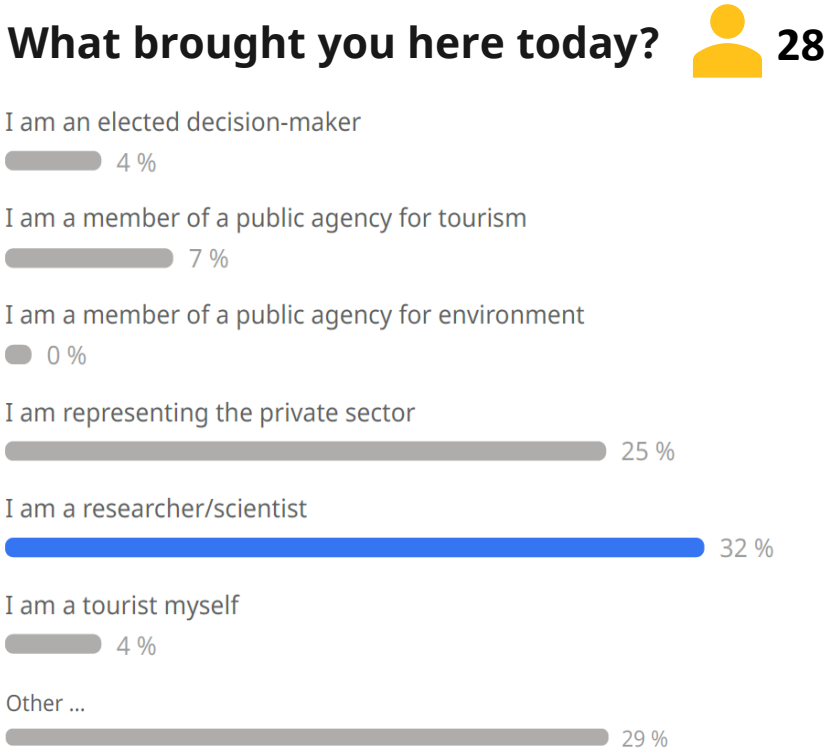
SURVEY 2/2 – FEEDBACKS FROM BRIDGE-BS WEBINAR ON SUSTAINABLE TOURISM MODELS

In October 2024, during the 2nd webinar organized by WP8 **on Sustainable tourism models in the Black Sea,** participants were invited to react on the Sustainable Blue Economy imaginaries for 2050. In particular, they were asked **to rate each imaginary in terms of: probability** (likeliness to happen according to current trends and context) and **desirability** (subjective view on a preferred trajectory).

In total, **about 30 participants took part in the exercise**, with a majority of researchers and scientists, and with a strong focus on political and social sciences. A small share of participants were from the Mediterranean, including Greece.

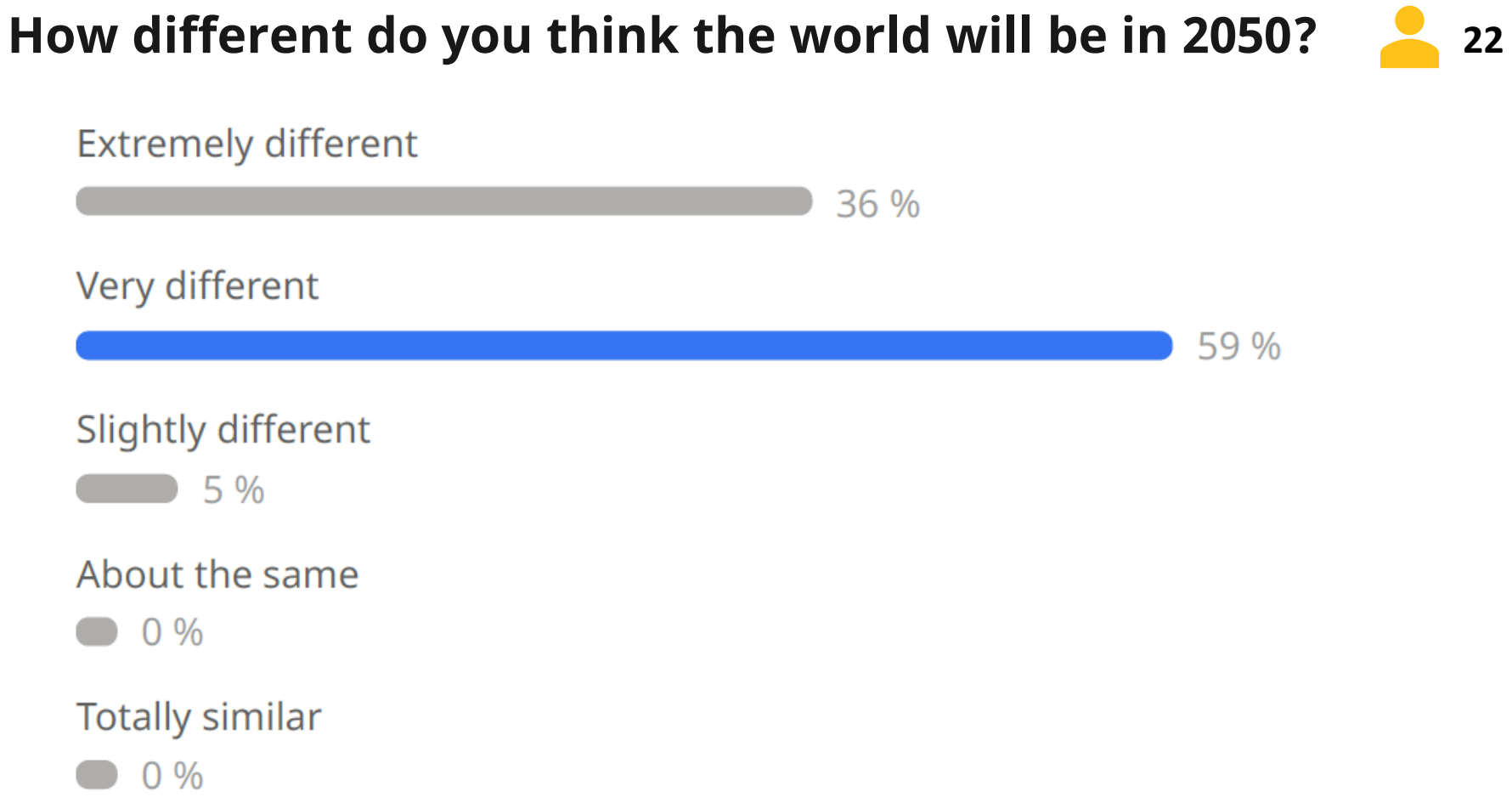
The results of this interactive session are detailed in the following slides.





