Black Sea CONNECT Caravan

12 May 2023, Burgas Professional Technical Secondary School

CONNECT BLACK SEA

A Story about the Sea that is Uniting Us

Prof. Eden MAMUT, BSUN Secretary General

Cristian MANEA, IT expert, BSUN IPS

emamut@bsun.org

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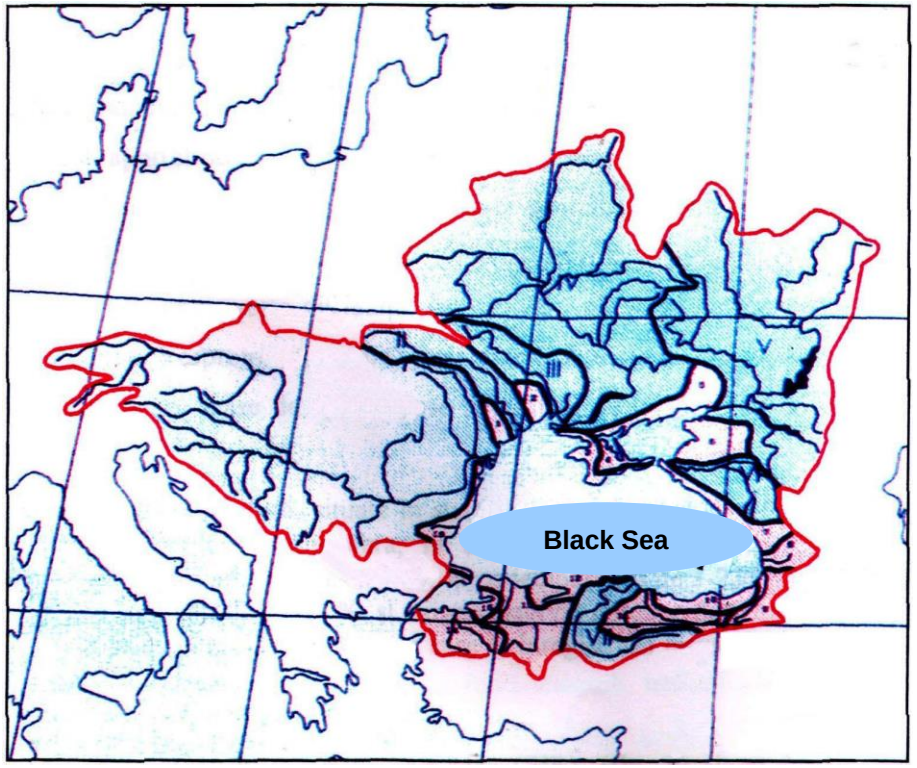
ENCLOSED SEAS

“Enclosed or semi-enclosed sea" means a gulf, basin or sea surrounded by two or more States and connected to another sea or the ocean by a narrow outlet” (*cf. UNCLOS*).

Important characteristics of enclosed seas:

1. Water budget
2. Retention or turnover time
3. Load of contaminants

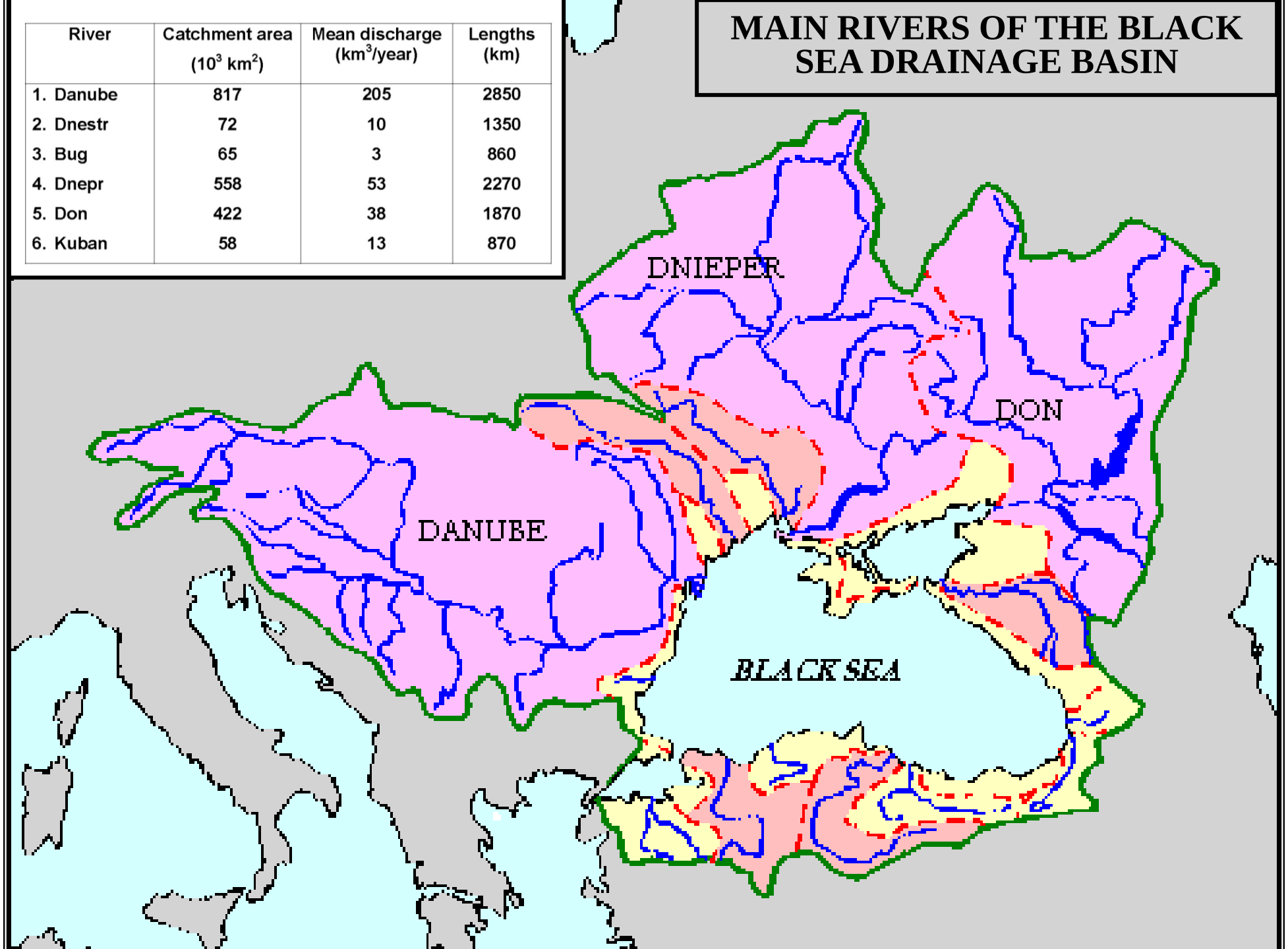
Hydrographic Basin



The Sea	The surface of the afferent hydrographic basin (km^2)	Sea surface (km^2)	The basin surface/sea surface proportion	Sea volume (km^3)
Black	2 405 000	466 200	5.15	530 000
Mediterranean	1 300 000	2 505 000	0.51	3 754 000
Baltic	1 800 000	414 000	4.34	33 000
North	800 000	575 000	1.39	54 000

MAIN RIVERS OF THE BLACK SEA DRAINAGE BASIN

River	Catchment area (10^3 km^2)	Mean discharge (km^3/year)	Lengths (km)
1. Danube	817	205	2850
2. Dnestr	72	10	1350
3. Bug	65	3	860
4. Dnepr	558	53	2270
5. Don	422	38	1870
6. Kuban	58	13	870



Hydric balance

$$X + Y + B + K = Z + B1 + K1X$$

where

X average rain quantity on the sea surface;

Y – average volume of continental water supply (rivers);

B – volume of water entered through Bosporus strait;

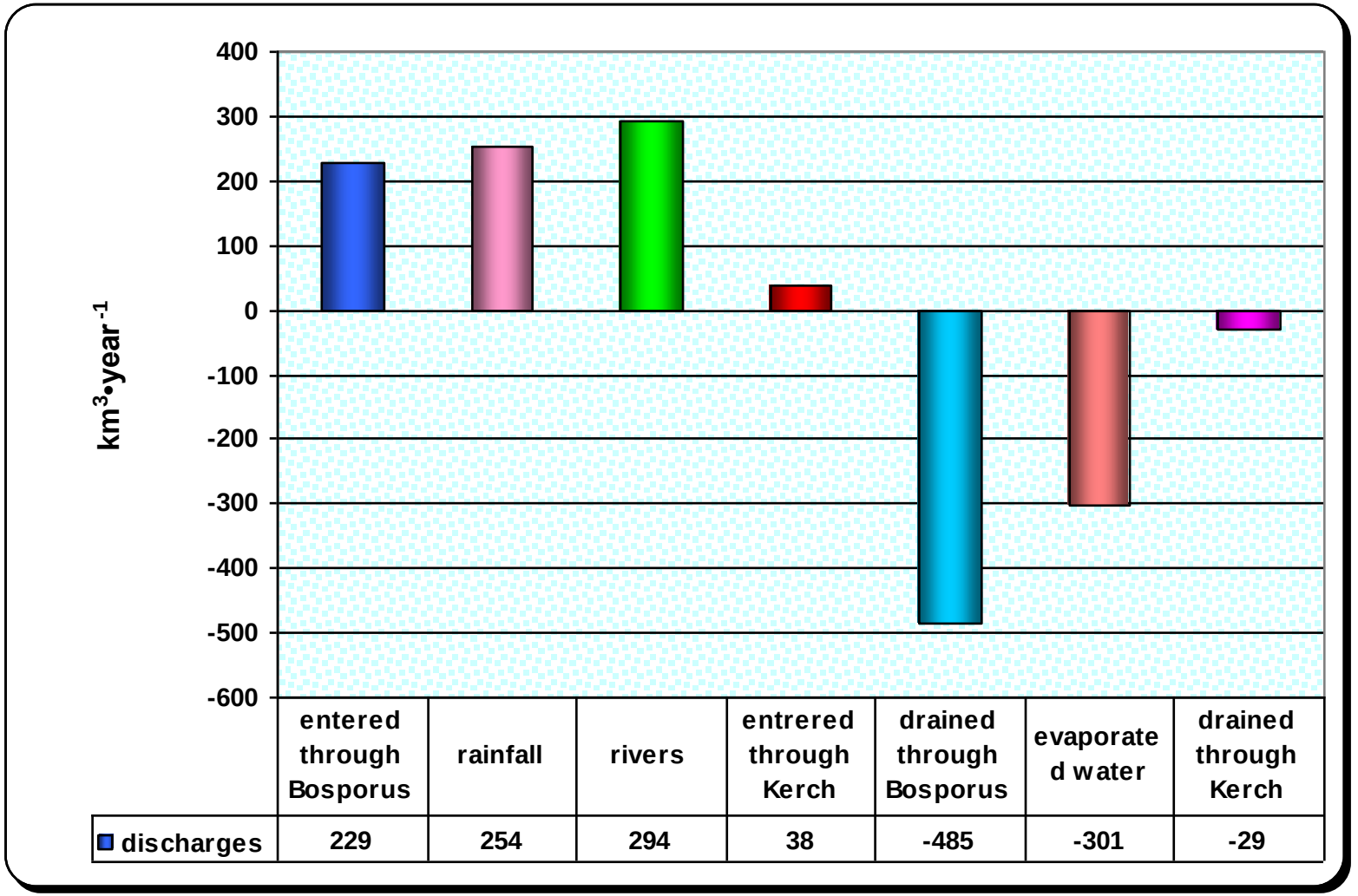
K – volume of water entered through Kerch strait;

Z – average quantity of water evaporated from the sea;

B1 – quantity of water drained through Bosporus strait;

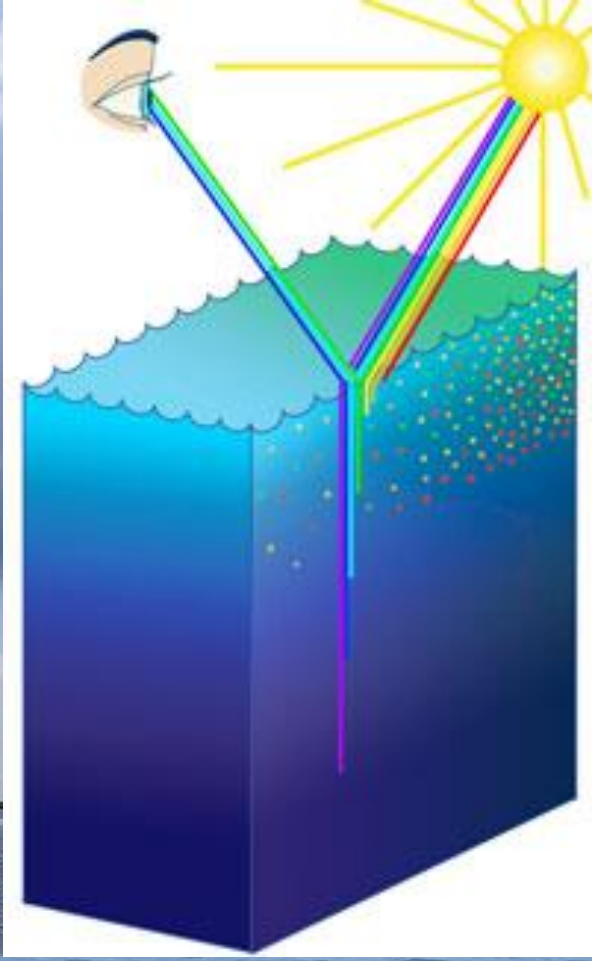
K1 – quantity of water drained through Kerch strait;

The hydric balance of the Black Sea



	entered through Bosporus	rainfall	rivers	entrered through Kerch	drained through Bosporus	evaporated water	drained through Kerch
discharges	229	254	294	38	-485	-301	-29

Why the Black Sea looks dark?

