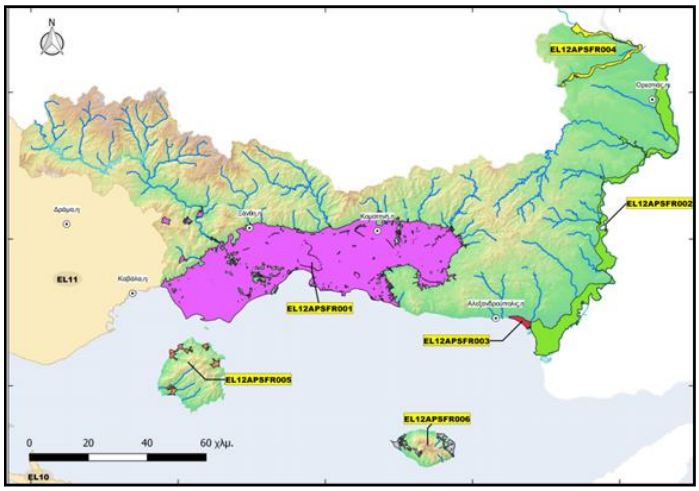
MINISTRY OF ENVIRONMENT& ENERGY

GENERAL SECRETARIAT FOR NATURAL ENVIRONMENT AND WATER

GENERAL DIRECTORATE FOR WATER



1st REVIEW of the

FLOOD RISK MANAGEMENT PLAN

for the River Basins of the Thrace River Basin District (EL12)

Phase 2 - Deliverable 19

TRANSLATION INTO ENGLISH OF THE DELIVERABLES' SUMMARY METHODOLOGIES AND STUDY RESULTS

Με τη συγχρηματοδότηση της Ευρωπαϊκής Ένωσης

ΕΣΠΑ 2021-2027
Βιώσιμη Ανάπτυξη για Όλους

HELLENIC REPUBLIC

MINISTRY OF ENVIRONMENT AND ENERGY

GENERAL DIRECTORATE FOR WATER

PROJECT: 1ST REVIEW OF THE FLOOD RISK MANAGEMENT PLAN FOR THE RIVER BASINS OF THE EAST MACEDONIA AND THRACE RIVER BASIN DISTRICTS

JOINT VENTURE: 1ST REVIEW OF THE FLOOD RISK MANAGEMENT PLAN FOR THE RIVER BASINS OF THE EAST MACEDONIA AND THRACE RIVER BASIN DISTRICTS:

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DRAFTING OF THE 1ST REVIEW OF THE FLOOD RISK MANAGEMENT PLAN FOR THE RIVER BASINS OF THE THRACE RIVER BASIN DISTRICT

PHASE 2

DELIVERABLE 19: TRANSLATION INTO ENGLISH OF THE DELIVERABLES' SUMMARY METHODOLOGIES AND STUDY RESULTS

Revisions:

Version	Date	Remarks
Ver. 1	27/08/2024	Original Version
Ver. 2	20/12/2024	Report updates
Ver. 3	30/05/2025	Final Report

Documents and Maps accompanying this Deliverable

no.	Title	Scale	Document / Map number
	DOCUMENTS		
1	Technical Report		P19-T.1.

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ABBREVIATIONS

APSFR	=	Areas of Potential Significant Flood Risk
CN	=	Curve Number
DEM	=	Digital Elevation Model
DTM	=	Digital Terrain Model
EC	=	European Commission
EU	=	European Union
FHM	=	Flood Hazard Maps
FRM	=	Flood Risk Maps
FRMP	=	Flood Risk Management Plan
GD	=	Guidance Documents
GDWM	=	General Directorate of Water Management
GIS	=	Geographic Information Systems
GSCP	=	General Secretariat for Civil Protection
GSNEW	=	General Secretariat for Natural Environment and Water
HEC	=	Hydrologic Engineering Centre
HMS	=	Hydrologic Modelling System
JMD	=	Joint Ministerial Decision
MoEE	=	Ministry of Environment and Energy
NCCCAS	=	National Climate Change Adaptation Strategy
NFR	=	National Flood Register
OEFWS	=	Operational Early Flood Warning System
PFRA	=	Preliminary Flood Risk Assessment
RB	=	River Basin
RBD	=	River Basin District
RBMP	=	River Basin Management Plan
RU	=	Regional Unit
SCS	=	Soil Conservation Service
SSW	=	Special Secretariat for Waters
WFD	=	Water Framework Directive

1 DIRECTIVE 2007/60/EC IN GREECE

In October 2007 the European Union enacted Directive 2007/60/EC[1]. The purpose of the Directive is to establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity. The Directive has been incorporated into National Law by Joint Ministerial Decision ΗΠ 31822/1542/E103/2010 (Government Gazette B'1108/21.07.2010), as amended and in force by Joint Ministerial Decision 177772/924 (Government Gazette B' 2140/22.06.2017).

According to Joint Ministerial Decision ΗΠ 31822/1542/E103/2010 (Government Gazette B' 1108/21.07.2010) as amended and in force, the geographical unit considered for application of Directive 2007/60/EC on the assessment and management of flood risks is the River Basin District, namely the same geographical unit as that of Directive 2000/60/EC on Water.

The key requirements of the European Directive are implemented in three (3) phases:

Phase 1: Preliminary flood risk assessment in river basins and respective coastal zones and identification of areas with potential severe flood risks or where flooding is likely to occur (Areas of Potentially Significant Flood Risk), (Articles 4 & 5).

Phase 2: Preparation of Flood Hazard Maps and Flood Risk Maps for the Areas of Potentially Significant Flood Risk (article 6).

Phase 3: Establishment of Flood Risk Management Plans (article 7). These plans shall include measures to forecast floods and reduce the likelihood of flooding and its consequences, and must also include ways of protecting such areas as well as preparing the population in the event of flooding.

Flood risk management under the Directive is an iterative process implemented over six-year cycles.

The following legislative provisions are considered in the implementation of Directive 2007/60/EC:

- Joint Ministerial Decision 177772/924 (Government Gazette B '2140/22.06.2017), on the Amendment of Joint Ministerial Decision No. 31822/1542/2010 (Government Gazette B'1108/21.07.2010).
- The Water Framework Directive 2000/60/EC, which sets the legislative framework for the proper management and protection of water resources.
- Law 3199/2003 (Government Gazette A'280/09.12.2003) "Water protection and management - Harmonization with Directive 2000/60/EC of the European Parliament and of the Council of 23October 2000", whereby and by the delegated regulatory acts of which, national law is harmonized with the provisions of the Water Framework Directive.
- The approved Flood Risk Management Plans for the River Basins of the country's 14 River Basin Districts and the River Basin of Evros river, as well as all the deliverables of the studies which formed the basis of the FRMPs (https://floods.ypeka.gr/index.php).

[1] Directive 2007/60/ EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks.

- The approved River Basin Management Plans (2nd Review) of the country's 14 River Basin Districts (http://wfdver.ypeka.gr/el/home-gr/).
- The 1st Review of the Preliminary Flood Risk Assessment under Article 14 of the Directive (Ministry of Environment and Climate Change – General Directorate for Water, 2019), and the identification of the Areas of Potentially Significant Flood Risk.
- The Guidance Documents for implementation of the Floods Directive 2007/60/EC, issued by the European Union.
- Information from other relevant studies or projects, which are being prepared or have been prepared, at national or regional level, by the involved Services, Bodies and Educational Institutions in Greece, as well as the available data from national platforms and databases.
- The results of the EU assessment of the approved Flood Risk Management Plans, including the respective assessments of the Preliminary Flood Risk Assessment and the Flood Hazard and Flood Risk Maps, as well as any EU recommendations for the preparation of 1st Review of the Flood Risk Management Plans.
- Implementation practices by other EU Member States in relation to the implementation of Directive 2007/60/EC.

Competent Authorities

The **Ministry of Environment and Energy (MoEE)** sets the policy for water protection and management and oversees its implementation. In particular, in accordance with Article 3(1.1) of Joint Ministerial Decision ΗΠ 31822/1542/E103/2010, as in force, the General Secretariat for Natural Environment & Water (GSNEW) /**General Directorate for Water** (GDW), in cooperation with the General Secretariat for Civil Protection of the Ministry of Climate Crisis and Civil Protection and possibly with other jointly competent Ministries, shall establish the national flood risk management programme. In addition, GDW monitors, assesses and controls the implementation of the national flood risk management programme. For this purpose, it prepares annual reports on the implementation, assessment and control of the previous period's national flood risk management programme, based on the annual reports of the individual Regions' Water Directorates, and submits them to the Minister of Environment and Energy (Article 3(1.5) of Joint Ministerial Decision ΗΠ 31822/1542/E103/2010, as in force).

The **Water Directorates of the Decentralized Administration** perform the responsibilities of the Decentralized Administration on water protection and management, including the flood risk. The Macedonia – Thrace Decentralized Administration, which is responsible for the river basins of the Thrace RBD - EL12, includes the Central Macedonia Water Directorate and the Eastern Macedonia – Thrace Water Directorate. Each Water Directorate is responsible for water protection and management and for assessing and managing flood risk in the respective Region (Central Macedonia and Eastern Macedonia and Thrace respectively) and performs the responsibilities assigned to the Decentralized Administration pursuant to the applicable legislation. The performance of their responsibilities is further qualified by decision of the Secretary of the Decentralized Administration. **As regards the river basins of the Thrace River Basin District, the responsibilities of the Decentralized Administration are performed by the Eastern Macedonia & Thrace Water Directorate.**

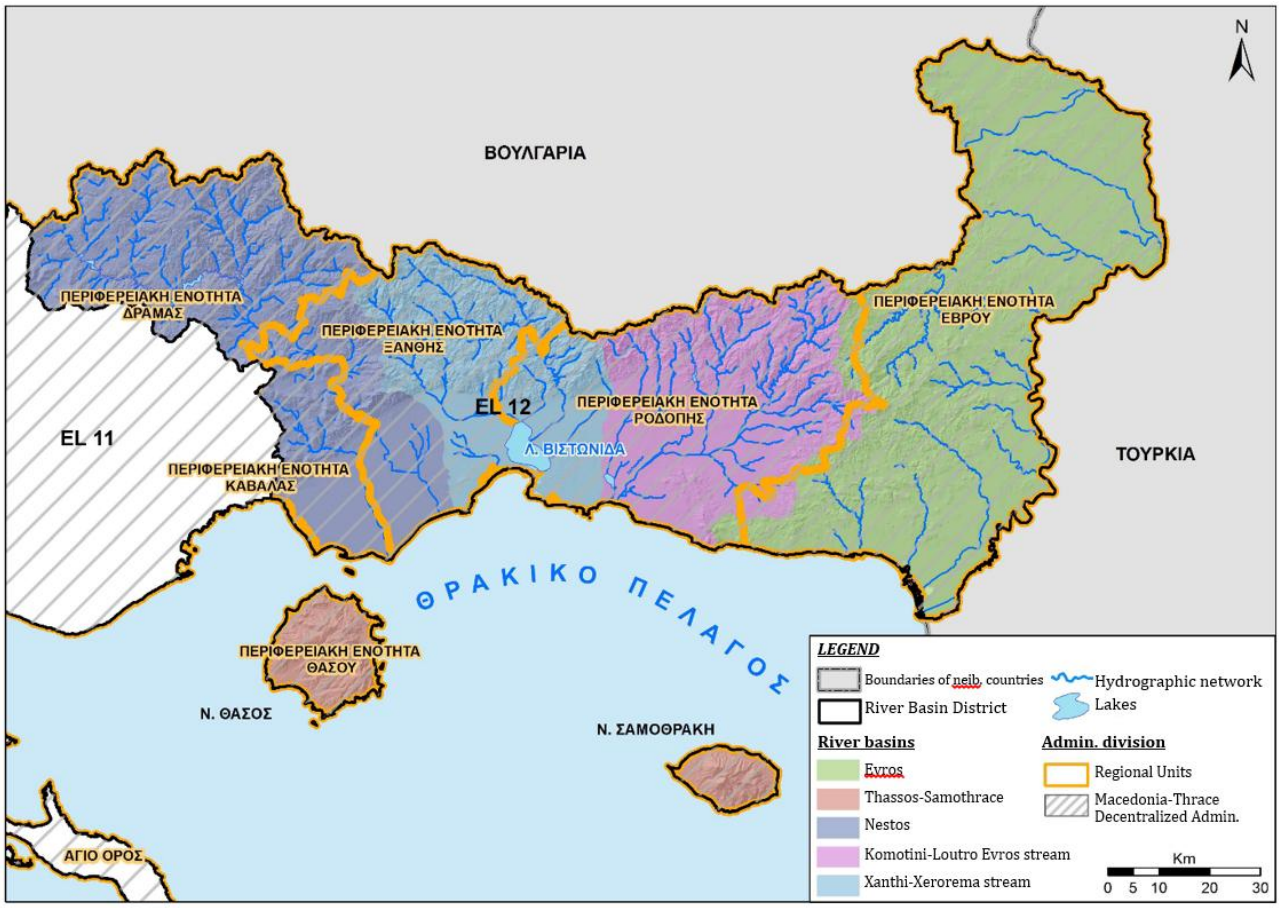

Figure 1.1: Administrative Division and Competent Authorities of the Thrace River Basin District (EL12).

2 THE THRACE RIVER BASIN DISTRICT EL12

The Thrace RBD consists of five (5) river basins, of which two, those of Nestos and Evros rivers, are transboundary basins. These basins are shared by Greece with Bulgaria (Nestos), and with Bulgaria and Turkey (Evros).

Table 2.1: Thrace RBD basins

Basin code	Basin name	Area (km^2)
EL1207	NESTOS	2,975.5
EL1208	XANTHI - XEROPOTAMOS STREAM	1,662.6
EL1209	KOMOTINI - LOUTRO EVROS STREAMS	1,958.3
EL1210	EVROS	4,080.8
EL1242	THASSOS - SAMOTHRACE	562.8
THRACE RBD		**11,240**

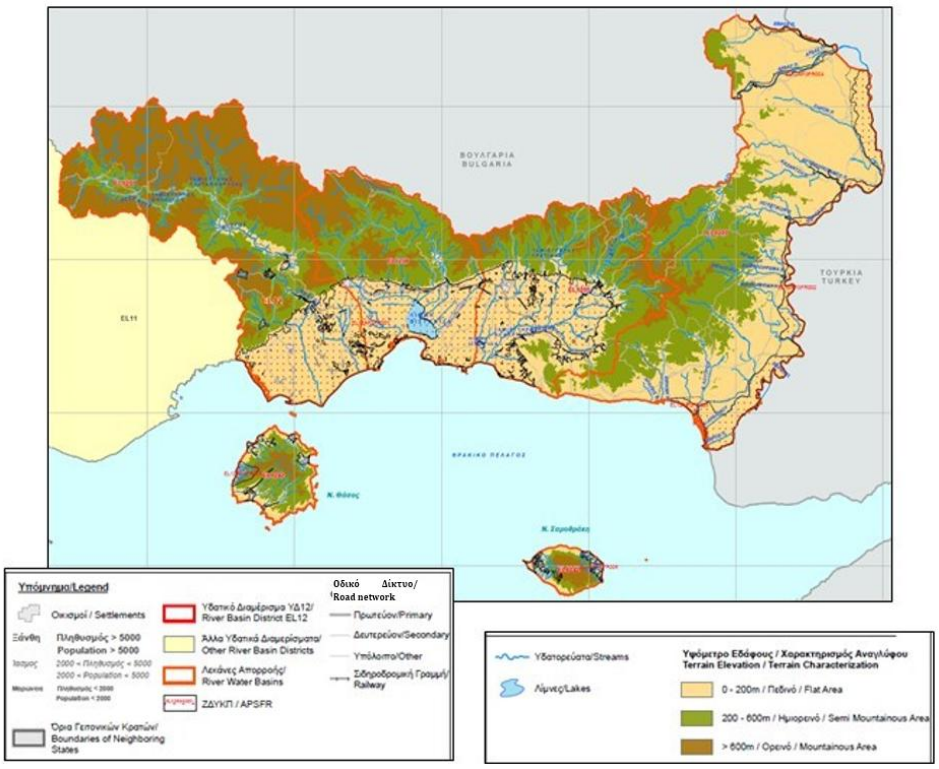

Figure 2.1: Thrace morphological map

Figure 2.2: Transboundary Nestos river basin

Figure 2.3: Transboundary Evros river basin

Nestos basin: located to the west of the RBD, Despatis and Nestos rivers flow through it. Nestos river springs from the Rila mountain in Bulgaria between the Balkan and Rhodope mountain ranges and flows into the Thracian Sea forming the Nestos Delta.

Xanthi – Xerorema Stream Basin: The main rivers of this basin are Kosynthos (or Xanthi stream), Kompsatos (or Xeropotamos stream), Travos (or Aspropotamos stream). The rivers flow south of lake Vistonida. To the west of the lake there are a series of lagoons (Kessani, Lafrouda, Lafri), and toi the southeast, the Porto-Lagos lagoon.

Komotini– Loutro Evros Streams Basin: The main rivers of this basin are Vosvozis (or Bosbos, or Komotini stream) and Filiouris (Fyliris or Lissos). Vosvozis flows into the natural lake Ismarida.

Evros Basin: The Evros river flows through it, which springs from the Rila mountain in Bulgaria and flows into the Thracian Sea. Important tributaries of Evros river are Ardas and Erythropotamos.

Thassos – Samothrace basin: On the island of Thassos there are no permanent watercourses, only in the western part there are some torrential watercourses, such as Dipotamos, Platanorema, Lakkos Marion, etc. In Samothrace, the main permanent watercources are found in the southern part of the island and are the Xeropotamos and Vatos rivers.

3 1ST REVIEW OF THE PRELIMINARY FLOOD RISK ASSESSMENT

The 1st Review of the Preliminary Flood Risk Assessment, reviews and updates the following: the Preliminary Flood Risk Assessment for all the Districts of the country, the list of Historical Floods and Significant Historical Floods as well as the Areas of Potentially Significant Flood Risk (APSFR).

Between the PFRA and the 1st PFRA Review, i.e. from 2012 to 2018, **30 flood events** were recorded in RBD EL12, resulting in **343 flood incidents** in as many locations. After processing historical incidents, the areas where significant floods have occurred in the past include the Municipalities of Orestiada (104 incidents), Soufli (86 incidents), Komotini (73 incidents), Didymoticho (50 incidents) and Avdira (42 incidents).

