OPERATIONAL PROGRAMME
ENVIRONMENT

European Union
European Structural and Investment Funds

Updated Draft Preliminary Flood Risk Assessment for the Black Sea River Basin Management District

Executive Summary

March 2021

This updated draft Preliminary Flood Risk Assessment for the the Black Sea River Basin Management District has been prepared with the financial support of the Cohesion Fund of the European Union, through Operational Program "Environment 2014-2020", under a Priority Axis 4 "Flood and Landslides Risk Prevention and Management" procedure for direct grant BG16M1OP002-4.005 "Implementation of studies and assessments in relation to the second FRMP for the period 2022-2027" for the project: BG16M1OP002-4.005-0001 „FRMP – second cycle 2022-2027". Project beneficiary is the Water Management Directorate, in partnership with the four River Basin Directorates.This activity has been carried out by the International Bank for Reconstruction and Development under an Agreement with the Ministry of Environment and Waters on providing support for the development of RBMPs and FRMPs for Bulgaria.

The current document is an executive summary of the updated Preliminary Flood Risk Assessment (PFRA) for Black Sea River Basin Management District. PFRA is an initial stage of the implementation process of Directive 2007/60/EC (European Floods Directive, FD). As per the requirements of FD Chapter VI, every six years EU Member States shall review and if necessary, update the PFRA.

1. Legal basis, objectives and scope

Directive 2007/60 / EC (Floods Directive or FD) has been in force since November 26, 2007. In the legislation of the Republic of Bulgaria it has been transposed with the amendment of the Water Act (WA) in 2010, SG No. 61/2010).

The purpose of the FD is to establish a framework for flood risk assessment and management, aiming to reduce the adverse effects on human health, economic activity, the environment and the cultural heritage associated with floods and thus to have a positive impact on flood risk management at a Member State level as well as in international river basins.

The FD requires Member States to apply a long-term planning approach to flood risk mitigation at national level in three successive stages:

- Preparation of Preliminary Flood Risk Assessment (PFRA) and identification of areas with a significant potential risk of floods (APSFR);
- Development of flood hazard and risk maps for the identified flood risk areas (mapping);
- Development of Flood Risk Management Plans (FRMPs), including Programme of measures to achieve the objectives of flood risk management.

The requirements regarding the content of the PFRA are set out in Section II "Preliminary Flood Risk Assessment" of Chapter Nine of the WA.

PFRA OBJECTIVES

PFRA aims to provide a quick overview of flood hazard and flood risk across the country, identifying areas where hazard and risk levels are higher based on certain criteria.
Analyzes must be based on available or readily accessible information on both hazard and risk, whereas climate change and its impacts on flood hazard and risk must also be taken into account.

The ultimate objective of the PFRA is to identify Areas of Potential Significant Flood Risk (APSFRs) where there is:

- Potential significant flood risk;
- Likelihood for potential significant flood risk.

PFRA SCOPE

- River basin maps indicating topography and land-use;
- Description of past floods with significant adverse effects on human health, the environment, cultural heritage and economic activity;
- Identifying areas with potential flood hazard of 1% exceedance probability;
- Determining potential damages in areas with potential hazard depending on land-use type;
- Assessing possible adverse effects of future floods on human health, the environment, cultural heritage and economic activities;
- Flood risk assessment by applying significance criteria of potential damages and identifying areas with significant flood risk.
- Informing the public.

1.1. Used PFRA Methodology

The Preliminary Flood Risk Assessment shall be performed in line with an approved methodology under WA Art. 187(2), item 6. The current PFRA 2022-2027 has been carried out in accordance with the adopted "2020 Preliminary Flood Risk Assessment Methodology" (https://www.moew.government.bg/static/media/ups/tiny/filebase/Water/PURN/PURN%202022-2027/Metodika.pdf)

The updated 2020 PFRA Methodology is divided into two main parts and includes methodological guidelines and a work algorithm, which are presented in Figure 1.

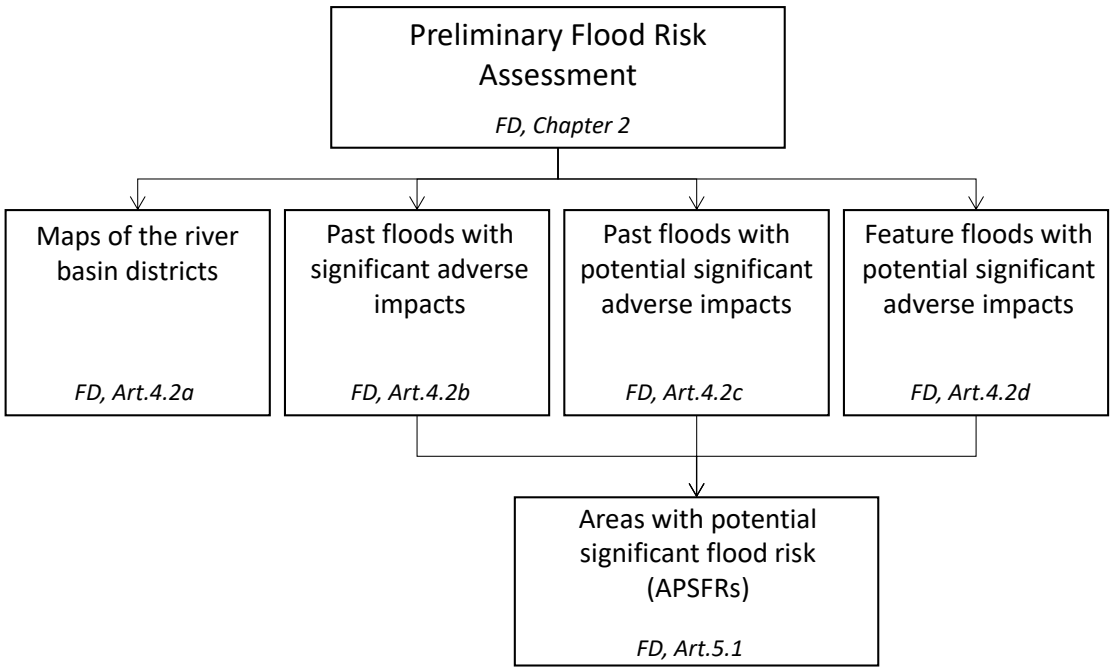


Figure 1: Diagram of main PFRA elements in line with the FD and the 2020 PFRA Methodology

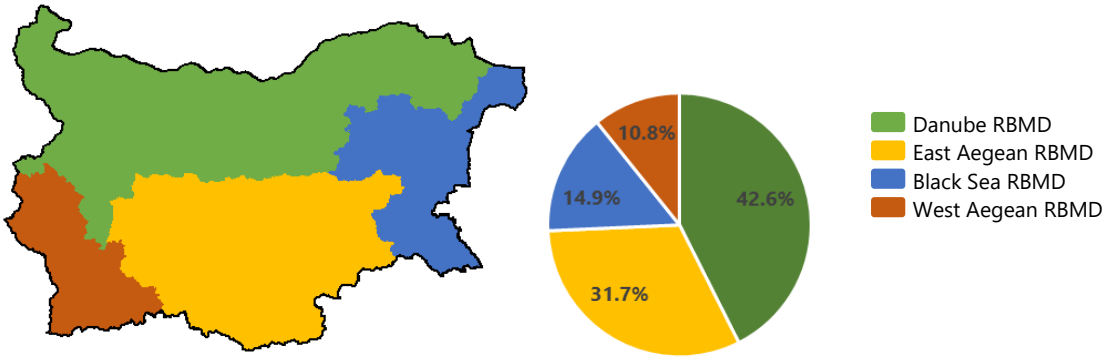
Black Sea RBMD PFRA Content

This updated draft Preliminary Flood Risk Assessment (PFRA) for the Black Sea River Basin Management District consists of several reports, their respective appendixes, databases and cartographic materials. On the one hand, they provide MOEW and RBD with up-to-date and comprehensive information, and on the other hand, they allow the general public and stakeholders to be better informed about the PFRA results.

The updated draft PFRA is available on the website of the Black Sea River Basin Directorate under: https://www.bsbd.org/PURN/2022-2027/00_PFRA_BG2_MainReport.docx

Characteristics of the Black Sea River Basin Management District

The Black Sea River Basin Management District covers the eastern parts of the Republic of Bulgaria. It includes all river valleys with direct inflow to the Black Sea. The district's area is 16,568 sq.km or 14.9% of the country's territory.



