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Ebun Akinsete*[1], Alice Guittard[2], Phoebe Koundouri[3] and Lydia Papadaki[4]

[1] Sustainable Development Unit, Athena RC; School of Economics and ReSEES Research Laboratory, Athens University of Economics and Business; UN SDSN Global Climate Hub

[2] Sustainable Development Unit, Athena RC; School of Economics and ReSEES Research Laboratory, Athens University of Economics and Business; UN SDSN Global Climate Hub

[3] School of Economics and ReSEES Research Laboratory, Athens University of Economics and Business; Department of Technology, Management and Economics, Denmark Technical University (DTU); Sustainable Development Unit, Athena RC; UN SDSN Global Climate Hub; UN SDSN Europe & Greece

[4] Sustainable Development Unit, Athena RC; School of Economics and ReSEES Research Laboratory, Athens University of Economics and Business; UN SDSN Global Climate Hub

*Corresponding author: E-mail: eakinsete@athenarc.gr

Abstract

This paper captures an ongoing joint initiative which spans three EU-funded projects active within the Black Sea region, each utilising living labs to support the overall development of the Blue Economy in a sustainable manner. The Black Sea is a complex resource-rich socio-ecological ecosystem nestled within a dynamic geo-political space, thus providing both fundamental challenges and great opportunities within the Blue Economy sectors. Each of the projects adopts diverse yet complimentary focii in terms of stakeholder groups, geographic location, thematic focus and level of governance. The paper outlines the overarching methodology of Systems Innovation implemented by the initiative, before presenting each project and the activities undertaken therein. The paper concludes on the potential implications held by emerging findings, both methodological and thematic, on the sustainable development of the Blue Economy and related policy in the region.

Key Words: Living Labs, Co-creation, Blue Economy, Black Sea, Systems Approaches

Introduction

Nearly half of the EU population lives less than 50 km from the sea (2001), concentrated in urban areas along the coast (Eurostat, 2011); with the seaside being Europe's most popular holiday destination. As much as 51 % of bed capacity in hotels across Europe is concentrated in coastal regions with the coastal tourism sector employing over 3.2 million people. The sector generates

183 billion EUR in gross value added which represents over one third of the maritime economy – a major component of the Blue Economy.

The Blue Economy represents the overall contribution of seas, oceans and other marine or aquatic ecosystems to a nation or a region's wealth. With an added value of 500 billion EUR annually, the EU's blue economy is recognized as a major driver for development within Europe, and is clearly identified as a priority area for growth (European Commission, 2012). At the same time, European seas are overexploited, being placed under multiple pressures from human activities (EEA, 2019); this has led the European Commission, in line with the objectives of the European Green Deal, to acknowledge the need to transition toward a sustainable Blue Economy (EC, 2021). This can only be achieved through the preservation of marine ecosystem services and their resilience towards the multiple anthropogenic stressors.

Figure 1: Map of the Black Sea

Located in south-eastern Europe, the Black Sea is an inland sea which covers an area of 436,400 km2 and is bordered by Bulgaria, Georgia, Romania, Russia, Turkey, Ukraine. Located on the outer limits of the EU, the Black Sea region is regarded as a 'strategic bridge' an economic, geo-political and trade corridor of strategic importance, connecting to the Mediterranean Sea via the Marmara and Aegean Seas, and Europe with Asia to the Caspian Sea, Central Asia and the Middle East and with south-east Asia and China. It is a dynamic, heterogeneous region of political, economic and diversified societal cultures characterised by the countries' close ties and their great economic potential, but also by diverging interests (European Commission, 2022). That said, the Blue Economy within the region is still largely under-developed (EC, 2022), with vast reserves of untapped potential for economic development in the region. The significance of the Blue Economy for development in the region was formally recognized by the key regional actors in the Burgas Vision paper (VP, 2018) and the Common Maritime Agenda (CMA, 2019). The Black Sea itself, despite being resource-rich, also exemplifies the current poor environmental

status of European Seas, and is widely regarded as one of the most polluted seas on the globe. It contains twice as much marine debris as the Mediterranean and is severely eutrophicated, with elevated levels of phosphorus, nitrogen, and other plant nutrients. The poor water quality has had a significant impact on fish populations, and the diversity of species is gravely threatened; while the introduction of alien species, deoxygenating, climate change are further affecting its unique ecosystem (the largest anoxic-sulfidic water body of the Earth). The negative environmental effects of the poor ecological status inevitably harbour socio-economic consequences on employment, food security, tourism and health; thereby calling for an urgent transition towards a more sustainable trajectory of development within the Blue Economy.