For the Thrace RBD (EL12), the methodology ultimately revealed the existence of 6 zones. The differences compared to the 1st PFRA are that 2 new areas have been added (Low Zones on Thassos and Low Zones on Samothrace), and the surface of three (3) areas (EL12APSFR001, EL12APSFR002 and EL12APSFR004) has been slightly increased.

Table 3.1: Revised APSFR in the Thrace River Basin District (EL12).

Name of APSFR*	Code	Area (km2)
Xanthi - Komotini Plain (low zones of the Nestos, Kosynthos, Kompsatos, Apropotamos, Bosbozi, Filiouris rivers and riparian areas of lake Vistonida)	EL12APSFR001	1,956.4
Riparian areas south of Nea Vyssa and delta of Evros river	EL12APSFR002	369.4
Areas west of Loutro torrent	EL12APSFR003	12.6
Areas north of Evros and Ardas	EL12APSFR004	52.9
Low Zones of Thassos	EL12APSFR005	49.0
Low Zones of Samothrace	EL12APSFR006	28.1
	TOTAL	**2,468.4**
	Difference compared to PFRA 2012	**+4.9%**
	Percentage over the entire RBD	**22%**

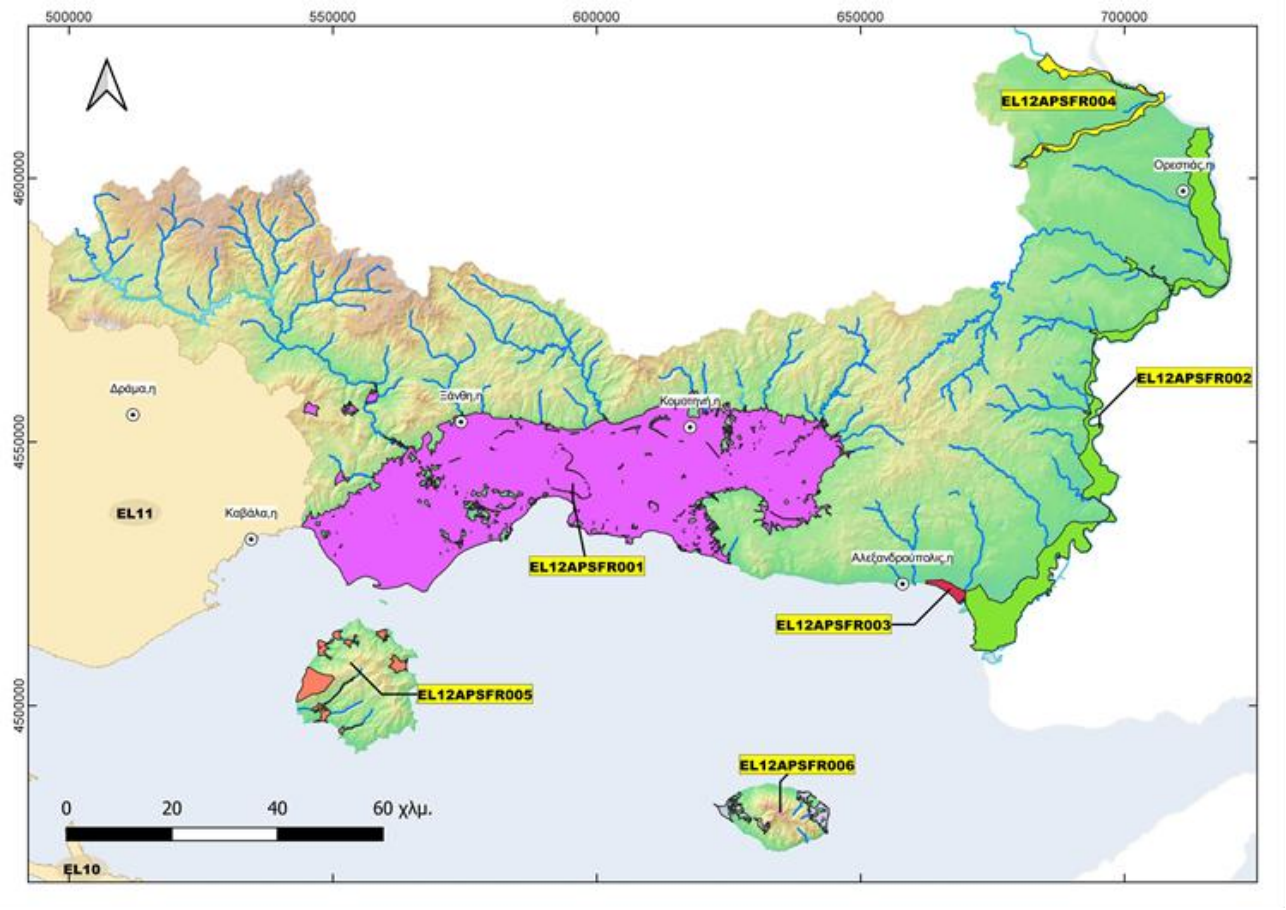

Figure 3.1: Revised APSFR in the Thrace River Basin District (EL12).

The area of **APSFR EL12APSFR001** covers 3 of the 5 river basins of RBD EL12; the main river systems are Nestos and Laspias in EL1207, Kosynthos and Kompsatos in EL1208 and Vozvozis and Liouris in EL1209.

APSFR EL12APSFR002 consists of the Evros river and its wider bed from the point of entry of the river on the Greek-Turkish border, north-east of Nea Vyssa settlement, to its estuary in the Evros Delta, and of Erythropotamos river, from its confluence with Evros river up to Kyani and Mani settlements.

APSFR EL12APSFR003 meets the Sarantametro trench to the east, the beach of Alexandroupolis to the west and the Alexandroupolis-Greek-Bulgarian border railway line to the north. Essentially, it consists of the western, coastal part of the National Wetland Park of Evros Delta with a total area of 12.63 km^2. The main stream that discharges within the APSFR is Loutro (or Vathy), which springs from the south-eastern heights of Rhodope mountain. Apart from Loutro, the Sarantametro trench and Anthia stream are also part of this zone.

APSFR EL12APSFR004 has two sections: ☑ the Greek section of Evros river from Ormenio on the Greek-Bulgarian border to the tripoint on the borders of Greece, Bulgaria and Turkey, and ☑the Greek section of Ardas river, which springs from the Bulgarian mountains and enters Greek territory next to the village of Milea. It meets Evros river after travelling 43 km on Greek territory, in the area of the village of Kastanies, near Edirne.

APSFR EL12APSFR005 is found on Thassos island and includes the Dipotama, Platanorema, Portes,

Kallirachis, Prinos, Rachoni, Limenas, Potamias and Lefkas streams.

APSFR EL12APSFR006 spans over the western and eastern part of the Samothrace island. It includes the following streams: Xeropotamos in the SW part of the island, Fonias on the NE side of the island, Angistros on the east side of the island, Polypouri on the SW side of the island, Kamariotissa and Rodofili.

4 HYDROLOGY OF THE THRACE RIVER BASIN DISTRICT (EL12)

4.1 Watercourses considered

The FRMP review redefined the basins and sub-basins of the 1st cycle, and added new basins for the new APSFRs as they resulted from the 1st PFRA review. Overall, the number of basins/sub-basins included in the hydrological simulation conducted to prepare the flood hydrographs in the Thrace RBD are presented in the table below per RB (Table 4.1).

Table 4.1: Number of basins per RB in RBD EL12

RIVER BASIN	No. of Hydrological Systems	No. of Sub-basins
Nestos RB	2 (Nestos, Laspias)	21
Xanthi – Xerorema Stream RB	5 (Kompsatos, Kosynthos, Aspropotamos, Potamias, Ammorema)	23
Komotini– Loutro Evros Streams Basin	2 (Filiouris, Vozvozis)	40
Evros RB	13 (Antheia, Loutro, Sarantametros, Xyla, Provatona, Kamilopotamos – Diavolorema, Kazani, Potistiko, Erythropotamos, Xeros, Ardas, Tigono stream, Anonymous)	18
Thassos – Samothrace RB	19 (Dipotamos, Platanorema, Lakkos Marion et al./Xeropotamos, Vatou stream et al.)	28

4.2 Hydrological Scenarios Considered

The technical requirements of the 2nd implementation cycle of Directive 2007/60/EC and the relevant Joint Ministerial Decision ΗΠ 31822/1542/E103/21.07.2010 incorporating it into National Law, require the preparation of hydrographic media, depicting favourable and unfavourable conditions for the following scenarios regarding rivers, streams and torrents of the River Basin District:

- Floods with **return period T = 50 years**, high exceedance probability.
- Floods with **return period T = 100 years**, medium exceedance probability.
- Floods with **return period T = 1000 years**, low exceedance probability.

In particular, as regards the transboundary Evros basin, covering a total area of 53,000 km² of which 35,085 km² (66.2%) belong to Bulgaria, 14,575 km² (27.5%) belong to Turkey, and 3,340 km² (6.3%) belong to Greece, it was deemed, as in the 1st cycle, that the above return periods relate to the frequency of the main flood event examined each time, namely a flood from the main Evros river basin. Given the large area of the entire basin, but also of each of the sub-basins of the major Evros tributaries, i.e. Ardas, Tountzas, Erythropotamos and Erginis, it would not be plausible to assume that all sub-basins might at

the same time present a flood incident of exactly the same rarity as the main basin. Therefore, regarding the combination of the flood events that feed into the hydraulic model, the assumption made in the 1st FRMP is maintained, i.e. that the return period under consideration each time concerns the main Evros basin, whereas the major tributaries contribute with floods that correspond to the next smaller return period than the one considered for the main river.

The final combination of the flood events considered in the Evros RB is presented in the table below (Table 4.2). As regards Ardas river, the flow rate, being fully controlled by the operation of the upstream dams in Bulgaria, is deemed independent of the return period of this analysis. The respective level of contribution to the flood scenarios considered was determined based on "threshold" flow rates detected in the empirical distributions of observed data, as given in Table 4.2. Peak flow rates of <750 m^3/sec are selected in the analysis for return periods of 50 and 100 years and >750 m^3/sec for a return period of 1,000 years.

Table 4.2: Combinations of simulated flood incidents in Evros RB - Return periods and sub-basins

River	Baseline scenario (Evros flood)			Ardas overflow
	Return periods (years) / Max flow rates			
Evros	T=50	T=100	T=1000	T=50
Ardas	~500 m^3/s	~700m^3/s	~940 m^3/s	1,600 m^3/s
Tountzas	T=20	T=50	T=100	T=20
Erythropotamos	T=50	T=100	T=1000	T=50
Erginis	T=20	T=50	T=100	T=20
Greek section sub-basins	T=50	T=100	T=1000	T=50

4.3 Flood Hydrographs

River basins within Greece

Flood hydrographs were prepared for the **Greek basins** at the entry points of the APSFRs and at selected intermediate locations of the study area's hydrographic network, by solving mathematical rainfall-runoff models.

In the context of the 1st Review of the FRMP, the time series of the hydrometeorological data were supplemented with the most recent available data as well as with data from new stations, where available, and the rainfall curves were revised for the entire country. Rainfall curves are a parametric relationship linking the intensity of rainfall to the rainfall return period for each rainfall duration. Compared to the rainfall curves of the 1st cycle (MoEE 2016), it is observed that for the 24 h scale, estimates are generally in good statistical agreement for the usual design return periods (T=50, 100 years), while deviations tend to increase (in favour of safety) for the longer return periods. In short return periods, spatially generalised rainfall curves lead to lower estimates (by a median of -12% for a return period of 2 years), while in medium return periods there is a small trend of higher estimates (e.g. by a median of +0.6% and +3.3% for a return period of 50 and 100 years respectively), which becomes even higher for T=1000 years (+14.3%). At basin level, compared to the 1st cycle, for the majority of the sub-basins under review, there generally appears to be a decreasing trend for rainfall heights in the -50% to 0% change interval.

The hydrological simulation considered a new Digital Terrain Model (DTM), which was based on the most recent DTM used in the Cadastre with a 2m x 2m resolution, and extracted the morphometric - geometric characteristics of basins and sub-basins: area, maximum, mean elevation and outlet elevation, as well as the thalweg length. Hyetographs (rainfall graphs) were prepared for design storms with return periods T = 50, 100, and 1000 years and rainfall duration D times the basin concentration time, based on the revised rainfall curves and morphometric - geometric characteristics. Point rainfall was extrapolated to surface rainfall using a surface runoff coefficient. Hyetographs were prepared as follows:

- using the alternating block method for medium and high exceedance probability floods, i.e. with return periods of 100 and 50 years, respectively.
- using the worst profile method in preparing the design hyetograph for low exceedance probability floods, i.e. with return periods of 1000 years.

The amount of active rainfall was estimated separately in each sub-basin, using the curve number (**CN**). The calculation was made for three types of soil moisture conditions. In addition, recent fires were considered to increase the curve number in sub-basins with burnt areas. To convert the hyetograph (rainfall) into runoff (rate of flow), the flood hydrograph of each rainfall event is calculated considering the concentration time, the rainfall duration and the Unit Hydrograph of each basin / sub-basin. The **Muskingum method and the lag time method** were used for the **hydrologic channel routing** of the flood wave within the respective section of the watercourse. Flood hydrographs were generated using open source software HECHMS 4.10 (HydrologicEngineeringCenter – HydrologicModelingSystem). The HEC-HMS can model all the hydrological processes (calculation of hydrological losses, transformation of active rainfall into direct runoff, hydrologic channel routing, etc.) that occur during the transformation of rainfall into runoff in dendritic basins.

The following table presents the results of the hydrologic flood routing for the River Basin District's basins for which a hydrological analysis was carried out, and the three return periods considered, for average humidity conditions:

Table 4.3: Summary results of the hydrological model of the basins in RBD EL12, with average humidity conditions.

Hydrosystem	no.	BASIN CODE	Area	H (mm) Average Surface Rainfall			Qmax (m3/s)			RAINFALL DURATION t (hr)
			(km²)	T50	T100	T1000	T50	T100	T1000	
	1	EL1207FL00002	1216.71	126.47	148.41	244.49	150.00	150.00	3-573.00	48
	2	EL1207FR00024	13.40	136.71	160.62	265.30	37.00	51.00	140.72	48
	3	EL1207FR00012	281.38	160.38	188.76	313.04	544.00	773.00	2468.77	48
	4	EL1207FR00010	276.21	154.21	181.36	300.26	365.00	528.00	1767.70	48
	5	EL1207FR00219	41.21	196.24	231.56	386.23	128.00	178.00	534.97	48
	6	EL1207FR00217	28.72	219.00	258.60	432.01	56.00	91.00	396.64	48
	7	EL1207FR00133	15.03	189.19	223.03	371.19	45.00	63.00	190.09	48
	8	EL1207FR00221	63.30	203.25	240.14	401.64	180.00	262.00	847.67	48
	9	EL1207FR00090	77.85	224.70	265.99	446.76	204.00	301.00	1050.19	48
Nestos r.	10	EL1207FR00131	14.36	239.58	283.29	474.68	40.00	62.00	241.30	48
	11	EL1207FR00225	14.10	242.34	286.66	480.72	33.00	52.00	230.50	48
	12	EL1207FR00223	7.64	228.98	270.68	453.26	20.00	32.00	128.75	48
	13	EL1207FR00018	26.61	210.39	248.62	416.02	39.00	68.00	350.37	48
	14	EL1207FR00016	36.37	207.60	245.28	410.23	63.00	101.00	445.75	48
	15	EL1207FR00001	100.78	181.20	213.81	356.59	114.00	185.00	872.20	48
	16	EL1207FR00163	18.81	188.33	222.43	371.71	19.00	34.00	208.29	48
	17	EL1207FR00014	29.52	179.95	212.73	356.25	84.00	118.00	372.13	48

Hydrosystem	no.	BASIN CODE	Area	H (mm) Average Surface Rainfall			Qmax (m3/s)			RAINFALL DURATION t (hr)
			(km²)	T50	T100	T1000	T50	T100	T1000	
	18	EL1207FR00004	18.30	163.12	192.90	323.31	29.00	46.00	192.61	48
	19	EL1207FR00022	25.06	165.09	195.58	329.06	41.00	55.00	140.23	48
Laspias r.	20	EL1207FR00008	112.48	218.63	258.21	431.47	467.00	609.00	1365.00	48
	21	EL1207FR00020	55.38	204.45	241.73	404.97	148.00	195.00	439.00	48
	22	EL1208FR00115	25.33	235.17	277.62	463.48	94.74	124.80	274.25	48
	23	EL1208FR00117	11.00	231.44	273.47	457.47	51.88	66.64	141.00	48
Potamia streams/trenches	24	EL1208FR00111	1.62	229.58	271.26	453.78	12.70	16.06	33.86	48
	25	EL1208FR00113	33.74	225.21	266.14	445.37	186.68	239.22	505.84	48
	26	EL1208FR00026	27.04	216.56	255.88	428.02	89.80	116.44	251.73	48
	27	EL1208FR00031	236.17	257.31	303.92	507.96	1052.28	1425.81	3756.68	48
	28	EL1208FR00029	35.25	262.17	309.47	516.59	294.90	386.02	883.54	48
	29	EL1208FR00013	12.91	280.34	330.47	549.96	138.18	175.42	375.74	48
	30	EL1208FR00015	26.81	268.97	317.57	530.38	199.32	268.34	684.85	48
	31	EL1208FR00017	2.84	257.26	303.68	506.92	33.87	42.00	82.49	48
	32	EL1208FR00023	14.85	238.74	281.76	470.13	109.19	147.55	363.44	48
Kosynthos r.	33	EL1208FR00019	59.78	245.30	289.58	483.44	428.31	554.71	1204.10	48
	34	EL1208FR00011	2.96	240.25	283.65	473.65	28.47	36.05	77.03	48
	35	EL1208FR00025	21.60	212.39	250.65	418.19	152.51	198.13	463.03	48
	36	EL1208FR00211	10.80	206.18	243.38	406.26	83.46	110.03	240.62	48