To the West, the Black Sea RBMD borders the Danube and East Aegean management districts. Said boundary is not clearly expressed in terms of topography. To the North, it starts at the state border with Romania, at Kardam border checkpoint close to the village of Yovkovo (General Toshevo Municipality), and to the South it follows the secondary watershed of the country up to Vratnik pass (921 m). From here further to the South, the boundary coincides with the main watershed all the way to the state border with Turkey, at the eastern end of Derventski uplands close to the village of Strandzha (Bolyarovo Municipality). The western boundary's length is 625 km.

The southern boundary coincides with the state border with Turkey. In its western part, it passes through the northern slopes of Strandzha mountain, and southwest of the town of Malko Tarnovo, near Gradishte peak (709.6 m) it becomes a river border. Said river border initially follows Deliyska river (a left tributary of Rezovska river), and after its confluence with Rezovska river it coincides with it all the way till its outflow into the Black Sea. The southern boundary's length is 162 km, 103 km of which are river.

The eastern boundary coincides with the Black Sea coastline, with endpoints to the North being the village of Durankulak (Shabla Municipality) and to the South - the village of Rezovo (Tsarevo Municipality). The coastal boundary's length is 415 km.

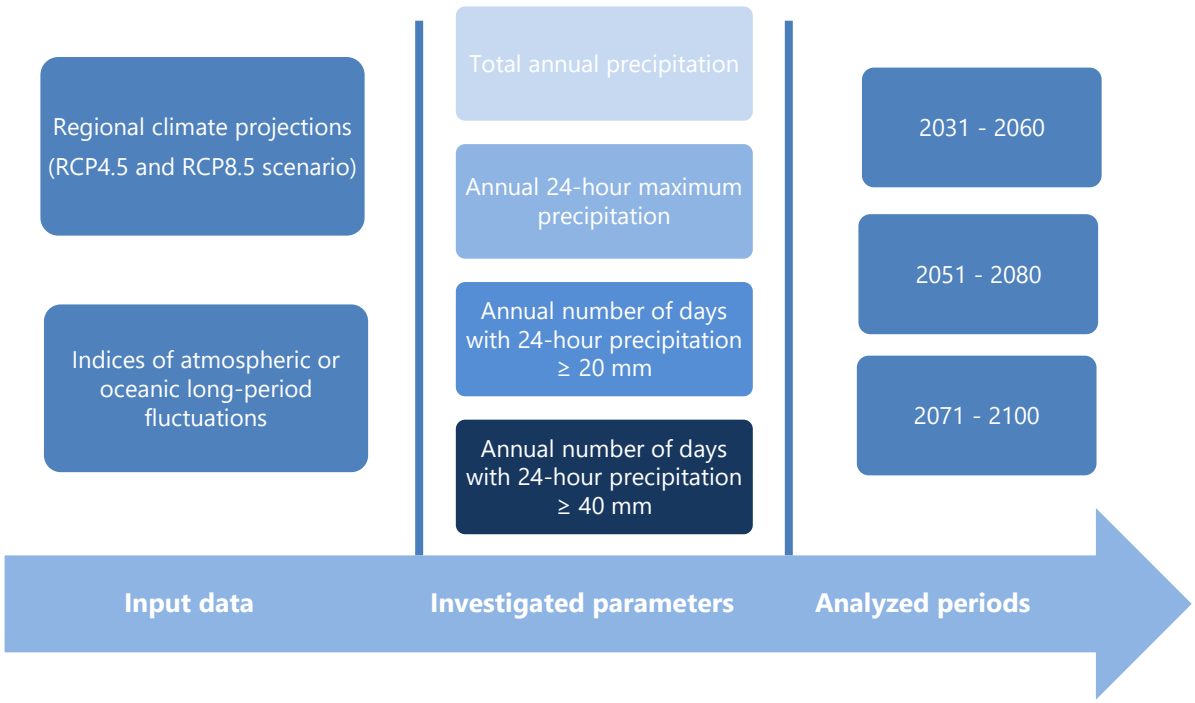
To the North, the district's boundary coincides with the country's state border with Romania. It stretches from west to east from the village of Yovkovo (General Toshevo Municipality) to the Black Sea coast, north of the village of Durankulak. Its length is 30 km.

The Black Sea RBMD includes 27 river valleys located entirely within the district, 2 transboundary river valleys - those of Veleka and Rezovska rivers, and territories with direct run-off into the Black Sea.

There are 8 administrative districts, 44 municipalities and 633 settlements within the RBMD's territorial scope.

Climate Change Assessment

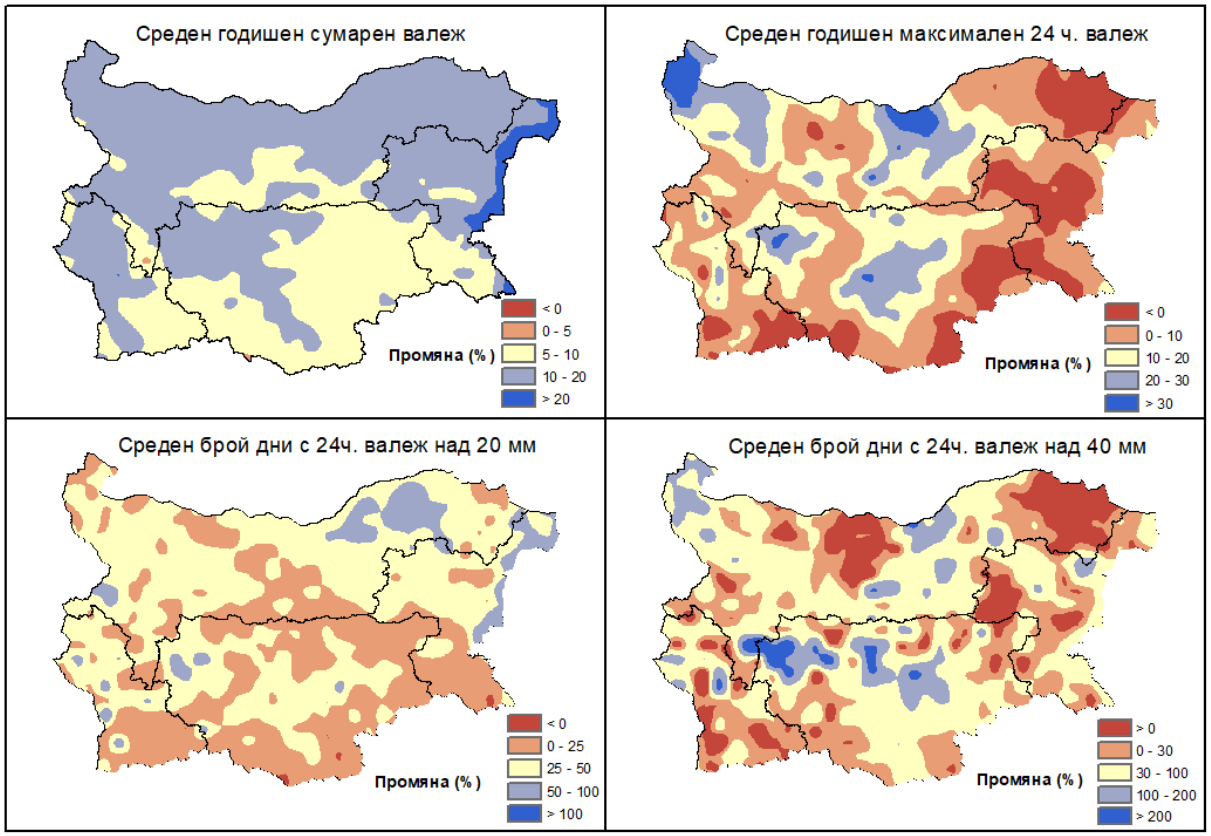
Climate change has been assessed within the updated PFRA based on two types of input data for four main flood-related parameters. The respective changes have been assessed for 3 time periods and two Intergovernmental Panel on Climate Change (IPCC) scenarios, as shown in the following diagram:



The PFRA has been carried out using data from the CORDEX project (Coordinated Regional Climate Downscaling Experiment) and in particular, its MED-CORDEX subproject - specially developed for the Mediterranean by the National Center for Meteorological Research - France (CNRM, Météo-France).

With regard to atmospheric or oceanic long-period fluctuations, a total of 7 indices of atmospheric or oceanic long-period fluctuations have been considered. Climate data series from ground-based stations of the Bulgarian national meteorological network are limited, both in terms of their quantity and data access, and in some cases there is no metadata on their accuracy. Hence, 24-hour precipitation data from the regional reanalysis MESCAN-SURFEX - a Copernicus Climate Change Service (C3S) product, have been used as historical data.

Schematic maps of the most significant projected changes have been prepared for each of the investigated precipitation indicators for the three periods 2031-2060, 2051-2080 and 2071-2100, as compared to the reference period 1961-2017. These schematic maps present the data under two IPCC RCP scenarios (RCP4.5 and RCP8.5). Below figure shows a schematic map for the period 2051-2080 under the RCP4.5 scenario.