FORESIGHT: INTRODUCTORY QUESTIONS

As an introductory question, participants were asked how different they think the world would look in 2050. This was intended to gauge their potential interest in foresight exercises, often designed to anticipate changing contexts. Clearly, participants had a strong feeling that 2050 would look at least very different from today, if not extremely different.



FORESIGHT: INTRODUCTORY QUESTIONS

At the time of the webinar, half of the respondents were not familiar with foresight exercises such as the 2050 sustainable blue economy imaginaries, but had the feeling it could be of use to prepare for the future. A significant share (40%) were familiar with such exercises and found them very useful. Nonetheless, 10% of the respondent, being familiar with foresight, did not find it useful overall.

ONGOING TRENDS IN TOURISM

Before getting the participants to think about possible future projections, they were asked to describe the recent trends in the touristic sector of their country/area, which could provide food for thought for the forward-looking exercise. Participants did not always specify the countries in which these trends were taking place. Nevertheless, some converging dynamics can be noted.

How has tourism evolved in the past years in your country/area? (i.e, decrease of the activity, changes in the demand, new infrastructure/investment)

20

Ukraine:

- Unfortunately, during the war, we have a lot of destroyed and occupied territory. We have **lost inbound tourism**.
- Unfortunately, military actions in Ukraine play a negative role in the development of tourism.
- Because of war, unfortunately there is a shortage of tourism activity

Romania:

- Increased number of tourists, but the **sustainable tourism is ensured** mainly in rural areas.

Moldova:

- Comeback from pandemic period, but not to the pre-pandemic level yet
- Changes in the demand

Greece:

- Increase tourism flows due to safe environment and beautiful weather.
- There is a major increase in the number of tourism and many **new investments** are implemented. There is a substantial **increase in incomes**, especially in geographically remote areas. However, there are noticed **new problems in environment** and, in some cases, a **social division**.
- Overtourism (Greece)

Responses not linked to specific countries:

- Recently, tourism has grown with more visitors, **new destinations**, better infrastructure, **a focus on sustainability**, and a **boost in local travel** after the pandemic.
- More tourists **from outside** the Black Sea region.
- **New infrastructure** (accommodations in general), coastal works (beach nourishment, hard coastal structures), increase of "weekend tourism" based on **domestic tourists**
- With support of donors and interested people, there were **opened locations and wine routes**.
- Activity highly increased, increased infrastructure/investments
- New trends
- Overtourism
- Tourist activity in my area saw an increase, particularly during the pandemic period.

DRIVERS OF CHANGE FOR BLACK SEA TOURISM

When asked about the main drivers that could affect the black sea touristic activity in the coming years, participants highlighted both transversal drivers (climate change, state of the global economy, development of artificial intelligence, etc.) and regional ones (geopolitical stability and political situation, accessibility, etc.) as well as environmental drivers (reduction of overtourism and its impacts, environmental protection, etc.).

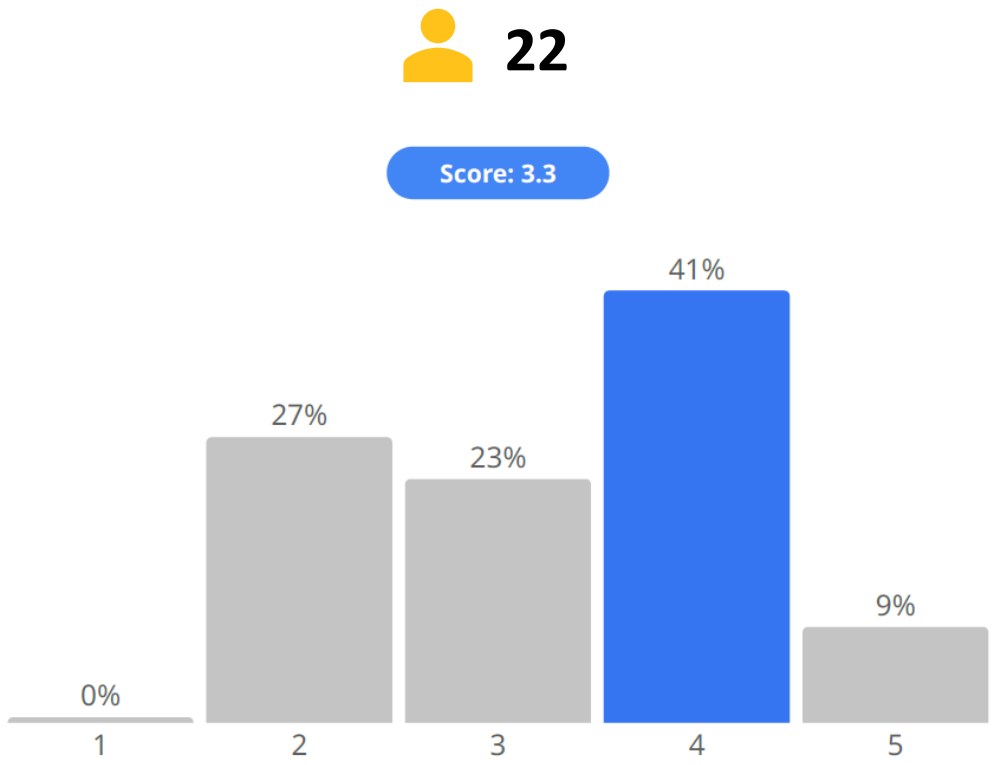
What will be the main driver(s) of change for tourism in the coming years?