Hydrosystem	no.	BASIN CODE	Area	H (mm) Average Surface Rainfall			Qmax (m3/s)			RAINFALL DURATION t (hr)
			(km²)	T50	T100	T1000	T50	T100	T1000	
	37	EL1208FR00009	1.64	209.44	247.30	413.04	13.98	17.67	37.19	48
	38	EL1208FR00021	24.79	216.22	255.27	426.23	158.95	210.33	481.78	48
	39	EL1208FL00041	11.77	199.83	235.99	394.32	75.42	98.01	214.98	48
Ammorema stream	40	EL1208FL00007	28.92	134.48	159.00	266.35	110.76	158.00	505.03	12
Kompsatos r.	41	EL1208FR00033	550.47	223.13	263.16	438.43	1575.76	2129.83	5403.94	48
	42	EL1208FL00003	13.83	183.21	216.54	362.45	73.85	95.90	211.63	48
Aspropotamos stream	43	EL1208FR00027	18.39	141.78	167.40	279.59	118.25	158.83	383.61	24
	44	EL1208FL00005	99.68	146.34	172.81	288.69	282.96	384.80	993.56	24
	45	EL1209FL00039	62.90	142.31	168.36	282.40	107.20	159.34	573.82	48
	46	EL1209FL00037	6.07	140.89	166.17	276.87				48
	47	EL1209FR00097	190.34	142.61	168.19	280.18	308.17	446.76	1470.82	48
	48	EL1209FR00103	21.48	138.99	163.74	272.09	61.86	83.69	214.90	48
	49	EL1209FR00079	12.77	138.35	162.97	270.76	44.61	59.73	152.19	48
	50	EL1209FR00099	297.01	147.66	173.83	288.41	557.12	772.75	2191.07	48
	51	EL1209FR00087	46.69	146.59	172.59	286.43	116.84	164.89	494.48	48
	52	EL1209FR00109	97.04	144.50	170.12	282.27	221.32	313.56	953.27	48
	53	EL1209FR00073	3.12	139.93	164.80	273.68	11.81	15.82	43.33	48
	54	EL1209FR00107	2.91	138.89	163.53	271.44	12.87	16.95	41.78	48
	55	EL1209FR00071	3.51	139.42	164.19	272.66	14.95	19.43	45.16	48

Hydrosystem	no.	BASIN CODE	Area	H (mm) Average Surface Rainfall			Qmax (m3/s)			RAINFALL DURATION t (hr)
			(km²)	T50	T100	T1000	T50	T100	T1000	
	56	EL1209FR00077	17.99	141.04	166.15	276.06	61.77	82.81	210.06	48
	57	EL1209FL00067	3.44	140.01	164.85	273.58	14.28	20.86	50.46	48
	58	EL1209FR00069	44.42	140.58	165.52	274.69	86.79	128.58	447.05	48
Filiouris r.	59	EL1209FR00063	16.14	138.65	163.25	270.97	16.67	28.66	145.43	48
	60	EL1209FR00055	12.98	137.25	161.52	267.79	22.88	34.90	133.63	48
	61	EL1209FR00085	57.09	139.40	164.21	272.82	129.89	174.32	437.46	48
	62	EL1209FR00065	24.06	138.57	163.14	270.71	61.17	81.34	197.91	48
	63	EL1209FR00057	27.89	138.26	162.74	269.90	78.27	104.22	257.33	48
	64	EL1209FR00053	55.04	140.98	166.03	275.71	148.70	196.35	463.45	48
	65	EL1209FR00061	9.71	141.74	166.98	277.53	27.19	36.28	89.41	48
	66	EL1209FR00043	20.31	145.37	171.24	284.47	72.27	97.89	253.10	48
	67	EL1209FR00049	42.23	142.32	167.60	278.29	127.22	171.80	450.52	48
	68	EL1209FR00045	1.98	146.94	173.12	287.72	12.30	15.78	31.81	48
	69	EL1209FR00213	59.09	152.58	179.79	298.90	205.74	267.86	611.25	48
	70	EL1209FR00047	14.65	145.61	171.57	285.22	63.28	80.45	170.69	48
	71	EL1209FR00051	42.93	150.29	177.14	294.69	135.05	176.84	403.56	48
	72	EL1209FR00059	3.52	142.71	168.18	279.73	14.04	18.31	41.56	48
	73	EL1209FR00101	11.50	147.79	174.26	290.15	44.48	58.95	145.09	48
	74	EL1209FR00105	65.67	140.37	165.36	274.81	133.79	177.54	417.51	48

Hydrosystem	no.	BASIN CODE	Area	H (mm) Average Surface Rainfall			Qmax (m3/s)			RAINFALL DURATION t (hr)
			(km²)	T50	T100	T1000	T50	T100	T1000	
	75	EL1209FR00006	200.82	152.74	180.52	302.12	364.34	478.68	1062.13	48
	76	EL1209FR00091	56.73	158.30	187.27	314.10	176.45	251.35	751.72	48
	77	EL1209FR00089	79.50	161.32	190.54	318.49	284.97	379.55	918.67	48
	78	EL1209FR00075	18.39	156.33	184.55	308.13	65.55	85.21	188.41	48
Vozvozis r.	79	EL1209FR00095	40.25	149.04	176.56	297.04	108.67	155.68	491.14	48
	80	EL1209FR00083	6.15	147.91	174.67	291.86	28.78	37.65	89.12	48
	81	EL1209FR00093	25.15	147.27	174.29	292.62	70.77	100.66	309.31	48
	82	EL1209FR00081	23.20	147.69	174.25	290.52	82.00	108.56	255.83	48
	83	EL1209FR00215	10.07	148.88	175.77	293.49	43.59	56.59	123.69	48
	84	EL1209FL00035	70.83	167.54	197.91	330.90	190.20	248.17	546.10	48
Trigonou stream	85	EL1210FR00159	198.60	120.44	141.37	232.99	329.00	462.20	1353.50	48
Ardas r.	86	EL1210FR00153	346.28	122.77	144.14	237.72	453.70	609.00	1491.30	48
Xiron stream	87	EL1210FR00151	211.47	123.97	145.95	242.20	524.20	703.20	1700.70	48
	88	EL1210FR0B147	596.90	137.28	161.24	266.12	514.40	757.00	2628.90	48
Erythropotamos r.	89	EL1210FR0B145	517.78	142.67	167.71	277.32	366.60	563.60	2265.50	48
	90	EL1210FR0B149	516.45	120.69	142.03	235.42	513.20	708.70	1916.40	48
Potistiko stream	91	EL1210FR00137	196.93	134.64	158.09	260.72	182.50	278.60	1096.30	48
Anonymous stream	92	EL1210FR00209	78.89	126.55	149.12	247.97	141.70	202.00	623.60	48

Hydrosystem	no.	BASIN CODE	Area	H (mm) Average Surface Rainfall			Qmax (m3/s)			RAINFALL DURATION t (hr)
			(km²)	T50	T100	T1000	T50	T100	T1000	
Kazani stream	93	EL1210FR00157	45.11	140.01	164.57	272.11	118.50	165.90	490.10	48
Diavolorema stream	94	EL1210FR00139	163.62	153.47	180.56	299.19	236.80	353.30	1297.80	48
Kamilopotamos stream	95	EL1210FR00135	69.70	143.97	169.29	280.13	106.80	158.40	567.40	48
Anthias stream	96	EL1210FR00034	65.42	125.22	147.16	243.23	150.40	208.50	585.50	24
Loutro stream	97	EL1210FL00143	94.54	153.55	180.74	299.79	174.00	258.80	939.30	48
	98	EL1210FR00030	113.90	154.00	181.10	299.74	282.30	384.50	1012.20	48
Sarantamatrou trench	99	EL1210FR00048	103.64	157.31	184.94	305.88	246.50	317.50	673.10	48
Xylas stream	100	EL1210FR00141	243.13	159.18	187.22	309.95	464.70	647.70	1839.10	48
	101	EL1210FR00032	190.17	156.61	184.10	304.46	262.90	339.40	710.10	48
Provatona stream	102	EL1210FR00155	211.47	160.75	189.09	313.18	408.30	554.90	1432.50	48
Portes stream	103	EL1242FL00169	11.57	146.66	173.26	289.72	70.94	100.85	286.03	24
	104	EL1242FR00062	32.84	139.35	164.60	275.19	171.97	236.37	626.04	24
Eastern Dipotamos stream	105	EL1242FR00064	40.93	141.13	166.73	278.77	172.55	242.20	717.69	24
Western Dipotamos stream	106	EL1242FR00068	8.43	144.97	171.28	286.45	62.39	82.69	213.45	24
Platanorema stream	107	EL1242FR00066	50.64	141.39	167.03	279.29	173.77	253.09	835.11	24
Kallirachi stream	108	EL1242FR00173	4.25	144.09	170.21	284.56	24.05	35.93	113.59	24
	109	EL1242FR00070	4.81	141.89	167.60	280.16	38.60	51.63	140.89	24
Ormos Prinou stream	110	EL1242FR00072	9.75	147.22	173.90	290.72	81.98	106.45	257.24	24

Hydrosystem	no.	BASIN CODE	Area	H (mm) Average Surface Rainfall			Qmax (m3/s)			RAINFALL DURATION t (hr)
			(km²)	T50	T100	T1000	T50	T100	T1000	
Rachoni stream	111	EL1242FR00181	10.44	149.31	176.38	294.90	51.78	76.44	265.05	24
	112	EL1242FR00074	12.22	149.00	176.01	294.28	70.92	99.28	289.47	24
Potamias stream	113	EL1242FR00175	6.37	151.98	179.54	300.21	38.01	56.55	176.34	24
	114	EL1242FR00076	9.97	151.99	179.61	300.57	39.64	62.52	233.25	24
Small Potamias stream	115	EL1242FR00078	2.70	153.46	181.36	303.51	18.23	25.12	81.39	24
Lefkas stream	116	EL1242FR00080	8.05	148.48	175.46	293.60	37.67	54.86	210.43	24
Western Limena stream	117	EL1242FR00088	3.35	163.83	193.57	323.77	15.93	23.74	97.15	24
Prinou stream	118	EL1242FR00171	17.55	145.36	171.70	287.06	167.88	220.12	482.63	24
	119	EL1242FR00084	3.74	143.36	169.33	283.04	16.65	23.68	76.43	24
Central Limena stream	120	EL1242FR00086	16.78	155.75	184.00	307.70	54.33	84.00	357.43	24
Rodofili stream	121	EL1242FR00042	0.65	214.37	255.07	433.26	11.71	18.25	29.37	24
	122	EL1242FR00193	1.08	215.00	255.88	434.83	25.83	32.41	71.71	24
Fonias stream	123	EL1242FR00044	10.22	180.81	214.24	360.65	174.69	218.56	474.46	24
Kamariotissa stream	124	EL1242FR00040	1.25	228.22	272.33	465.45	29.51	38.11	79.46	24
Angistri stream	125	EL1242FR00205	2.80	177.30	209.96	352.94	58.75	76.00	136.71	24
	126	EL1242FR00046	4.26	169.99	201.16	337.65	34.52	45.25	136.96	24
Xeropotamos stream	127	EL1242FR00036	6.93	228.67	273.55	470.05	122.62	143.50	341.50	24
	128	EL1242FR00183	8.69	204.99	243.97	414.64	186.13	239.48	489.15	24

Hydrosystem	no.	BASIN CODE	Area (km²)	H (mm) Average Surface Rainfall			Qmax (m3/s)			RAINFALL DURATION t (hr)
				T50	T100	T1000	T50	T100	T1000	
Polypoudi stream	129	EL1242FR00187	3.20	230.84	276.09	474.17	83.14	111.53	216.86	24
	130	EL1242FR00038	2.66	231.45	276.81	475.41	52.31	62.79	140.79	24

Transboundary Nestos and Evros River Basins

The Thisavros and Platanovrysi hydroelectric dams of PPC significantly affect the hydrological regime of Nestos river. As in the 1st FRMP, considering how structures are operated by PPC, it is assumed that any inflow into the Thisavros reservoir is used for the needs of the hydroelectric power plant and the downstream flow rate amounts to no more than 150 m^3/s. This assumption is adopted for the medium and high exceedance probability scenario (T=100 and T=50 years), where it appears that the Thisavros reservoir contributes to the containment of runoff. In the low exceedance probability scenarios (T=1000 years), the T1000 flood hydrograph at Platanovrysi was taken into consideration, which has been calculated in the PPC study, "Preparation of a comprehensive study to determine the flood limits (demarcation) of the Nestos riverbed downstream of the Platanovrysi dam and up to the estuary (river delta), for various flood flow rates and the effects of flood wave passage from failure of the Nestos river dams, in the administrative boundaries of the Prefectures of Drama, Kavala and Xanthi" (E.T.ME., November 2014).

The flood hydrographs of Evros and its tributaries (Toutzas, Erginis) were calculated:

- by processing available hydrometric data;
- using probabilistic analysis of historically recorded hydrometric peak inflows from Bulgaria and Turkey to estimate flood peak; and
- by analysing historically recorded hydrographs to estimate a typical dimensionless hydrograph.

Flood hydrographs were prepared (a) for Evros river at the Greek-Bulgarian border for periods of T50, 100 and 1000 years, (b) for Ergini and Tountza rivers, at their confluence with Evros river, for periods of T20, 50 and 100 years, (c) for Ardas river, at the Greek-Bulgarian border for a peak flood flow of 750 m^3/sec and for a peak flood flow of 1600 m^3/sec.

Table 4.4 below shows the estimates of peak flood flow rates for the various return periods at the locations of interest on Evros river and its tributaries.

Table 4.4: : Flood flow rate estimates for the various return periods at the locations interest in the Evros basin (m^3/s)

		Return period				Data period
River	Station	T = 20	T = 50	T = 100	T = 1000	
Evros	Harmanli [BG]	1468	1695	1851	2292	1914-2022
	Svilengrad [BG]	1393	1653	1844	2443	1936 - 2022 [note 1]
	Kirishane [TR]	1774	2256	2654	4245	1986 - 2022 [note 2]
	Kipi [GR]	2978	3432	3742	4601	1962 - 2022 [note 3]
Tountzas	Suakacagi [TR]	366	461	535	810	1961 - 2022
	Elhovo [BG]	215	258	290	392	1952 - 2021 [note 4]
Erythropotamos	Didymoticho [GR]	-	1154	1682	5387	Rain - runoff simulation
Erginis	Yenicegorece [TR]	1160	1564	1914	-	1997 - 2022 [note 5]

5 HYDRAULIC SIMULATION OF THE THRACE RIVER BASIN DISTRICT (EL12)

To prepare the FHMs, hydraulic routing analyses of the flood hydrographs were performed, that feed into the APSFRs, as identified in the 1st Review of the Preliminary Flood Risk Assessment. Hydraulic analyses were performed using the HEC-RAS 6.3.1 software of the Hydrologic Engineering Center of the United States Army Corps of Engineers.

In RBD EL12, 30 hydraulic models were prepared in total with a view to the best possible "grouping" of the study sections, so that adjacent streams, with overlapping floodplains, can be studied in a single computational grid, considering the topography of the respective simulation area. In cases where this was not possible, the maps were prepared with appropriate processing of the results of the hydraulic models. **In total, hydraulic solutions have been developed for approximately 800 km of watercourses**.

The flood flow hydraulic calculations apply the **full two-dimensional field** solution, under non-steady conditions defined in the hydrographs prepared in the course of the hydrological analysis. The following were considered as **inputs** to the hydraulic simulation for flood routing:

- The DTM, which was based on the most recent DTM used in the Cadastre with 2m x 2m resolution, appropriately edited,
- Surveying data and technical structures surveys. In total, 122 new positions of technical structures and cross-sections were recorded on the watercourses examined beyond the 77 positions of the 1st cycle. Data on 65 technical structures from existing studies were used,
- Hydrographs – Boundary conditions and hydrographs of transboundary basins, as derived from the hydrological analysis for average conditions.
- Values of Manning's roughness coefficient 'n' based on newer land use data.
- Initial conditions and specific hydraulic simulation assumptions.

The Copernicus European Digital Elevation Model, EU-DEM v1.1 was used for the hydraulic simulation of the international sections of the Evros basin, with a 30x30m grid. The two topographic backgrounds (2x2 of the Greek Cadastre and 30x30 of the Copernicus) were collated together in the river's zone. To achieve spatial interpolation of the data of the two DTMs, the EU-DEM grid was converted to a denser 2m x 2m.

In shaping the Evros river bed, the cross-sections of the 1st FRMP were used, based on data from a 1999 study by the Aristotle University of Thessaloniki (the available river geometry data included a longitudinal section with the bottom elevation, the elevation of the flood overtopping embankment at each distance marker and the upper width of the river bed). These data were appropriately modified using the latest satellite imagery from Google Earth to reflect, as far as possible, the current location of the river's central and flood bed. Regarding the geometry of the embankments in the Turkish territory, it was assumed that they have the same crest height and similar geometry (slope angles, etc.) as those located in the Greek territory.

In shaping the Ardas river bed and calculating the elevation of flood protection embankments, the cross-sections of the 1st FRMP were used, based on the digital terrain model (DTM) of the ARDAFORECAST

research program, in which the embankments have been included based on in situ topographical mapping of selected cross-sections.

The open-source software system USACE HEC-RAS, version 6.3.1 was used to conduct the **hydraulic simulation**. The software performs calculations at steady and non-steady flow conditions and extracts the surface water profile. It also offers the possibility of solving a two-dimensional floodplain and extracting the water information (depth, level, flow rate), for any point in time of the simulation. It also provides simulation capabilities for a wide range of technical structures and mainly bridges, culverts and spillways/terraces, as well as the ability to simulate natural lakes and reservoirs.

The following is a characteristic snapshot from the graphic interface of the HEC-RAS software, when introducing a technical structure in a two-dimensional simulation field within APSFR EL12APSFR001 (Chionorema stream).

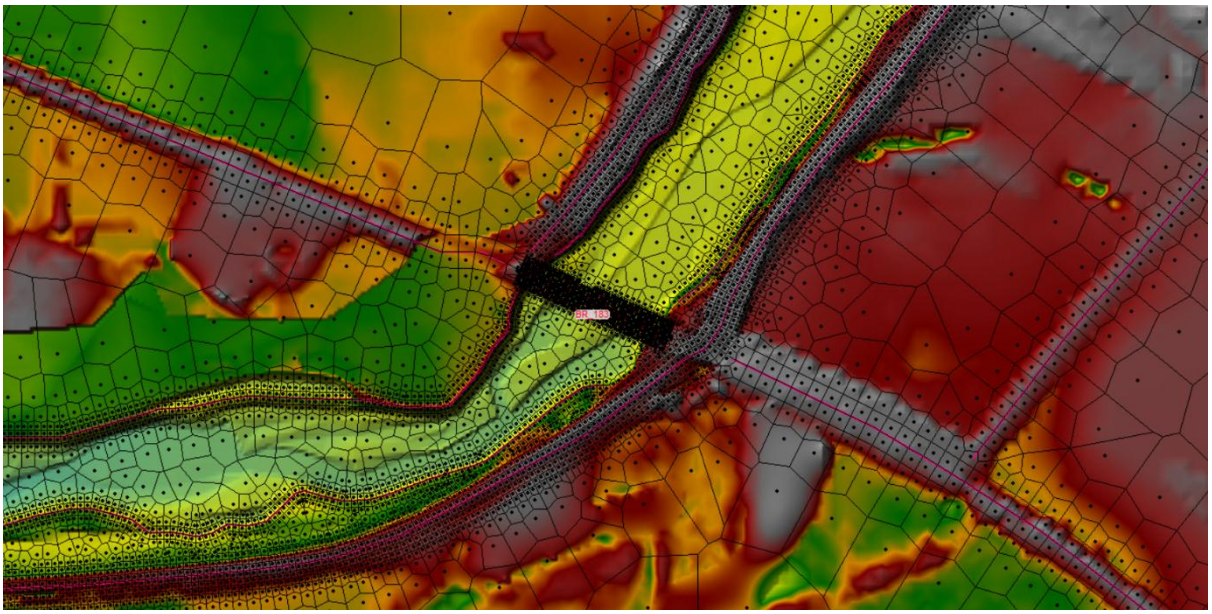

Figure 5.1: Screenshot of the HEC-RAS 6.3.1 graphic interface, with the DTM in the background, the two-dimensional solution grid, and a technical structure perpendicular to the watercourse flow.