Climate change analysis results have been used to:

- Determine and investigate areas of future floods;
- Identify APSFRs;
- Create APSFR passports.

Information Used for the Preparation of PFRA

The PFRA update requires carrying out a number of analyzes on flood hazard and risk covering the entire Black Sea RBMD territory. On the other hand, the need to compare results between the country's different river basin management districts mandates that the input data used should be readily available and easily accessible at national level, as well as standardized and of the same quality and detail.
The following types of data have been used to perform the PFRA:

Databases maintained by the Black Sea RBD

- Information available in the Black Sea RBD collected during the first FD implementation cycle, registers, databases and information arrays generated during the implementation of activities by the Black Sea RBD

Administrative-territorial and territorial division

- Updated data, as of 2020, on the country's administrative spatial planning according to NSI data

Topographical data

- Digital Elevation Model from two sources: the Ministry of Agriculture, Food and Forestry (MAFF) and SLED (Shuttle Land Elevation Data)

Hydrographic and hydro-meteorological data

- River network, hydrotechnical facilities, monitoring stations, hydrological data;
- Accessible hydro-meteorological data, methodological guidance documents on intensive rainfall, etc..

Data on past floods

- Questionnaire survey on past floods (which occurred in the period 2011 - 2019)
- Data from specialized institutions: DG Fire Safety and Civil Protection, NSI, NIMH and others

Data on risk elements

- Current information, registers, state institutions and agencies' databases
- Information collected from open data sources

Data on long-term special development

- Municipal Master Plans (MPs) for the country, as well as LPIS (for the period 2011-2019).

Climate change data

- Climate reanalysis references for the period 1961-2017 (EU Copernicus Program)
- Regional climate models developed under the MED-CORDEX project.

Data on flood recurrence probability

- Data on implementation of measures envisaged during the first FD implementation cycle - FRMP 2016-2021.

Past Floods

Past floods registered in the period 2011-2019.

148 floods were registered on the territory of the Black Sea RBMD between 2011 and 2019. They occurred in 141 locations (settlements). The distribution of flooding instances per years shows a decreasing trend in the number of occurrences until 2013 and a clear peak in 2014, followed by an alternation of years with higher and lower number of floods. About 38% of all registered floods during the observed period occurred in 2014. (Figure 2)

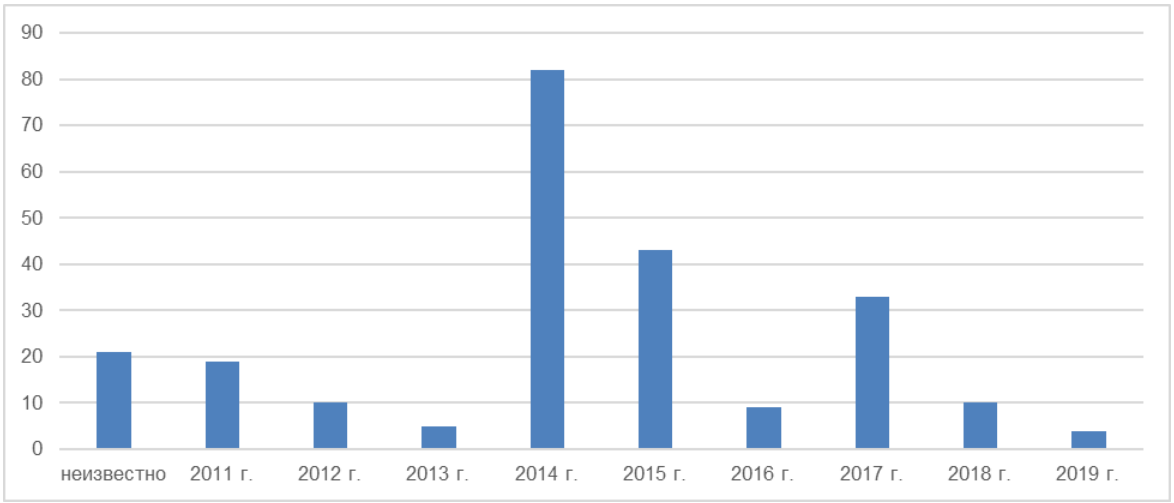
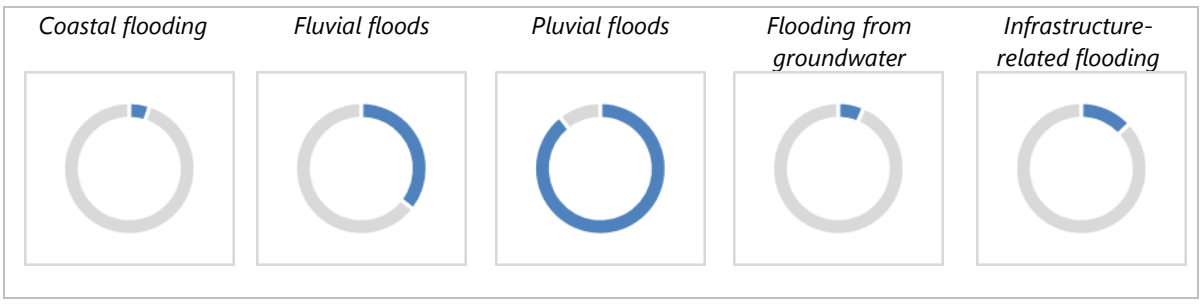


Figure 2: Distribution of registered past floods in the Black Sea RBMD per settlements and per years

Pluvial floods have the largest relative share, as well as mixed fluvial-pluvial floods. Fluvial floods come second in terms of relative share. Infrastructure-related flooding, coastal floods and flooding from groundwater have the smallest share.



2011

Number of registered floods is small. In terms of their source, they were pluvial for the most part and mixed pluvial-fluvial.

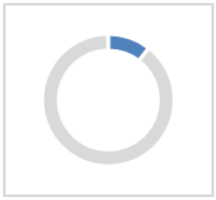
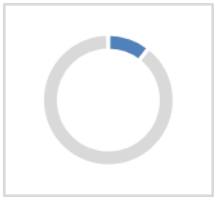
Floods occurred mainly in the far northern (Dobrudzha) and far southern (catchment area of Veleka river) parts of the district.

Floods in the Veleka catchment area occurred in early January. Floods were also registered at the end of the same month around Burgas and Kranevo; however, they were coastal in nature. The next sequence of floods occurred in mid-October and affected the Dobrudzha region. In December, several floods were registered in the central part of the region - the Burgas lowland and the upstream section of Luda Kamchia river.

Described adverse effects fall mainly under the category Economic Activity, in particular damages on infrastructure sites and to a lesser extent on real estate. The relative share of disruption of public service access is significant.

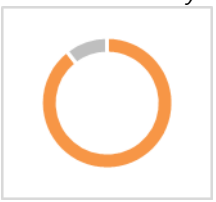
Types of floods

Number of floods per type in relation to total number

Coastal flooding	*Fluvial floods*	*Pluvial floods*	*Flooding from groundwater*	*Infrastructure-related flooding*
				

Adverse effects

Types of described adverse effects per category in relation to total number of floods

Human Health	*Economic Activity*	*Environment*	*Cultural Heritage*
			

2012

There is a slight drop in the number of registered floods.

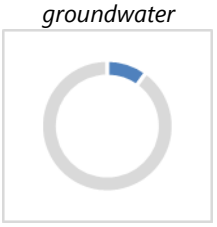
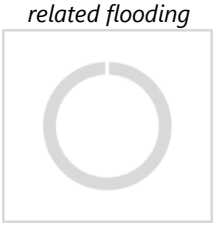
Floods occurred mainly in the Provadiiska river valley, the upstream section of Luda Kamchia river and in the Burgas area.

The floods around Burgas occurred in early February and were coastal and mixed pluvial-coastal. In the Provadiyska catchment area flooding occurred in May and the first half of June. Those floods were pluvial and mixed fluvial-pluvial. New mixed (pluvial and coastal) flooding was registered in Burgas at the end of October.

Described adverse effects again fall under the category Economic activity - mainly damages on infrastructure sites and to a lesser extent on real estate and primary sector activities. The share of disruption of public service access was small, whereas environmental consequences were related to flooded agricultural lands.