25

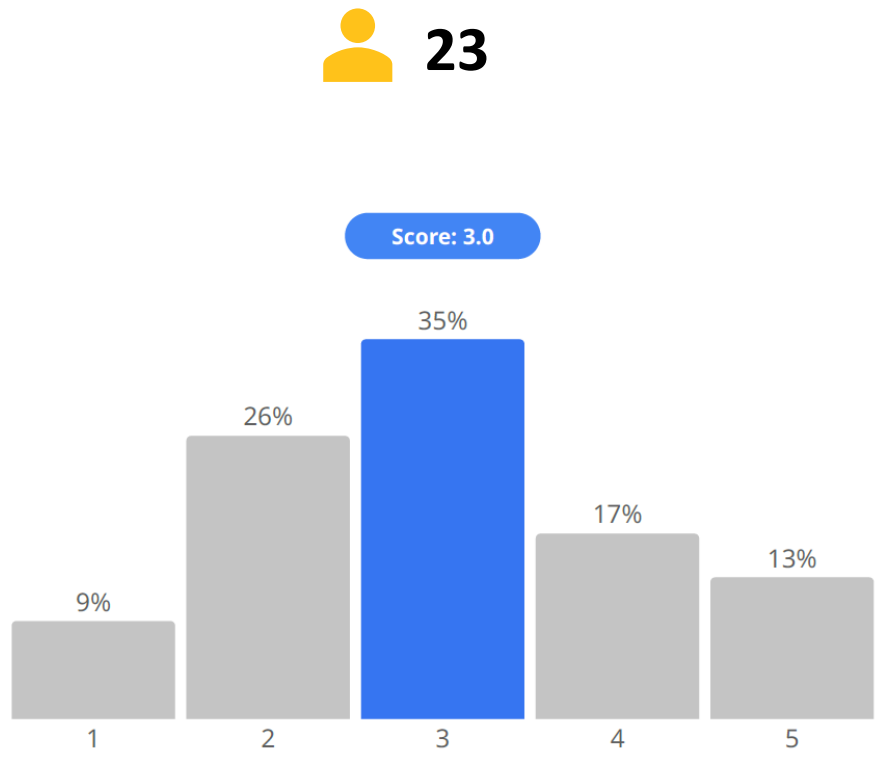
EXPECTED PROBABILITY OF EACH IMAGINARY

For each imaginary, participants were asked to rank its probability of occurrence (according to current trends). Technocracy appeared as the most probable imaginary, followed by Unity in Adversity and The Great Decoupling in second place, while Ecotopia was considered the least probable.

TECHNOCRACY - How probable do you think this touristic future is ? i.e. is it likely to happen, according to current trends? (1= It is impossible ; 5= It is totally possible)



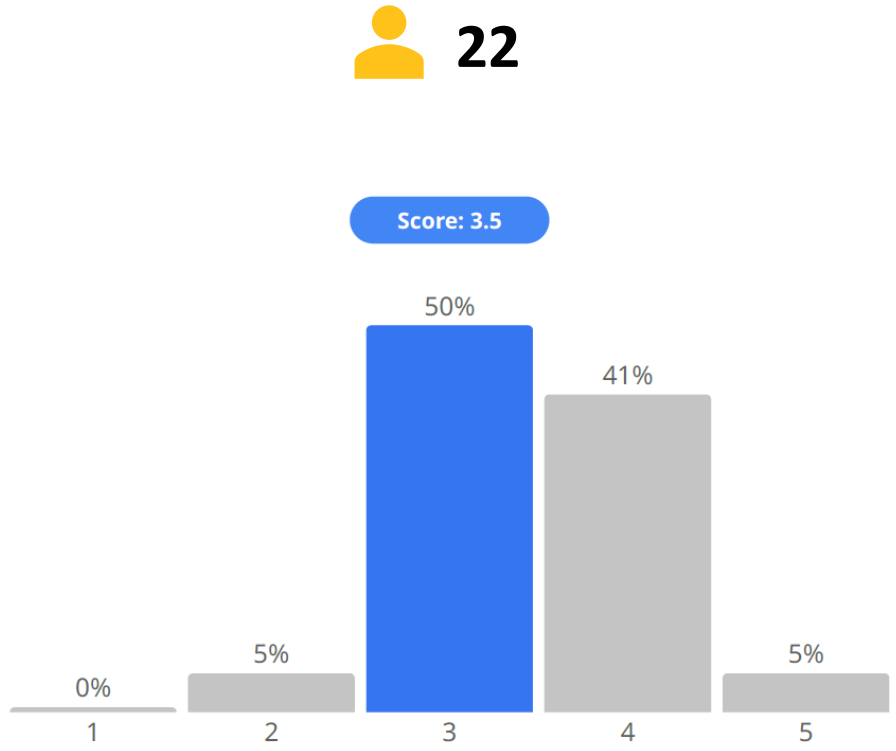
UNITY - How probable do you think this touristic future is ? i.e. is it likely to happen, according to current trends? (1= It is impossible ; 5= It is totally possible)



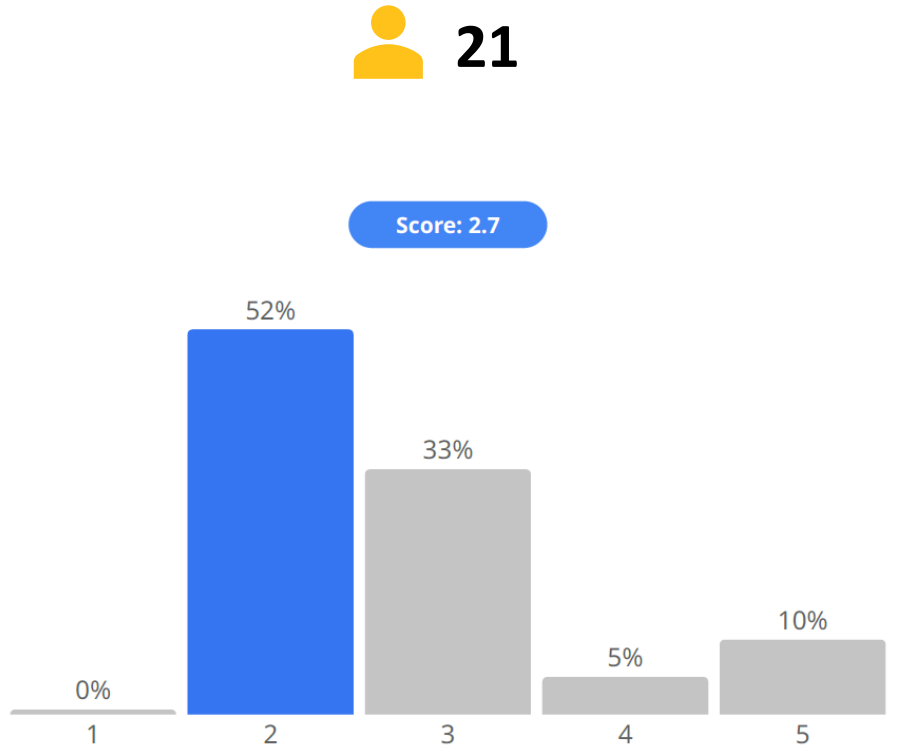
EXPECTED PROBABILITY OF EACH IMAGINARY

For each imaginary, participants were asked to rank its probability of occurrence (according to current trends). Technocracy appeared as the most probable imaginary, followed by Unity in Adversity and The Great Decoupling in second place, while Ecotopia was considered the least probable.