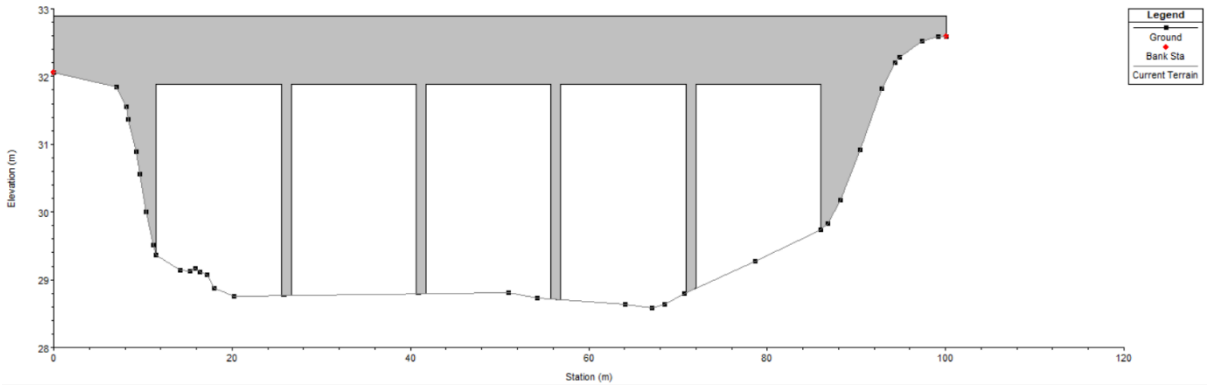

Figure 5.2:View of the HEC-RAS 6.3.1 graphic interface, with the introduction of the geometric characteristics of the spans of a technical structure, upstream to downstream view.

6 FLOOD HAZARD MAPS - FHMs

FRMs were prepared on a 1:25,000 scale for the three river flow/lake flood scenarios, T=50, 100 and 1000 years, as mentioned above. FHMs were also prepared with the spatial distribution of the flooding area from sea level rising for floods with a high exceedance probability of a 50-year return period and floods with an average exceedance probability of a 100-year return period.

River flow/lake FHMs show the spatial distribution of both maximum depth and maximum water velocity for the three scenarios under review. The maximum flow depth is represented by a blue five (5)-level scale, and the maximum velocity is represented by a red four (4)-level scale. The mean sea level rise FHMs show the spatial distribution of the maximum flow depth, with a blue four (4)-level scale.

For all the points of interest affected by the river flow/lake floods under review, the flood wave arrival time and duration for flow depths >0.3 m has been calculated and indicated on the **river flow/lake FHM**. Arrival times and duration are indicated in a table and correlated with the code number of each characteristic point. These maps also show:

- the boundary of the Area of Potentially Significant Flood Risk as determined at the Preliminary Assessment Review stage;
- water bodies (rivers, lakes);
- the position marker (every 500 m from downstream to upstream);
- constructed technical structures that affect water flow and have been considered during the hydraulic simulation, such as bridges, culverts, dams, embankments, etc.;
- the locations and names of settlements in RBD EL12;
- the border lines;
- the boundaries of the adjacent River Basin Districts;
- the locations and unique code number of each point of interest (Healthcare Units, Sports Venues, Cultural Heritage Sites, Industries, Sanitary Landfills, Uncontrolled Waste Disposal Sites, Industrial Parks, Industrial Areas, Airports), for which the arrival time and duration of the flood have been calculated.

The **mean sea level rise FHMs** show the following:

- the boundary of the Area of Potentially Significant Flood Risk as determined at the 1st Review of the Preliminary Assessment stage;
- water bodies (rivers, lakes);
- the locations and names of settlements in RBD EL12;
- the border lines;
- the boundaries of the adjacent River Basin Districts;
- constructed technical structures (bridges, embankments, culverts, dams, terraces).

In the Thrace RBD, coastal areas with an estimated total MSL rise of more than 1 m being considered are the areas of the Regional Units of Xanthi, Rodopi and Evros. In RBD EL12, the APSFRs with a MSL rise of

more than 1 m are the following:

- EL12APSFR001, with a total MSL rise of 1.11 m for return period T=50 years and 1.23 m for return period T=100 years
- EL12APSFR002, with a total MSL rise of 1.18 m for return period T=50 years and 1.23 m for return period T=100 years
- EL12APSFR003, with a total MSL rise of 1.22 m for return period T=50 years and 1.28 m for return period T=100 years.

The floodplains in the entire RBD for all hydrological scenarios and the sources of flooding under review (river flows and the sea) are illustrated in the following graph (Figure 6.1) and in the following map (Figure 6.2). The areas flooded by river flows and the overflow of lakes range from 637.55 thousand stremma (63,755 hectares) to 1,106.24 thousand stremma (110,624 hectares) depending on the return period considered. The areas flooded by sea flooding range from 220.50 to 2289.85 thousand stremma (22,050 to 22,885 hectares) depending on the return period considered.

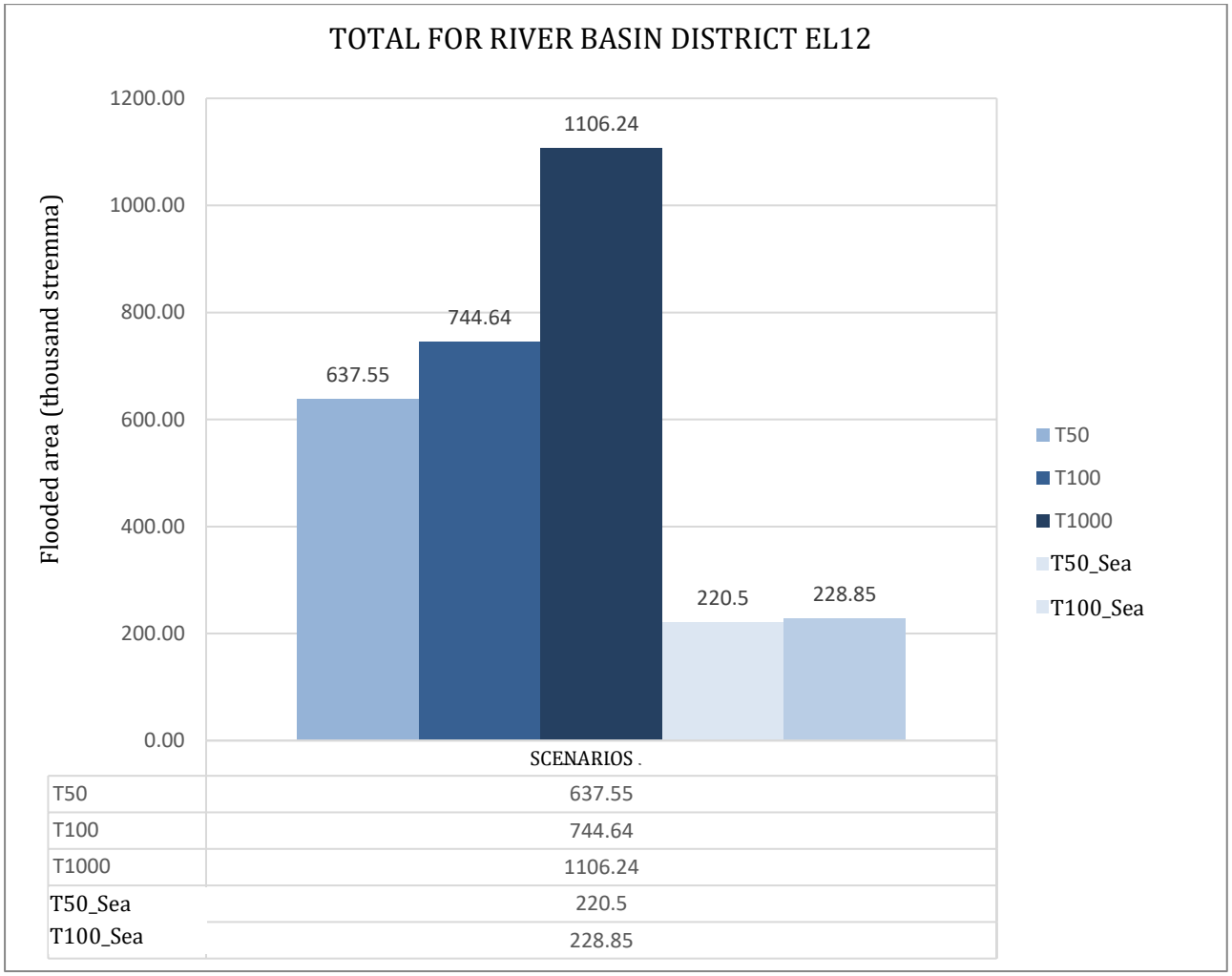

Figure 6.1: Total RBD EL12 - Flooded areas for river flow/lake flood scenarios with return period T=50, 100 and 1000 years, and for sea level rise scenarios with return period T=50 and 100 years

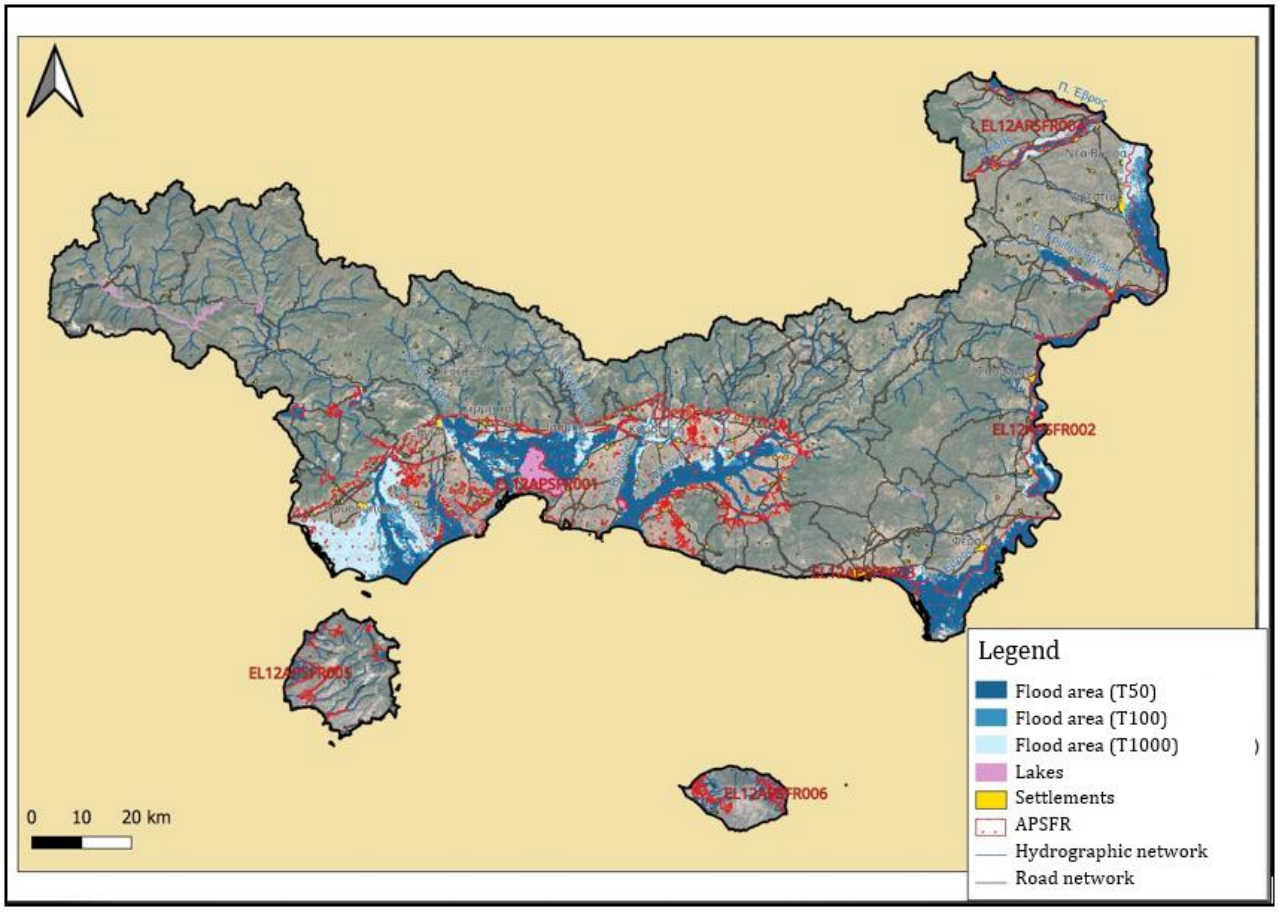

Figure 6.2: Flooded areas in RBD EL12 from river flows for floods occurring with a return period of T50, T100 and T1000 years

In **APSFR EL12APSFR001**, the flooded areas from river flows and lake overflow are 311.36 km^2, 375.78 km^2 and 639.85 km^2 for flood events with return periods T50, T100 and T1000 respectively. The difference of flooded areas between the T50 and T100 scenarios is 21%, whereas the increase from T100 to T1000 is significantly greater and was estimated at 72% (a significant increase is observed in Nestos river). In the mountainous/semi-mountainous parts of the APSFR , in Kechrokampos and Stavroupoli basin, the flood areas show little differences in the various scenarios due to the more rugged terrain.

The area occupied by APSFR EL12APSFR001 is also affected by sea floods in the scenarios with return period T50 and T100. The differences between the two scenarios are small and calculated at 118.26 km^2 for scenario T50 and 123.41 km^2 for scenario T100. The sea flood area extends over the largest part of the coastal front corresponding to APSFR EL12APSFR001, from the settlement of Profitis Ilias in the Municipality of Maronia – Sapes to the east, up to the boundary of RBD EL12 to the west, east of the Nea Karvali settlement. Sea floods affect coastal and lakeside settlements, beaches (Agiasmata and Mesi), transitional ecosystems (such as the lagoons of Keramoti and Porto Lagos, the Nestos Delta, as well as Vistonida and Ismarida lakes).

In **APSFR EL12APSFR002** flooded areas from river flows and lake overflow are 266.18 km^2, 300.97 km^2

and 379.78 km² for flood events with return periods T50, T100 and T1000 respectively. A significant part of the area's surface is flooded in all three scenarios. The difference of flooded areas between the T50 and T100 scenarios is 15%, whereas the increase from T100 to T1000 is significantly greater and was estimated at 31%.

In APSFR EL12APSFR002, flooded areas from sea floods are 88.19 km² and 90.91 km² for flood events with a return period of T50 and T100 respectively, where no settlement is flooded and the flood area is in any case limited south of the National Road.

In **APSFR EL12APSFR003** flooded areas from river flows and lake overflow are 18.06 km², 19.55 km² and 24.51 km² for events with return periods T50, T100 and T1000 respectively. A significant part of the area's surface is flooded in all three scenarios. The increase of flooded areas for T100 compared to T50 is 8%, whereas for T1000 and T100 the respective increase is 25%. In all three scenarios, floods do not affect any settlements and the greatest difference in the extent of the flood occurs in Loutro stream, at the Alexandroupolis-Svilengrad railway bridge.

The flooded areas from sea floods are 14.06 km2 and 14.53 km² for events with return period T50 and T100 respectively. A small part of the Amfitriti settlement is found within the flood area.

In **APSFR EL12APSFR004** flooded areas from river flows are 33.01 km², 38.08 km² and 48.14 km² for flood events with return periods T50, T100 and T1000 respectively. Flood limits extend beyond the limits of the APSFR in all scenarios. The increase of flooded areas for T100 compared to T50 is 17%, whereas for T1000 and T100 the respective increase is 25%.

In **APSFR EL12APSFR005** flooded areas from river flows are 7.61 km², 8.75 km² and 11.95 km² for flood events with return periods T50, T100 and T1000 respectively. The flooded area is relatively small. The increase of the flood zone for T100 compared to T50 is 15%, whereas for T1000 and T100 the respective increase is 37%.

In **APSFR EL12APSFR006** flooded areas from river flows are 1.34 km², 1.52 km² and 2.01 km² for flood events with return periods T50, T100 and T1000 respectively. The part of APSFR EL12APSFR006 that is flooded is relatively small. The increase of flooded areas for T100 compared to T50 is 14%, whereas for T1000 and T100 the respective increase is 31%.

Below follows the distribution of Flood Hazard Maps, both for river flow/lake floods and for sea flooding. Note that the distribution tiles are common to the Flood Risk Maps (FRM) presented below.