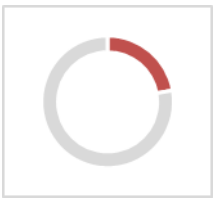
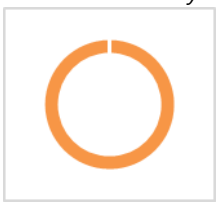
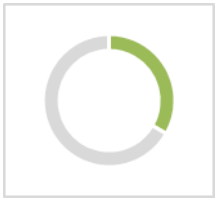
Types of floods

Number of floods per type in relation to total number

Coastal flooding	*Fluvial floods*	*Pluvial floods*	*Flooding from groundwater*	*Infrastructure-related flooding*
				

Adverse effects

Types of described adverse effects per category in relation to total number of floods

Human Health	*Economic Activity*	*Environment*	*Cultural Heritage*
			

2013

The number of registered floods continued to decrease. Floods were pluvial in nature.

They were registered in two main areas.

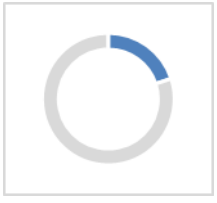
The first is the Rusokastrenska river valley and the area around Burgas, where flooding occurred at the start of the year - January and February.

The second is to the North, covering the catchments of Provadiiska and Batova rivers and the RBMD's Dobrudzha part. Here, flooding occurred in July and October.

Described adverse effects again fall under the category Economic activity - mainly damages on infrastructure sites and to a lesser extent on real estate and primary sector activities. The share of disruption of public service access was small.

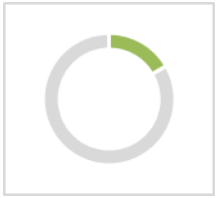
Types of floods

Number of floods per type in relation to total number

Coastal flooding	*Fluvial floods*	*Pluvial floods*	*Flooding from groundwater*	*Infrastructure-related flooding*
				

Adverse effects

Types of described adverse effects per category in relation to total number of floods

Human Health	*Economic Activity*	*Environment*	*Cultural Heritage*
			

2014

The number of registered floods is highest for the entire reviewed period (2011-2019) - a total of 82. They were mainly pluvial - in 46% of all cases rainfall was their sole source, whereas this percentage grows to 93% when we add mixed source occurrences - pluvial and coastal.

Flooding occurred throughout the entire RBMD with highest concentration in downstream sections of all rivers, just before they flow into the Black Sea. Outside these areas, more typical occurrences were observed in the upper parts of the Kamchia and Provadiiska catchments.

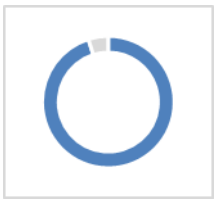
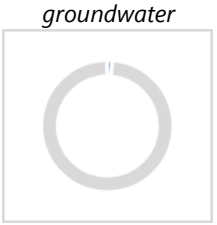
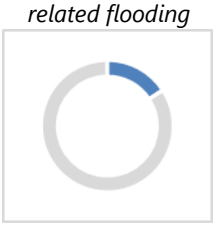
The distribution of floods per respective months of the year began with coastal flooding in Burgas in January, which reoccurred also in early April.

A major flood occurred at the beginning of March along Kotlenska river (left tributary of Luda Kamchia river). Floods in the upper and middle valleys of Provadiiska and Kamchia rivers continued in late May and early June, including further the area around Balchik. 46% of all floods in the RBMD for this year were registered from mid to late June. They affected the catchment area of Batova river and territories to the north of it, small sections of the Provadiiska river watershed, the area around Burgas. New pluvial floods occurred in Burgas in mid July and then reoccurred in early September, but their coverage expanded south along the Black Sea coast all the way to Ahtopol. Flooding continued in this area towards the end of October and beginning of December.

Described adverse effects fall mainly under the category Economic activity - mainly damages on infrastructure sites and to a large extent on real estate and primary sector activities. The secondary sector was affected to a small extent. Disruption of public service access was significant, whereas human health impacts had a smaller share. The environmental consequences were related to flooded agricultural lands.

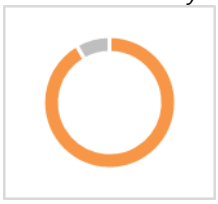
Types of floods

Number of floods per type in relation to total number

Coastal flooding	*Fluvial floods*	*Pluvial floods*	*Flooding from groundwater*	*Infrastructure-related flooding*
				

Adverse effects

Types of described adverse effects per category in relation to total number of floods

Human Health	*Economic Activity*	*Environment*	*Cultural Heritage*
			

2015

There was a drop in the number of registered floods; however, the year ranked second for this indicator for the observed period. The main flood source were rainfalls.

Floods were again concentrated in two areas.

The first area covers the far north parts of the Kamchiya catchment area, the middle and lower reaches of Provadiiska river, the entire Batova river catchment area and the Dobrudzha territories.

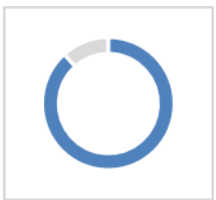
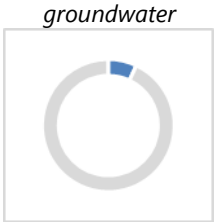
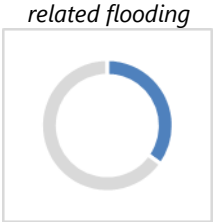
The second is concentrated in downstream sections of rivers flowing through the Burgas lowlands - Rusokastrenska, Sredetska, Fakiyska rivers.

Floods occurred mainly in winter (January and February). Those along the downstream section of Fakiyska river were in early August, whereas the upstream section of Kamchia river was affected in late September.

Described adverse effects fall predominantly under the category Economic activity - mainly damages on primary sector activities, infrastructure sites and real estate. Environmental consequences related to flooded agricultural lands take up a significant share. Human health impacts and disruption of public service access take up a small share.

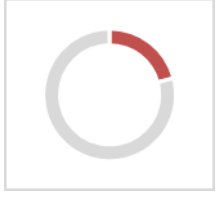
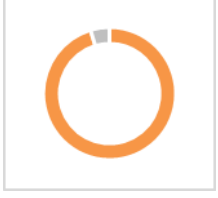
Types of floods

Number of floods per type in relation to total number

Coastal flooding	*Fluvial floods*	*Pluvial floods*	*Flooding from groundwater*	*Infrastructure-related flooding*
				

Adverse effects

Types of described adverse effects per category in relation to total number of floods

Human Health	*Economic Activity*	*Environment*	*Cultural Heritage*
			

2016

There was a significant drop in the number of registered floods. They were pluvial in nature.

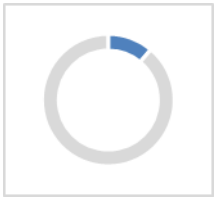
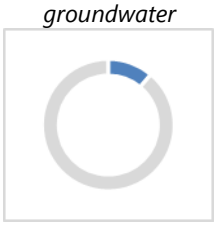
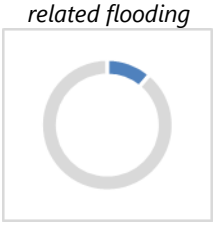
Floods occurred in the two areas described above, but their extent was much smaller - the lower valley of Provadiiska river and the Batova river catchment, as well as the downstream sections of Rusokastrenska and Fakiyska rivers.

Floods in the Burgas area occurred in January and June, whereas those in the North - in January, April, mid-May and mid-October.

Described adverse effects fall mainly under the category Economic Activity - mainly damages on infrastructure sites and to a lesser extent on real estate. The share of human health impacts was small. Environmental consequences were related to flooded agricultural lands and disruptions in water body status.

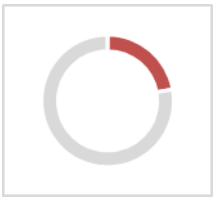
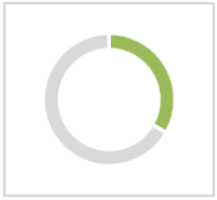
Types of floods

Number of floods per type in relation to total number

Coastal flooding	*Fluvial floods*	*Pluvial floods*	*Flooding from groundwater*	*Infrastructure-related flooding*
				

Adverse effects

Types of described adverse effects per category in relation to total number of floods

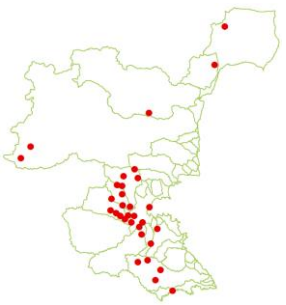
Human Health	*Economic Activity*	*Environment*	*Cultural Heritage*
			

2017

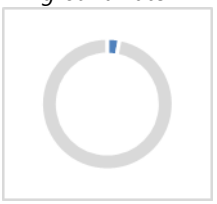
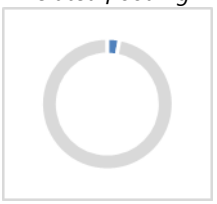
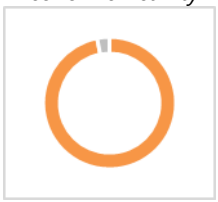
The number of floods increased. They were mainly caused by rainfall.