DECOUPLING - How probable do you think this touristic future is ? i.e. is it likely to happen, according to current trends? (1= It is impossible ; 5= It is totally possible)



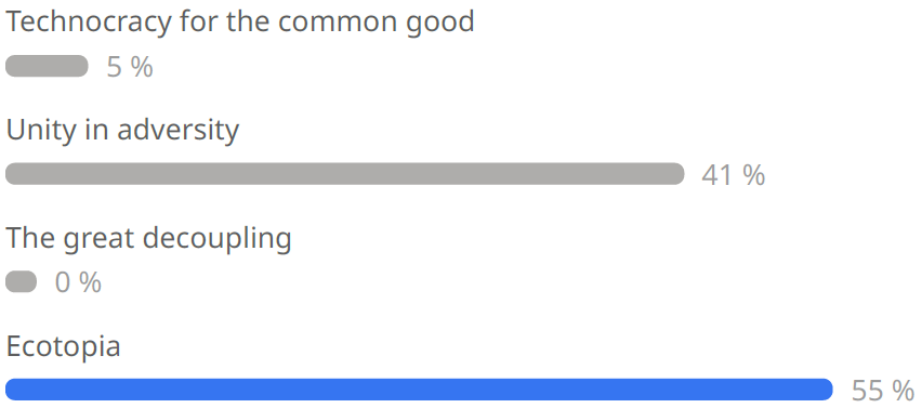
ECOTOPIA - How probable do you think this touristic future is ? i.e. is it likely to happen, according to current trends? (1= It is impossible ; 5= It is totally possible)



DESIRABILITY VS CURRENT STRATEGIES

After the 4 imaginaries were presented and discussed, participants were asked to select their most-desired imaginary (subjective opinion). While considered the least probable, Ecotopia also appeared as the most desired, closely followed by Unity in Adversity. However, contrastingly, a majority of participants noted that their current local touristic strategy was mostly leaning towards a Technocracy for the common good imaginary.

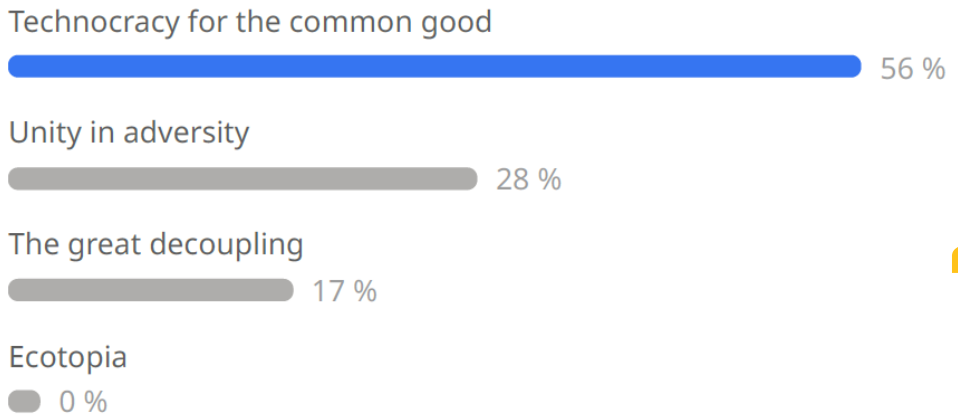
Which of the 4 scenarios would you like to see become true? (i.e. subjective opinion: would you like it to happen?)



22

VS

Towards which scenario is your tourism strategy is leaning to ?