Through 3 different EU Horizon funded projects, Living Labs are currently being implemented in the Black Sea countries to support this transition towards a sustainable development of the Blue Economy in the region, bringing stakeholders at the core of the strategy. This current research-in-progress paper seeks to share with the Living Lab community insights from the current experiments on 1) how Living Labs are used in the context of the "blue transition" 2) how a system innovation approach has been implemented to trigger transformative processes, 3)how collaboration across Living Labs initiatives strengthen stakeholder engagement impacts.

1. Methodology:

a. A System Innovation Approach for Blue transition in the Black Sea

The System Innovation Approach is a methodological framework which enables **systemic change** Based on interconnected set of innovations, where each influences the other; with innovation both in the parts of the system and in the ways in which they interconnect. SIA is rooted in **system thinking (**Meadows, 2008), and it's implementation within the context of the research draws on **transition management** (Roorda et al. 2014; Loorbach, 2007) in order to deal with persistent problems and facilitate sustainable. The emphasis is on the functions of the **cross-sectoral system "as a whole"** and on the **variety of actors that are part of the system**, instead of just focusing on specific functions or individual/sectoral benefits. It is based on a highly participatory methodology where stakeholders are actively engaged in Living Labs setting, resulting in the co-identification of an interconnected set of innovations to drive the desired transition**:** a portfolio of connected projects across technologies, governance, finance, social innovations. In this context Living Labs LLs act as open innovation spaces which foster **co-creation with users** and the end result is expected to **better solve stakeholder needs**. Here we aimed at engaging stakeholders from many different domains and scale-levels in solving problems oriented activities, co-production of knowledge and co-design of solutions in an iterative process (Geel and Schot, 2007; Roorda and Akisnete, 2013). Living Lab participant are involved in mapping exercises related to the main challenges and needs for the sustainable development of the Blue Economy in the Black Sea, co-identifying common goals in a form of a desirable future vision across coastal communities, sectors and stakeholder groups. Envisioning desirable futures is a critical step toward creating a sustainable future (Bennett et al. 2021); it gives a sense of direction to enable positive transformation (Milkoreit, 2017; Riedy and Waddock, 2022). The common visions co-developed across sector and stakeholder groups gave the goal and objectives to be achieved by the pathways to be co-developed in the final step in order to drive the blue economy towards a sustainable state in the region.

b. Three Projects across One Sea: Towards a complementary stakeholder strategy for a sustainable Black Sea region

We are currently engaging Black Sea stakeholders (representatives of the private and public sectors, civil society and academia) through 3 different projects which allow us to involve multi-level stakeholder (local, national and regional) and cover different part of the problem (Blue economy policies; marine ecosystem services and the blue economy; fresh and marine ecosystems in the context of climate change).

The EU H2020 Horizon BRIDGE-BS project objective is to advance the Black Sea's marine research and innovation to co-develop Blue Growth pathways under multi-stressors for the sustainable utilization of the ecosystem services. Five living Labs covering the Romanian, Bulgarian and Georgian Black Sea coastline and marine space as well as two Turkish regions (Istanbul/Bosporus and Sinup) are being implemented. In the BRIDGE_BS context, Living Labs represent an instrument to empower local communities in the future sustainable management of the Black Sea, breaking sectoral silos and ensuring a systemic approach. They create a new local participative dynamic to explore alternative forms of governance while being a focal point for greater interconnection between physical and socio-economic sciences. Various tools (role play, decision support tools, system innovation tools, participative scenarios) will exploit and enhance the inter-actor exchanges in, to create a learning loop, raise awareness on ecosystem services and their multi-stressors, current and future, stimulate a thinking "out of the box", develop trust and collaborations, to foster the adoption and implementation of innovative eco-solutions. The main outputs will be transformative pathways for a sustainable blue economy for each country.