Flooding occurred almost entirely in the southern part of the RBMD, mostly in the Burgas lowland river valleys - Aytoska, Chukarska, Rusokastrenska, Fakiyska rivers. There were cases of floods also in the upstream sections of Veleka river.

Floods occurred in the second half of the year. In the southernmost parts, floods were registered at the end of September and towards the end of December, whereas those in the Burgas area occurred at end of October.



Described adverse effects fall predominantly under the category Economic activity - mainly damages on infrastructure sites and to a lesser extent on real estate and primary sector activities. Adverse effects on human health and disruption of public service access had a significant share. Environmental consequences were related to flooded agricultural lands and disruptions in water body status.

Types of floods Number of floods per type in relation to total number				
Coastal flooding	*Fluvial floods*	*Pluvial floods*	*Flooding from groundwater*	*Infrastructure-related flooding*
				
Adverse effects Types of described adverse effects per category in relation to total number of floods				
Human Health	*Economic Activity*	*Environment*	*Cultural Heritage*	
				

2018

A decreasing trend was observed in the number of registered floods. They were pluvial in nature.

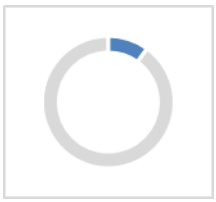
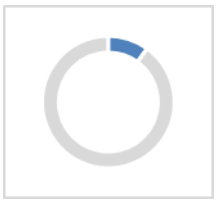
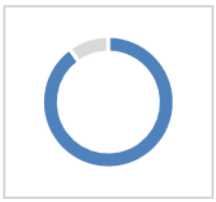
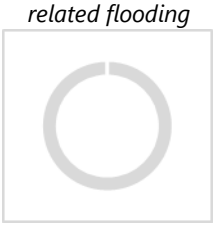
Floods occurred mainly in the lower reaches of Kamchia and Provadiyska rivers - the area between the town of Dalgopol and the village of Blaskovo (Provadia Municipality)

They occurred in late July and early August.

Described adverse effects fall mainly under the category Economic Activity - mainly damages on infrastructure sites and to a lesser extent on real estate. Adverse effects on human health and disruption of public service access had a small share.

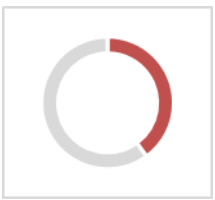
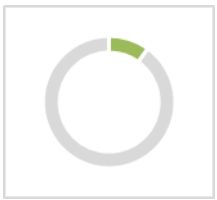
Types of floods

Number of floods per type in relation to total number

Coastal flooding	*Fluvial floods*	*Pluvial floods*	*Flooding from groundwater*	*Infrastructure-related flooding*
				

Adverse effects

Types of described adverse effects per category in relation to total number of floods

Human Health	*Economic Activity*	*Environment*	*Cultural Heritage*
			

2019

This is the year with the lowest number of registered floods in the RBMD for the entire observed period, almost as many instances as in 2013. They were pluvial in nature.

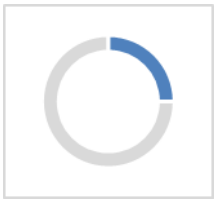
Flooding occurred in the catchment area of Vrana river, in the vicinity of the town of Targovishte and in the town of Provadia.

These floods occurred in July.

Described adverse effects fall mainly under the category Economic Activity - mainly damages on infrastructure sites and to a lesser extent on real estate. Adverse effects on human health and disruption of public service access had a small share.

Types of floods

Number of floods per type in relation to total number

Coastal flooding	*Fluvial floods*	*Pluvial floods*	*Flooding from groundwater*	*Infrastructure-related flooding*
				

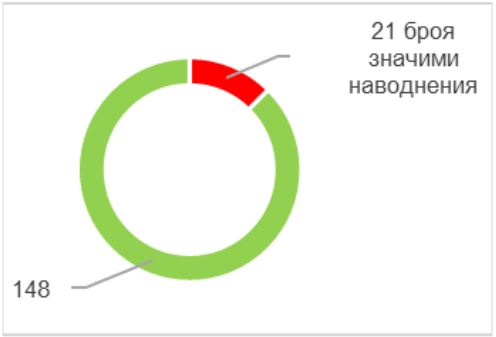
Adverse effects
Types of described adverse effects per category in relation to total number of floods

Human Health	*Economic Activity*	*Environment*	*Cultural Heritage*
			

Past Floods with Significant Adverse Effects

All registered past floods are classified according to significant adverse effects criteria, thereby identifying all significant events and locations.

Total number of past floods, incl. significant ones

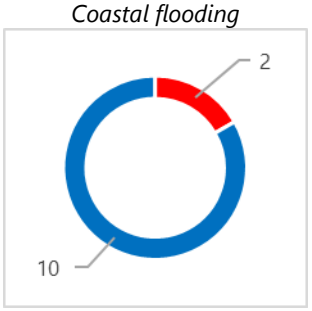


Total number of locations, incl. such with significant adverse effects

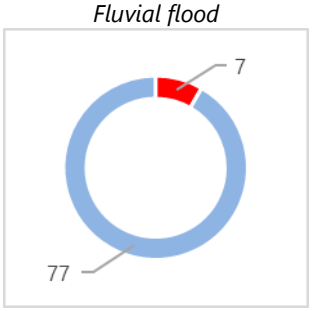
More detailed information on all past floods, and in particular on those with significant adverse effects can be found in the diagrams below. They show the relative share of floods per location in relation to different types of flood sources, mechanisms and characteristics. Complex floods, i.e. with more than one source of origin, are also included in the analysis, whereby different types of floods may have occurred in one location. The total number of locations is therefor greater than the one shown on the previous chart.

According to their **source**, floods are classified into coastal, fluvial, pluvial, flooding from groundwater and infrastructure-related flooding. Below diagram indicates the number of floods in each category, whereby significant floods are marked red.

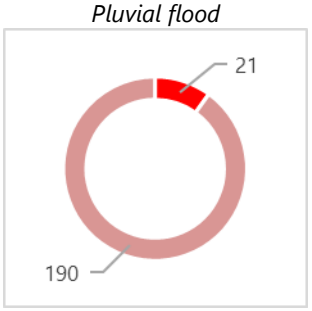
Coastal flooding



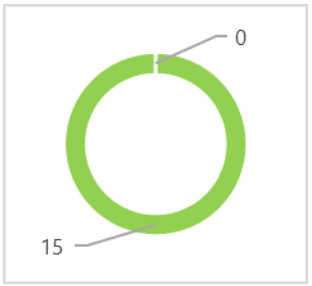
Fluvial flood



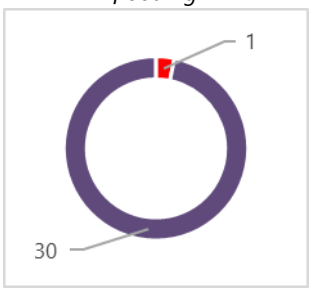
Pluvial flood



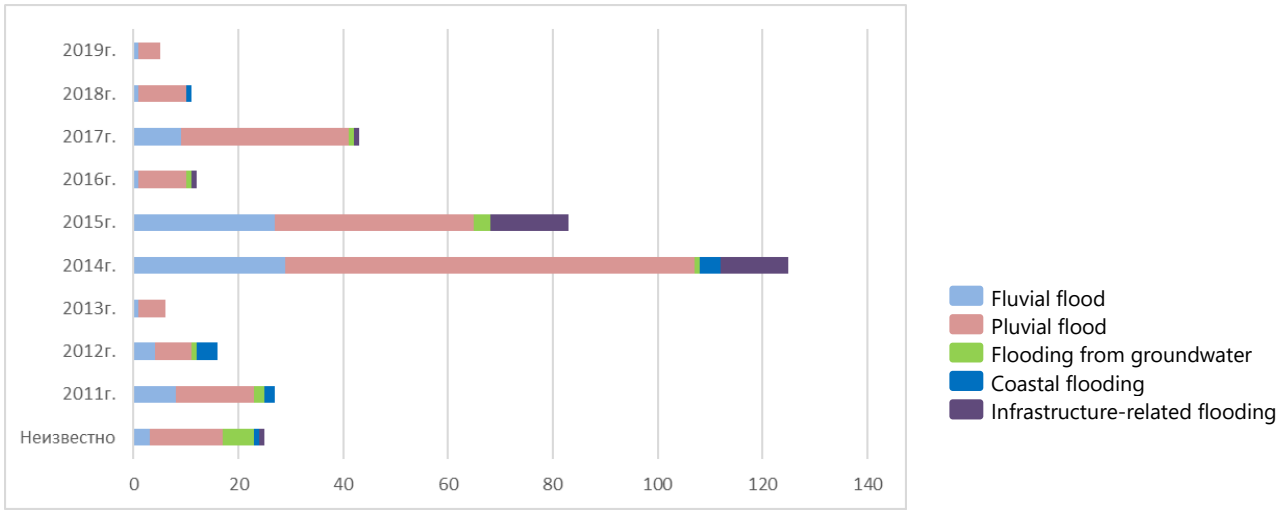
Flooding from groundwater



Infrastructure-related flooding

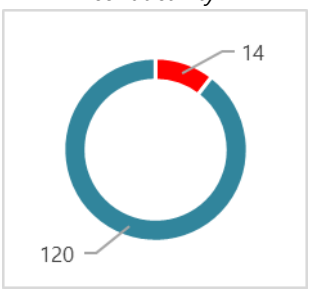


The distribution of past floods depending on their source per year is presented in the diagram below.