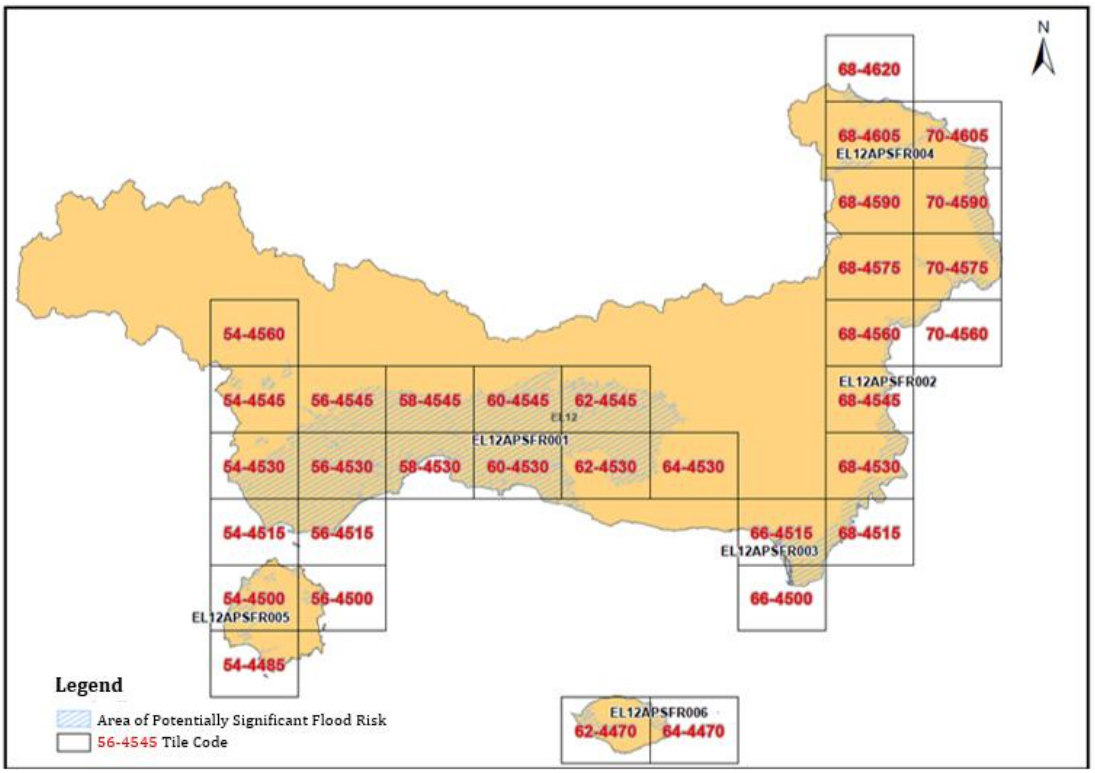

Figure 6.3: Tile Distribution for river flow/lake FHM and FRM.

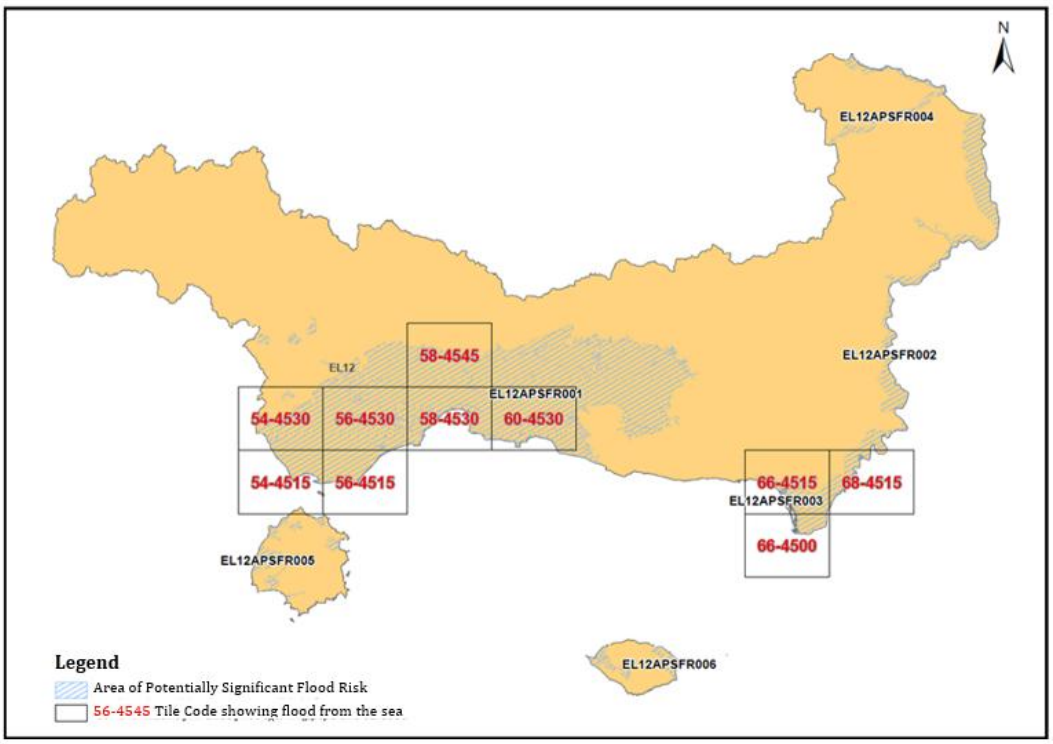

Figure 6.4: Tile Distribution for sea flood FHM and FRM.

The following Figures show typical samples of FHMs with spatial distribution of maximum depths and maximum velocities for APSFR EL12APSFR001.

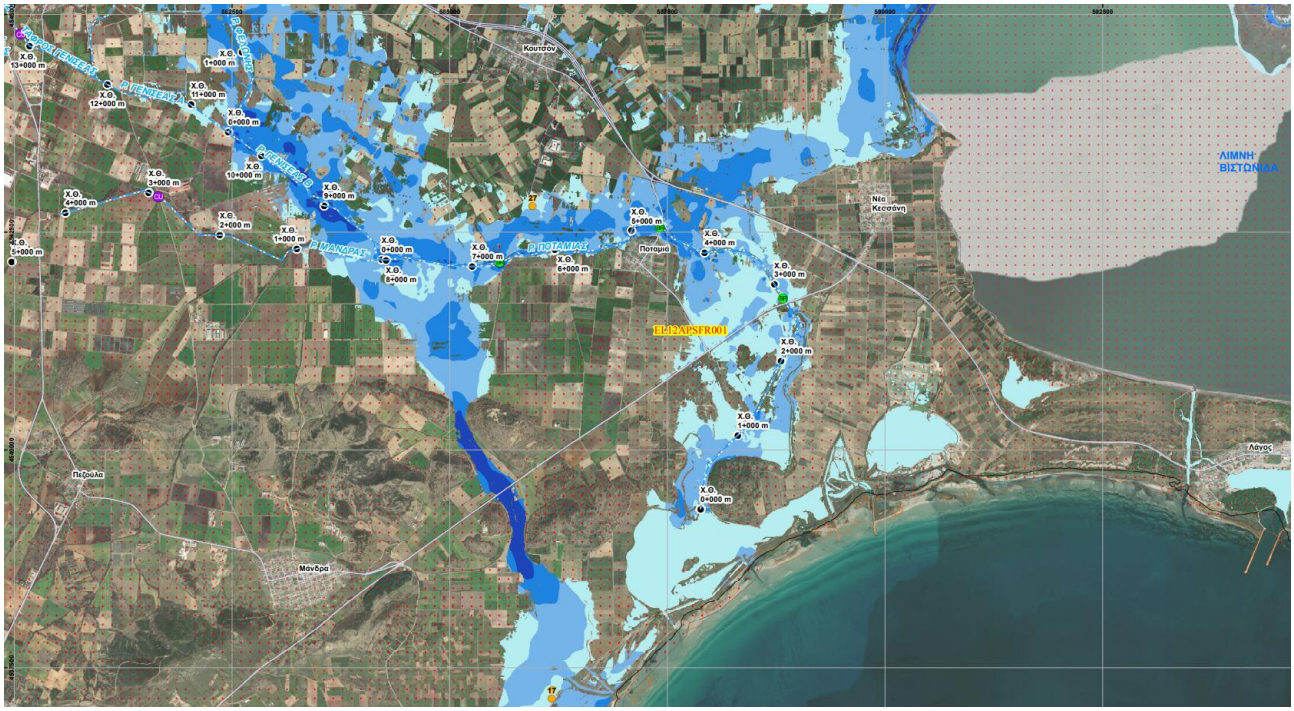

Figure 6.5: Part of a river flow/lake FHM (Nea Kessani area), APSFR EL12APSFR001 with colour-coding of maximum floodwater depths, for T=100 years.

Figure 6.6: Part of FHM (Nea Kessani area), APSFR EL12APSFR001 with colour-coding of maximum floodwater velocities, for T=100 years.

Figure 6.7: Part of FHM from mean sea level rise (Nea Kessani area), APSFR EL12APSFR001 with colour-coding of maximum floodwater depths, for T=100 years.

7 FLOOD RISK MAPS - FRMs

FRMs are presented on a 1:25,000 scale for the three river flow/lake flood scenarios, T=50, 100 and 1000 years, and the two sea flood scenarios, T= 50 and 100 years. FRMs depict land uses, economic activities, protected areas, and cultural heritage sites that fall within flood zones and are delimited by flood boundaries.

Specifically, FRMs present the following flooded elements:

- Indicative affected population in urban areas (<500, 500-2,000, >2,000)
- Health Infrastructure (Hospitals, Clinics and Health Centres)
- Social Infrastructure (Education facilities: Kindergartens, Schools, Universities, Colleges, Vocational Training Institutes, Sports venues, Open Care Centres for the Elderly)
- Water Supply Infrastructure (Community water boreholes, Water pumping stations)
- Energy Infrastructure (Electricity Stations - Substations, Small hydroelectric plants)
- Civil Protection Infrastructure (Police, Fire Brigade, Central Ambulance Facilities)
- Agricultural areas (Greenhouses, Rice Crops, Other Crops)
- Livestock units (Stable facilities)
- Tourist facilities (Developed and Developing)
- Industrial concentrations (Industrial Areas, Industrial Parks, informal industrial concentrations)
- Industries outside industrial concentrations (SEVESO, IPPC, IED, Other industrial units)
- Networks (Trans-European, primary national road network, Secondary – Tertiary national road network, Primary provincial road network, Secondary – Tertiary provincial road network, Railway network)
- Airports
- Wastewater Treatment Plants (WWTP with a capacity of <10,000 PE, WWTP with a capacity of 10,000 – 100,000 PE, WWTP with a capacity of >100,000 PE)
- Municipal solid waste management and disposal sites (sanitary landfills)
- Protected areas (SACs and SPAs)
- Monuments - Archaeological sites (of international, national and regional importance)

In addition to the above, flood maps show the floodplain for the respective return period (T50, T100 and T1000 for river flow/lake floods and T50 and T100 for mean sea level rise), the bodies of water that have been designated as recreational waters, the settlements, the watercourses and the boundaries of APSFRs, the names of settlements and streams, the border lines and the River Basin District boundaries.

The following Flood Risk Maps have been prepared for RBD EL12:

- **River Flow/Lake Flood Risk Maps** for 50-, 100- and 1000-year return periods (99 maps, scale 1:25,000)
- **Rising Mean Sea Level Flood Risk Maps** for 50 100-year return period (20 maps, scale 1:25,000)

FRMs also include the following maps:

- **Soil Erosion Vulnerability Map** (1 map, scale 1:400,000)
- **Maximum Potential Impact from River Flow/Lake Flood Map** for a 1000-year return period (2 maps, one on a scale of 1:200 000 covering the eastern part of RBD EL12 and one on a scale of 1:175 000 covering the western part of RBD EL12)
- **Degree of Impact from River Flow/Lake Flood Maps** for 50-, 100- and 1000-year return periods (three maps-one for each return period-on a scale of 1:200 000 covering the eastern part of RBD EL12 and three maps-one for each return period-on a scale of 1:175 000 covering the western part of RBD EL12)
- **Impact Assessment of River Flow/Lake Flood Maps** for 50-, 100- and 1000-year return periods (three maps -one for each return period- on a scale of 1:200 000 covering the eastern part of RBD EL12 and three maps -one for each return period- on a scale of 1:175 000 covering the western part of RBD EL12)
- **Maximum Potential Impact from Rising Mean Sea Level Flood Map** for 100-year return period (2 maps, scale 1:175 000)
- **Degree of Impact from Rising Mean Sea Level Flood Map** for 100-year return period (2 maps, scale 1:175 000)
- **Impact Assessment of Rising Mean Sea Level Flood Risk Map** for 100-year return period (2 maps, scale 1:175 000)

The maps use the Greek Geodetic Reference System (EGSA '87). ESRI's Basemap satellite images are on the background of the maps. Satellite photos are sourced from "ESRI, Maxar, Earthstar Geographics, and the GIS User Community", as offered in ESRI's respective map background services (data retrieval November 2023).

Overall, the Flood Risk assessment at River Basin District level is presented below:

- **T=50 years scenario, flooding from river flows and overflow of lakes**. 53.43% of the flood area is characterized as very low risk, 34.80% as low risk, 6.63% as medium risk, 4.51% as high risk and 0.62% as very high risk. 88.23% of the flood area is characterized as low and very low risk. High risk mostly exists in the Municipality of Thassos, at 30.09% of the municipality's flood area, followed by the municipalities of Soufli, Didymoticho and Orestiada with 8.99%, 7.95% and 7.73% of their flood area respectively. Very high risk mostly exists in the Municipalities of Thassos, Xanthi, Didymoticho and Maronia – Sapes with 11.08%, 5.78%, 2.51% and 1.17% of the flood areas respectively.
- **T=100 years scenario, flooding from river flows and overflow of lakes**. 50.58% of the flood area is characterized as very low risk, 36.73% as low risk, 7.01% as medium risk, 4.89% as high risk and 0.78% as very high risk. 87.32% of the flood area is characterized as low and very low risk. High risk

mostly exists in the Municipalities of Thassos, Soufli, Didymoticho and Maronia – Sapes, where 38.34%, 10.25%, 7.72% and 7.49% respectively of the flood areas within these Municipalities is in the high risk category. Very high risk mostly exists in the Municipalities of Thassos, Xanthi and Didymoticho, where 14.40%, 7.54% and 2.77% respectively of the flood areas within the Municipalities is in the very high risk category.

- **T=1000 years scenario, flooding from river flows and overflow of lakes**. The distribution of flood areas among the very low, low, medium, high and very high risk categories is 37.10%, 46.59%, 8.72%, 6.09% and 1.50% respectively. 83.69% of the flood area is characterized as low and very low risk. High risk mostly exists in the Municipalities of Thassos, Xanthi and Didymoticho, where 41.21%, 11.30% and 10.47% respectively of the flood areas within the Municipalities is in the high risk category. Very high risk exists in 26.42%, 11.83%, 2.86% and 1.77% of the flood areas within the municipalities of Thassos, Xanthi and Soufli respectively.
- **T=50 years scenario, flood from Rising Mean Sea Level**. 54.07% of the flood area is characterized as very low risk, 45.45% as low risk, 0.42% as medium risk, 0.06% as high risk and 0% as very high risk. 99.52% of the flood area is characterized as low and very low risk. High risk exists solely in the Municipality of Kavala, whereas no Municipality in RBD EL12 is in very high risk regarding the sea flood scenario with return period T=50.
- **T=100 years scenario, flood from Rising Mean Sea Level**. 53.88% of the flood area is characterized as very low risk, 45.63% as low risk, 0.43% as medium risk, 0.06% as high risk and 0% as very high risk. 99.51% of the flood area is characterized as low and very low risk. High flood risk exists solely in the Municipality of Kavala, whereas no Municipality in RBD EL12 is in very high risk regarding the sea flood scenario with return period T=100.

Areas with a high, medium and low flood risk for all return periods and the sources of flooding under review are described in detail in the Thrace FRM Plan. The Table and the Figure below show the distribution of flooded areas (in km²) over the entire RBD EL12 based on the Flood Risk class (Flood Impact class) for each flood scenario considered.

Table 7.1: Areas flooded by Flood Risk Class (Flood Impact Class) and by scenario considered (total RBD EL12)

TOTAL RBD EL12					
Flood Scenario	Flood area (km²)				
	Very Low	Low	Medium	High	Very High
T50	340.61	221.85	42.28	28.78	3.98
T100	376.44	273.36	52.20	36.42	5.78
T1000	410.37	515.41	96.43	67.39	16.63
T50θαλ	119.21	100.21	0.92	0.14	0.00
T100θαλ	123.27	104.39	0.99	0.14	0.00

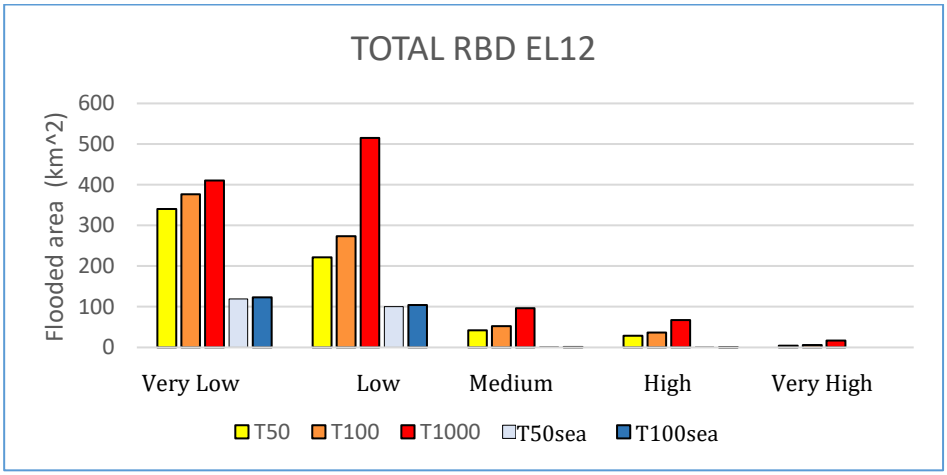

Figure 7.1: Areas flooded by Flood Risk Class (Flood Impact Class) and by scenario considered (total RBD EL12)

The following tables summarize the potentially affected population, the potentially affected economic activities as well as significant infrastructure within the flooded areas for each return period (T=50, 100, 1000 years) from river flows/lakes, and T=50 and T=100 years for the sea floods considered, for the entire Thrace River Basin District.

Table 7.2: Infrastructure and economic activities within the flooded areas of the Thrace RBD per return period

Infrastructure – Economic Activity		T=50	T=100	T=1000	T=50 sea	T=100 sea
Settlements		74	91	130	13	13
Indicative potentially affected population (inhabitants)		36,673	52,227	126,114	3,485	3,485
Rural areas (km²)	Rice crops	4.32	4.71	9.08	3.20	3.57
	Greenhouses	0.04	0.07	0.19	0.00	0.00
	Other crops	309.43	371.47	599.62	30.36	44.57
Stable facilities (no.)	Facilities	348	564	985	38	42
	Animals	40,305	50,659	435,976	4,226	4,637
Industries (no.)		23	29	97 and 1 IED	1 and 1 SEVESO	1 and 1 SEVESO
Developed and developing tourist areas (km²)		119.87	135.79	217.28	104.95	109.46
Road network (km)	National	38.97	50.13	82.5	0.11	0.11
	Provincial	29.54	36.91	90.64	1.43	1.63
	Other	29.09	36.88	68.34	0.15	0.16
Rail network (km)		70.27	82.63	130.57	0	0
Water supply boreholes (no.)		39	50	101	0	0

Infrastructure – Economic Activity	T=50	T=100	T=1000	T=50 sea	T=100 sea
WWTPs (no.)	1	2	6	0	0
Uncontrolled landfill (no.)	2	3	3	0	0
Educational institutions (no.)	13	28	91	0	0
Sports facilities (no.)	19	24	48	2	3
Protected areas (km^2)	301.75	340.8	455.87	185.39	191.1
Healthcare facilities (no.)	7	9	18	0	0
Civil Protection facilities (no.)	5	12	22	0	0
Cultural Heritage sites (no.)	27	37	95	7	7

The following are typical examples of river flow/lake and rising mean sea level FRMs.