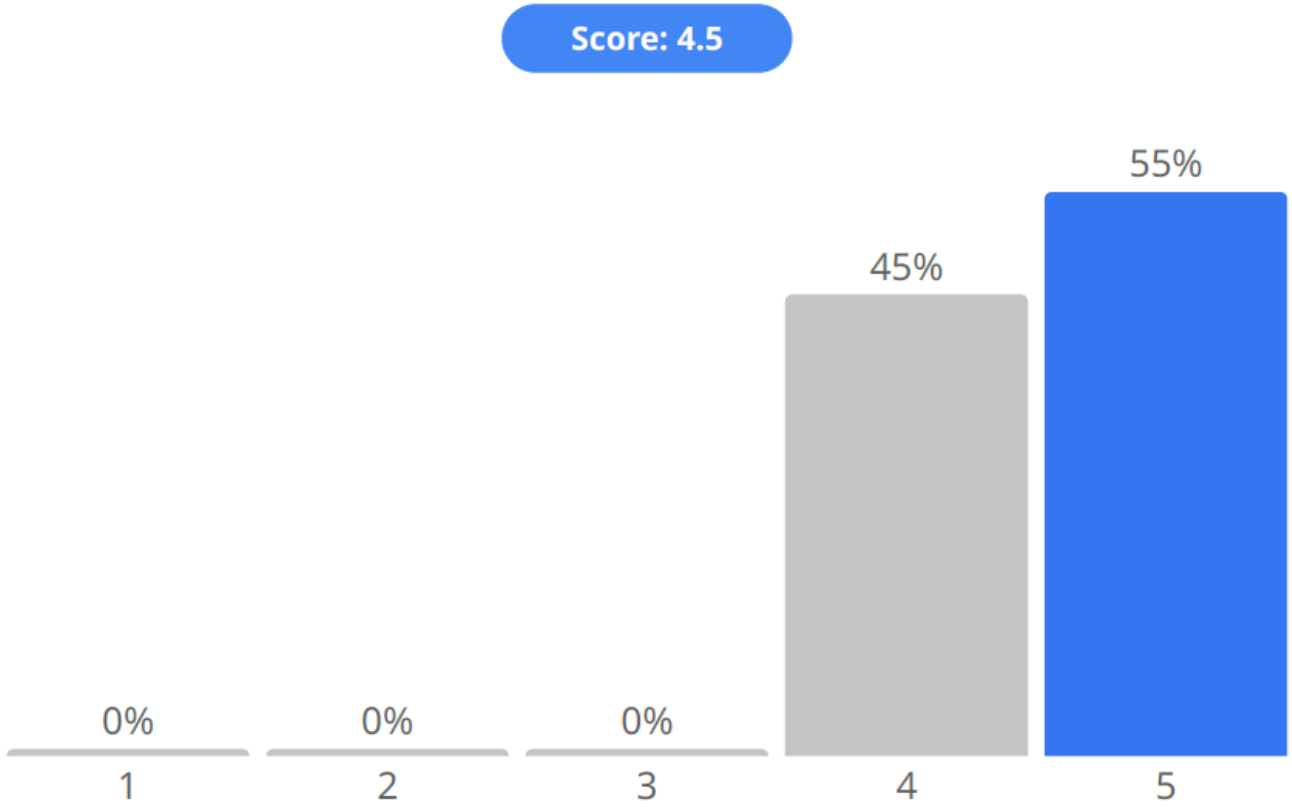
18

FORESIGHT FOR TOURISM IN THE BLACK SEA

To conclude the survey, participants were asked if they considered this type of foresight exercise to be of use to help prepare the future of the touristic activity in the Black Sea. A large majority considered it to be useful or very useful.

Do you think this type of exercise can help prepare for the future touristic activity in the Black Sea?

22



ANNEXES

ADDITIONAL ELEMENTS

ANNEX 1 - DETAILED COMPOSITION OF THE MARITIME AND COASTAL

NATURAL CAPITAL	
Natural heritage	Marine and coastal landscapes and ecosystems (including habitats and species) and associated ecosystem services.
Marine natural resources	Biological resources which are provided by the ecosystem (fish, algae…), energy resources (wind, waves, currents, heat, tides etc), and mineral resources.
Maritime and coastal space	Coastline (various types, including islands, lagoons, etc.), maritime zones and characteristics (bathymetry, etc.). Space is the fundamental support for all maritime and coastal activities, and coastal space is vital for the Blue Economy (all maritime activities begin and end on the coast).
HUMAN CAPITAL	
Knowledge and skills	Applied, scientific, theoretical, or practical knowledge and skills which can support maritime and coastal activities. This includes traditional knowledge and skills (sometimes referred to as maritime and coastal cultural heritage) and its physical and non-physical components.
Cultural heritage	Tangible and intangible heritage - local history and build heritage (lighthouse, forts), cultural sites (museums) and events, literacy, gastronomy and arts.
INSTITUTIONAL CAPITAL	
Institutions and policies	All policy-driven activities, existing frameworks, policies, regulations affecting blue economy sectors and their associated governance bodies. It also includes formal or informal cooperation between stakeholders, their commitment to work together and to act with these frameworks, regulations, and policies to facilitate institutional working. Institutional capital is necessary to support any decision and any action associated with the management of maritime and coastal activities, as the space and resources are usually shared between many stakeholders, and decisions or actions (private or public) overlap or conflict with the decisions or actions of others.
TECHNICAL CAPITAL	
Infrastructures and services	All infrastructure facilities provided to support maritime and coastal activities, including associated services (e.g. communications, meteorological and physical oceanographic services; water and energy supply; waste treatment)
Financial capital	Capacity to invest (capital) or support public and private investment to support maritime and coastal activities. It also includes the attractiveness for public and private funds / investments.

Imaginary 1 – Technocracy for the common good (1/2)

Sustainability through state control

In 2050, Europe has achieved high living standards and healthy ecosystems through meticulous, top-down steering of the economy and society. After decades of persistent and growing social and environmental problems, which many blamed on liberalised markets, Europeans have increasingly turned to the state for solutions. An important watershed was the Ukraine war, which was widely understood to demonstrate the necessity of powerful political leadership.

By 2050, national governments have a strong role in organising production and consumption — for example through regulation, market design and taxes — so that economies operate largely within environmental limits. Advanced information and communication technologies and other high-tech innovations enable unprecedented monitoring of ecological, social and economic systems and more efficient use of materials.

Economic growth and big business

Data-intensive planning at the national scale, combined with well-targeted interventions, enable steady economic growth (mainly in the service sector) within environmental boundaries and without social disruptions. However, 'old industry' sectors have not disappeared. On the contrary, problems with global supply chains worsened during the 2020s and early 2030s, especially in the aftermath of the Ukraine crisis. European nations had to rethink resource use, and consequently much manufacturing was reshored to Europe. In 2050, some governments provide massive support to 3D printing and circular economy concepts, with a focus on manufacturing, construction and agriculture. Others emphasise compliance with climate protection targets without supporting specific technologies or industries.

State interventions and network economies have contributed to the emergence of 'big businesses' that collect vast amounts of behavioural data from users, develop powerful artificial intelligence (AI) tools and dominate their respective industries.

While these businesses are potentially influential political actors, governments curb their power and ability to profiteer, for example by imposing strict rules for corporate governance (e.g. relating to remuneration, liability for harms), enforcing rigorous transparency and increasing public ownership in some sectors. The overall aim is to create and sustain a business sector that generates collective societal value before private profit.

The tendency towards centralised governance is reflected in the ways that sectors are structured and operate. For example, the energy system embraces the use of nuclear power and centralised power generation combined with long-distance transfers of energy. This is true even for renewable energy: concentrated solar power and giant photovoltaic fields are favoured over photovoltaic panels on individual houses.

Agriculture is large scale and intensive, making widespread use of high-tech solutions from AI and robotics to genetically modified crops. Precision farming has made the use of pesticides and fertilisers much more efficient; heavy agricultural machinery is increasingly replaced by swarms of drones and 'agrobots' (agricultural robots). From automation to data collection and analysis, the digital evolution of agriculture is a fact of life on farms across Europe. Agricultural yields have increased, production costs have reduced and environmental standards are complied with.

Prioritising society's collective interests

In general, ecosystems and natural resources are primarily valued for their capacity to serve human interests, not for their intrinsic ecological value — the 'inherent worth of life' — as the deep ecology movement demands. Consequently, large-scale industries such as fishing and forestry rely on monitoring to secure maximum sustainable yields, often impairing other ecosystem services and reducing resilience.

