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Editorial Note: Black Sea - a pearl in the crown of Bulgaria. Part III. Future

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The Black Sea is a small but attractive site for many different areas of multifaceted human activity. In this last part of the editorial notes on the Black Sea, we will try to look at the future of some of the most important of them.

The potential for extraction of minerals from the Black Sea is still under development. Currently in the shelf of the Bulgarian Black Sea coast there is only one borehole for natural gas production. It is located near the city of Varna. Studies on the extraction of fuels from the Black Sea have been conducted for many years. Bulgaria and its neighboring countries have granted permits for oil and gas exploration in the deeper parts of the Black Sea to large companies such as Shell, Total and others. In 2016, results were published for the discovery of an oil field in the Khan Asparuh block in the waters of Bulgaria. Expectations for success and for the discovery of natural gas are realistic. The following examples are convincing enough in this respect: in 2012, natural gas deposits estimated at about 84 billion cubic meters were discovered in the Neptune block in the Romanian waters. In the western parts of the Black Sea in the block Tuna-1 (renamed the Sakarya field) in the waters of Turkey in 2020 was discovered a field of 320 billion cubic meters of natural gas.

Another potential source of energy is hydrogen sulfide deposits in the Black Sea. The unique deposit of hydrogen sulfide in the waters of the Black Sea is estimated at about 4.6 billion tons. The extraction of electricity and hydrogen from these deposits is an idea on which a team of Bulgarian researchers from the Institute of Engineering Chemistry of the Bulgarian Academy of Sciences has been working since 2008. An original technology for extraction and processing of hydrogen sulfide has been developed and currently has a

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recovery rate. of the raw material about 60%. The work on its improvement continues and it is expected that upon reaching 90% utilization of hydrogen sulfide it will be implemented in real production.

One of the most successful industrial productions on the Bulgarian Black Sea coast is the production of sea salt. It takes place in two coastal lagoons: Pomorie and Atanasovsko lakes. What is unique about this production is that the salt is produced using the same technology that was used centuries ago. The salt pans are numerous shallow saltwater basins, separated from each other by embankments of wood and soil. The water evaporates from the sun's rays and gradually concentrates. At the end of the process, the crystallized sea salt remains at the bottom of the pools. Only 10% of the sea salt obtained is processed into table salt. The remaining quantities are intended for various industries: chemical, textile, transport, and engineering. In addition to salt, lye and healing mud are also extracted from the salt pans.

The only museum of salt in Bulgaria and for the whole of Eastern Europe is located in the Black Sea town of Pomorie, 20 km from the port city of Burgas. It is dedicated to the production of salt by solar evaporation of sea water. The production of salt in the region of Pomorie existed even before the establishment of the town (around the 5th century BC).

The second uniqueness of this production is the fact that the Black Sea salt pans are located on the territory of 3 protected areas of the European ecological network "Natura 2000". A number of ecological projects related to the protection of coastal natural habitats and related birds have been implemented on their territory. In addition, the Black Sea salt marshes are a place for rest and feeding of thousands of birds during their spring and autumn migration, as they are located on the route of one of the main migration routes of birds between Europe and Africa, called "Via Pontica". In this region can be seen 318 species of birds out of a total of 423 species of birds found in Bulgaria. For this reason, Pomorie and Atanasovsko lakes are included in the Network of ornithological important places in Bulgaria. The two lakes are one of the most attractive places for ecological and ornithological tourism. All this makes the Black Sea salt pans a unique example of a combination of nature protection and business. Sustainable coexistence between humans, birds and habitats is one of the best local examples of good conservation practices that are considered to be the future of conservation.