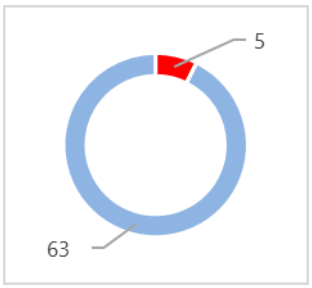


Given their occurrence **mechanism**, floods resulted predominantly from backwatering or reduced conductivity. The share of those caused by natural river overflow and overtopping of protective facilities is twice as low. The number of floods related to protective or infrastructural system failure is lowest. A relatively small number of described past floods are classified as significant, and it terms of their origin - they were the result of all types of mechanisms.

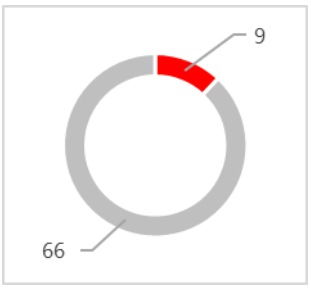
Backwatering or reduced/disrupted conductivity



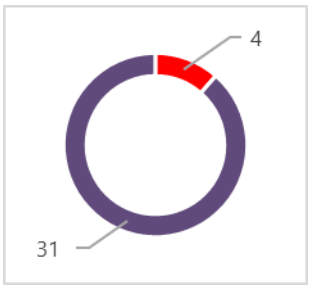
Natural river overflow



Overtopping of protective facilities

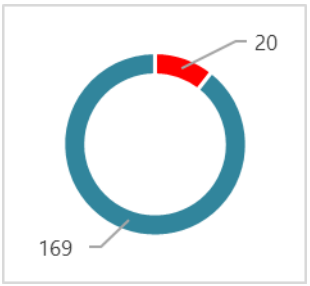


Protective or infrastructural system failure

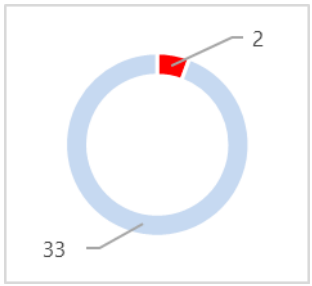


In terms of their **characteristics**, torrential floods have the largest share. Significantly fewer floods were described as gradual, with high flow velocities, other flash floods or as alluvial fan flooding. Only one occurrence was described as snowmelt flooding. No floods in the Black Sea RBMD were characterized as slow and deep water flooding.

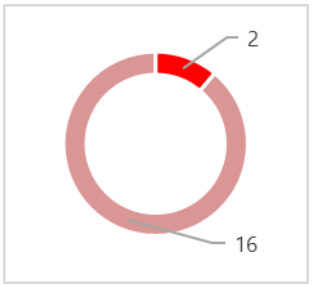
Torrential flooding



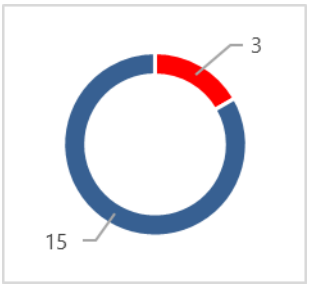
Gradual flooding



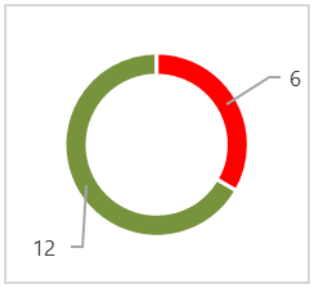
High flow velocity



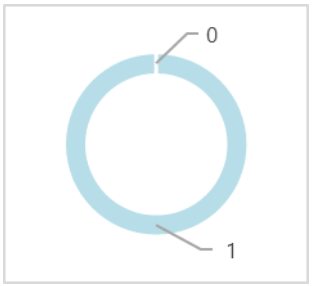
Other flash flooding



Alluvial fan flooding



Snowmelt flooding



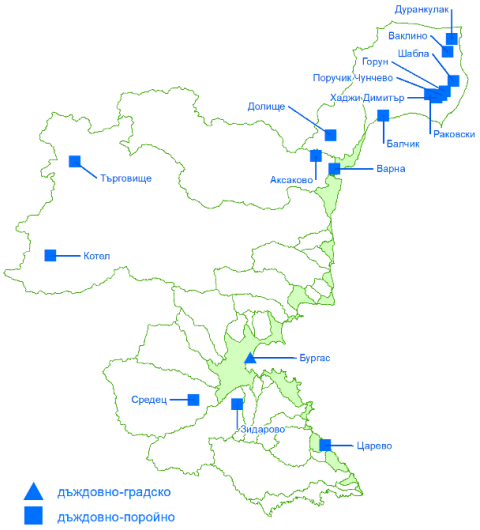
After reviewing past floods and identifying those with significant adverse effects, an analysis of all unclassified occurrences was carried out as to whether they would lead to significant potential consequences, if they were to recur today or in the future (as per FD Art.4.2(c)). 188 floods have been analyzed in accordance with the 2020 PFRA Methodology requirements in terms of their locations. The analysis was facilitated by the database, prepared under the Methodology in MS Excel format with its respective functionalities, where parameters are automatically calculate after entering flood data. These parameters include: specifics of settlements (number of affected settlements and number of inhabitants),

flood characteristics (size of flooded area, recurrence and duration). By entering data for each flood within the database, parameters for probability of its recurrence are automatically calculated. In order to calculate risk elements in the floodplain, NSI population data from 2012 to 2019 were used to track changes. Master Plan and Cadaster data on current or planned land-use and infrastructure changes was also taken into account.

The analysis identified only 1 location where risk indicators exceeded significance thresholds - for number of inhabitants. Detailed follow-up analysis showed that the floodplain is outside urban territories, which is why the flood is assessed as insignificant.

Future Floods

After performing a comprehensive analysis of the Black Sea RBMD, **13** floods have been identified (distributed in 18 locations), for which future pluvial flood hazard and risk shall be mapped in detail in the next stage of FD implementation. These include **12** pluvial-torrential floods that will be examined in a total of 16 locations, as well as **1** pluvial-urban flood, as presented on the schematic map below.

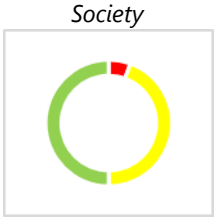


A risk assessment was carried out for each identified flood per the main 4 categories: human health, economic activity, environment and cultural heritage and their respective sub-categories. Summarized results for all locations are presented in the following diagrams.

Human Health Category

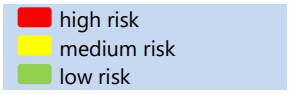
Human Health

Society



Cultural Heritage Category

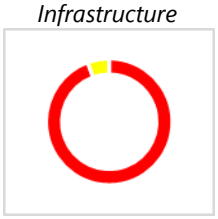
Cultural property



Economic Activity Category

Real estate

Infrastructure



Primary sector

Secondary sector

Environment Category

Water body status	*Protected areas*	*Pollution with hazardous substances*	*Other adverse effects for the environment*

Facility Impact Analysis

The current draft PFRA takes into account all available information at the time of assessment on hydrotechnical systems and facilities, facilities for protection against harmful effects of water and sewerage systems.

An analysis was carried out in terms of the condition of complex and significant dams (WA, Appendix №1 under Art. 13(1)), reservoirs that are part of the hydro-melioration system under the stewardship of Irrigation Systems of MAFF, as well as small reservoirs, i.e. so called 'micro dams' that are municipally-managed or leased.

For facilities, where information was received that they are in faulty condition, on-site consultations were conducted and relevant facilities representing a threat have been identified based on received additional information.

