REPUBLIC OF BULGARIA
MINISTRY OF ENVIRONMENT AND WATER

INITIAL ASSESSMENT
OF THE MARINE ENVIRONMENT
IN ART. 8 OF MSFD 2008/56/EC and NOOSMV (2010)

(SUMMARY)

Marine Region "Black Sea"

The initial assessment of the Black Sea marine environment considers the hydrological characteristics of the marine region - large catchment area, relative isolation and low water exchange with the World Ocean, anaerobic conditions in the Black Sea depression, significantly impact global climate systems on hydrological and ecological characteristics of the sea. In the context of global changes, the significant pressure from human activity from the Black Sea countries contributes to deterioration of the living conditions for the marine life and the ecosystem services, most noticeable in nearshore. Meanwhile, the natural circulation of the sea and the relative proximity of the large rivers, having a major share in the water balance and pollution of the Black Sea, and increases the vulnerability of marine ecosystems within the Bulgarian territorial waters to transboundary impacts, which determines the importance of the regional cooperation in solving common environmental problems. The Initial assessment of the state of the marine environment is the first step to establish environmental targets and measures to achieve good ecological status.

Section I designates the areas initial assessment within two habitat types – bentic and pelagic. The characteristics listed in Annex III of the MSFD are analysed. The Black Sea waters are characterized by thermohaline stratification with seasonal variability. The circulation of the Black Sea waters is determined by the influence of the Main Black Sea current with predominant northeast-southwest direction in the western part of the sea and the modifying influence of the river runoff in the north-western Black Sea shelf. The coastal currents are unstable, wind-generated and with varying intensity. The Bulgarian Black Sea coast is exposed to waves from the

eastern half, stronger in the winter months. The main storm waves are generated by east and northeast winds. Multi-annual changes in the sea level are determined by the ratio between the main components of the water balance: river flow, evaporation and water exchange through the Bosporus, developing in the context of the global climate change.

The chemical properties of the Black Sea waters are controlled by external factors, the major one being the river runoff. This largely determines the increasing concentration of nutrients and solutes in the nearshore direction, while the oxygen and oxygen saturation increases in the opposite offshore direction.

The Black Sea waters stratification results in the formation of two layers - upper aerobic (0 m to -100/150 m below sea level) and lower anaerobic, abundant in hydrogen sulphide.

Section II is an evaluation of the prevailing, special and national types of **seabed (bentic) habitats** and the predominant types of **water column** (pelagic) habitats, according to the assessment areas designated in Section I.

The assessment of **seabed habitats** is performed according to prevailing types of bottom habitat MSFD, in coherence with the habitat types in Annex I of the Habitats Directive and national habitat subtypes (biotopes) in the Bulgarian Black Sea waters. The greatest alterations in the natural conditions undergo the **coastal (mediolittoral and shallow sublittoral) habitat** resulting from sealing, burial, changes in hydrology, and in some cases - pressure of invasive species on the native habitat-forming species. The future trends to 2020 in the development of this type of habitats would be negative, because the anthropogenic pressure is likely to increase, resulting from the new coastal developments related to the tourism, port construction, coastal protection and urbanization.

There are **four major pelagic habitats** identified in the Bulgarian Black Sea waters:

 1) Coastal water habitats in the 1-mile zone (13 water bodies identified by the criteria of the WFD 2000/60/EC),

2) Nearshore habitats (outside the 1-mile zone to a depth of 25-30 m);

3) Shelf habitats (up to 200 m depth) and

4) Open sea habitats (> 200 m).

The approach used in assessing the **phytoplankton communities** in the MSFD is coherent with the quality elements for assessing the marine environment under the WFD - species diversity (species richness), taxonomic structure and quantitative development. For the 2006-2011 persiod, the phytoplankton communities are characterized by the dominance of a few species, deviation of the taxonomic structure from both the typical referent taxonomic structure, and from the taxonomic structure characterizing the period of increased eutrophication. In general, the assessment of the phytoplankton communities revealed deviation of the features corresponding to the reference state, as defined by the WFD and MSFD.