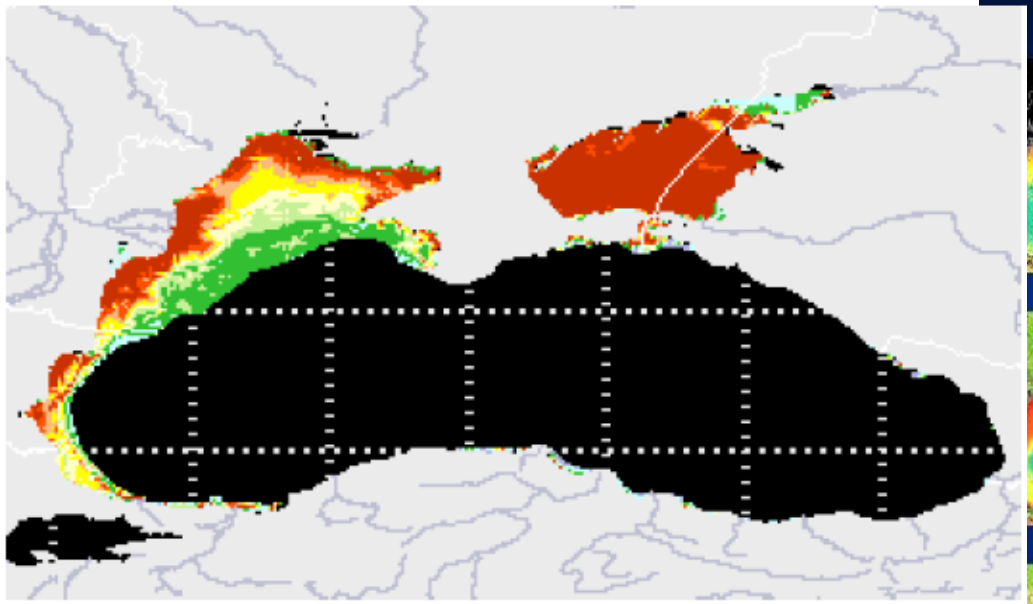


The average quantity of organic carbon in the Black Sea is **3 mg•m^{-3}**, twice more than in the Planetary Ocean.

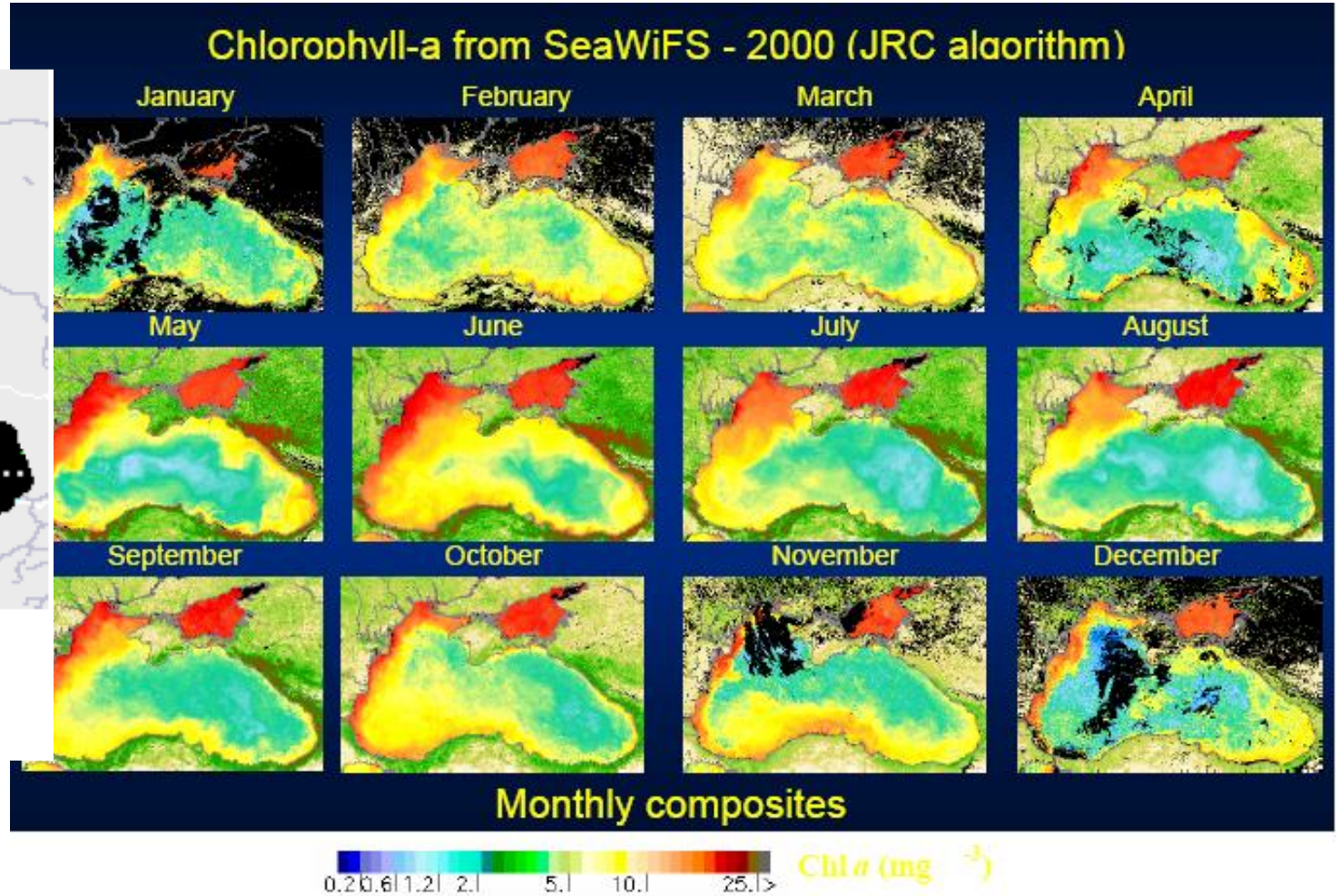
- **The rivers transport great quantities of ions in solution;**
- **The annual chemical inflow in the Black Sea is 80 x 10^{6} tones, of which 60% belongs to the Danube;**

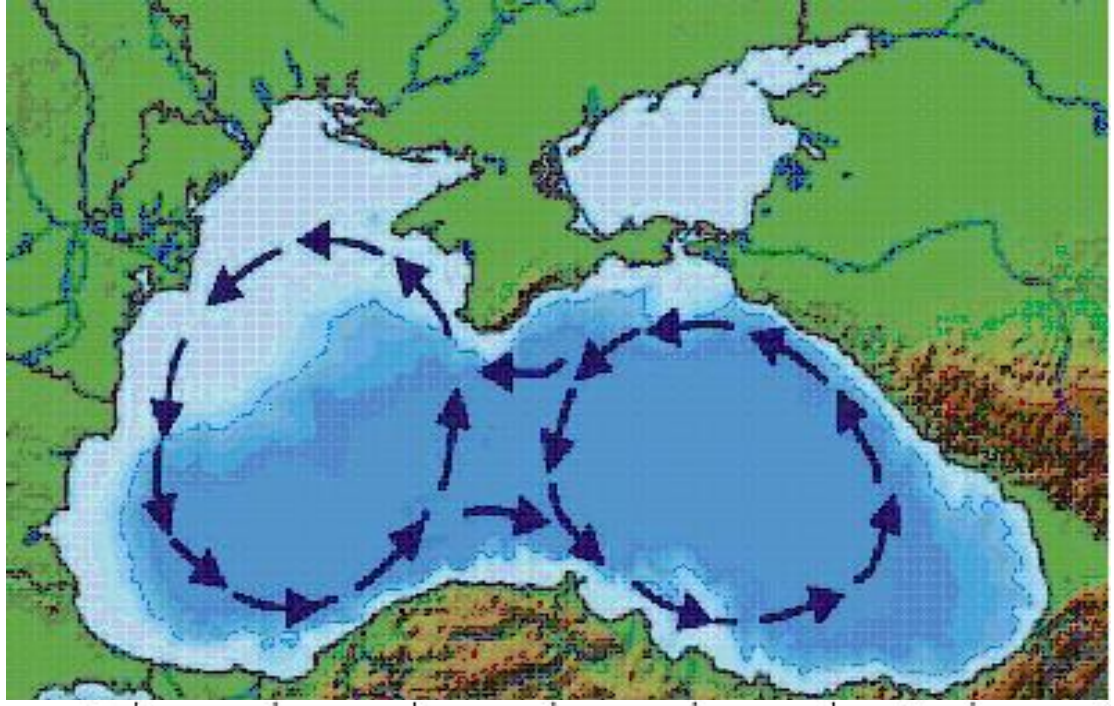
Consequently, in the Black Sea water is a large amount of organic and mineral suspensions that absorb light coming from the sun and the water appears to be black