Perhaps the most popular economic use of the Black Sea is fishing. The main economic species caught in the Black Sea are: 1) pelagic species: *Sprattus sprattus*, *Trachurus mediterraneus* subsp. *ponticus*, *Mugil cephalus*, *Sarda sarda*, *Pomatomus saltatrix*; and 2) demersal species: *Mullus barbatus* subsp. *ponticus*, *Squalus acanthias*, *Raja clavata*, *Scophthalmus maximus* subsp. *maeoticus*. Catch of molluscs may be added to them, such as *Rapana venosa* and *Mya arenaria*. In recent years, catches of *Rapana venosa* have exceeded those of *Sprattus sprattus* due to high export demand. Due to long-term fishing practices in the Black Sea, inconsistent with the principles of sustainable development, stocks of commercial fish species have fallen

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sharply. Therefore, the future of the use of commercial fish species and other living marine resources lies in their sustainable use and in the creation of aquaculture. Aquaculture is one of the pillars of the European Union's blue economy strategy. They are the subject of growing interest in the Bulgarian Black Sea coast, but so far mainly in the establishment of farms for the cultivation of the mussel *Mytilus galloprovincialis*.

In the first editorial note on the Black Sea past, we cited data on impressive archaeological discoveries along its shores, which testify to the earliest traces of human settlements in Europe. Not only the shores, but also the coastal parts of the Black Sea are the subject of archaeological research. According to researchers, the coast in ancient times was about 30-40 km deeper into the sea. The most logical place to look for the remains of settlements are the valleys of the rivers that flow into the Black Sea and have a natural continuation under the sea waters. Finding traces of underwater settlements is proving to be a difficult task. Preserved finds from the modern coast show that the settlements during the Eneolithic and Neolithic were built of wood and clay, and only the foundations of the buildings were made of stone. Studies are ongoing. Time will tell whether there are still undiscovered archeological sensations under the depths of the sea.

The strategic location of the Black Sea between two continents and between two military-political camps gives it the place of a desired site for conducting naval exercises. The last of them, held under the name "Breeze 2021", involves ships from 14 countries. According to official statements by one of the leading countries, the ongoing exercises of the Black Sea naval forces are a key component of the integrated containment strategy, a way to deter future military threats. In response, Russia is also conducting its exercises in the Black Sea. All this maintains tensions in the region, which have so far been successfully balanced and are not allowed to escalate into conflict.

Pollution of Black Sea waters is one of the threats to the health of marine ecosystems, reduces the quality of ecosystem services and has a negative effect on a number of sectors, such as fisheries, aquaculture and recreational activities. Pollution from land-based sources is a major threat, accounting for about 70% of total Black Sea pollution. The untreated nutrients that enter the sea through rivers are one of the biggest pollutants causing eutrophication. They come from fertilizers, fossil fuel combustion products, human waste, livestock, aquaculture and industry. To meet this challenge, Bulgaria is setting up a system of measures for the full implementation of Directive 91/676/EEC on the protection of waters against pollution caused by nitrates from agricultural sources. In recent years, the number of wastewater treatment plants has also increased. In the case of pollution with solid waste, the largest quantities are registered during the summer period, due to the increased number of tourists. The total number and weight of waste for 2019 is less than the previous 2017 and 2018. This is encouraging and is the result of undertaking a number of activities to raise public awareness about the negative impacts of waste on the environment and human health, campaigns to clean sea beaches and build a greater civic culture to protect the marine environment.

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For the protection of natural habitats and wild flora and fauna Bulgaria is involved in the construction of the European ecological network "Natura 2000". In Bulgaria it includes 31 protected areas in which there are all or part sea parts. Of these, 14 protected areas are protected under the Birds Directive, 17 protected areas are protected under the Habitats Directive and two areas are protected under both Directives. Each protected area includes as habitats natural habitats, plant and animal species. So far, the area of natural habitats, their conservation status and the status of the populations of the species subject to protection have been studied. From now on, an assessment of the ecosystem services they provide will be carried out.

It can be assumed that the future of the Black Sea will continue to be complex and difficult to balance what its present is. The identified opportunities, problems and measures that will be taken will continue to intertwine and intersect their interests. We believe that a sensible approach will allow us to continue to call the Black Sea "Pearl in the crown of Bulgaria."

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Front Cover

The Black Sea coast, south of the village of Sinemorets, Bulgaria

Photo by Prof. Dimcho Zahariev

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