The zooplankton communities are an important connection between the primary producers and higher levels in the food chains. The assessment of zooplankton based on the available data series comprising the coastal, shelf and territorial sea over in front of Cape Galata and covers the period 1967-2011. The comparison of the assessment period with the historical data reveals that the biomass of zooplankton fluctuates by increasing in the period 1967-1973, and

declining in 1980-1993, up to today's unstable condition, which makes it impossible to display either a positive or negative trend in its development.

The assessment of **fish** is performed based of available data for the period 2009-2011. The assessment of ecological status carried out by 5 - grade classification system corresponding to the one used under the WFD. The analysis of species diversity reveals that the nearshore and the shelf areas are in poor environmental conditions.

The Black Sea are characterized **4 species of marine mammals**: *Phocoena phocoena, Tursiops truncates, Delphinus delphis, Monachus monachus*. In Bulgaria the latter type, also known as the monk seal, is considered extinct. In the absence of specific studies on cetaceans, an assessment of the current status of the populations of the three cetacean species can be made by indicators based on the abundance, distribution, size-varastova structure, sex ratio. Despite the insufficient research, the three species of dolphins are subject to special protection in the Bulgarian.

The ecological status assessment by **species, designated for protection** under the EU directives embraces the three types of cetaceans *(Phocoena phocoena, Tursiops truncatus* and *Delphinus delphis*) and fish *(Acipenser sturio* and Alosa spp.). The sturgeon (*Acipenser sturio*) is considered extinct in Bulgaria. Alosa spp. is endangered species, particularly vulnerable to human activities, especially those related to access to their breeding areas and the quality of the marine environment.

The environmental assessment of the **commercial species** includes sprat (*S. sprattus*), Rapana (*R. venosa*) and turbot (*Sc. maeoticus*). The populations of sprat are characterized by variation, resulting from the combined effects of the biology of the species, peculiarities of reproduction, fishing pressure and environmental factors. The population status of the predatory snail Rapana and the trends for the 2006 – 2011 period are not well understood, which complicates the initial assessment. The population status of turbot for the 2006 - 2011 period indicates that the population is distressed.

The assessment of the **ecosystems** is based on literature data, because there are neither experimental, nor model tests performed in front of the Bulgarian coast. Depending on the degree of eutrophication and the response of the biota, there are three periods in the Black Sea ecosystems evolution - reference "clean" period (during the 1960s), a period of intense anthropogenic eutrophication (from 1970s to 90s) and the modern period characterized by anthropogenic eutrophication decrease. However, for the period 2006-2011 is characterized by both positive and negative trends in the ecosystem. Coastal sea remains the most vulnerable and reflects the state of the levels in the food chain under the influence of the high variability of natural and anthropogenic factors.

The impact of **alien species** indicates that for the 2006-2011 period there are 20 new alien species registered, of which 14 phytoplankton (not including the cysts), 2 zooplankton, 1 zoobenthic, 3 species of fish and 1 species of macrophytes. The trend is increasing i.e. the risk of invasions is still high.

Section III is an evaluation of **pressures and impacts** (Art. 8 (1B) of the MSFD) as a result of two types of activities: land-based and marine activities.

Physical losses in the coastal zone include **sealing (technogenic load)** and **burial (reclaimed land)**. These activities are analyzed according to the assessment areas designation

proposed in Section I. The maximum pressure suffer the mediolittoral and shallow sublittoral ecosystems, expressed in loss of bottom substrate (habitat) and associated species and communities as a result of the coastal protection projects, port development, fisheries and tourism in the coastal zone. Besides the direct losses, the construction of coastal structures has indirect harmful effects on the lythodynamic and hydrodynamic regime, leading to deterioration of water quality and siltation. The greatest degree of anthropogenic alteration experience the heavily urbanized assessment areas: Cape Kaliakra - Cape Galata and Cape Emine - Sozopol.