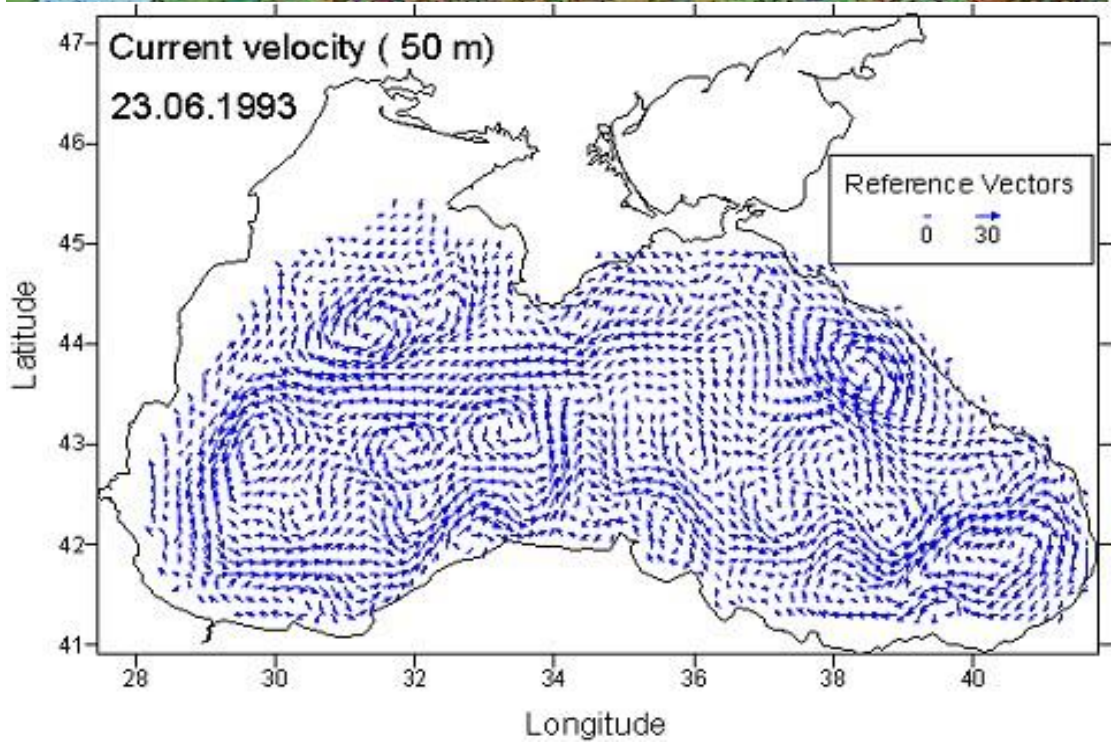
Eutrophication



Oxygen depletion risk index







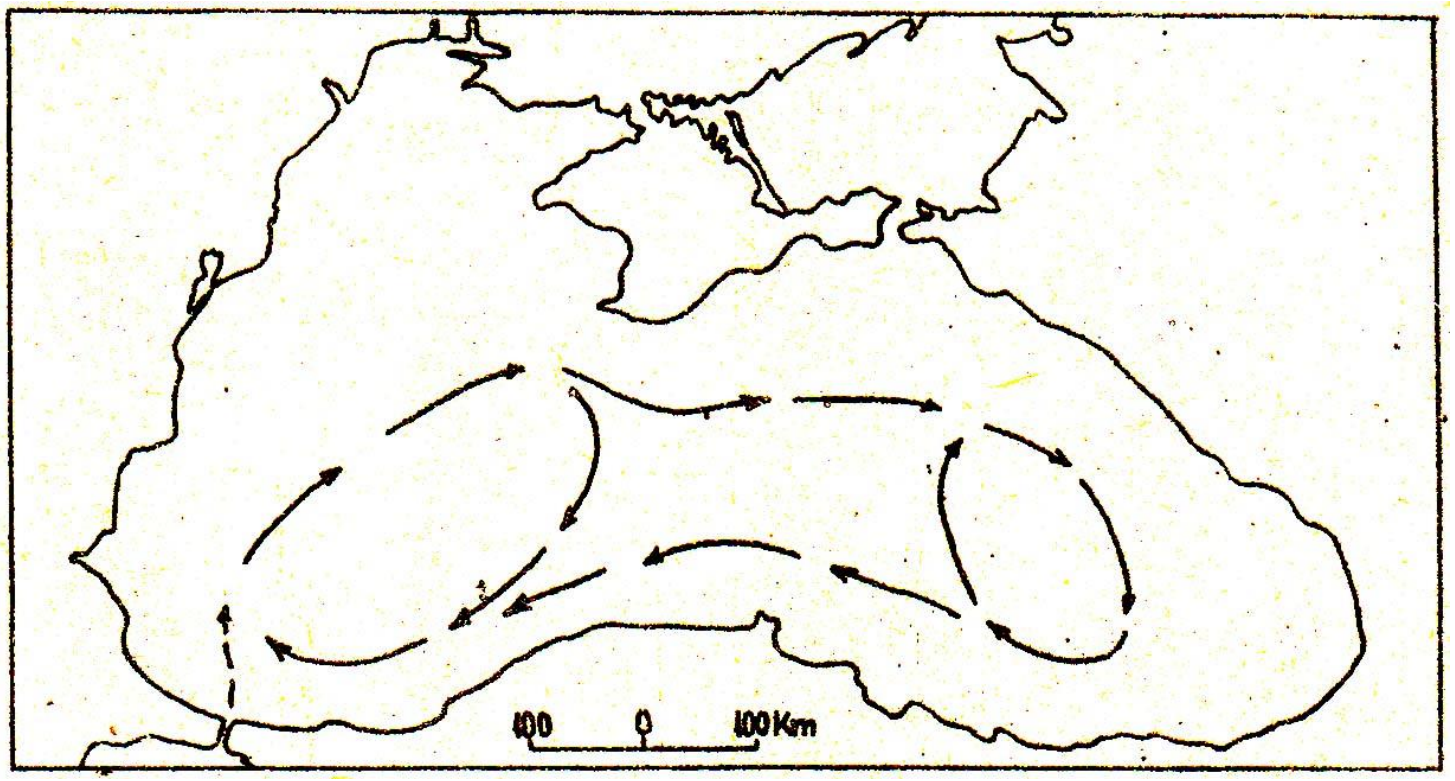
WATER CURRENTS

Boundary current, anticlockwise, parallel to the shore

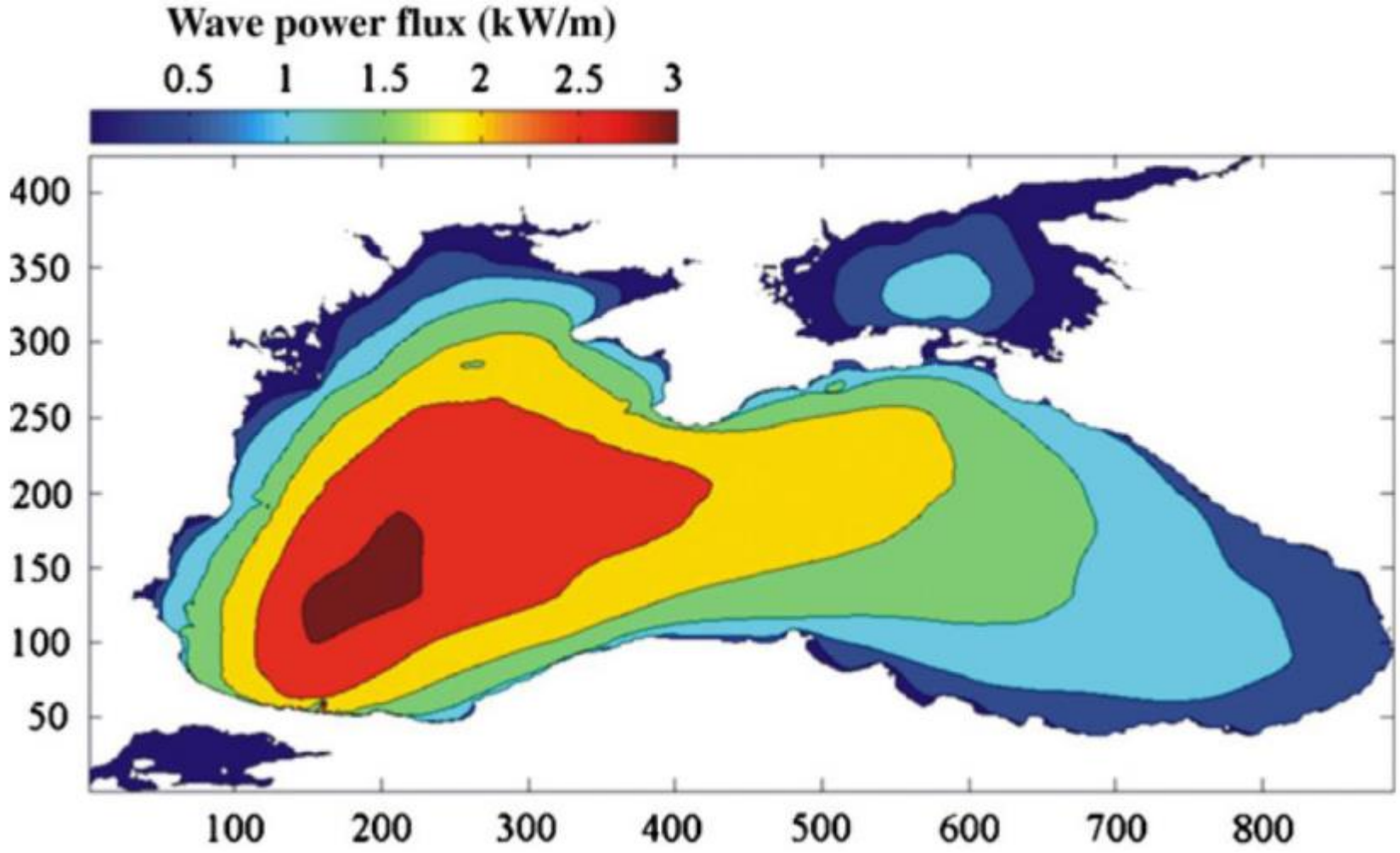
Two cyclonic spiral flows, that divide the basin in two (East and West)

Several small spiral flows

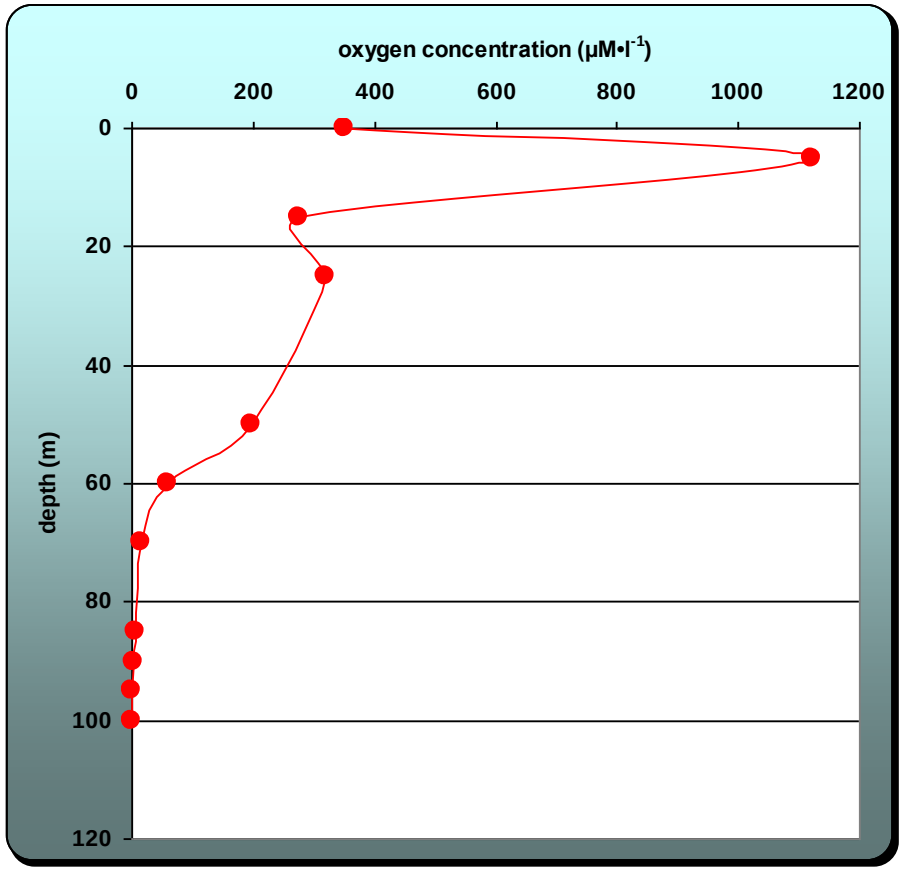
The circulation in the deep waters of the Black sea – the antic-cyclonal current, transporting mediterranean salted waters



Wave power in the Black Sea

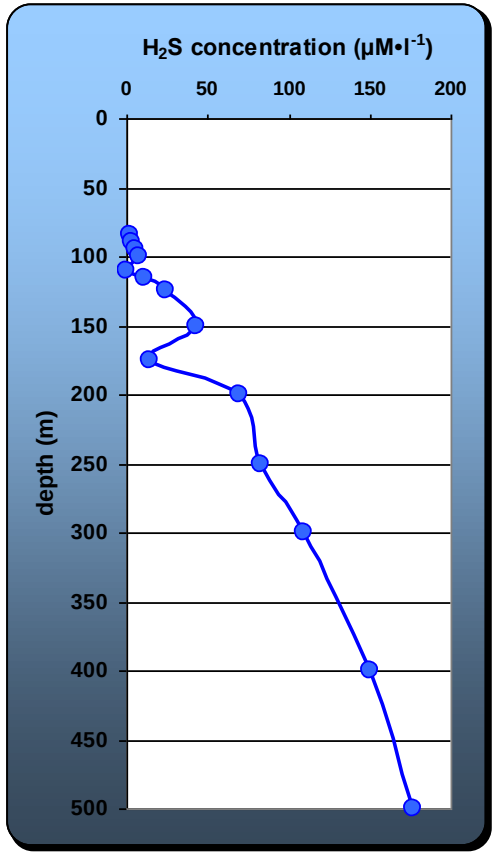


The tendency of the variation of dissolved oxygen concentration in the Black Sea water