Sometimes the new concepts of comprehensive real-time ecosystem management are ridiculed as a 'digital fad'. However, in an age of rapid climate change, weather extremes and frequent calamities, such approaches are a simple necessity.

Imaginary 1 – Technocracy for the common good (2/2)

Within cities, advanced planning has expanded green infrastructure as a means of delivering valuable services such as mitigating climate change impacts related to air quality, flood risks and urban heat islands.

The strong performance of national economies generates the fiscal revenues to sustain powerful centralised governments, public services and welfare systems, and to successfully mitigate climate change impacts. This model of governance focuses on maximising the 'collective interests of society' for both current and future generations based on a broadly shared understanding of these interests.

This sometimes means setting aside individual rights and personal freedoms for the sake of the common good. However, the political system enjoys broad popular support because of the widely shared prosperity and stability that it provides in a world full of crises and conflicts. Behind the scenes, most national governments exert a subtle control over public discourse.

Digital technocracy

The digital transformation pervades all aspects of life, the economy, education, infrastructures and the built environment. Connectivity is ubiquitous. Most citizens interact continuously with a wide array of highly personalised apps. As a consequence, the online public sphere is vibrant, with high levels of participation from citizens, public authorities and businesses. Government uses the latest digital solutions to scan for societal problems or unrest and provide targeted programmes for citizens who are in danger of being marginalised or creating disorder. Pro-social and pro-environmental lifestyles are encouraged through nudging and choice editing.

Governments have made administrative decision-making as transparent as possible, arguing that this increases acceptance and efficiency. But it is widely rumoured that the primary goal is to limit corruption in powerful state bureaucracies that interact closely with private companies.

Civil society organisations have an important role in governance but operate primarily as extensions of government influence, rather than independent and critical voices. Nevertheless, there is a continual complaint on social media about 'too much control, too many restrictions'.

Catchphrases such as 'Big Brother 4.0' are occasionally used, for example when some countries introduced personal carbon budgets and again 5 years later when they were made publicly available. This sparked controversies when would-be parents realised that their carbon budget would be insufficient to cover their usual level of consumption and the needs of a child.

In some countries, libertarian groups have emerged protesting against the 'digital technocracy'. However, political parties increasingly seem to be a thing of the past. Technical experts and their AIs manage many fields of politics in many parts of Europe. However, EU Member States differ substantially in their approaches to regulating personal life, for example in terms of higher or lower privacy standards or the use of bonus/malus systems to promote environmentally sustainable behaviour. In about 2040, attempts to 'harmonise' approaches at the EU level failed. Confronted with 'exit threats' from some Member States, the EU even devolved some powers.

The EU was cut back to a well-functioning partnership among strong national governments, which together focus on protecting their interests and shielding Europe from external pressures, including immigration and economic competition. Despite these differences, all Member States adhere to a broadly similar economic model, leaning towards deglobalisation, self-sufficiency and technocratic management.

Imaginary 2 – Unity in adversity (1/2)

Responding to recurrent crises

For Europe, the decades leading up to 2050 have been dire. First there was the COVID-19 pandemic, then the Ukraine war with the displacement of millions of refugees, then extreme weather events with large forest fires and floods, then heat waves resulting in high death tolls in many cities, and then heavy storms wrecking power infrastructure, and subsequently increasing levels of internal migration. Europe's socio-economic and political systems had to evolve substantially in response to worsening environmental conditions, disasters and disruptions and their financial fallout.

In a way, nature has provided the primary driving force for change, and European societies painfully learned their lesson. Increasing geopolitical tensions, only in part connected to climate change, contributed to this learning process. Populations across Europe concluded that dealing with these tasks required more resilient infrastructures, more efficient disaster relief systems, more climate change mitigation and adaption, more efficient governance, more European cooperation (also in the field of foreign and security policy) and much more financial resources.

A unified Europe

In the end, recurrent disasters triggered widespread acceptance of the need for a new approach to economic development and governance and for more resilient, less consumption-oriented lifestyles. Confronted with adversity — and with growing pressures from electorates — governments of EU Member States responded by joining forces. In the late 2030s, the call for more cooperation resulted in a process that led to a European Constitution, replacing the Treaty on European Union. This created a new balance of power between the main European institutions, often expressed simplistically as 'Power to the Parliament'.

A strong, federal EU government is now in charge of ensuring Europe's resilience to climate change impacts and steering towards sustainability, primarily using stringent, top-down measures such as regulations and economic instruments

Europe's new constitution requires economic and societal stakeholders to operate within strict environmental limits as its core guiding principle – even in times of substantial defence spending. Governments still promote economic growth as a means of sustaining employment levels and fiscal revenues, but GDP is no longer the primary measure of society's economic performance.

European governments (at the EU and federal state levels) are therefore trying to become more 'growth agnostic', looking for ways to make social well-being and the functioning of the state less dependent on increasing GDP. A more far-fetched move by some activists to use GNH (gross national happiness) instead of GDP failed because happiness proved to be a rather elusive concept. But this move indicated a subtle change in lifestyle throughout much of Europe: away from seeking happiness in high incomes, high levels of consumption and 'fun', towards a strong emphasis on well-being, sufficiency and steadiness. There is a widespread feeling of self-reliance and mutual help among Europeans: we survived the last crisis; together we'll cope with the next.

An economy within strict limits

European solidarity and deepening integration offer ways to cope with the weak and uncertain growth of GDP. EU-level taxation of individuals and companies provides the basis for large fiscal transfers between regions, cushioning the effects of localised shocks and crises and enabling peripheral and other disadvantaged regions to catch up step by step and to build up resilience to climate change impacts. Coordination of tax rates on the principle 'pay tax where you make revenue' has eliminated many tax havens and enabled much more robust taxation of multinationals, including powerful tech companies.

These efforts have been further reinforced by measures to shift the tax base to include digital taxes, financial transactions taxes, progressive consumption taxes and wealth taxes. The eurozone has been greatly strengthened by the introduction of jointly issued debt, a common fiscal framework and mechanisms to limit current account imbalances

Imaginary 2 – Unity in adversity (2/2)

The digitalisation of the currency has further bolstered efforts to address tax evasion by greatly increasing transparency and by giving the European Central Bank much greater control over monetary conditions, helping to manage inflation and minimise unemployment. Political and economic integration has been further consolidated through new rules on how the European market works. Strong regulations control financial flows and current account imbalances within Europe and help reduce market instability. Corporate governance rules strengthen workers' voices and mandate maximum differences between top and bottom earners in companies. The European Parliament has also reacted to the increasing number and severity of disasters by strengthening EU laws on environmental and social governance. Strictly enforced liability for environmental damages drives better conduct while comprehensive sustainability accounting requirements enable the rewiring of financial flows.