Physical losses in Black Sea shelf result from commercial fishing. Fishing with bottom gear (trolling) leads to seabed abrasion, and in particular the vulnerable biogenic substrates. The trawl pressure measured by the ratio between the total length of trawl routes in an area and the area of the zone, allowing to distinguish areas of strong, moderate and weak pressure. Over 50% of the area of the seabed up to 100 m depth in 2011 is under significant pressure from abrasion as a result of intensive fishing. Bottom below 100 m depth is not affected. An assessment of pressure from abrasion due to fishing on the main types of substrates - sand, mussel banks on shelf sediment muds of the upper and lower circalittoral and mixed phaseolin shelf sediments. From the bottom substrates, the biogenic mussel banks are characterized by the highest sensitivity to abrasion, because the habitat-forming species *Mytilus galloprovincialis* and the associated typical representatives of the epifaunal community i.e. develop on the seabed surface and fall under the direct physical impact on the bottom towed fishing gears.

Descriptor 11 "Underwater noise" (8B03) and other forms of energy input into the marine environment are not well understood, and therefore this descriptor is not included in the report the initial assessment of the marine environment, as required by Art. 8 of the MSFD. Further research is required to supply the data needed for the assessment, which will be provided in the next reporting cycle of Art. 8, 9 and 10 in 2018,

The assessment of pressures and impacts of the **marine litter** (section III.4) in the Bulgarian Black Sea waters summerizes the result of individual studies for the 2006 – 2011 period.

The assessment of alterations of **hydrological processes** (III 0.5) is performed by analysing the thermohaline (T, S-) structure, sea surface temperature, intensity of the Main Black current, and the impact of global climate systems. There is no statistical assessment regarding the sea surface temperature of the Bulgarian shelf waters and adjacent deep-water areas for the period after 2005. The literature studies reveal a trend of increasing sea surface temperature in the western part of the Black Sea from 15 ° C to ~ 16 ° C after 2006, which is confirmed by the results of the analysis of satellite data. There is no evidence for any significant changes in salt balance of the sea waters. There is sufficient research proving the impact of the global climate systems on the hydrological processes. There is no objective evidence for any lasting significant changes in the wave climate. At present, the complex and irregular nonlinear structure of hydrological changes in the western part of the Black Sea precludes the drawing of explicit quantitative assessments, only qualitative estimates and hypotheses.

The marine pollution by hazardous substances (III.6) is analysed by types of human activities and economic sectors by using data from the synthetic and non-synthetic pollutant loads from terrestrial point and diffuse sources. The chemical pollution is one of the problems of the Black Sea, determined by the Transboundary Diagnostic Analysis (TDA, 2008).

The share of the domestic wastewaters and river loads is significantly higher than the proportion of industrial wastewaters discharged into the sea.

The comparison of the types of pollutants would be difficult, since no information is available for each of the years in the 2006 – 2011 period. This further complicates the analysis of the pollution trends. The available data reveals that areas with high levels of contamination Varna and Bourgas bay, owing to the direct or indirect influence of the industrial runoff, port operations and marine transport. Two other areas at risk of contamination are: the Shabla region subjected to the direct influence of purified industrial runoff from the nearby industrial site for oil and gas extraction and the area in front mouth of Kamchiya the river. In the region of Bourgas are detected the highest concentrations of nickel and lead in marine waters.

The results obtained from the analysis of **priority substances** are not sufficient for assessing the chemical status and highlighting the trends of change over the years.

The **pollutants assessment in marine biota** is based on literature data for the period 2004 – 2011. A study of the polychlorinated biphenyl content of five commercial fish species the three regions of the Bulgarian coast (northern, Varna, and southern) reveals absence of seasonal differences and a higher content in the Varna region and to the north of it. Furthermore, studies on the quantity of some organic pollutants and heavy metals in different types of coastal fish of economic importance for the period 2007 – 2011 are further analyzed in this report.

There are no **cases of acute pollution** (section III.7) with large-scale and fatal consequences for the environment for the period 2006 - 2011. According to the Executive Agency "Maritime Administration", there is evidence of accidental oil spills, most often of unknown origin in the bays areas and the nearby water areas. The spills are localized and the contaminants – cleaned up. The general trend is to reduce of the number of spills and the hydrocarbon contamination in the two bay areas (Varna and Burgas) compared with the beginning of the evaluation period 2005-2006 г.