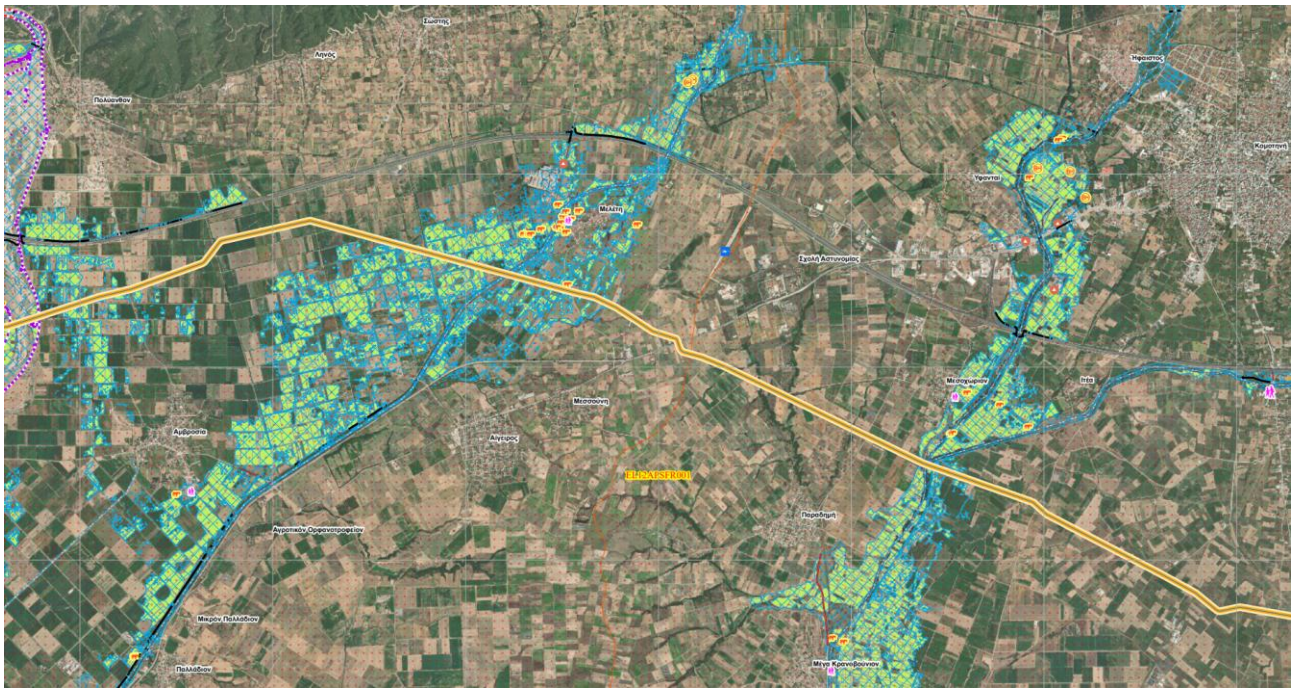

Figure 7.2: Part of a river flow/lake FRM (greater area of Komotini), APSFR EL12APSFR001 showing the affected surface and point uses, for T=100 years.

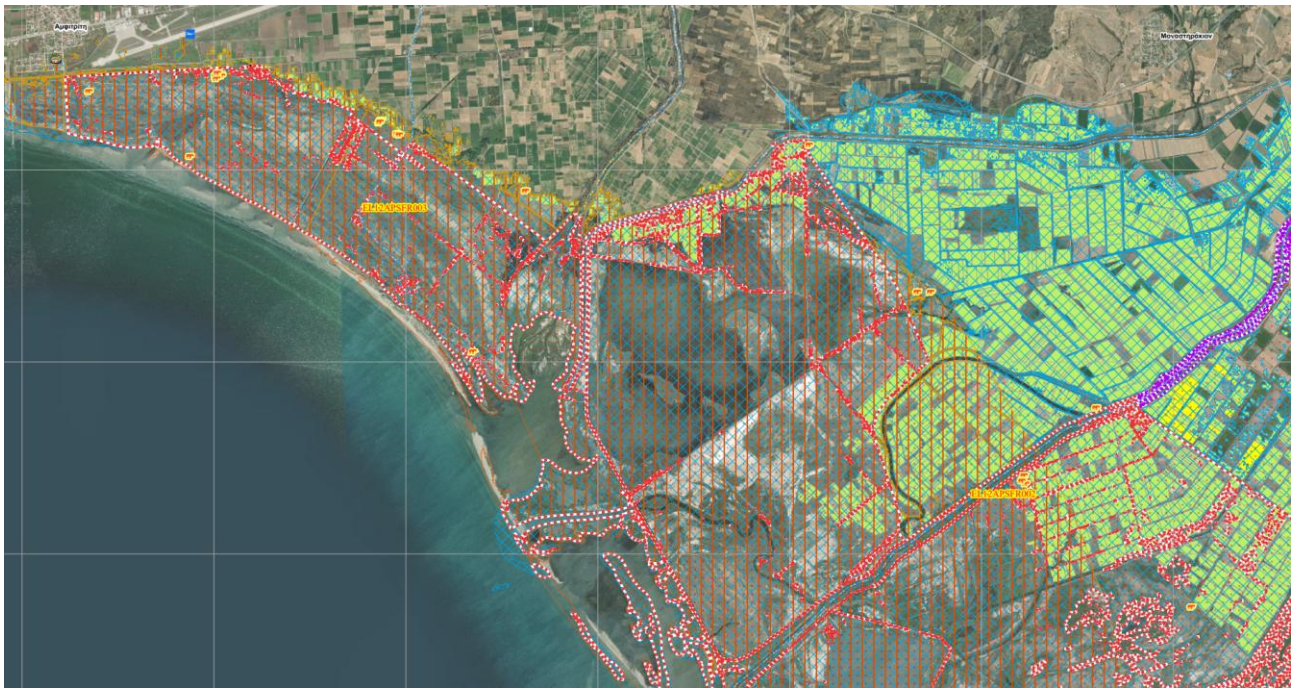

Figure 7.3: Part of a rising mean sea level FRM, APSFR EL12APSFR002 & EL12APSFR003 showing the affected surface and point uses, for T=100 years.

8 1ST REVIEW OF THE FRMP - INVESTIGATION OF CLIMATE CHANGE

The EU recognises that changes in the intensity and frequency of extreme rainfall, coupled with land-use changes, are expected to increase the risk of flooding across Europe. The overall guiding principle of the EU is to adapt flood risk management to potential climate change. In accordance with Article 14 of Directive 2007/60/EC, the likely impact of climate change on the occurrence of flood events shall be taken into account in reviews of the flood hazard and risk maps and the Flood Risk Management Plans (FRMPs), in this 1st Review of the FRMPs.

The aim of this 2nd implementation cycle of Directive 2007/60/EC is to determine how climate change affects the occurrence of flood events. More specifically, the research looks into the reduction or increase of the return period of a flood event which in the current climatic conditions and data corresponds to an event with T= 50, 100 or 1000 years.

The Methodology applied to assess how climate change affects the occurrence of flood events based on rainfall intensity, uses climate projection data from 675 pluviometric station locations in Greece. These data were developed under the SWICCA program (Service for Water Indicators in Climate Change Adaptation, 2015-2018) and are derived from 9 combinations of Global Circulation Models (GCMs), Regional Climate Models (RCMs) and Representative Concentration Pathways (RCPs).

For each point determination of rainfall runoff curves position, the new frequency of recurrence of design floods of this 1st Review of the FRMP, as this results from the climatic projections, is defined for **two future climatic periods**:

- Mid-century (2041-2070 or 2050s) and
- End of century (2071-2100 or 2080s).

In the **Thrace RBD (EL12)**, climate change adversely affects the frequency of occurrence of flood events. Specifically:

- although in some locations of the RBD the periods of return of extreme rainfall are the same or even increase (favourable climatic future), in most of the RDB there is a significant decline in the periods of return (increase in frequency of occurrence) of intense rainfall events. This suggests that in the climatic future, rainfall intensities associated with a given occurrence (period of return) will increase or, equivalently, the occurrence frequency of historically observed flood events will increase. Therefore, the climatic future is expected to be more unfavourable in terms of the observed flood events at River Basin District level, and to the extent that these concern medium and large-scale hydraulic structures (periods of return T=50, 100 and 1000 years).
- As regards **average values for the RBD**, there is a significant decline in the return periods (increase in frequency of occurrence) of intense rainfall events during the climatic period 2071-01-01 to 2100-12-31 (2080s) in relation to the climatic period 2041-01-01 to 2070-12-31 (2050s).

The following Tables show the expected change of frequency for flood magnitudes corresponding to actual return periods of T=50 years, T=100 years, and T=1000 years, considering the climate projection scenario RCP4.5 for two future periods: (a) 2041-2070 and (b) 2071-2100.

Table 8.1: Change, for the 2050s climate period, in the average return periods of rainfall events that in the current period correspond to return periods T = 50, 100 and 1000 years, in the river basins of the Thrace RBD.

no.	RIVER BASIN	$T^{hist.T50}$(2050s)	$T^{hist.T100}$(2050s)	$T^{hist.T1000}$(2050s)
1	NESTOS	38	82	1000
2	XANTHI-XEROREMA	26	51	659
3	KOMOTINI - LOUTRO EVROS	24	44	635
4	EVROS	35	75	1000
5	THASSOS - SAMOTHRACE	25	47	642

Table 8.2: Change, for the 2080s climate period, in the average return periods of rainfall events that in the current period correspond to return periods T = 50, 100 and 1000 years, in the river basins of the Thrace RBD.

no.	RIVER BASIN	$T^{hist.T50}$(2080s)	$T^{hist.T100}$(2080s)	$T^{hist.T1000}$(2080s)
1	NESTOS	22	40	506
2	XANTHI-XEROREMA	20	33	346
3	KOMOTINI - LOUTRO EVROS	21	37	416
4	EVROS	35	73	1000
5	THASSOS - SAMOTHRACE	22	40	482

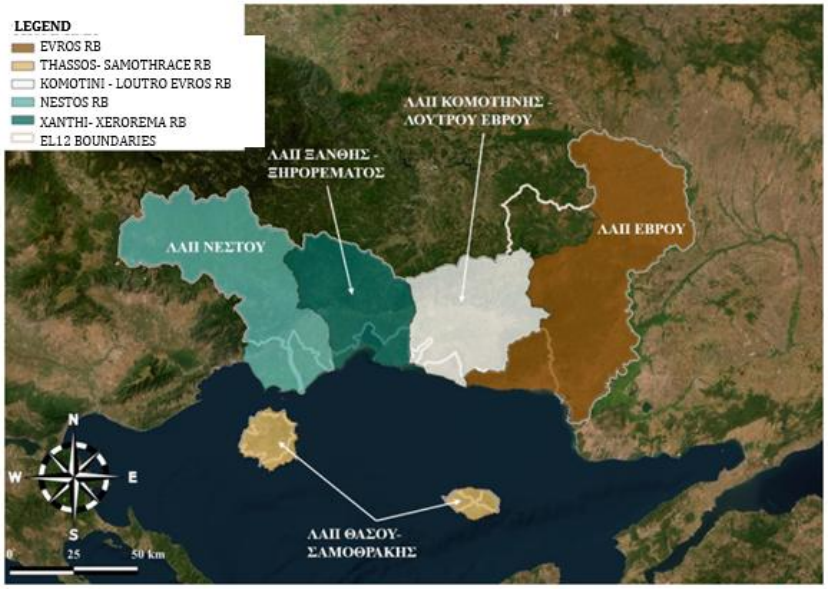

Figure 8.1: Drawing of the Thrace RBD basins (EL12)

9 DIFFERENCES IN RELATION TO THE ORIGINAL FRMP FOR THE THRACE RBD (EL12)

The most important differences of this 1st FRMP Review compared to the 1st Implementation Cycle of Directive 2007/60/EC (First FRMP) are found in the following points:

- Different boundaries of the Areas of Potentially Significant Flood Risk in the Thrace River Basin District (EL12) in the 1st Review of the Preliminary Flood Risk Assessment. The 1st Review of the PFRA introduced two new APSFR that include watercourses on the islands of Thassos and Samothrace and extended APSFR EL12APSFR001 to confluent branches of Nestos river.
- The incorporation into a single FRMP for RBD EL12 of the Evros river basin, which in the 1st FRMP was considered in a separate FRMP.
- Use of a new Digital Terrain Model based on the most recent Digital Terrain Model (DTM) of the Cadastre, with a 2x2m resolution, created for the purpose of orthorectification and generation of LSO25 orthophoto maps, in 2015-2016. All the required correction and improvement work was performed on the model, and on-site measurements were incorporated (see Detailed Documentation "Production of a High Resolution and Precision Digital Terrain Model in Mild Relief Areas as well as in High and Very High Risk Areas, as these resulted from the flood impact assessment maps of the 1st implementation cycle of Directive 2007/60/EC and described in the corresponding measure of the FRMPs").
- Change in land use, economic activities and infrastructure in the APSFR of the Thrace River Basin District (EL12)
- Difference in the rainfall data and rainfall curves used in the preparation of flood hydrographs and, consequently, in the use of new hydrographs for all three return periods (see Detailed Documentation "Flood Hydrographs").
- Use of a different hydraulic simulation software compared to the 1st FRMP (HEC-RAS vs FLO 2D)
- the addition of new watercourses and parts of watercourses and rivers for routing (see Detailed Documentation "Analysis of area characteristics and flood mechanisms").

In relation to the results of the 1st cycle, where there are comparable results, the size of the flood area presents certain differences : in all scenarios, there is a small decrease in floods from river flows/lakes in APSFR EL12APSFR001, a small increase in APSFR EL12APSFR004 and approximately a doubling in APSFR EL12APSFR002 and EL12APSFR003 (note that, as regards APSFR EL12APSFR003, the 1st cycle only considered sea floods, therefore in this area the results are not practically comparable). As regards the size of the sea flood, there is a significant increase due to the more detailed Digital Terrain Model used.

In terms of Flood Risk, comparable results exist only for APSFR EL12APSFR001. The main difference is observed in the T1000 scenario, where the size of the flood area is reduced (as in the other river flood scenarios), but the flood risk is increased (mainly the high and very high risk category percentages). The differences in the other 2 river flood scenarios are smaller, however they follow the same pattern. Sea floods also present higher percentages of high and very high risk areas compared to the 1st cycle.

10 PREPARING THE PROGRAMME OF MEASURES FOR THE 1ST FRMP REVIEW OF THE THRACE RBD (EL12)

10.1 Objectives of the 1st FRMP Review for the Thrace RBD (EL12)

In accordance with Directive 2007/60/EC Member States shall set objectives focusing on:

(a) the reduction of potential adverse consequences of flooding:

- **for human health,**
- **the environment,**
- **cultural heritage, and**
- **economic activity, and/or**

(b) the reduction of the likelihood of flooding (with construction or non-construction projects).

To date, no uniform methodology has been developed at European level to establish Flood Risk Management objectives. Thus, there is a considerable difference in approach between Member States.

The objectives established in the framework of the First FRMP for the Thrace RBD took into account the provisions of Directive 2007/60/EC and the Guidance Texts, and were set as follows:

General Objectives of the First FRMP:

- Mitigation of exposure to flooding (Management Objective O1)
- Flood likelihood reduction (Management Objective O2)
- Enhancing flood preparedness (Management Objective S3)
- Improving the restoration mechanisms of affected areas (Management Objective O4)

The above General Objectives of the **First FRMP** correspond to the four lines of action of Flood Risk Management (Prevention, Protection, Preparedness, Restoration) and are strategic in nature to establish a common understanding and policy on the issues related to flood risk management.

In this **1st Review of the FRMP**, the above General Objectives are maintained, in accordance with the provisions of Directive 2007/60/EC and the Guidance Texts, and are further specified in **Specific Objectives** established to identify, distinguish and explain the individual objectives that together will effectively cover the achievement of each general objective, in correlation both with the axes of the programme of measures being prepared and with the proposed measures.

To achieve **General Objective O1 to mitigate exposure to flooding** affecting human health, the environment, cultural heritage and economic activity, the following **specific objective**s are established:

O1.1: Organisation and improvement of available information, by implementing actions and measures for obtaining and supplementing information, such as the creation of registers of flood events and technical data of flood defences and demarcations, to ensure the optimal monitoring of the FRMP's Programme of Measures.

O1.2: Improvement of knowledge on flood prevention by implementing actions and measures for training/information, modernisation and organisation of a network of meteorological and hydrometric data.

O1.3: Adoption of appropriate terms and restrictions, consistent with the FRMP by implementing actions and measures for spatial and urban planning, the relocation of activities and protection of critical infrastructure, through appropriate legislative/administrative arrangements.

To achieve **General Objective O2 to reduce the likelihood of flooding** affecting human health, the environment, cultural heritage and economic activity, the following **specific objective**s are established:

O2.1: Reduction of flood risk through natural water retention by implementing environmental actions and measures to contain, shape and manage the floodplain of the watercourses.

O2.2: Reduction of flood risk using other means by implementing actions and measures for the development of reservoir projects, the modernisation, restoration and construction of drainage networks, rainwater management and flood defences.

O2.3: Strengthening flood risk management practices at the protection stage by implementing actions and measures for strategic planning of flood defences and rainwater projects while promoting natural retention or controlled flooding solutions to improve runoff management through appropriate legislative/administrative arrangements.

To achieve **General Objective O3 to enhance flood preparedness** and mitigate the impact of flood events on human health, the environment, cultural heritage and economic activity, the following **specific objectives** are established:

O3.1: Increase the level of preparedness against flood risk by implementing actions and measures for the development of early flood warning tools and the organisation and licensing of actions for the restoration/maintenance of embankments.