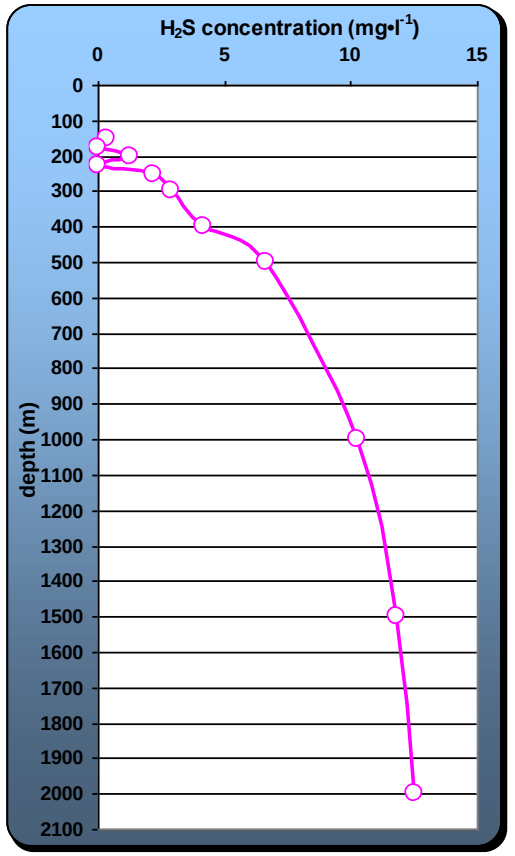


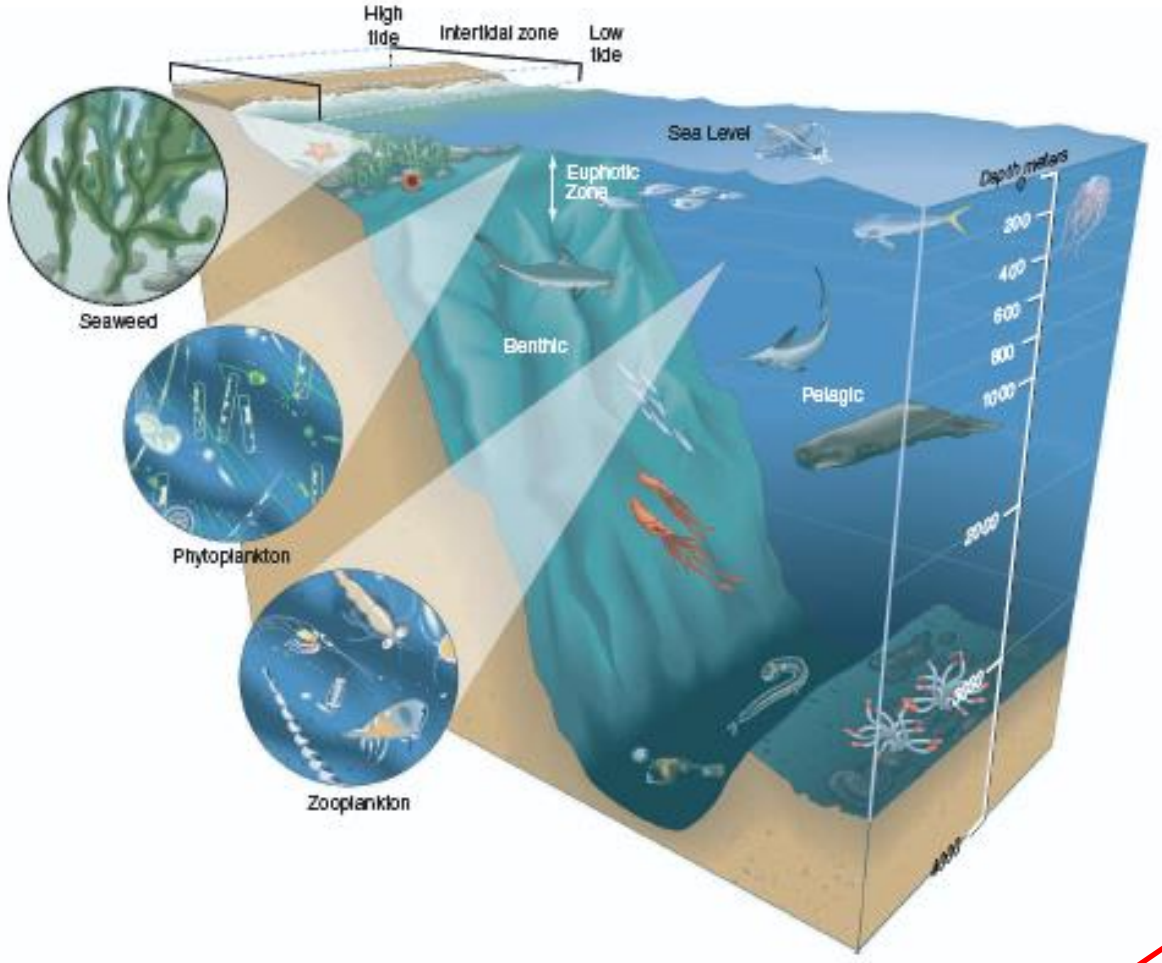
- maximum values in the surface horizon (0-10 m) where the most active exchange with the atmospheric air take place;
- the oxycline settles in the horizon between -35 and -60 m
- at -80 m the $\mathbf{O_2}$ concentration decreases to 5-6µM•l^{-1};
- at – 100 or -120 m the $\mathbf{O_2}$ is not available (suboxic stratum = SOL)

The tendency of the vertical distribution of the hydrogen sulphide concentration in the Black Sea waters



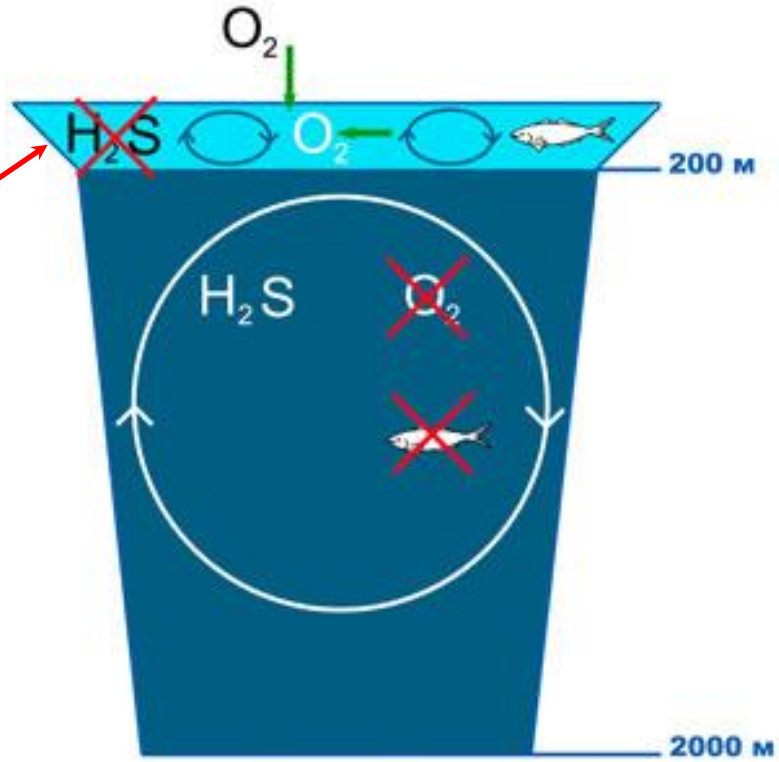
- **H_2S** results as a final product of the chemical reactions involving non-decomposed rests of organic material that which is oxidized on the account of the oxygen from the sulphate ion (resulted from the relatively big quantity of $CaSO_4$ drawn by the tributary rivers), in the presence of sulphate reducing Bacteria (*Thiomicrospira* sp);
- The organic matter is thus decomposed to **CO_2** and **H_2S** is set free;
- The vertical distribution of **H_2S** indicates a continuous rise from a depth of 150 m to –200 m. In the column down to -500 m, the synthesis process of the gas reaches maximum cotes at a depth of 1000 m





Organisms' distribution in the Oceans:

- multicellular organisms are spread throughout the whole water column;
- the distribution of photo-synthetic organisms depends on distribution of light intensity;
- multicellular organisms are present to the great depths.



Distribution of organisms in the Black Sea

- multicellular organisms are spread only in the 200 m water column oxygenated (10% of total volume of the Black Sea);
- in the oxygen-free waters (the remaining 90% by volume) only bacteria are present.

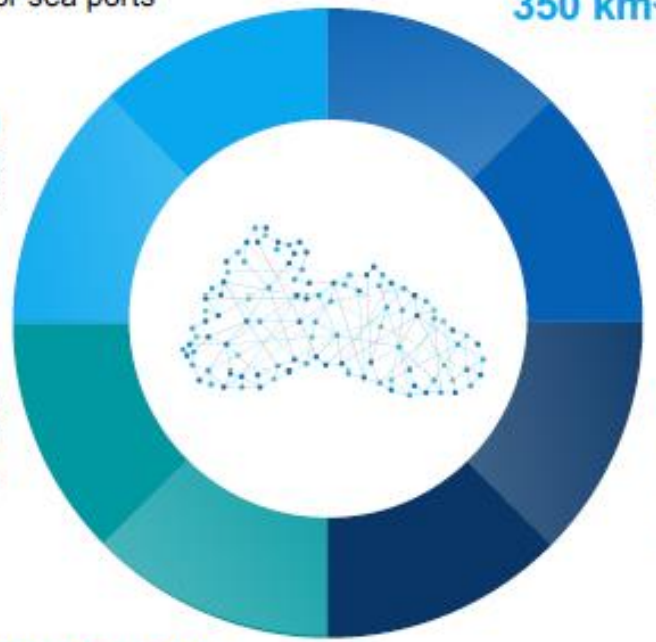
BLACK SEA in Figures

4869 km coastline with
421 639 km² total area and
18 major sea ports

10 large rivers flowing to the sea,
with a total river input exceeding
350 km³ year⁻¹