The assessment of the **enrichment of biogenic and organic substances (eutrophication)** (Item III.8) is complicated, because there is no information available for each year for the period 2006 – 2011 and for all sources of pollution. There are difficulties in calculating the loads in rivers due to lack of data on water levels (not all rivers are monitored). It is impossible to evaluate the contribution of the different diffuse sources and the degree of diffuse pollution with nitrogen and phosphorus. Despite the shortage of information, the analysis of available data shows that areas with high nutrient overloads the Varna and Burgas bay areas, owing to the direct or indirect influence of the industrial inflow, domestic inflow from wastewater treatment stations, port activities and rivers. Another vulnerable to eutrophication area lies in front of the Kamchiya River.

There shortage of data on nitrogen and phosphorus loads of from groundwater flowing into the sea to provide a more complete picture of the diffuse sources of pollution. The information provided on dredging activities is incomplete, because it specifies the place of disposal of dredged material without specifying the dredging period and the composition of the deposited material. The exact concentrations of nitrogen and phosphorus in the sediments are not measured, precluding the assessment of their distribution in the marine environment during dredging operations or transportation. There is also information deficiency about the wastewaters from the livestock farming.

The assessment of pressures and impacts of **phytoplankton blooms** in the period 2006 - 2011, shows that while the quantitative parameters of total phytoplankton biomass decrease, the taxonomically based metrics correspond to the unstable structure of phytoplankton communities,

more pronounced in coastal marine areas. While in the spring period factors of regional scale related to the cross-border transfer of water masses from the northeast, have greater significance on the state of phytoplankton communities, especially the shelf areas, in the summer a key role play local factors (intake of nutrients and organic matter), mostly associated with the state of wastewater treatment plants and runoff of other land-based sources, in the conditions of increased influence of natural factors such as extreme high summer temperatures, increasing the intensity of the storms, the changes in the cycle and intensity of rainfall, typical for the period. However, the lack of data with sufficient spatial and temporal resolution both in terms of phytoplankton, and in terms of the pressure and specific local studies, preclude from drawing definite conclusion.

The assessment of the pressure and impact of **microbial pathogens** (so III.9) on water quality in bathing areas for the period 2007 - 2011 evaluates the areas complying with accepted sanitary requirements: there are 12 areas in Dobrich (60%), 7 in Varna (30%) and 12 in Burgas (26%). Although the proportion of areas in the Varna region is significant, according to the criterion about "areas incompatible with the standard values of the microbial pathogen", the largest share of such areas lies again in the Varna region. The only area closed due to microbiological contamination is precisely the areas in Varna region. The trend for the period is shows percent increase of the areas incompatible with the standards of the microbial pathogen.

There is a marked increase in the pressure of **invasive species** (III.10). Most important for the distribusion of the alien species in the Black Sea is marine transport. The greatest pressures on benthic communities have the predatory snail *Rapana venosa* and the pelagic ctenophore *Mnemiopsis leidyi*. However, the lack of sufficient data and irregular studies do not allow the development of indicators.

The selective extraction of species (III.11) is an assessment of pressures and impacts of commercial fishing on the Black Sea ecosystem in Bulgarian territorial waters. The degree of impact include – sprat (*S. sprattus*), turbot (*Sc. maeoticus*), whiting (*M. merlangus*) and anchovy (*E. encrasicolus*). The evaluation results are presented in the report.

In **Section IV** provides a **Socio-economic analysis of the seawater use**.

The description sea water use by economic sectors in the Black Sea region is largely dependent on the available data. These are industries, located on the coast and operating in the coastal or territorial waters and exclusive economic zone of the Republic of Bulgaria.

The socio-economic analysis of the sea water use covers the following economic sectors, consuming sea water but also pressures on the marine environment:

Land-based activities
- Urbanization - Population
- Tourism

Activities in Marine (uses of the sea)
- Fisheries and aquaculture
- Marine transport and port activities
- Shipbuilding and ship repair
- Extraction and transportation of oil and gas

Assessment of the use of marine environment and its socio - economic significance for the period 2006 to 2011.