The BRIDGE-BS sister project, DOORS will link citizens, science, and industry for the vital regeneration of the Black Sea, stimulating a new wave of 'blue economy' opportunities through the development of a system of system (SoS) to address the human and climate change impacts on the marine ecosystem. Stakeholder engagement determines DOORS' success, value, and impact. They drive science and technology breakthroughs with researchers, making the project work more meaningful on the ground. Here Multi-Actor Forums (MAFs) are implemented, as a different form of stakeholder engagement structure, which bring together national stakeholders in Romania, Bulgaria, Turkey and Georgia from all backgrounds to help scientists prioritizing Black Sea issues with a focus on Blue economy policies and the use of innovations to fill identified gaps. This approach is also helping the co-design of the System of Systems for the region with the aim to provide researchers with the datasets they need to address environmental challenges and define strategies to develop the blue economy in the region.

Finally, the H2020 ARSINOE project aims at building an ecosystem for climate change adaptation solutions, it does not focus on the Black Sea specifically but has a dedicated Black Sea case study covering the Danube Delta in Romania, the Ropotami river in Bulgaria and the Bosporus region in Turkey focusing on land-sea interactions from source-to-sea in the context of climate change. Stakeholders from each region are engaged in what is called national working groups (WG) which are then feeding the discussion occurring in an international living labs where representatives from regional institutions and national WG are brought together to tackle the identified problems and envisage solutions in a regional perspective.

2. Spaces for Change: Engaging Stakeholders via Living Labs
    a. The BRIDGE Living Labs progress

The implementation of the BRIDGE Living Labs started in January 2022, 8 workshops where organised in the 4 Black Sea countries, involving more than 120 stakeholders from the quadruple helix representing all blue economy sectors. The workshops where divided into four active participatory activities in order to 1) identify key Black Sea ecosystem services from the perception of local stakeholders 2) Pressures and risks related to ecosystem services, 3) Local challenges and needs for the sustainable development of the region, and finally 4) Blue Economy opportunities. The results allow to draw a comprehensive understanding of the system, key drivers and issues to tackles which turned out to be very similar across countries calling for a coordinated Blue economy strategy across the region. In early 2023, a second round of workshops took place, with the main objective to move the discussion from the current problems to a sustainable future using visioning exercise..

    b. The DOORS Multi-Actor-Forums

Four National workshops where implemented between November and February 2023 where Tourism, academic, industrial, fisheries, and local government delegates share their perspectives on Black Sea coast socioeconomic and policy needs In April 2023, an online survey was launched to determine the Blue economy obstacles and potential of the Black Sea region. It inquires about the development of Blue Economy sectors and entrepreneurial support, obstacles, and priorities. This first round of MAF workshops, prioritised the Blue Economy sectors based on the local context, before mapping needs and opportunities. These outputs will be analyses in order to identify policy gaps between national Black Sea Blue Economy needs, and EU strategic and policy priorities. Working in collaboration with the project's Blue Growth Accelerator (a hub and support mechanism for Blue economy entrepreneurs and innovators), the MAFs will work to co-create Innovation Pathways in subsequent round of workshops.

    c. The ARSINOE international Living Lab

Two online international workshops took place since October 2022. Following a mapping of the land-sea system integrating the output of national workshops in Romania, Bulgaria and Turkey, data collection and monitoring was identified as a key priority issue across the region when it comes to sustainability and climate change which became the focus of this international living lab.