160 million
population of Black Sea
Coasts and catchment

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



Deep Black Sea as the
paleoclimate archive of
5 million years

Rich in energy sources
such as wave, currents,
offshore wind, H2S,
gas hydrates

30 to 8 reduction
in the number of fish species
with enocomical significance

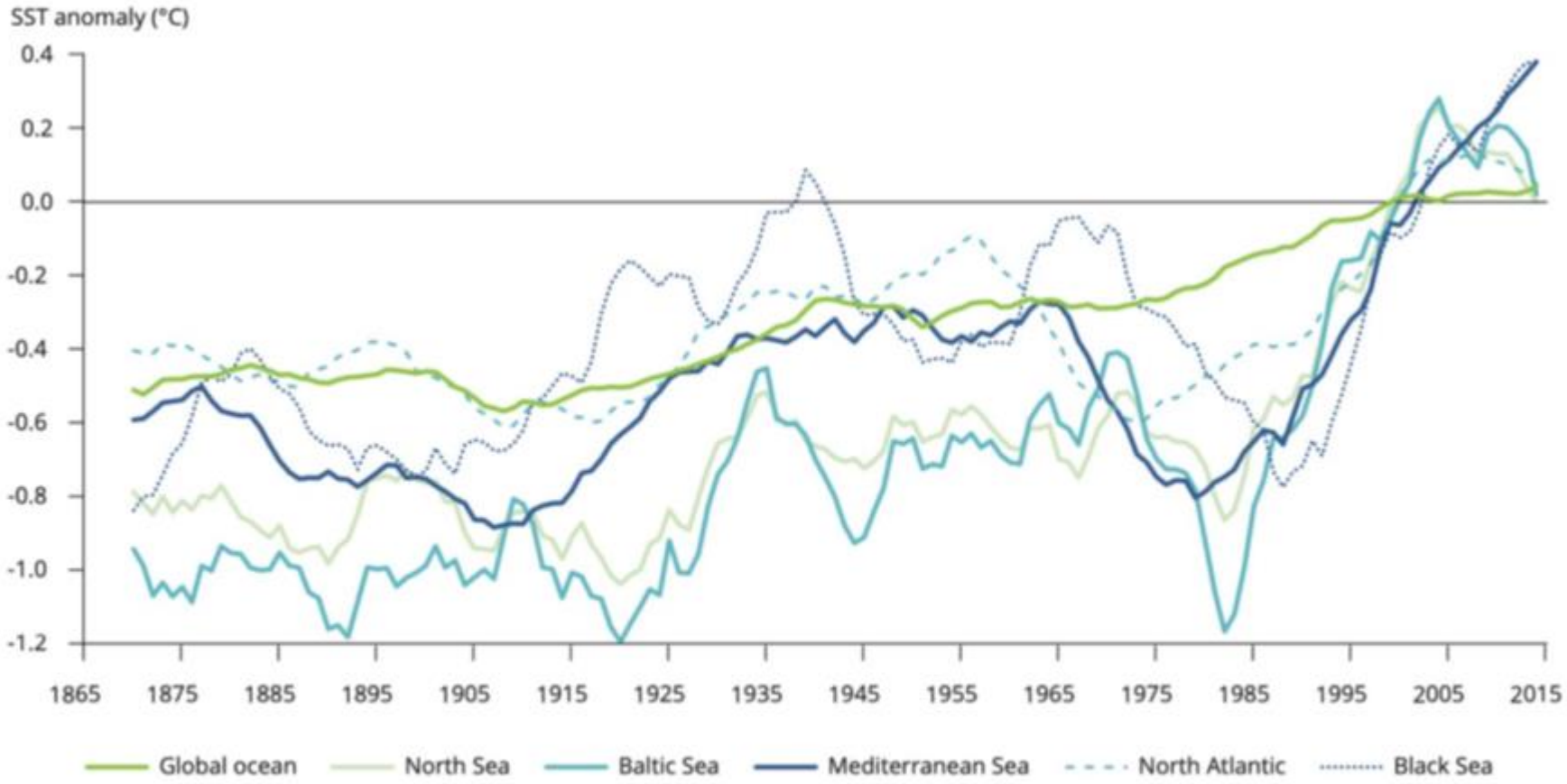
90% of oxygen free,
H_2S-rich volume

We and the Sea

- **Eutrophication**
- **Diffusion of solid pollutants**
- **Accumulation of industrially manufactured nanomaterials, antibiotics, hormones and other highly complex pollutants**
- **Hypoxia in the sea water**
- **Overfishing**
- **Invasive species**
- **Impact of climate change**

Surface Temperature Anomaly

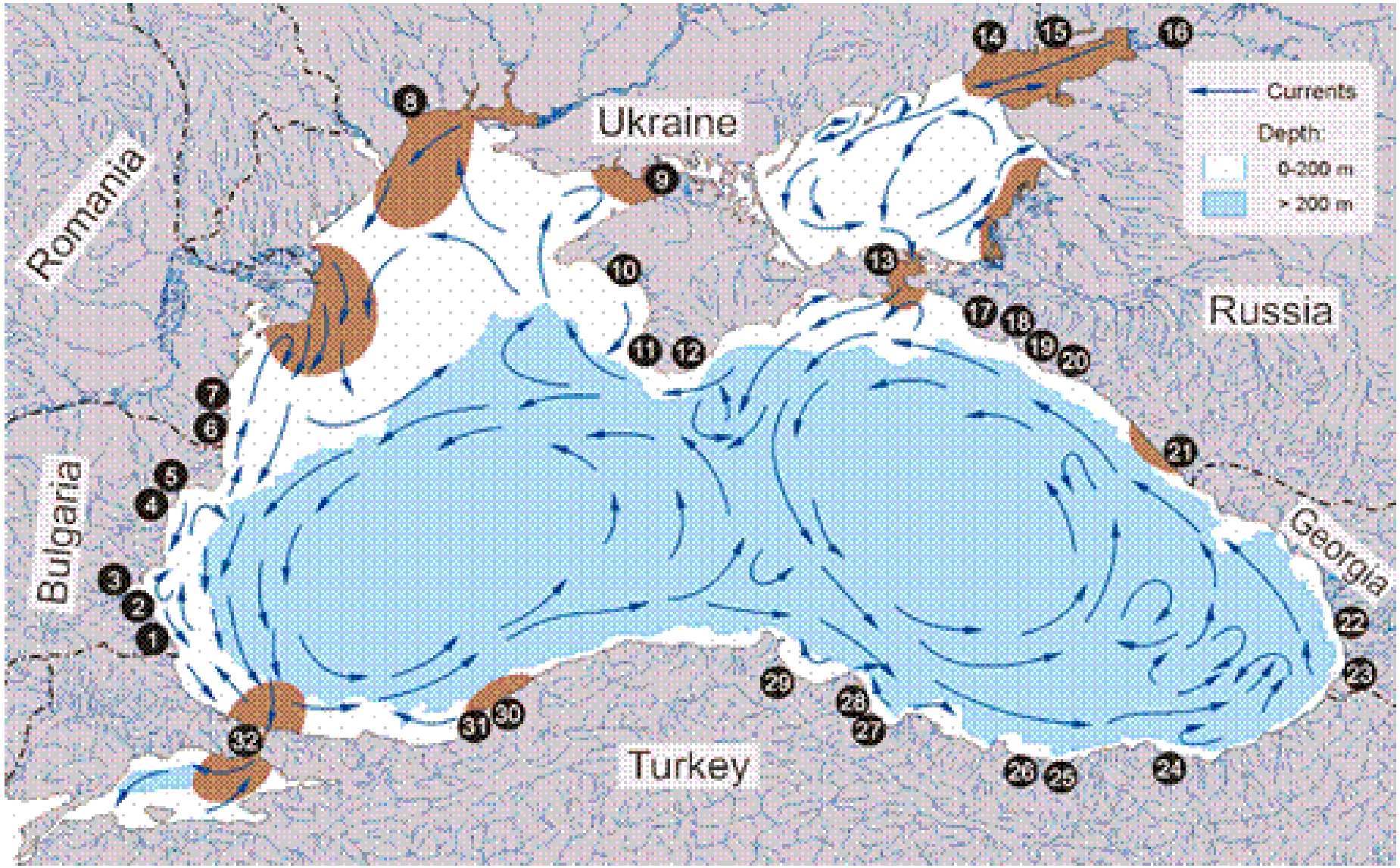
Average sea surface temperature (SST) anomaly (running average over 11 years)



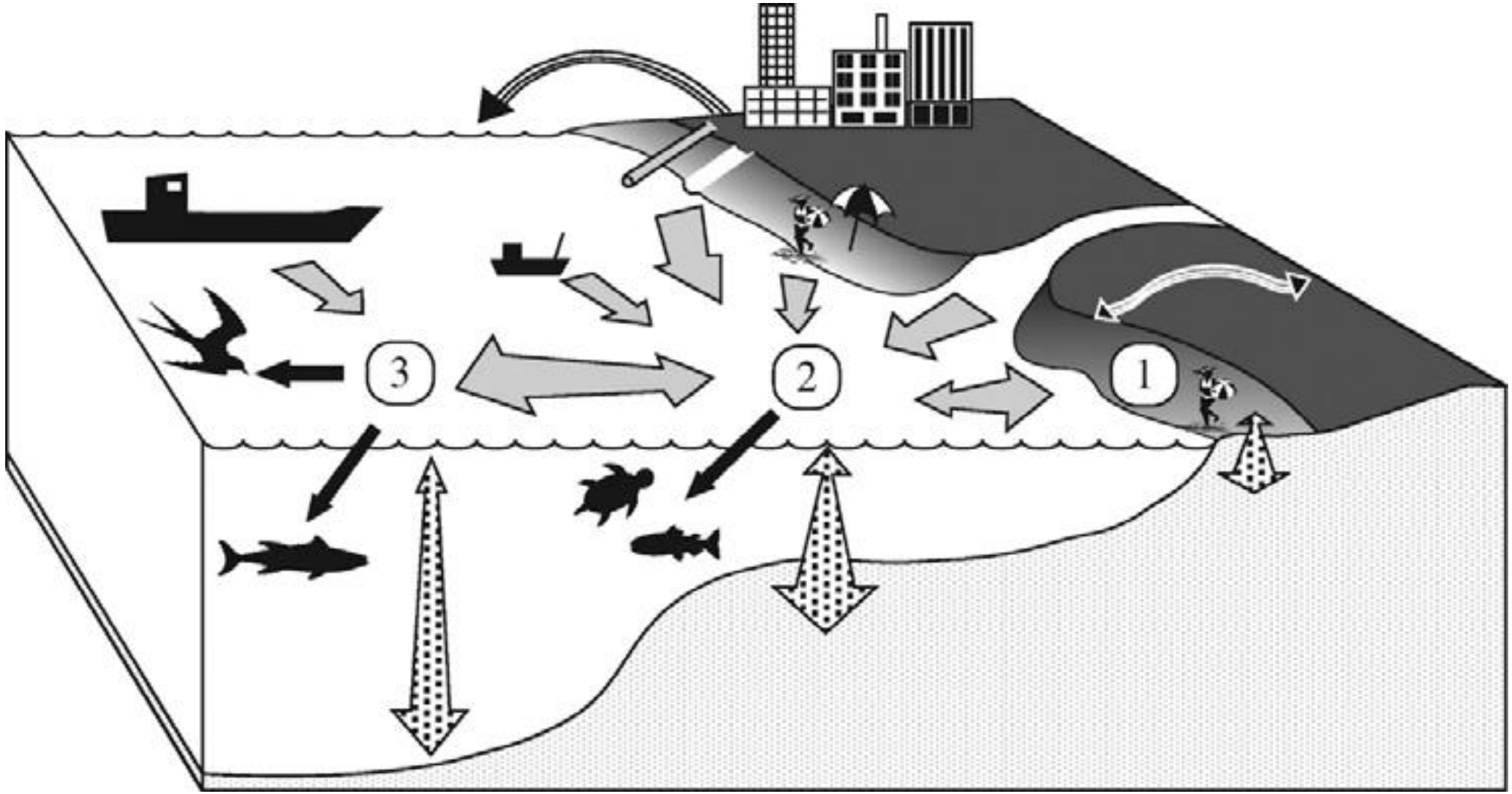
Note: Time series of annual average sea surface temperature (°C), referenced to the average temperature between 1993 and 2012, in the global ocean and in each of the European seas. Data sources: SST data sets from Copernicus Marine Environment Monitoring Service (Mediterranean Sea) and the Hadley Centre (HADISST1; global and other regional seas).

Source: EEA (2016b).