The three Bulgarian Black Sea provinces - Dobrich, Varna and Burgas - take 14.7% of Bulgaria's territory and are home to the same percentage of the population according to the census of 2011. Together they generate 13.1% of Gross Added Value (GAV) and Gross Domestic Product (GDP) at the national level. Approximately 80% of the area and 90% of the population of the three provinces are included in the Black Sea River Basin District. The basic social and economic indicators of the three coastal provinces are presented in Table IV.1. to Section IV.

The analysis of the socio - economic significance of different sectors for the 2006 – 2011 assessment period provides the following conclusions:
- The main share in the **commercial fishing** have the sprat and turbot, comprising 92% of the total fish catches.
- The Black Sea mussel (*Mytilus galloprinciallis*) is the most important **marine aquaculture** grown in Bulgarian marine waters. In the last year production for consumption in specialized farms has decreased by 18%.
- The **tourism** is one of the most active areas of use of the marine waters in Bulgaria. In the recent years there has been an increased revenue from night stays in accommodation facilities and residence buildings. The percent increase in these services in 2011 is about 10% than in 2007.
- In the **maritime transport and port operations sector**, the cargo traffic analysis reveals that in the 2006 – 2011 assessment period it fluctuated between 22–28 million tons. The decrease in 2009 – 2010 results from the economic crisis, which decreased the trade turnover and the volume of imports and exports. In 2011, the total traffic volume restores the average level for the assessment period of 25 million tons.
- There are projects planned in the sector "**Extraction and transportation of oil and gas**", have the potential to generate significant economic benefits, but can also have a significant impact on the marine environment.

Evaluation of the pressure caused by the use of the marine environment.
The second part of the analysis presents the relationship between different types of uses of the marine environment by the economic sectors with the pressure that they exert on the state of the marine environment, with regards to the descriptors of good state of the marine environment.

Baseline scenario for future development to 2020
The development of the marine environment by 2020, the socio-economic and legal environment, provided that the MSFD is not implemented, represents the baseline scenario. It is consistent with the implementation of existing international and national legislation outside the MSFD and the ensuing consequences. The analysis provides the following conclusions:
- The baseline scenario by 2020 contains expected pressure increase on the marine environment by the tourism and the maritime transport, proportional to the growth of GDP. The growth forecasts to the end of the period on the 2011 basis, produces an average annual growth between 2.5% and 3.7%.
- The dynamics of the sectors identified as land-based sources of pressure, is determined mostly by the country commitments under the WFD and the related legislation. The achievement of good surface water status by 2015 is a prerequisite to reduce the pressures on marine environment from land-based sources, within the time horizon of the MSFD.
- Considerable uncertainty involves the development of the fisheries sector. Most of the revenues are generated from the capture and export of the sea snail *Rapana venosa*, complicated by the long-term conflicts between the business, regulatory authorities and other stakeholders. There is also a negative precedent in Turkey, where the species catches is terminated because of the collapse of the population and body size reduction of the captured individuals, which decreases their commercial value (Todorova, 2011).

- Another unknown is the potential oil and gas extraction in the Black Sea. The present research work is at a very early stage. The possible discovery of significant deposits may trigger the need to build additional institutional capacity to reduce negative impacts on the marine environment.

Estimation of the cost of the deterioration of the marine environment.

The estimation made for selected economic sectors. The analysis includes the present value of the commercial production and two scenarios of the marine environment deterioration. The chosen approach is necessitated by the absence of reliable quantitative estimates of the effects of environmental degradation in these sectors.

Two sector, the **fishing and the tourism**, which are directly affected by the deterioration of the marine environment.

The analysis shows that the potential damage to fisheries range from 575 to 890 thousand Euros in permanent damage to the marine environment and fluctuate between 1–2% of regional GDP, and in the tourism sector - from 39 to 58 millions of Euros in permanent damage to the marine environment, fluctuating around 1% of the regional GDP.

Conclusions:

A major problem in the analysis is the information deficit. In most cases, there is a lack of data on key economic indicators for the sea water use, such as: *number of employees, added value, income, etc.* If there are data provided, they are often aggregated and allow certain industries sub-industries to be analysed. In practice, there is no way to distinguish the data from the business sectors serving both the marine-related economic activities, and a wider range, which are not related to the use of marine waters.