3. Conclusions and Next steps

The development of the Blue Economy within the Black Sea is at a crucial juncture, where strong foundations must be laid to ensure the that burgeoning Blue Economy in the region evolves and transitions in a direction that is in harmony with sustainability and resilience. Living Labs have been implemented across the Black Sea region to support the transition towards a sustainable development of the Blue Economy, Local, national, and regional stakeholder representatives of the Blue Economy are being engaged in solving problems oriented activities, co-production of knowledge and co-design of solutions in an iterative process. The use of a

system innovation approach combining system thinking and transition management methodology allowed us so far to a better understanding of complex Black Sea systems from science-society perspectives in an iterative, interactive and reflexive ways. It will enable the co-development of complementary pathways based on the co-identification of a portfolio of innovations (technologic but also social) to support the transition towards a sustainable blue economy in the region

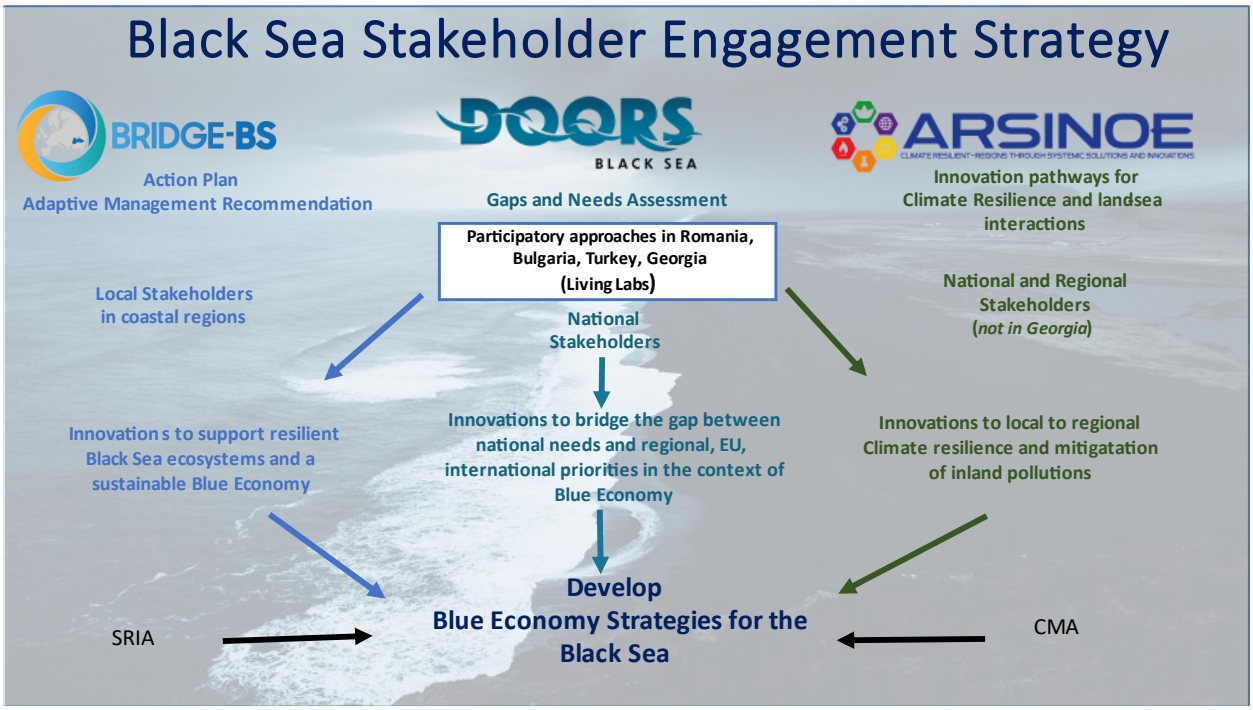

Figure 2: The overarching framework for the interactions between the three projects

A comparative analysis of the initial outputs of the BRIDGE-BS local LL and DOORS national MAF will allow us to assess whether local and national needs and priorities aligned and flag out to national policy maker potential mis-matched. The national innovation pathways to be developed by the DOORS MAF in order to fill existing regional blue policy gaps will serve as a basis for the co-development of the BRIDGE-BS transformative pathways which aim at providing a roadmap for change in order to reach the sustainable future co-designed by local stakeholders in each country. The ARSINOE international living lab will provide the international fora for the long term vision of the DOORS SoS.

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