O3.2: Improvement of knowledge on flood preparedness by implementing non-structural interventions, actions and measures for education/information and awareness-raising of the public and bodies, as well as actions to determine, in advance, alert levels and introduce signage/warnings for flood-risk areas.

O3.3: Strengthening flood risk management practices at the preparedness stage by implementing actions and measures for the preparation of plans and regulations for organisation-related actions, and by applying appropriate non-structural interventions and legislative/administrative arrangements.

To achieve **General Objective O4 to improve the restoration mechanisms of affected areas** (human health, the environment, cultural heritage and economic activity), the following **specific objectives** are established:

O4.1: Improvement of the post-flood damage assessment and compensation mechanism by implementing actions and measures of a financial and legislative/administrative nature to regulate actions and responsibilities for recording damages.

O4.2: Improvement of preparation of restoration work by implementing actions and measures of an environmental nature to identify restoration methods and emergency actions after flood events.

O4.3: Improvement of the restoration mechanism by implementing actions and measures of a financial and legislative/administrative nature to support the affected population after flood

events.

To achieve the **Goals**, the revised FRMP includes a comprehensive **Programme of Measures** as presented in the following sections. According to this, each Measure contributes to one Specific Objective. Therefore, **achievement of objectives can be quantified by measuring the implementation percentage (%) of proposed Measures per Specific Objective**.

10.2 Preliminary Assessment of All Measures

To achieve the Flood Risk Management objectives, as revised in the 1st Review of the Flood Risk Management Plan (FRMP), a superset, a "pool", of Measures, common to all River Basin Districts in the country, was prepared, considering:

- The requirements arising from the implementation of Directive 2007/60/EC.
- The measures of the first FRMP and the progress of their implementation.
- The EU's comments made on the country's first FRMP (September 2021)
- The available financing instruments and the funds that can be drawn from such instruments for Flood Risk Management and the implementation of specific actions.
- The National Climate Change Adaptation Strategy (NCCCA) and the Regional Climate Change Adaptation Plan (RCCAP) of the Region of Central Macedonia.
- The provisions and limitations of the RBMPs (2nd Review).
- The existing synergies between FRM measures and other measures and actions aimed at the protection and upgrading of the environment, and specifically the objectives of the Water Framework Directive - WFD (premium for measures which are compatible with the objectives of both Directives, win-win measures).
- The impact the measures may have on the economy, society and the environment.
- The existing institutional framework.

Moreover, all other actions currently implemented that contribute to the response to and management of flood risks were also considered.

In the context of the 1st Review of the FRMP and for the purpose of developing the programme of measures for the Management and Response to flood risks in each River Basin District, a Preliminary Assessment of the superset of measures reviewed at country level was carried out with the help of a single multi-criteria analysis methodology described in detail in the Detailed Documentation "Preliminary Assessment of measures of the 1st Review of the FRMP".

After the Preliminary Assessment, **out of a total of 40 reviewed measures** (initial pool of measures), **32 were selected for further investigation** as to their implementation in RBD EL12 and 8 measures were withdrawn. Note, however, that after the consultation process, the following measure was also removed: "Providing incentives for private flood insurance", which according to the Preliminary Assessment methodology, had initially qualified.

Thus, 31 measures are ultimately proposed for flood risk management in RBD EL12, of which 9 relate to Prevention, 12 to Protection, 8 to Preparedness and 2 to Restoration.

Table 10.1: : Number of measures per line of action considered in RBD EL12

LINE OF ACTION	Total number of measures reviewed	Number of FRMP Measures following the Preliminary Assessment and Public Consultation
Prevention	11	9
Protection	14	12
Preparedness	10	8
Restoration	5	2
TOTAL	**40**	**31**

Of the **31** proposed measures, **23** are ongoing from the 1st FRMP (either from the 1st FRMP of RBD EL12 except the Evros basin, or from the FRMP of the Evros river basin) either unchanged or as amended. More specifically, the number of ongoing and new measures of the Programme of Measures of the revised plan per Line of Action are presented in the Table below (Table 10.2).

Table 10.2: Ongoing and New Measures of the 1st FRMP Review for RBD EL12 by Line of Action

LINE OF ACTION	Measures ongoing from 1st cycle	New measures	Total
Prevention	7	2	9
Protection	10	2	12
Preparedness	6	2	8
Restoration	0	2	2
TOTAL	**23**	**8**	**31**

10.3 Programme of Measures for the FRMP of the Thrace RBD (EL12)

A summary diagram of the measures of the 1st Review of the FRMP of the Thrace RBD (EL12) per General Objective and Specific Objective is given below (Figure 10.1).

During implementation of the 1st Review of the FRMP for the Thrace River Basin District (EL12), the Programme of Measures became considerable more specific, with more detailed proposals for projects and measures at RBD or APSFR level. Apart from the requirements of Directive 2007/60 and the General and Specific Objectives of the 1st Review on the reduction of flood risks, this specification also considered other flood protection plans and studies implemented in RBD EL12. Out of the 31 measures proposed for implementation in this FRMP, 21 are applied across the entire RBD EL12. The remaining 10 measures are applied to specific APSFRs at selected locations which have resulted from the available data and calculations of this FRMP (Table 10.3).

Note that this 1st Review of the Flood Risk Management Plan concerns the Areas of Potentially Significant Flood Risk and is based on the results of the Flood Hazard and Flood Risk Maps. Projects and actions of the FRMP Programme of Measures in areas that do not constitute Areas of Potentially Significant Flood Risk of the 1st Review of the Preliminary Flood Risk Assessment, but have suffered a large-scale flood event and/or a major forest fire either within such areas and/or downstream/upstream of them, may be financed by submitting a substantiated proposal to the financing instrument, provided that the compatibility of the projects/actions with the Objectives of Directive 2007/60/EC on the assessment and management of flood risks can be ensured, and that no conditions are created which are contrary to the relevant Flood Risk Management Plan and the provisions of this Programme of Measures.

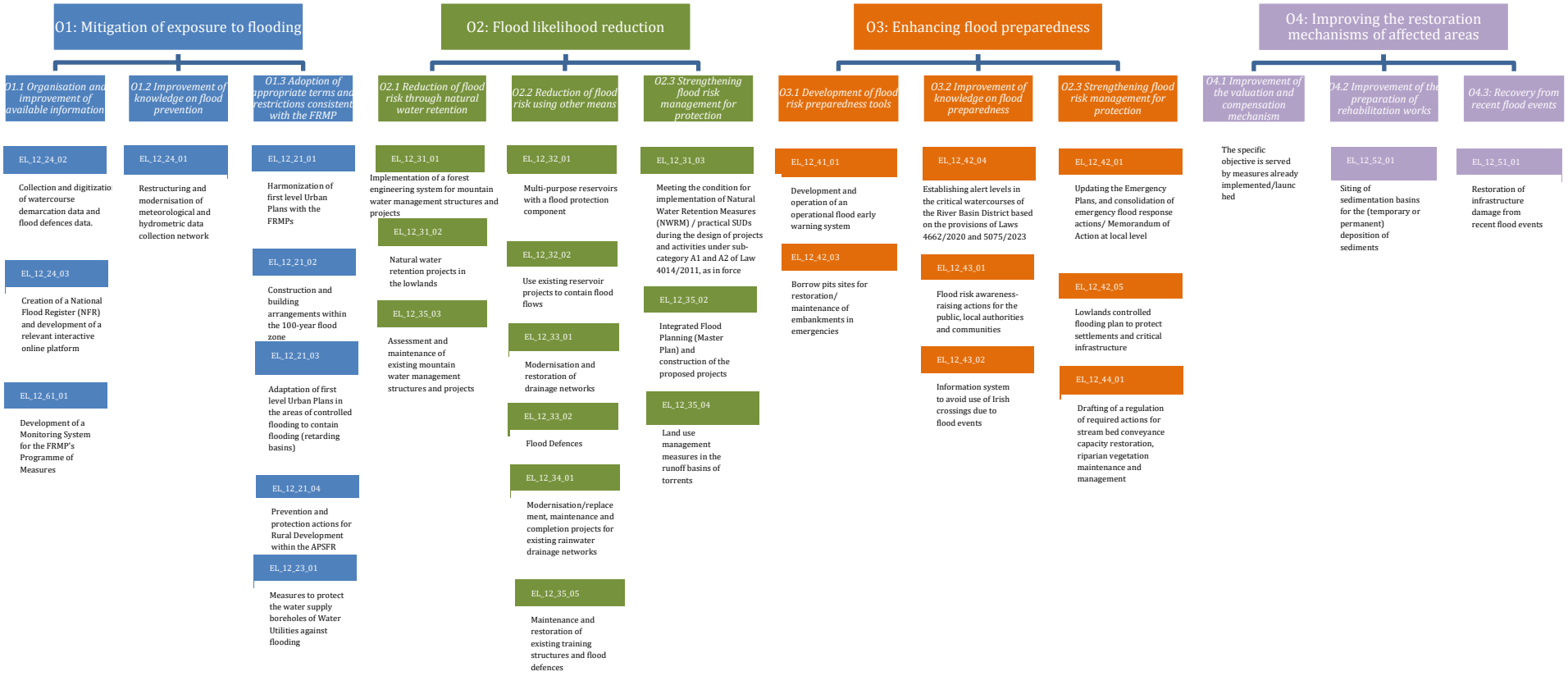
O1: Mitigation of exposure to flooding
O1.1 Organisation and improvement of available information
EL_12_24_02
Collection and digitization of watercourse demarcation data and flood defences data.
EL_12_24_03
Creation of a National Flood Register (NFR) and development of a relevant interactive online platform
EL_12_61_01
Development of a Monitoring System for the FRMP's Programme of Measures
O1.2 Improvement of knowledge on flood prevention
EL_12_24_01
Restructuring and modernisation of meteorological and hydrometric data collection network
O1.3 Adoption of appropriate terms and restrictions consistent with the FRMP
EL_12_21_01
Harmonization of first level Urban Plans with the FRMPs
EL_12_21_02
Construction and building arrangements within the 100-year flood zone
EL_12_21_03
Adaptation of first level Urban Plans in the areas of controlled flooding to contain flooding (retarding basins)
EL_12_21_04
Prevention and protection actions for Rural Development within the APSFR
EL_12_23_01
Measures to protect the water supply boreholes of Water Utilities against flooding
O2: Flood likelihood reduction
O2.1 Reduction of flood risk through natural water retention
EL_12_31_01
Implementation of a forest engineering system for mountain water management structures and projects
EL_12_31_02
Natural water retention projects in the lowlands
EL_12_35_03
Assessment and maintenance of existing mountain water management structures and projects
O2.2 Reduction of flood risk using other means
EL_12_32_01
Multi-purpose reservoirs with a flood protection component
EL_12_32_02
Use existing reservoir projects to contain flood flows
EL_12_33_01
Modernisation and restoration of drainage networks
EL_12_33_02
Flood Defences
EL_12_34_01
Modernisation/replacement, maintenance and completion projects for existing rainwater drainage networks
EL_12_35_05
Maintenance and restoration of existing training structures and flood defences
O2.3 Strengthening flood risk management for protection
EL_12_31_03
Meeting the condition for implementation of Natural Water Retention Measures (NWRM) / practical SIDs during the design of projects and activities under sub-category A1 and A2 of Law 4014/2011, as in force
EL_12_35_02
Integrated Flood Planning (Master Plan) and construction of the proposed projects
EL_12_35_04
Land use management measures in the runoff basins of torrents
O3: Enhancing flood preparedness
O3.1 Development of flood risk preparedness tools
EL_12_41_01
Development and operation of an operational flood early warning system
EL_12_42_03
Borrow pits sites for restoration/ maintenance of embankments in emergencies
O3.2 Improvement of knowledge on flood preparedness
EL_12_42_04
Establishing alert levels in the critical watercourses of the River Basin District based on the provisions of Laws 4662/2020 and 5075/2023
EL_12_43_01
Flood risk awareness-raising actions for the public, local authorities and communities
EL_12_43_02
Information system to avoid use of Irish crossings due to flood events
O2.3 Strengthening flood risk management for protection
EL_12_42_01
Updating the Emergency Plans, and consolidation of emergency flood response actions/ Memorandum of Action at local level
EL_12_42_05
Lowlands controlled flooding plan to protect settlements and critical infrastructure
EL_12_44_01
Drafting of a regulation of required actions for stream bed conveyance capacity restoration, riparian vegetation maintenance and management
O4: Improving the restoration mechanisms of affected areas
O4.1 Improvement of the valuation and compensation mechanism
The specific objective is served by measures already implemented/launched
O4.2 Improvement of the preparation of rehabilitation works
EL_12_52_01
Siting of sedimentation basins for the (temporary or permanent) deposition of sediments
O4.3: Recovery from recent flood events
EL_12_51_01
Restoration of infrastructure damage from recent flood events

Figure 10.1: Tree Diagram of Measures of the 1st Review of the FRMP for RBD EL12 by General and Specific Objective served

Table 10.3: Measures of the 1st Review of the FRMP for RBD EL12; linking measures with General and Specific Objectives, Level of spatial application and Implementing agencies

GENERAL OBJECTIVE/ MEASURE LINE OF ACTION	MEASURE CODE	MEASURE TITLE	AREA OF APPLICATION	IMPLEMENTING AGENCY
01 Mitigation of exposure to flooding PREVENTION	**Specific Objective: O1.1 Organisation and improvement of available information**			
	EL_12_61_01	Development of a Monitoring System for the FRMP's Programme of Measures	RBD EL12	MACEDONIA – THRACE DEC. ADM. (Eastern Macedonia - Thrace Water Directorate)
	EL_12_24_02	Collection and digitization of watercourse demarcation data and flood defences data	RBD EL12	MINISTRY OF ENVIRONMENT AND ENERGY (Technical Chamber of Greece) and MINISTRY OF INFRASTRUCTURE AND TRANSPORT
	EL_12_24_03	Creation of a National Flood Register (NFR) and development of a relevant interactive online platform	RBD EL12	MINISTRY OF ENVIRONMENT AND ENERGY (General Directorate for Water)
	Specific Objective: O1.2 Improvement of knowledge on flood prevention			

GENERAL OBJECTIVE/ MEASURE LINE OF ACTION	MEASURE CODE	MEASURE TITLE	AREA OF APPLICATION	IMPLEMENTING AGENCY
	EL_12_24_01	Restructuring and modernisation of meteorological and hydrometric data collection network	RBD EL12	MINISTRY OF ENVIRONMENT AND ENERGY (General Directorate for Water)
	Specific Objective: O1.3 Adoption of appropriate terms and restrictions consistent with the FRMP			
	EL_12_21_01	Harmonization of first level Urban Plans with the FRMPs	RBD EL12	MINISTRY OF ENVIRONMENT AND ENERGY (General Secretariat for Spatial Planning and Urban Environment)
	EL_12_21_02	Construction and building arrangements within the 100-year flood zone	RBD EL12	MINISTRY OF ENVIRONMENT AND ENERGY (General Secretariat for Spatial Planning and Urban Environment)
	EL_12_21_03	Adaptation of first level Urban Plans in the areas of controlled flooding to contain flooding (retarding basins)	RBD EL12	MINISTRY OF ENVIRONMENT AND ENERGY (General Secretariat for Spatial Planning and Urban Environment)
	EL_12_21_04	Prevention and protection actions for Rural Development within the APSFR	EL12APSFR01 EL12APSFR02 EL12APSFR04	MINISTRY OF RURAL DEVELOPMENT AND FOOD

GENERAL OBJECTIVE/ MEASURE LINE OF ACTION	MEASURE CODE	MEASURE TITLE	AREA OF APPLICATION	IMPLEMENTING AGENCY
	EL_12_23_01	Measures to protect the water supply boreholes of water utilities against flooding	EL12APSFR01 EL12APSFR02 EL12APSFR03 EL12APSFR05	(1) Water Utilities (2) MACEDONIA– THRACE DEC. ADM. (Central Macedonia Water Directorate)
O2: Flood likelihood reduction PROTECTION	**Specific Objective: O2.1 Reduction of flood risk through natural water retention**			
	EL_12_31_01	Implementation of a forest engineering system for mountain water management structures and projects	RBD EL12	MINISTRY OF ENVIRONMENT AND ENERGY (Directorates of Forests) and Forestry Offices of the Regional Units of Drama, Kavala, Xanthi, Rodopi, Evros
	EL_12_31_02	Natural water retention projects in the lowlands	EL12APSFR01 EL12APSFR02	MINISTRY OF INFRASTRUCTURE AND TRANSPORT/DIRECTORATE FOR FLOOD DEFENCES AND REHABILITATION PROJECTS (D19), EASTERN MACEDONIA AND THRACE REGION (Directorate of Technical Projects and RU Sub-Directorates of Technical Projects), MUNICIPALITIES
	EL_12_35_03	Assessment and maintenance of existing mountain water management structures and projects	RBD EL12	MINISTRY OF ENVIRONMENT AND ENERGY (Directorates of Forests) Forestry Offices of the RU Drama, Kavala, Xanthi, Rodopi, Evros
	Specific Objective: O2.2 Reduction of flood risk using other means			
		Multi-purpose reservoirs with a flood protection	RBD EL12	Project owner

GENERAL OBJECTIVE/ MEASURE LINE OF ACTION	MEASURE CODE	MEASURE TITLE	AREA OF APPLICATION	IMPLEMENTING AGENCY
		component		
	EL_12_32_02	Use existing reservoir projects to contain flood flows	EL12APSFR01 EL12APSFR03 EL12APSFR05	RESERVOIR MANAGEMENT BODIES
	EL_12_33_01	Modernisation and restoration of drainage networks	EL12APSFSR01 EL12APSFSR02	MINISTRY OF INFRASTRUCTURE AND TRANSPORT/DIRECTORATE FOR FLOOD DEFENCES AND REHABILITATION PROJECTS (D19), EASTERN MACEDONIA AND THRACE REGION (Directorate of Technical Projects and RU Sub-Directorates of Technical Projects), LAND RECLAMATION AGENCIES (OEB)
	EL_12_33_02	Flood Defences	RBD EL12	MINISTRY OF INFRASTRUCTURE AND TRANSPORT (DIRECTORATE FOR FLOOD DEFENCES AND REHABILITATION PROJECTS D19), EASTERN MACEDONIA AND THRACE REGION (Directorate of Technical Projects and RU Sub-Directorates of Technical Projects), MUNICIPALITIES