Identifying APSFRs

Designating APSFRs begins with identifying territories within the river basins, that were subject to floods under FD Art. 4.2(b), (c) or (d) for which potential, significant adverse effects have occurred or were identified. Defining APSFRs is the last stage of the PFRA and its results are used in the next FD implementation steps, namely mapping flood hazard and risk areas and preparing FRMPs.

Identified APSFRs

34 APSFRs have been identified within the Black Sea RBMD as a result of the PFRA (2022-2027), **4 of which are new**. They are located in 13 main river valleys. Their location and the number of river valleys are shown on the schematic map below.

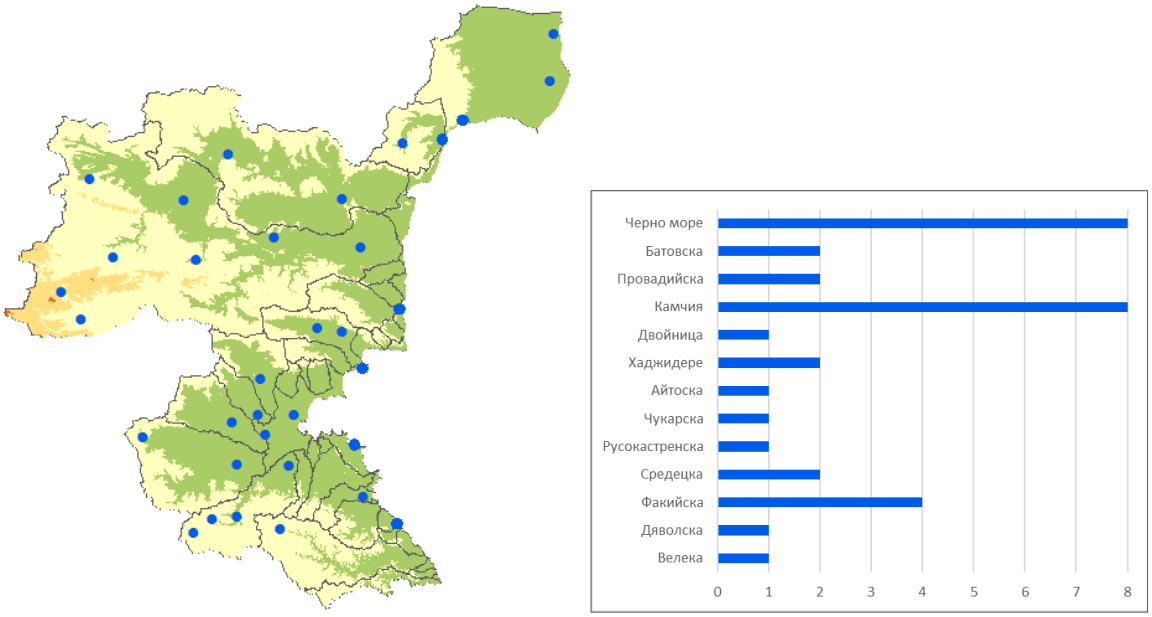
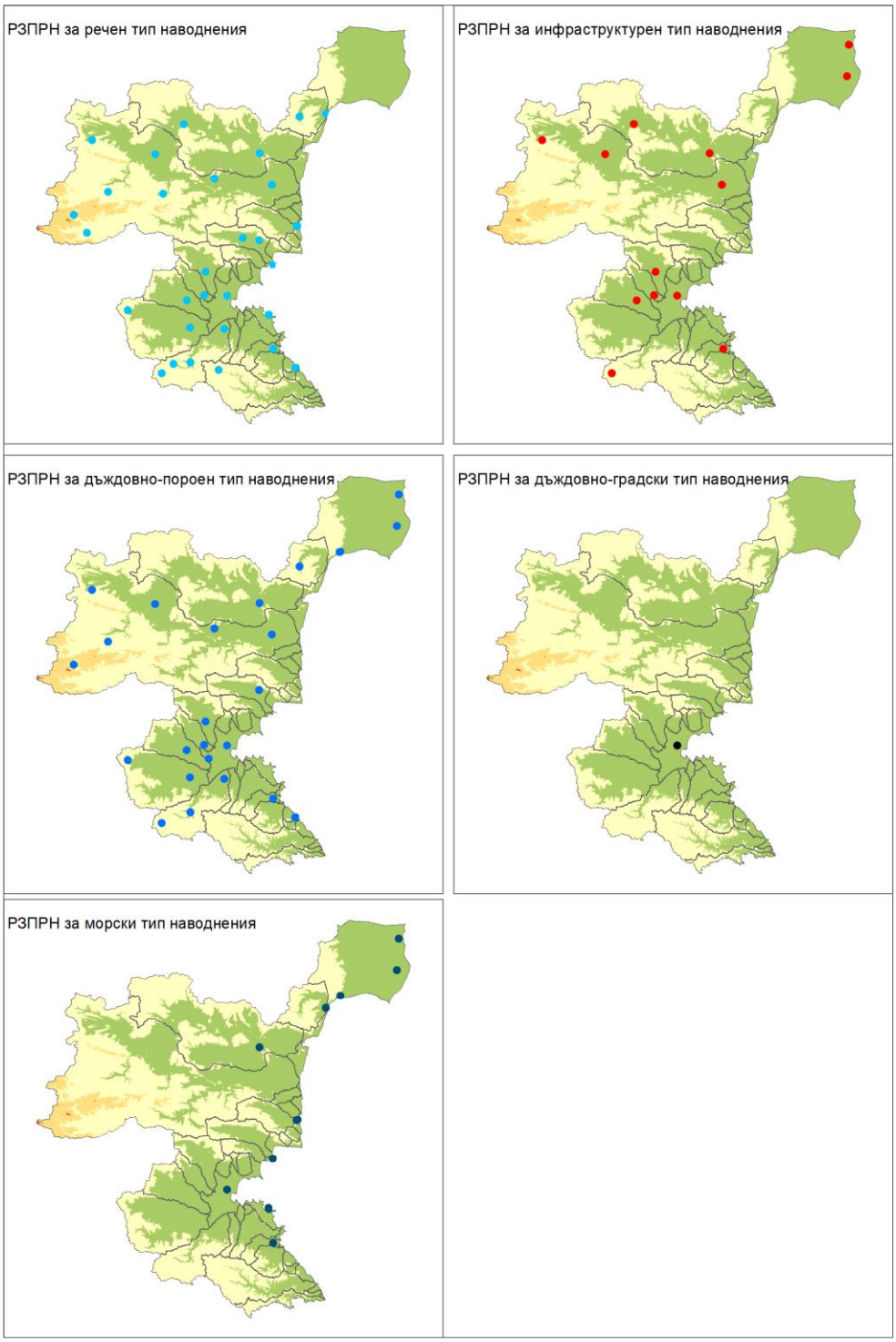


Figure 3 : Schematic map of APSFR locations in the Black Sea RBMD and distribution diagram per number of occurrences and river valleys

In each APSFR one or several different types of floods have been identified, for which flood hazard and risk maps shall be prepared within the next FD stages. There are a total of 5 types of floods: **coastal, fluvial, pluvial-torrential, pluvial-urban** and **infrastructure-related.** Infrastructure-related floods examine overtopping or dam failure hazards.

The location of APSFR per types of floods is presented in the schematic map below.


РЗПРН за речен тип наводнения
РЗПРН за инфраструктурен тип наводнения
РЗПРН за дъждовно-пороен тип наводнения
РЗПРН за дъждовно-градски тип наводнения
РЗПРН за морски тип наводнения