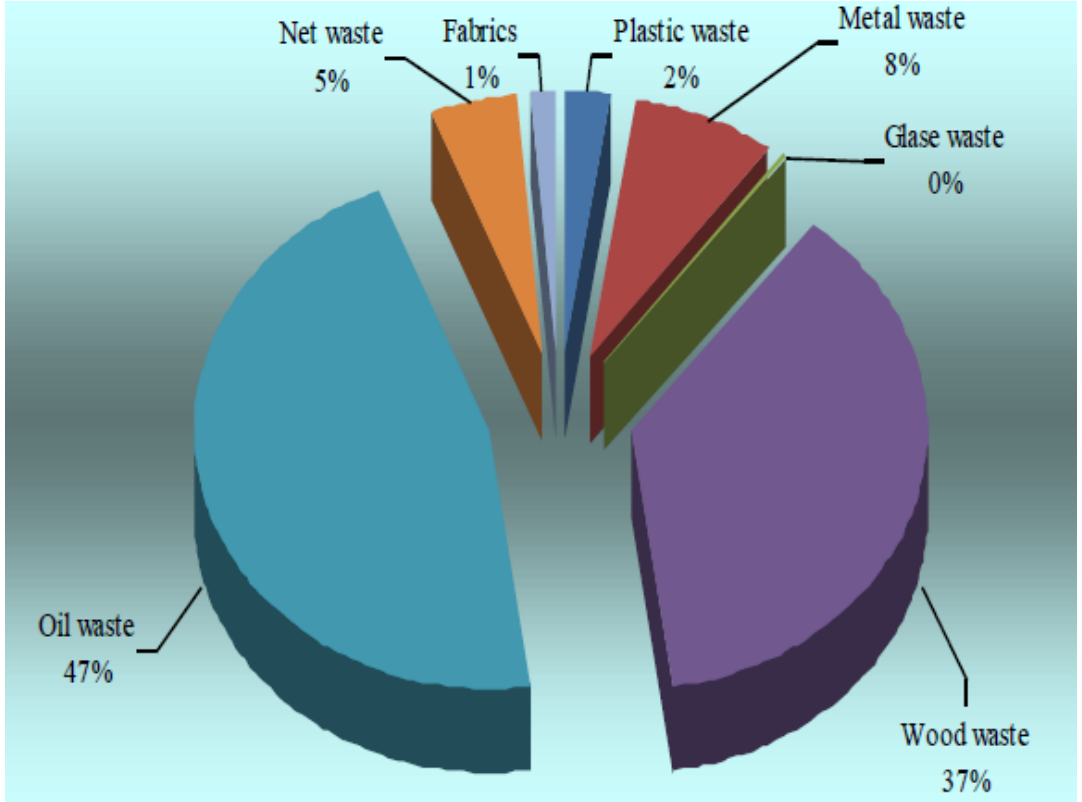
Local Impact Factors

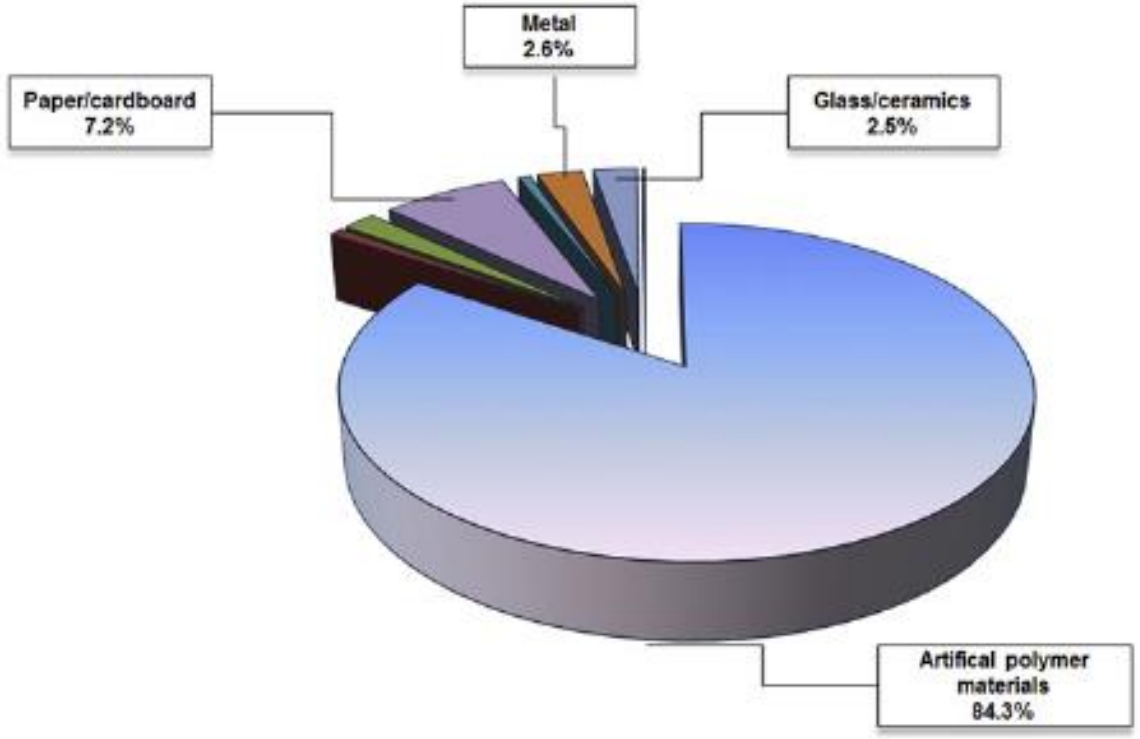


Marine Litter



Composition of solid waste





Strategic initiatives on Blue Growth - 2019

Strategic Research & Innovation Agenda

The Blue Growth Initiative for Research and Innovation in the Black Sea has determined four main pillars based on the Burgas Vision Paper and the Black Sea Strategic Research and Innovation Agenda.

Black Sea Knowledge Bridge
Addressing fundamental Black Sea reserach challenges

Empowered Citizens & Enhanced Blue Workforce
Education and capacity building

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

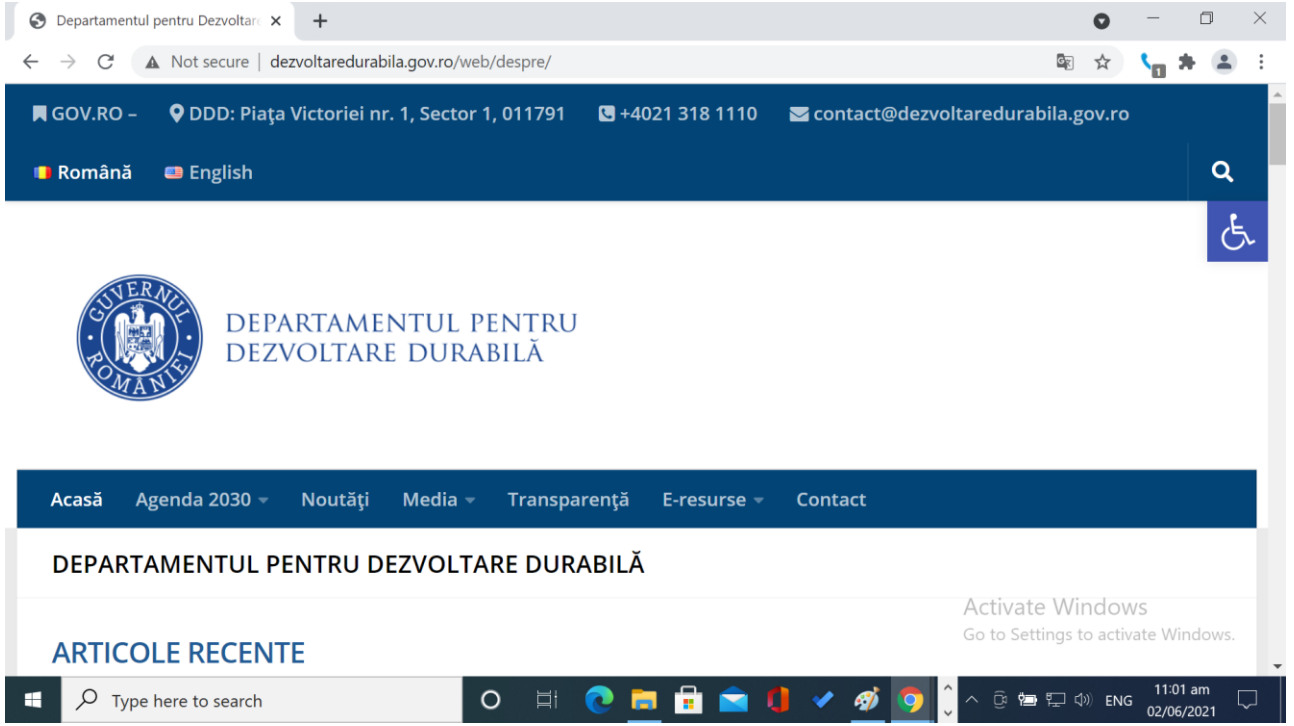
Key Infrastructures & Policy Enablers
Building of critical support systems And innovative infrastructures

Launch of the Black Sea SRIA Implementation Plan,

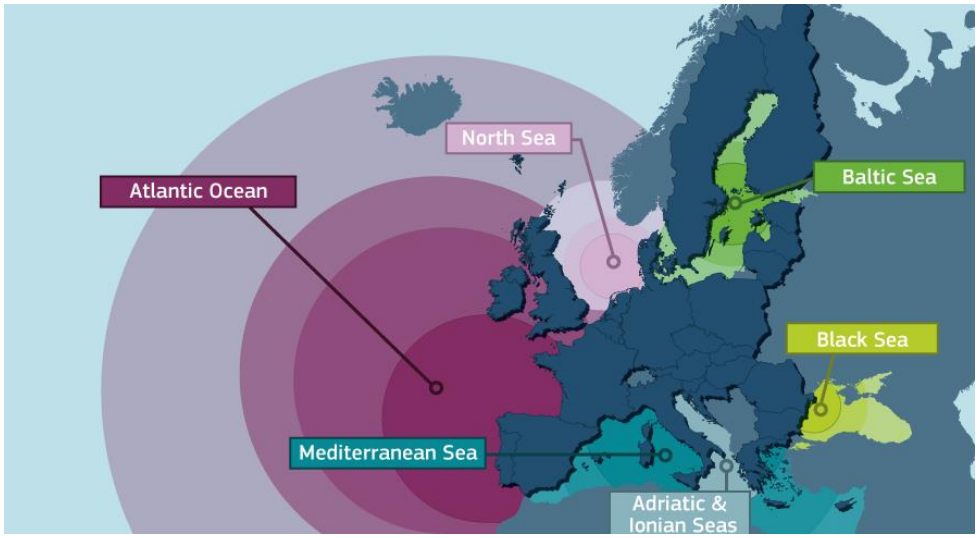
Connect2BlackSea.org

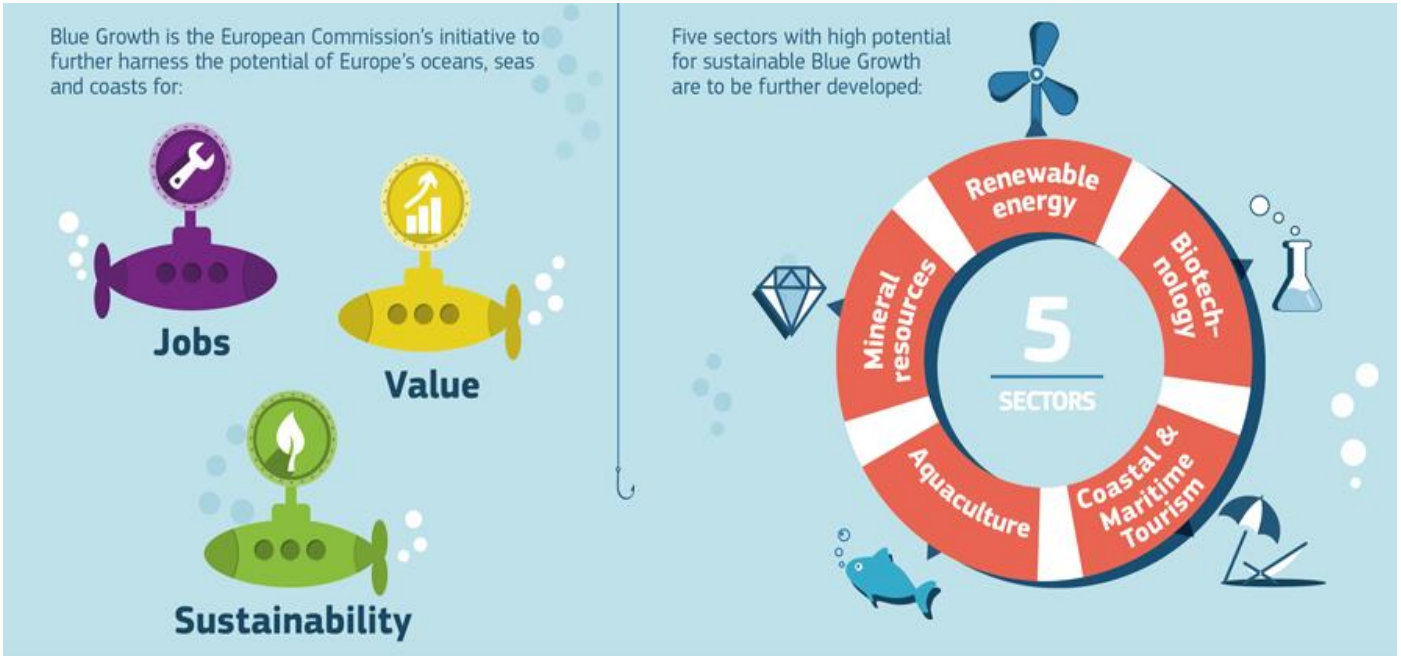
4 May 2023, European Parliament, Brussels

Romania – Sustainable Development Strategy 2030



Blue Growth Initiative





Black Sea CONNECT

Black Sea CONNECT is a key H2020 coordination and support action (CSA) which will scientifically, technically and logistically support the broader Black Sea Blue Growth Initiative, supported by the European Commission (EC) and composed of country-appointed experts, stakeholders and various national and international organizations.