Together these actions contribute to a shift in the role of businesses in society. Restrictions in the funding of political campaigns reduce the ability of the rich to influence the political process. Employees and the significant segment of self-employed workers have gained more influence in business life and in politics. In general, inequalities are successfully addressed through top-down policies characterised by extensive regulation and intervention to shape market outcomes.

Investing in nature

The increasingly severe environmental and climate pressures of recent decades have also shaped Europe's management of nature. There is a strong emphasis on investing in ecosystems to reduce impacts from climate change and environmental degradation. Controversies about 'restoring' or 'rebuilding' ecosystems (restoring the former composition of species or rebuilding by introducing new ones) have sharpened the common understanding of ongoing environmental change.

Interconnected networks of natural and designed landscape elements, such as water bodies and green and open spaces, are prominent features of urban areas, but restructuring cities in view of a changing climate poses, even in 2050, a major challenge. In many rural areas, agriculture and nature are highly integrated (e.g. by agroforests) with the aim of increasing the provision of regulating services and supporting services, thereby enhancing farming output and mitigating natural hazards. For example, soil management is adapted to increase soil biodiversity and to enhance nutrient cycling, soil formation, carbon storage and primary production.

By 2050, Europe has taken decisive steps towards sustainability and is much more resilient to disasters and shocks. It has thereby gained in stature as a global player.

Imaginary 3 – The great decoupling (1/2)

Innovation drives green growth

In 2050, Europe's economy is growing strongly while remaining within environmental boundaries. Technological breakthroughs and related shifts in social practices and norms have enabled an extraordinary decoupling of GDP growth from adverse environmental impacts. Economic growth has generated the resources to invest in rapid innovation, to continue investing in the upgrading of energy, mobility and food systems and the built environment, and to address the impacts of climate change. Green lifestyles have become the norm, with new technologies driving the adoption of new habits and routines. Resource efficiency and circularity are fully integrated into daily life.

It is debatable whether these breakthroughs were mainly driven by intelligently designed innovation policies or the need to cope with acute resource security concerns linked to shrinking resource stocks and severe disruptions in access to fossil fuels from Russia in the 2020s. A dramatically deteriorating global food situation created new opportunities for innovators in the European agri-food sector.

The biotech revolution

The effects of rapid technological and social innovation are particularly evident in the bioeconomy, which is the most dynamic part of the economy. Innovations are blossoming in areas from primary biomass production (e.g. plants, algae, bacteria), through biotechnology (e.g. cell factories, bio-based plastics), to innovative, circular business models and a flourishing, globally competitive health sector. Complex secondary and tertiary production processes enable high levels of circularity of biomaterials, reducing demand for critical resources from outside the EU. Fossil fuel substitution has been largely achieved through increased production of alternative fuels such as algae-based biofuels, 'green roof tiles' capable of photosynthesis, developments in the production of 'green hydrogen' and the cascading uses of agricultural waste.

Despite growing climate change impacts, frequent droughts and floods, crop yields are increasing.

Large-scale farms use data analytics, improved sensor technology and drones to collect data. Agro-ecosystem design — partly based on genetically modified species — has become a new technoscience.

Agricultural automation goes far beyond precision farming. Significant biotechnological advances enable environmental restoration and play a key role in addressing pollution in the countryside, on former brownfield sites and in urban areas.

Vertical farming has become mainstream in European cities. Traffic is based largely on biofuels and hydrogen, with a good share of electromobility in small vehicles. Unexpectedly, health care, an important issue for ageing populations, has not drained public resources, but inspired innovation and stimulated growth. Globally, European firms are among the top companies in fields as different as biomedical nanorobotics, pharmaceuticals, advanced tissue engineering and xenotransplantation, artificial organs and service robotics. European universities and research institutes specialising in biomedical and biotechnical fields attract students and researchers from all continents.

Liberalised markets

However, this success story is not exclusively based on the 'biotechnology revolution'. Efficient, liberal markets have played a central role in enabling green growth, with government interventions playing an essential role in correcting market failures and driving forward innovation. In the late 2020s and early 2030s, economic development in most European nations suffered from ageing and shrinking populations, with weak growth and high unemployment rates despite (or because of?) 'baby boomers' leaving the workforce.

Governments across Europe had to respond. They liberalised labour laws and lowered corporate tax rates, while investing in research, skills, experimentation and learning. Environmental, resource and consumption taxes helped to sustain tax revenues and incentivise green innovation but also had regressive effects. Competition between EU Member States increased in many fields: in fiscal/taxation issues, in approaches to 'liberalising labour', in regulation of biotechnology, etc.

126

Imaginary 3 – The great decoupling (2/2)

In response to divergent economic development and a further spreading of national debt burdens, the eurozone has broken up. In the immediate aftermath of the 'Euroxit' (some called it 'Eurocide'), economic and political disruptions shook the EU. In the end, however, a weaker EU provided a more flexible policy environment, better adapted to national realities — even if it also meant that EU countries were no longer major players in the global arena.

In 2050, cooperation between EU countries is pragmatic. Members States focus on a small number of areas of European competence. National policies are debated and adopted, with a prominent role for civil society organisations as accepted mediators between policymakers and the public, ensuring a functioning exchange between stakeholders.

Flexibility and mobility

The emphasis is on creativity, flexibility and mobility. Following the liberal ethos, policy aims for equality of opportunity, rather than equality of outcomes. Government policies actively promote the emergence of disruptive innovations and entrepreneurship that can drive transformative change. At the same time, policies also constrain the power of incumbents and limit monopoly power, including the power of the new giant biocompanies (the 'hulks', as the media call them). The result is a highly competitive market characterised by diverse platforms. National currencies are increasingly complemented and replaced by digital alternatives operated by multinational companies.