LIST OF IDENTIFIED APSFRS IN THE BLACK SEA RBMD

APSFR code	APSFR name	Type of flood according to source
BG2_APSFR_BA_100	Batova river - village of Kranevo	fluvial coastal
BG2_APSFR_BA_101	Batova river - village of Dolishte	fluvial pluvial-torrential
BG2_APSFR_BS_01	Black Sea - village of Durankulak and village of of Vaklino	coastal pluvial-torrential, rising water level of Durankulashko lake caused by rivers flowing into it
BG2_APSFR_BS_02	Black Sea - town of Shabla; Shablenska river - from village of Rakovski to town of Shabla	coastal pluvial-torrential, rising water level of Shablensko lake caused by rivers flowing into it
BG2_APSFR_BS_05	Black Sea - town of Obzor	coastal, fluvial
BG2_APSFR_BS_06	Black Sea - form town of Sveti Vlas to town of Pomorie	coastal fluvial
BG2_APSFR_BS_08	Black Sea - from town of Chernomorets to town of Sozopol	coastal fluvial
BG2_APSFR_BS_10	Black Sea - town of Tsarevo	fluvial pluvial-torrential
BG2_APSFR_BS_100	Black Sea - from town of Primorsko to village of Lozenets; Dyavolska river - from village of Yasna Polyana to town of Primorsko	coastal fluvial pluvial-torrential infrastructure-related (overtopping of Yasna Polyana dam)
BG2_APSFR_BS_101	Black Sea - town of Balchik	coastal pluvial-torrential
BG2_APSFR_BS_102	Black Sea - city of Burgas	coastal fluvial pluvial-torrential pluvial-urban (city of Burgas), infrastructure-related (dam failure of Dermen Dere reservoir), rising water level of Burgasko lake caused by the Black Sea
BG2_APSFR_KA_05	Brestova river - village of Veselinovo	fluvial
BG2_APSFR_KA_08	Vrana river - town of Targovishte	fluvial pluvial-torrential infrastructure-related (dam failure of Vardun reservoir)
BG2_APSFR_KA_10	Kotlenska river - town of Kotel	fluvial pluvial-torrential
BG2_APSFR_KA_100	Kamchia River - from village of Grozdyovo to the river mouth	fluvial pluvial-torrential infrastructure-related (dam failure of Dolni Chiflik reservoir)
BG2_APSFR_KA_101	Kamchia river - from town of Veliki Preslav to village of Byal Bryag	fluvial pluvial-torrential infrastructure-related (dam failure of Zlatar 3, Salmanovo, Dervish, Dragoevo reservoirs, a reservoir in Land Plot 23340.66.711, and Dibich and Shumen reservoirs (combined))
BG2_APSFR_KA_102	Kamchia river - town of Dalgopol	fluvial pluvial-torrential

BG2_APSFR_KA_11	Luda Kamchia river - village of Gradets; Neykovska river - village of Katunishte	fluvial
BG2_APSFR_KA_13	Gerila river - town of Varbitsa	fluvial pluvial-torrential
BG2_APSFR_MA_01	Rusokastrenska river - from village of Sarnevo to village of Konstantinovo	fluvial pluvial-torrential infrastructure-related (dam failure of Cherkovo and Golyamata Reka reservoirs (combined), Chonadzhika 1-4 cascade reservoirs (combined) and Chotorata reservoir)
BG2_APSFR_MA_02	Gospodarevska river - village of Lyulin	fluvial pluvial-torrential
BG2_APSFR_MA_03	Fakiyska river - village of Momina Tsarkva	fluvial pluvial-torrential infrastructure-related (dam failure of Vasileva Koriya and Dachkovitsa reservoirs)
BG2_APSFR_MA_04	Sredetska river - from village of Prohod to village of Debelt	fluvial, pluvial-torrential
BG2_APSFR_MA_05	Fakiyska river - village of Golyamo Bukovo	fluvial pluvial-torrential
BG2_APSFR_MA_06	Fakiyska river - village of Fakiya	fluvial
BG2_APSFR_MA_100	Fakiyska river - from village of Zidarovo to the river mouth	fluvial pluvial-torrential
BG2_APSFR_MA_101	Maldzhiisko Dere river - village of Polski Izvor and village of Cherni Vrah	pluvial-torrential
BG2_APSFR_PR_100	Provadiiska river - from town of Provadiya to city of Varna	coastal fluvial pluvial-torrential (city of Varna) infrastructure-related (dam failure of Manastir reservoir), rising water level of Varnensko lake and Beloslavsko lake caused by the Black Sea
BG2_APSFR_PR_101	Provadiiska river - town of Kaspichan	fluvial infrastructure-related (dam failure of Novi Pazar 1, Novi Pazar 2, Enevo and Kyulevcha reservoirs)
BG2_APSFR_SE_01	Byala river - from village of Gyulovtsa to village of Orizare	fluvial pluvial-torrential
BG2_APSFR_SE_03	Chukarska river - village of Ravnets	fluvial pluvial-torrential infrastructure-related (dam failure of Troyanovo reservoir)
BG2_APSFR_SE_04	Hadzhidere river - village of Galabets	fluvial
BG2_APSFR_SE_100	Aytoska river - from town of Aytos to city of Burgas	fluvial pluvial-torrential infrastructure-related (dam failure of Parka and Sadievo 1 reservoirs)
BG2_APSFR_UI_02	Mladezhka river - village of Mladezhko	fluvial

APSFR Documentation

Detailed documentation has been created for all identified APSFRs. It includes the following enclosures.

Description of main characteristics

- The Appendix is in tabular form and indicates the main characteristics of each APSFR, incl. its code, name, length, types of floods, changes compared to previous FD cycle, year of establishment.

Assessment in terms of risk categories and sub-categories

- Assessment of each APSFR under the 4 risk categories - human health, economic activity, environment, cultural heritage and their corresponding 12 sub-categories.

Passports

- Detailed description for each APSFR in the form of a passport.

GIS data

- GIS data presenting each APSFR - location and type of flood in kmz format.

Maps

- General map of all APSFRs in the Black Sea RBMD and thematic maps for each APSFR with information on its location, types of floods, past floods registered in the period 2011-2019, based on aerial photography.

Informing the Public and Consultations

In preparation for the current PFRA, stakeholders were consulted due to an established lack of information on past floods that occurred in the country in the period 2011 - 2019. This data is crucial in order to identify floods with significant adverse effects and serious floods, which could lead to significant adverse effects in the future. It is therefor also essential for the identification of APSFRs. These consultations were conducted in two stages:

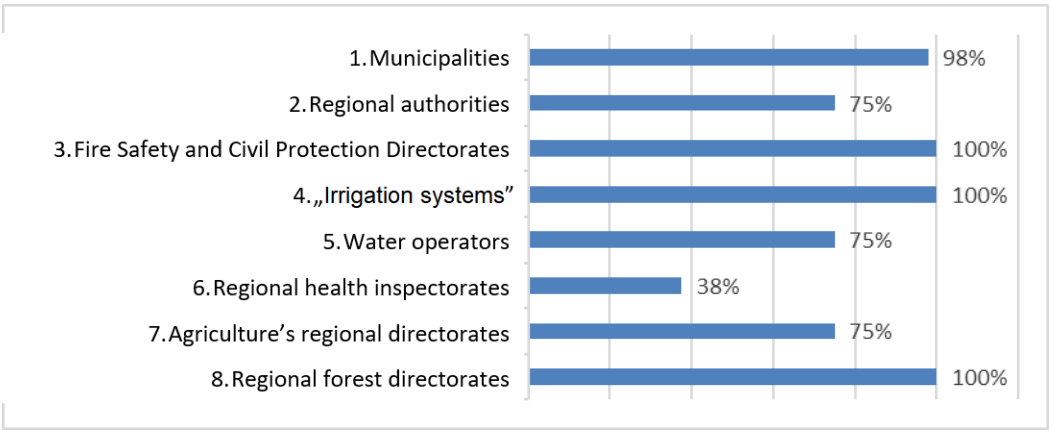
- Questionnaire survey;
- A series of workshops.

The purpose of the survey was to gather detailed information about past floods in the period 2011 - 2019 for the entire RBMD. The survey was carried out via a *Questionnaire on description of past floods*, prepared as part of the 2020 Preliminary Flood Risk Assessment Methodology. In early September 2019, said Questionnaire was sent by representatives of the Black Sea RBD to about 95 administrative structures and organizations, whose functions include activities related to flood prevention, protection, assistance and recovery, incl. local government bodies (district and municipal administrations), specialized state institutions (General Directorate for Fire Safety and Civil Protection and its territorial units, Regional Health Inspectorates, Regional Directorates of Agriculture, Regional Forestry Directorates), as well as others legal entities (incl. W&S operators, Irrigation Systems Company) directly related to and working in this field.

Information from the completed questionnaires was processed, systematized and entered into a common database.

In order to refine and supplement the data, 2 workshops were held in Burgas and Varna.

Representatives of 83 institutions and organizations, i.e. 87% of all respondents, participated in the survey and workshops. The diagram shows the number of participating institutions in relation to the total number of respondents.



Next Steps

PFRA and identifying APSFRs is the first stage of preparing FRMPs under the FD, which was transposed in the Bulgarian WA in 2010 and each stage of its implementation corresponds to the respective legislative provisions therein.

The requirements of the FD (Chapter II) and the WA (Section II) on the PFRA are set out in the following main articles of the two documents:

- Preparation of a PFRA, FD Art. 4 and WA Art. 146a-146c;
- Identifying APSFRs, FD Art. 5 and WA Art. 146d;

Fulfilling these requirements creates the basis for implementing next steps under the FD, namely:

- Flood hazard and flood risk maps - FD Chapter III, WA Section III;
- Flood Risk Management Plans (FRMPs) - DF Chapter IV, as foreseen in WA Section IV.