Black Sea CONNECT is the first project in its own field for Black Sea. The overall objective of the Black Sea CONNECT is to coordinate the development of the Strategic Research and Innovation Agenda (SRIA), based on the defined principles in the Burgas Vision Paper and support the development of the Blue Growth in the Black Sea.

The paradigm shift in education

- From fixed knowledge to asking good questions;
- From learning as a product to learning as a process and a product;
- From the teacher as an expert to expert and consultant;
- From looking at the student as empty frames to competent learners;
- From teaching as “chalk and talk” to learner centered approaches.

The New Goals in Teaching

- **Learning to learn;**
- **Coping with changes;**
- **Competence in relations;**
- **Proactive attitude to entrepreneurship & innovation.**

Entrepreneurship & innovation

Entrepreneurship and innovation is a specific approach or strategy to life and learning.

It means that you have the attitude and skills to affect and influence your life, your society and take responsibility for active participation.

Tentative Profile

- To take initiative;
- To be creative;
- To communicate in different contexts;
- To search for possibilities and to discover and see new possibilities;
- To sell ideas;
- To run risks and take responsibility;
- To implement ideas and take actions;
- To make products and services of values in life and business.

Teaching Approaches

- Asking good questions;
- Critical thinking;
- Commitment;
- Independence;
- Cooperative attitude;
- Action thinking;
- Responsibility.

Teaching Approaches

- In which ways are you strong?
- What are your interests?
- What aspects of yourself would you like to develop?
- Which subject areas would you like to be better at?

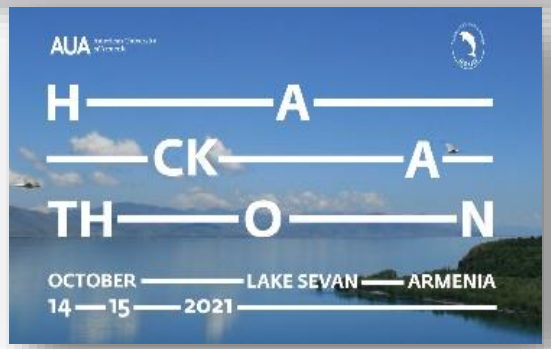
Individuals vs Teams

- What are you good at together with others?
- What are you good at alone?
- Which interests do each of you in your team have?
- What would you like to create?
- How would you like to be challenged?

Open Education

TASK 4.2: BLACK SEA AWARENESS & OUTREACH

HACKATHONS



HACKATHONS (Active involvement for Problem Solving): Online Hackathon will be organized with participants from all Black Sea riparian countries on existing Black Sea challenges possible on initial joint actions of Black Sea CONNECT; Effect of COVID-19 on Black Sea Ecosystem / Black Sea Plastic Pollution and possible solutions.

- A 24-hour online blue growth hackathon organized covering Romania in June 2021 Dobrogea Blue Bay, Romania (BSUN in collaboration with HârșovaCity Hall) dedicated to the identification of innovative solutions for the Sustainable Development of Hârșova City.
- Between October 14th – 15th, 2021, it has been organized in Armenia, the Lake Sevan Hackathon that was developed based on the experience of the Hackathon organized in Harsova, Romania. The hackathon aimed at better understanding the underlying drivers leading to the recent appearance of harmful cyanobacterial blooms in Lake Sevan and developing tools for the long-term monitoring of the lake's water quality.

Ongoing activities

- Based on the validation of the procedures of organizing pilot hackathons, this activity became a standard activity type that will be organized regularly by BSUN. In late May 2023, it shall be organized the next Hackathon dedicated to *"Composite and Advanced materials in the shipbuilding by minimizing the risks of marine litter"* in Trabzon, Turkyie. In October 2023, it shall be organized a Hackathon on "*Boosting Maritime Transport Businesses*" in Batumi, Georgia.

TASK 4.2: BLACK SEA AWARENESS & OUTREACH

ONLINE TRAINING PLATFORM

ONLINE TRAINING PLATFORM Using the platform www.BSUN.org for online courses and the procedures for facilitating the delivery of open online courses on topics related to the Implementation Plan for a large variety of experts acting within some specialized organizations or as freelancers such as teachers, sailors, biologists and other specialists there will be developed. This shall lead to the establishment of a **Massive Open Online Course – MOOC** on Blue Growth in the Black Sea Region.

- On 7 April 2021, it was initiated the series of BSUN Master Courses on Blue Growth, aiming to contribute to the establishment of regional cooperation between the pre-university and university sector from the Black Sea region for implementing a Regional Master Program on Blue Growth in the format of a MOOC.
- Within these series, there were prototyped two very high-level sessions, involving prestigious scholars from universities as: Wageningen University & Research and University of Rome I “La Sapienza”, but also University of Bucharest, “Ovidius” University of Constanta and Research organizations.
- In this way, it was facilitated the bridging of teachers from the selected group with the frontier researchers and scientists in the field of marine biology, genetic engineering, sustainable energy and marine environment protection.

Ongoing activities

- Development of the BSUN Metaverse for training purposes by transferring the existing courses in the new environment.

BSUN Metaverse

- The metaverse will be accessible via web browser or VR glasses and the Web browser users will be able to use full body avatars and VR users will be able to use VR avatars. In the lobby, all visitors will be able to chat with each other via voice or text.
- From the lobby environment, the visitors will be able to switch to the training classroom or conference room.
- In the training classroom and conference room, a live broadcast (via zoom, taeams, etc.) can be projected on the giant screen.
- The desired presentation (pdf), video or image can be uploaded and played on the screen.
- In the conference room, only authorized persons will be able to take the stage, address the room and make presentations.
- In the training classroom, the person with trainer authorization will be able to control the microphone authorization of other visitors in the classroom.
- A maximum of 100 people will be able to enter the BSUN Metaverse at the same time.
- The BSUN Metaverse will be used for providing training courses in the following fields:
  - Climate Change impacts on Marine Ecosystems and Coastal anthropogenic activities
  - Blue Economy Entrepreneurship
  - Submersed Cultural Heritage

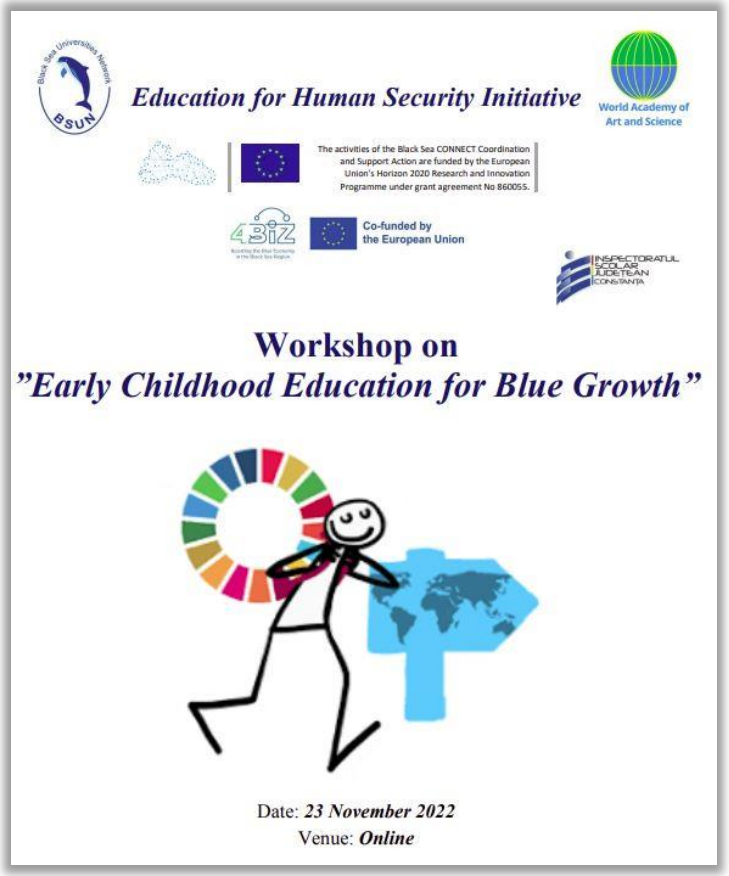
TASK 4.2: BLACK SEA AWARENESS & OUTREACH

Promoting science education in preschool education

❑ SciLabs in Kindergartens

- In 2020, the Black Sea Universities Network concluded a Memorandum of Cooperation with Constanța County School Inspectorate in order to support education in the pre-university sector on the following topics: STEM, blue growth and interethnic cultural exchange. There were carried out activities in order to assess the situation in schools, workshops with teachers on the three themes, courses, seminars and a series of pilot projects.

- Based on the collaboration between Prof. Eden Mamut and Prof. Dan Shechtman (laureate of the Nobel Prize for Chemistry in 2011 for the discovery of quasicrystals) there were evaluated the initiatives and achievements in the kindergartens from Haifa, Israel, for promoting science in the education of children from the earliest ages, that consisted on the organization of science teaching laboratories in several kindergartens. Following this collaboration, it was agreed on the initiation of a collaboration that would allow the transfer of best practices between Israel and Romania in this field.



- As a consequence, on November 23rd, 2022, it was organized the workshop on "Promoting the Concept of Blue Growth in Early Education". At this event, professors such as Dan Shechtman and Enrico Sciubba from the University of Rome, presented to the educators from the Constanța County School Inspectorate network, the motivation and ways of organizing science education in the preschool system.

TASK 4.2: BLACK SEA AWARENESS & OUTREACH

Promoting science education in preschool education

❑ SciLabs in Kindergartens

- Based on the success of this event, the Kindergarten no. 58 from Constanta together with BSUN decided to organize of a science laboratory - SciLab within the kindergarten.

The event

- On March 3rd, 2023, starting at 11 a.m., at Kindergarten no. 58 from Constanta was organized an open lesson, that was held by a team from "Grigore Antipa" Museum of Bucharest, for the kindergarten teachers from Constanța County.

- At the same time, also on March 3rd, 2023, from 11 a.m., in Haifa, at a kindergarten selected by the City Hall, an open lesson was organized in a specially dedicated laboratory for kindergarten children.

- Between the two events there was established a video and audio connection in order to be followed and for the interaction of the participants.

- The teachers were able to make comments, ask questions or formulate proposals.

- The aim of the event was to initiate a long-term cooperation between the teaching staff of Constanța and Haifa, in the preschool education field.

The science Laboratory

- The science Laboratory was established at the Kindergarten no. 58 from Constanta.

- For the establishment of the laboratory, the following items have been procured:

  - Laboratory furniture
  - Presentation Displays
  - Laboratory Kits
  - Microscopes and Measurement Sensors
  - 3D Printer for Laboratory tailored components
  - Drone for detailed presentation of coastal ecosystems

TASK 4.2: BLACK SEA AWARENESS & OUTREACH

MOBILE CARAVAN

Sf. Gheorghe (Saint George Village) located in the Danube Delta. The subject of the caravan is to present to the students from the gymnasium the concept of "Sustainable Development of Remote Communities based on Biomass as a Green Energy Resource".

MOBILE CARAVAN: Through the mobile caravan, Black Sea marine life/ecosystem/ecosystem stressors will be disseminated. Related games, Interactive digital applications based on multimedia and Augmented Reality (AR) technologies will be developed.