Alongside and in combination with the bioeconomy, robotics, automation and AI are thriving, driving productivity gains and economic growth. This creates an uncertain work environment, especially for low- and medium-skilled workers, but the labour market is adapting. Booming labour platforms create new kinds of 'crowd working', with short-term 'gig' engagements expanding rapidly at the expense of full- or part-time employment. Leisure and working time merge seamlessly. Job insecurity and inequality are generally accepted because social mobility is high, and growth means that governments have resources to finance generous social protection (e.g. unemployment benefits), retraining for new jobs in different branches of the bioeconomy and fiscal transfers to households or communities in need of support.

In the middle of the century, Europe has become a patchwork of specialised, highly dynamic regions where new, sustainable industries and services flourish, alongside rather depopulated regions that are left to 'rewild', used for recreation or employed to generate bioresources.

127

Imaginary 4 – Ecotopia (1/2)

Rejecting consumerism

By 2050, Europe has undergone a profound socio-political and economic shift, reversing some of the societal changes of past centuries. This change in mentality has partly been driven by the impact of climate change, with weather extremes and disasters affecting large parts of the population, and the wish of the younger generations to live at peace with nature.

But some researchers also argue that the Ukraine war and its aftermath contributed to the emergence of a counterculture (a little like in the 1960s), which emphasised the capacity to live a good life in times of hardship, in preference to consumerism. Consequently, markets and centralised national governments are no longer so dominant in shaping collective thinking and action. Power has shifted to local communities and civil society organisations.

This profound shift should be understood in the context of an equally profound generational change. The 'Greta and post-Greta generations' developed a deep scepticism about market-driven or 'liberal' economic models and about strong central states and their ability to stop climate change. Profit maximisation and conspicuous consumption, according to their credo, should be replaced by sufficiency, equity and respect for nature. The new generations favour sharing and collaboration over competition, especially at local and regional levels.

Empowered by social media, young people have become much more engaged politically, balancing the influence of the large constituency of elderly voters. Public pressure — with the incessant activity of powerful non-governmental organisations — has forced companies to rethink their business models and to really implement corporate social responsibility. As a result of more frugal lifestyles, the consumption of a broad variety of goods declined. Consequently, economic output and finally resource use were scaled back.

Growing role for civil society

The full impact of this shift hit governments in the late 2030s. Reduced economic output implied a reduction in the fiscal resources available to central governments. This contributed to a reduction in the state's capacities and roles, including its ability to finance public health and welfare expenditure.

While this has created challenges, it also created space for civil society and grassroots initiatives to play a more important role in devising and delivering novel ways of providing care and support. Family ties and neighbourhoods regained importance, in keeping with the mentality of the younger generations. With the spread of 'repair and exchange cafés', old crafts have been revived.

Social and cultural innovations (such as these cafés) often have more impact on society and the economy than new technologies, although there are many exceptions. For example, information and communication technologies are important in engaging communities and enabling individuals to help each other via non-market transactions. Paradoxically, the nature-loving youngsters spend a large part of their time in the digital sphere.

By 2050, families have benefited from reduced working hours and work-life balance is no longer an issue. Stress-induced mental disorders have nearly vanished, although even volunteers sometimes still overexert themselves.

Local empowerment

Social, economic and political systems are decentralised. As far as possible, public policies are debated and adopted with the involvement of citizens, and non-governmental groups are actively engaged in political processes. As in society at large, there is a strong emphasis on experimentation in governance, with the lessons learned widely shared and discussed on social media, at the market or in the town hall. At the European scale, the EU persists but is relatively weak, although it is not exactly an unnecessary 'empty shell', as some complain. Member States normally join forces flexibly in 'coalitions of the willing' to tackle policy areas such as defence, taxation or social affairs. Cities, regions and non-governmental groups and networks have a strong voice in EU policy discussions.

Imaginary 4 – Ecotopia (2/2)

Europe is inward looking. It contributes massively to climate change mitigation and reacts to disaster relief calls from the United Nations. But it does not see its role as including engaging in conflicts and local wars elsewhere in the world. In retrospect, most people regard the development and aid programmes of past decades as counterproductive. Asylum seekers — politically persecuted people — are welcome; war refugees are welcome to a certain extent; migrants are mostly unwelcome. Some people have a simple ecological interpretation: 'Europe has reached carrying capacity'.

Economic activities and sectors are similarly fragmented and localised. Decentralised digital currencies (some of them successors to local and regional currencies) are used to boost local economies or reward unpaid work (e.g. care for the elderly). Businesses are often managed by stakeholders, including customers, employees and local communities. The energy sector is likewise highly decentralised. Private households and commercial units produce and store energy through a mix of renewable sources. Many homeowners and communities aim to be completely self-sufficient. Centralised energy production is largely reserved for industries. Nuclear power plants are close to being completely decommissioned.

Declining economic activity has alleviated some of the social and environmental pressures that previously demanded public spending. Finding ways to live and do business within nature's limits is now part of society's 'common sense'. Ecosystems are prized for their inherent value rather than their capacity to generate profits. The widespread desire to reconnect with the natural world (together with other factors such as new technologies enabling remote working) has encouraged people to move out of cities to ecovillages and local sustainable communities in rural areas. Some have adopted a specific philosophical or religious orientation, sometimes in line with traditional forms of esotericism.

Reconnecting with nature

Many agricultural regions that had previously been abandoned have been reinhabited. Natural resources are managed with the aim of maximising biodiversity and ecosystem health and resilience, rather than economic returns. Agriculture is generally smaller scale and much more diverse. Small farms, often run by cooperatives, provide high-quality nutritious food and recreational opportunities for families; some are an integral part of ecosystem rehabilitation schemes. Just as citizens wish to reconnect with nature, more engaged consumers want to reconnect with their food, understanding more about how it is sourced, processed and produced. Environmental and health problems associated with intensive agriculture and long food chains, now almost a spectre of the past, have led most consumers to favour organic and local food.

Meanwhile, nature has been invited back into towns and cities, with public authorities making land and resources available for engaged citizens to greatly expand blue and green urban areas. In many places, decommissioned infrastructures — such as former motorway junctions — have been dismantled. Their space has been given back to nature. 'Gardening' is a widely used catchphrase: let's undo the harm done to nature and transform the spoilt environment into a garden.

In the middle of the century, lifestyles across Europe, in villages as in cities, have become more relaxed, more frugal, more cheerful than in previous years. Some of the older people would add that life is more sedate, even more complacent. Deceleration, once an academic concept, has become reality.