- A pilot activity conducted in Romania, on «Sustainable Development of Remote Communities based on Biomass as a Green Energy Resource» aiming the promotion of “Blue Growth” strategy with an emphasis on the issues related to the importance of watercourses, the conservation of the quality of the marine and coastal environment, but also the perspectives and implications of Sustainable Development in coastal areas. The event took place on 11 June 2021, in Sfântu Gheorghe (Saint George Gymnasium) located in the Danube Delta, with the participation of students from the Saint George Gymnasium School.

❑ Ongoing activities

- With the experience gained with this pilot Mobile Caravan, to continue this process by organizing a second edition of the Blue Growth Caravan at a kindergarten from Burgas, Bulgaria, situated near the Ropotamo Reserve.

TASK 4.2: BLACK SEA AWARENESS & OUTREACH

GAMING OF BLUE GROWTH IN THE BLACK SEA

GAMING OF BLUE GROWTH IN THE BLACK SEA: The Black Sea CONNECT will engage known software companies to create a game which have some simplified models on ecosystems services connected with blue growth principles especially under human impact scenarios (fisheries, energy and tourism).

- In 2020, the Black Sea Universities Network developed the repository dedicated for uploading and making available games for promoting Blue Growth principles. As pilot case, it was developed the beta version of the Serious Game "Diving in Blue".
- The platform www.bluejoy.bsun.org has been established with the 1st phase – a repository of existing games.

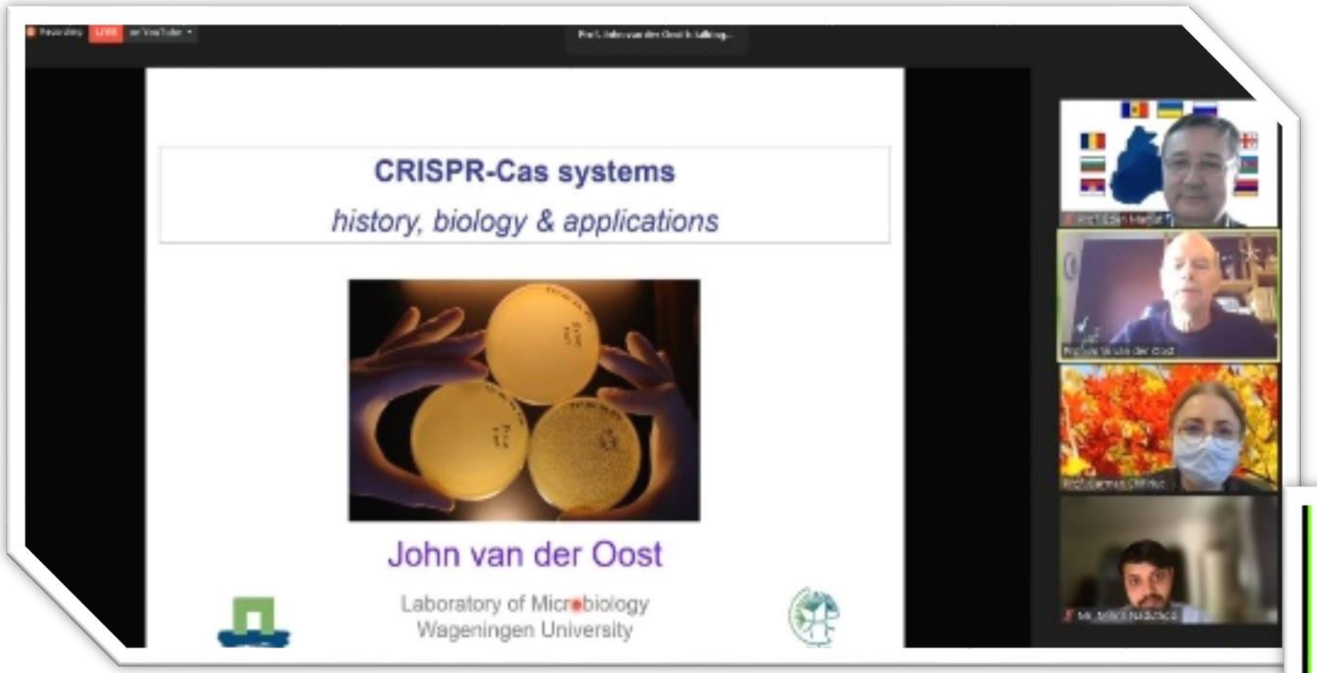
❑ Ongoing activities

- Development of the "Bluwareness" Serious Game. The serious game has been conceived as a route planner from Bucharest Airport and it integrates a list of targeted beaches (Mamaia and Eforie Sud - Romania, Golden Sands – Bulgaria), alternative travel routes (car, bus, rail, plane, bicycle), lodging and tourism activities to be carried out. There are evaluated aspects related to CO2 equivalent emissions, other type of wastes and particularly, the risks for causing pollution of coastal waters. At the end of the game, the player will be informed on how eco-friendly his choices are. Additionally, feedback and future advice will be provided on how to make more environmentally friendly choices.

Task 4.2 – Educational activities related to Blue Growth initiative

- **Online Training Platform Massive Open Online Course – MOOC on Blue Growth in the Black Sea:** On 7 April 2021, it was initiated the series of BSUN Master Courses on Blue Growth, aiming to contribute to the establishment of regional cooperation between the pre-university and university sector from the Black Sea region for implementing a Regional Master Program on Blue Growth in the format of a MOOC – Massive Open Online Course.
- Within these series, there were prototyped two very high-level sessions, involving prestigious scholars from universities as: Wageningen University & Research and University of Rome I “La Sapienza”, but also University of Bucharest, “Ovidius” University of Constanta and Research organizations.
- In this way, it was facilitated the bridging of teachers from the selected group with the frontier researchers and scientists in the field of marine biology, genetic engineering, sustainable energy and marine environment protection.

Task 4.2 – Educational activities related to Blue Growth initiative



Task 4.2 – Educational activities related to Blue Growth initiative

- **Tv Show: The Blue Dobrogea**
- **Broadcasting channel: Dobrogea TV**
- **Aim: promotion of Blue Growth in the SE Region of Romania**
- **Format: a discussion with a notorious personality and inserts of different documentary movies, news, debates, opinions and actions**
- **Link: https://dobrogeaalbastra.ro/**

TASK 4.2: BLACK SEA AWARENESS & SCIENCE FAIRS

Science Fairs: Events like European Researchers' Night and science festivals aiming to integrate/translate scientific information to a non-academic public.

❑ Ongoing activities

- Participation in the **AstroFest 2023**, an event with a very large audience that shall be organized in Bucharest, in May. BSUN will prepare posters, flyers and roll-ups for presenting the activities developed under the frame of the Black Sea CONNECT Project.

- Participation in the **European Maritime Day**, to be organized in Brest, France, on 24-25 May 2023 as physical event, at Brest Expo - Parc de Penfeld. BSUN will prepare posters, flyers and roll-ups for presenting the activities developed under the frame of the Black Sea CONNECT Project.

TASK 4.2: BLACK SEA AWARENESS & OUTREACH

ART FAIR

ART FAIRS: A series of art events, such as photo contest and/or film festival will engage artists and the general public in expressing their views, concerns and relationship to the sea and its sustainability.

- **Black Sea CONNECT Art Fair *"Healing the Black Sea by Art"*** was conducted on October 31st, 2021. An event dedicated to the International Black Sea Action Day aimed to use the artworks and the educational context as a source of empowering awareness to guide us towards taking action for protecting the Black Sea. It features collaboratively speaking stories that will reiterate among the public for the embracement and the engagement of the reality through art, in order to witness the messages sent from the sea.

https://bsun.org/pages/resources/artfair.php

TASK 4.2: BLACK SEA AWARENESS & OUTREACH

BLACK SEA OBSERVATORY ON BLUE GROWTH

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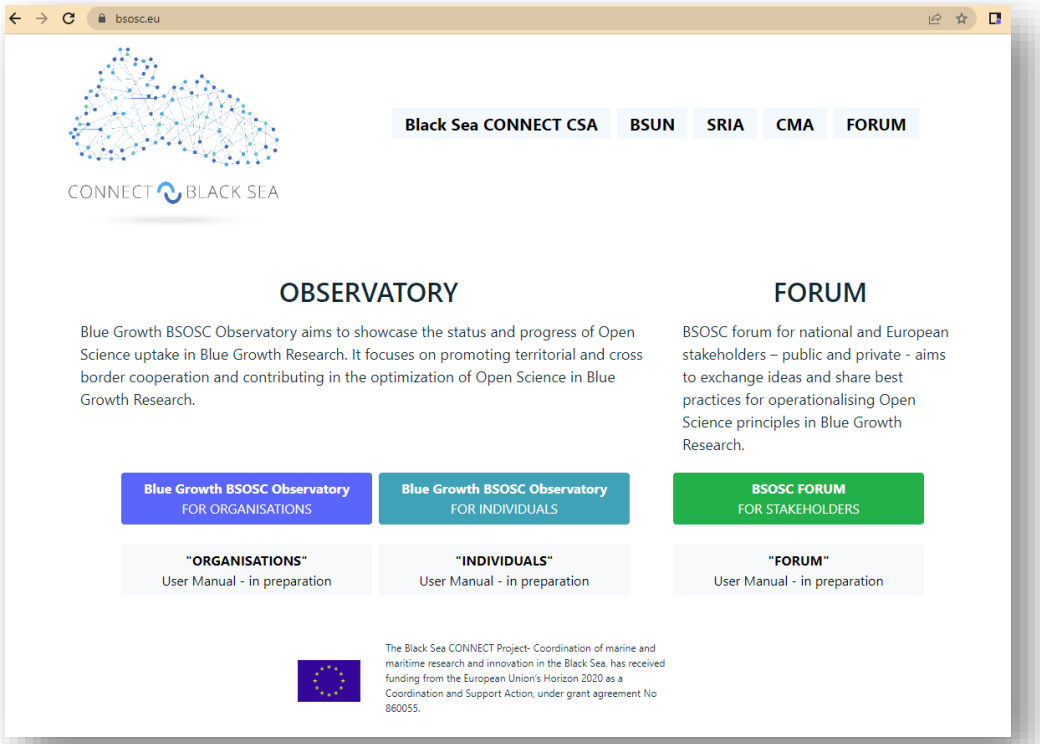

- **Blue Growth BSOSC Observatory** (www.bsosc-observatory.eu)
  - **Blue Growth BSOSC Observatory for Organizations**
  - **Blue Growth BSOSC Observatory for Individuals**
  - **Blue Growth BSOSC Forum for Stakeholders**
  - **Supporting Organizations**

BLACK SEA OBSERVATORY ON BLUE GROWTH: A section in the project website dedicated to the indexing of open publications on topics related to the Implementation Plan in order to facilitate the exchange of scientific results via open science actions, internet-based gatherings of scientists, policy makers and civil society to maximize the impact the science diplomacy in the region.

- BSUN partnership with EGI for accessing EOSC - In 2021, it was signed a Memorandum of Understanding between BSUN and EGI – European GRID Infrastructure, that is the largest European federated digital infrastructure for processing scientific research data and a main contributor to the European Open Science Cloud – EOSC. Based on this partnership, BSUN set the foundations for organizing an Observatory for Scientific Research Open Data on Blue Growth in the Black Sea Region.

Ongoing activities

- Integration of open publications from “Ovidius” University of Constanta, National Research and Development Institute for Biological Sciences Bucharest, University of Bucharest, Bogazici University, Karadeniz Technical University, Sofia University

TASK 4.2: BLACK SEA AWARENESS & OUTREACH

BSUN Energy Innovation Challenge 2023

- The Black Sea Universities Network is organizing a new edition of the BSUN Energy Innovation Challenge, in a new format that aims to put in forefront the need of instructing the young generation of future entrepreneurs, putting an emphasis on the development of mandatory skills and abilities in the field of sustainable and accessible energy.

- The event is organized in collaboration with the Constanta County School Inspectorate and the „Ovidius" University of Constanta and it will be hosted by the Energetic High School of Constanta.

- The event is addressed to the students from BSUN member universities, but also to the students from other universities, to students from different high schools and young graduates.

- The topic of the event is dedicated to the field of sustainable energy in coastal areas, the promotion of value chains based on decarbonized technologies, the use of advanced materials for increasing the efficiency for the systems of conversion and conservation of energy, the promotion of IT technologies and the use of smart grid through ecoinnovative solutions.

THANK YOU!

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