GENERAL OBJECTIVE/ MEASURE LINE OF ACTION	MEASURE CODE	MEASURE TITLE	AREA OF APPLICATION	IMPLEMENTING AGENCY
	EL_12_34_01	Modernisation/replacement, maintenance and completion projects for existing rainwater drainage networks	RBD EL12	EASTERN MACEDONIA AND THRACE REGION (Directorate of Technical Projects / RU Sub-Directorates of Technical Projects), MUNICIPALITIES, Water & Sewage Companies, Road maintenance bodies
	EL_12_35_05	Maintenance and restoration of existing training structures and flood defences	RBD EL12	EASTERN MACEDONIA AND THRACE REGION (Directorate of Technical Projects / RU Sub-Directorates of Technical Projects)
	Specific Objective: O2.3 Strengthening flood risk management for protection			
	EL_12_31_03	Implementation of Natural Water Retention Measures (NWRM) / practical SUDs during the design of projects and activities under sub-category A1 and A2 of Law 4014/2011, as in force.	RBD EL12	Implementing Agency of each project
	EL_12_35_02	Integrated Flood Planning (Master Plan) and construction of the proposed projects	EL12APSFR01 EL12APSFR02 EL12APSFR03 EL12APSFR04	Action [A] : MINISTRY FOR CLIMATE CRISIS AND CIVIL PROTECTION (Technical Chamber of Greece) Action [B] & Action [C] : To be determined on the basis of projects proposed in the Masterplan
	EL_12_35_04	Land use management measures in the runoff basins of torrents.	RBD EL12	EASTERN MACEDONIA AND THRACE Region

GENERAL OBJECTIVE/ MEASURE LINE OF ACTION	MEASURE CODE	MEASURE TITLE	AREA OF APPLICATION	IMPLEMENTING AGENCY
O3: Enhancing flood preparedness PREPAREDNESS	**Specific Objective: O3.1 Development of flood risk preparedness tools**			
	EL_12_41_01	Development and operation of an operational flood early warning system	EL12APSFR01 EL12APSFR02 EL12APSFR04	ESEPP (Operational Early Flood Warning System) Developer: MINISTRY OF ENVIRONMENT AND ENERGY ESEPP Operator: MINISTRY FOR CLIMATE CRISIS AND CIVIL PROTECTION (General Secretariat for Civil Protection) or EASTERN MACEDONIA AND THRACE REGION (Independent Civil Protection Directorate)
	EL_12_42_03	Borrow pits sites for restoration/ maintenance of embankments in emergencies	EL12APSFR01 EL12APSFR02 EL12APSFR04	EASTERN MACEDONIA AND THRACE REGION (Directorate of Technical Projects / RU Sub-Directorates of Technical Projects, Independent Civil Protection Directorate)
	Specific Objective: O3.2 Improvement of knowledge on flood preparedness			
	EL_12_42_04	Establishing alert levels in the critical watercourses of the River Basin District based on the provisions of Laws 4662/2020 and 5075/2023	EL12APSFR01 EL12APSFR02 EL12APSFR04	EASTERN MACEDONIA AND THRACE REGION (Directorate of Technical Projects / RU Sub-Directorates of Technical Projects, Independent Civil Protection Directorate)
	EL_12_43_01	Flood risk awareness-raising actions for the public local authorities and communities	RBD EL12	MINISTRY OF CLIMATE CRISIS AND CIVIL PROTECTION, MINISTRY OF EDUCATION, MINISTRY OF ENVIRONMENT AND ENERGY,

GENERAL OBJECTIVE/ MEASURE LINE OF ACTION	MEASURE CODE	MEASURE TITLE	AREA OF APPLICATION	IMPLEMENTING AGENCY
				DECENTRALISED ADMINISTRATION OF EASTERN MACEDONIA AND THRACE (Civil Protection Directorate), EASTERN MACEDONIA AND THRACE REGION (Independent Civil Protection Directorate), MUNICIPALITIES in cooperation with the administration of school units
	EL_12_43_02	Information system to avoid use of Irish crossings due to flood events	RBD EL12	The road network operator, EASTERN MACEDONIA AND THRACE REGION (Independent Civil Protection Directorate, Directorate for Technical Projects)
	Specific Objective: O2.3 Strengthening flood risk management for protection			
	EL_12_42_01	Updating the Emergency Plans, and consolidation of emergency flood response actions/ Memorandum of Action at local level	RBD EL12	EASTERN MACEDONIA AND THRACE REGION (Independent Civil Protection Directorate), MUNICIPALITIES (Civil Protection Offices), DECENTRALISED ADMINISTRATION OF EASTERN MACEDONIA AND THRACE (Civil Protection Directorate)
	EL_12_42_05	Lowlands controlled flooding plan to protect settlements and critical infrastructure	EL12APSFR01 EL12APSFR02 EL12APSFR04	MINISTRY OF INFRASTRUCTURE AND TRANSPORT / Directorate for Flood Defences and Rehabilitation Projects (D19), EASTERN MACEDONIA AND THRACE REGION (Directorate for Technical Projects / RU Sub-

GENERAL OBJECTIVE/ MEASURE LINE OF ACTION	MEASURE CODE	MEASURE TITLE	AREA OF APPLICATION	IMPLEMENTING AGENCY
				Directorates for Technical Projects), MINISTRY FOR CLIMATE CRISIS AND CIVIL PROTECTION (General Secretariat for Civil Protection)
	EL_12_44_01	Drafting of a regulation of required actions for stream bed conveyance capacity restoration, riparian vegetation maintenance and management	RBD EL12	MINISTRY OF ENVIRONMENT AND ENERGY in cooperation with jointly competent bodies
O4: Improving the restoration mechanisms of affected areas RESTORATION	**Specific Objective: O4.2 Improvement of the preparation of rehabilitation works**			
	EL_12_52_01	Siting of sedimentation basins for the (temporary or permanent) deposition of sediments	EL12APSFR01 EL12APSFR02 EL12APSFR03 EL12APSFR04	EASTERN MACEDONIA AND THRACE REGION (Directorate of Technical Projects / RU Sub-Directorates of Technical Projects, Independent Civil Protection Directorate)
	Specific Objective: Σ4.3: Recovery from recent flood events			
	EL_12_51_01	Restoration of infrastructure damage from recent flood events	RBD EL12	Competent bodies, depending on the type of infrastructure, for recording, designing and restoring/providing compensation, in accordance with the applicable legislation

The 31 measures included in this 1st Review of the Thrace FRMP are presented in management action sheets, colour-coded per the General Objective served: Blue for S1, Green for S2, Orange for S3 and Purple for S4. Each management action sheet is accompanied by the documentation justifying the necessity of the measure and its connection with the calculations of this FRMP. The following Table (Table 10.4) shows the format of the management action sheets.

Table 10.4: Special Measures description form

MEASURE TITLE	Includes the title of the measure
MEASURE CODE	The measures are numbered as follows: EL_XX (RBD number)_XX (Measure Type according to WISE) _XX (Measure serial number)
CORRELATION WITH A MEASURE FROM THE FIRST CYCLE	Ongoing from the 1st Plan or New Measure
LINE OF ACTION	Prevention, Protection, Preparedness, Restoration
GENERAL OBJECTIVE	The FRM General Objective to which the measure relates (O1, O2, O3, O4)
TYPE OF FRM MEASURE	The FRM type code of the measure and its description
TYPE OF NATURAL WATER RETENTION MEASURE	The code number of the Natural Water Retention measure type and its description according to the Text "EU policy document on Natural Water Retention Measures, Technical Report", WFD CIS Working Group Programme of Measures (WG PoM), 2014 *and the Catalogue of NWRM | Natural Water Retention Measures*
SPECIFIC OBJECTIVE	The FRM Specific Objective to which the measure refers (O1.1, O1.2, O1.3, O2.1, O2.2, O2.3, O3.1, O3.2, O3.3, O4.1, O4.2, O4.3)
TYPE OF MEASURE	Legislative/ Administrative arrangements Measures of an economic nature Education/information measures Non-structural interventions Obtaining, supplementing and improving information Environmental measures (green infrastructure) Technical Flood Defences
MEASURE DESCRIPTION	A detailed description of the measure
IMPLEMENTING BODIES	Reference to the Competent Authority responsible for the implementation, application and coordination of the proposed measure at national, regional, local level as well as to the other bodies involved in its implementation
AREA OF APPLICATION OF THE MEASURE	River Basin District, APSFR, Runoff Basin, Water Body, place, etc.

MEASURE TITLE	Includes the title of the measure
MEASURE APPLICATION MONITORING INDICATOR	Varies by measure
TARGET VALUE	Varies by measure
MEASURE AREA OF IMPACT	River Basin District, APSFR, Runoff Basin, Water Body, place, etc.
MEASURE IMPACT MONITORING INDICATOR	Varies by measure
TARGET VALUE	Varies by measure
RESILIENCE TO CLIMATE CHANGE[2]	The resilience of the Measure to climate change conditions. Performance is assessed as Critical, High, Medium, Low.
CORRELATION WITH CLIMATE CHANGE TARGETS AND MEASURES	The correlation of each Measure with the targets and actions of the National Climate Change Adaptation Strategy (NCCCA 2016), the EASTERN MACEDONIA AND THRACE Regional Plan for Climate Change Adaptation (2023), the Climate Law and the EU Specifications.
CORRELATION WITH RBMP OBJECTIVES AND MEASURES	Notes on how the measure relates with the objectives and measures of the RBMP
IMPLEMENTATION PHASE	• Maturity • No tender • To be implemented • In a tendering or procurement procedure • Implementation
IMPLEMENTATION DURATION	Short-term : 0-2 years Medium-term : 2 - 6 years Long-term : > 6 years
PROPOSED IMPLEMENTATION TIMELINE	• Preparation and issuance of regulatory decision (for legislative arrangements): 6 to 12 months

[2] Climate resilience is defined as "The ability of interrelated social, economic and ecological systems to address a dangerous event or trend or disruption, through their response or reorganization in ways that maintain their main function, identity and structure" [PROVISIONAL FRAMEWORK FOR THE ASSESSMENT OF CLIMATE RESILIENCE OF INFRASTRUCTURE PROJECTS SUBMITTED FOR CO-FINANCING IN THE NSRF 2021 – 2027 PROGRAMMES, National Coordination Authority, General Secretariat of Public Investments & NSRF, Ministry of Development & Investments, December 2022.

MEASURE TITLE	Includes the title of the measure
(MILESTONES)	• Planning and implementation of educational actions : 12 to 24 months • Project dossier preparation, technical sheets and inclusion in a financing instrument – securing funding: 12 months • Tender procedure for contract award: 12 months • Preparation of designs, procurement, development of registers/systems and other plans. Varies by measure. • Licensing (if required) : 12 to 24 months • Project dossier preparation, technical sheets and inclusion in a financing instrument- securing funding for construction projects: 12 months • Tender procedure for construction project contract award: 12 months • Construction project implementation: Varies by measure.
PRIORITY RANKING ORDER	The ranking of the measure's priority based on the results of the assessment of its economic effectiveness.
ESTIMATED COST	An estimate of the cost of the measure
INDICATIVE FINANCING INSTRUMENT	The agencies/programmes that may be financing sources for the

10.4 Final Description of Measures of the 1ST FRMP Review of the Thrace RBD (EL12)

EL_12_61_01: Development of a Monitoring System for the FRMP's Programme of Measures

The project concerns:

(1) the development of a database and interactive platform to collect and monitor the information required by all actors involved in the implementation of the Programme of Measures; and

(2) receiving advisory services for this purpose from qualified staff. The provision of advisory services will include but not be limited to: (a) monitoring the implementation of the River Basin District's FRMP measures, (b) preparing designs and regulatory decisions, (c) coordinating the services involved in the implementation of the measures, (d) recording and analysing data related to FRMP measures/actions, (e) preparing methodological texts and technical specifications for implementation of FRMP measures, (f) actions for the collection/ updating of key data and data used in the preparation of the FRMP, (g) support on issues of the review of the Flood Risk Management Plan and participation in working groups to be established depending on the River Basin District's needs.

In the context of this project, evaluation reports will be drawn up on the progress of the implementation of the Programme of Measures, guidance will be given on the actions required to complete implementation, and measures will be evaluated for effectiveness.

EL_12_21_01: Harmonization of first level Urban Plans with the FRMPs

The measure concerns the issuance of a Circular Directive to recommend data that should be drawn from the FRMPs during the Analysis Stage/Diagnosis Section of the designs of the first level Urban Plans (Local Urban Plans/ Special Urban Plans), to formulate substantiated disaster hazard reduction Proposals, in accordance with the qualitative urban planning guidelines by way of the new Urban Planning Standards (Ministerial Decision ΥΠΕΝ/ΔΝΕΠ/32892/1414/2024, Government Gazette D' 200/01.04.2024).

EL_12_21_02: Construction and building arrangements within the 100-year flood zone

Introduction of special provisions in the Construction and Building Regulation to reduce the vulnerability of constructions / installations and structures within the 100-year Flood Zone from their exposure to flood risk, with the aim of reducing the disaster risk.

EL_12_21_03: Adaptation of first level Urban Plans in the areas of controlled flooding to contain flooding (retarding basins)

The measure concerns the appropriate adaptation of first level Urban Plans (Local Urban Plans/ Special Urban Plans) in the areas of controlled flooding, to recommend permitted uses and restrictions therein. The controlled flooding areas are identified in the special design of measure EL_12_42_05.

EL_12_21_04: Prevention and protection actions for Rural Development within the APSFR

The measure concerns actions such as, but not limited to, the following:

a) Identifying crops and sites that are subject to systematic flood damage. This is mainly related to the season and duration of flooding. It is a known fact that flooding for short periods and in wintertime or springtime may even be beneficial for some crops. In these cases, no compensations are paid out from ELGA (Agricultural Insurance Organisation) so particular care is required in collecting data from various bodies (in addition to ELGA).

b) Identifying and recording point, local or broader issues in artificial or natural drainage networks and their E/M equipment that exacerbate flood damage, and the improvement/restoration of which would reduce the losses, in order to propose restoration projects in application of measure EL_12_33_01 "Modernisation and restoration of drainage networks".

c) Recording the positions of livestock / poultry units suffering systematic flood damage (with IACS final data). Facilities with makeshift accommodation should be inventoried separately (Law 4056/2012 as in force) from the permanent stables.

d) Identifying crops and livestock facilities that need, as a priority and not exclusively, protection from flood.

e) Investigating alternative crops and/or varieties, which are effective, direct and can yield in the future the same level of agricultural income as existing crops, considering the suitability of soil and climate conditions, the knowledge of local producers and the available mechanical equipment and buildings of agricultural holdings. Further investigation into the possibility of irrigating same(since they will obviously be water-intensive) through land reclamation projects (existing or to be constructed) and the provision of irrigation and/or flood water, irrigation boreholes, irrigation network, etc., especially in times of water scarcity or drought.

f) Proposals for the use of alternative agricultural practices (sowing season, fertilization, harvesting, grazing sites, etc.), taking into account the seasonality of flood events and identifying the possible economic and other impacts of modifying agricultural practices.

g) proposals for financial and other incentives to change crops and/or relocate livestock units.

EL_12_23_01: Measures to protect the water supply boreholes of Water Utilities against flooding

The measure includes:

(1) The adoption by Water Utilities of appropriate measures for the flood protection of their water supply boreholes, located within the T=100-year flood zone. Such measures can be either e.g. lifting the electromechanical systems, piping and cabin of each borehole to a higher level, or constructing a protective perimeter embankment of appropriate height using suitable materials, etc.

(2) The River Basin Districts are to introduce a term stipulating the obligation to take flood protection measures in all water usage licenses issued under Joint Ministerial Decision 146896/27.10.2014 (Government Gazette B' 2878 and B' 3142) "Categories of licenses for the use and performance of water development projects. Procedure and terms for issuing licenses, content and term thereof and other relevant provisions", as amended and in force.

By taking appropriate flood protection measures, the risks inherent in a water supply borehole are avoided, and in addition to the damage to its above-ground electromechanical equipment, flood water ingress in the underground aquifer is also prevented.

EL_12_24_01: Restructuring and modernisation of meteorological and hydrometric data collection network

The measure concerns the upgrading and modernisation of the existing analogue network of hydrometeorological stations of the MoEE. The implementation of the measure includes, but is not limited to, the following actions:

a) the replacement of analogue hydrometeorological stations with digital telemetry stations across the country, and expansion of the network where required

b) the creation of a digital platform for recording and transmitting hydrometric and meteorological information.

The measure will be implemented in cooperation with the Water Directorates of the relevant Decentralised Administrations.

EL_12_24_02: Collection and digitization of watercourse demarcation data and flood defences data

The measure concerns the creation and maintenance of a database, by collecting and digitising information at APSFR level, regarding:

- Information on existing and new stream demarcation files per River Basin District and other useful information to prepare demarcation studies
- Already demarcated watercourses (geospatial elements of demarcation lines, etc.).

- Technical data of flood defences that affect water flow, including topographic surveys of existing structures conducted in the context of the FRMPs and other studies, as well as other available information on technical structures from designs and archives of other agencies.

EL_12_24_03: Creation of a National Flood Register (NFR) and development of a relevant interactive online platform

This is the design and development of a National Flood Register and a relevant interactive online platform, with the development of an appropriate spatial data system.

The NFR will at least include entries of flood events and their data made by competent services and involved agencies, in accordance with the General Emergency Response Plan and Immediate/ Short Term Management of Flood Consequences "DARDANOS", as applicable each time, based on guidelines to be issued by the competent service of the MoEE.

This way, the purpose is for all involved agencies to have and use uniform data to assess the damage and impact from extreme flood events, supporting management plans and flood risk assessments.

EL_12_31_01: Implementation of a forest engineering system for mountain water management structures and projects

The measure concerns natural water retention projects in mountainous areas.

(A) The Forest Engineering System for Mountain Water Training, which includes three organically linked and interdependent projects and measures:

1. Horticultural projects to create normal hydrogeonomic forests and shrubs, resistant to climate change, which contribute to the prevention of surface erosion, the increase of water retention and infiltration into the soil, the conversion of surface into subsoil runoff, and the deceleration of runoff.

2. Geotechnical projects (grading, scraping of slopes, drainage, trenches, dry stone walls, wattle, log erosion barriers, etc.) for the purpose of eliminating sediment-generating source or temporarily retaining rainwater.

3. Hydraulic technical structures involving a variety of technical constructions such as :

a) low dams built in the beds of the main and smaller branches used primarily to secure the beds, contain or sort sediments, prevent slides, contain flood peaks, abstract or store water, etc.

b) structures arranged in parallel to the water flow (embankments, linings, etc.) to protect the bank of streams and prevent slope erosion, limit the flow within a defined bed and protect riparian zones or enlarge the bed to allow natural formation.

(B) Open-type dam constructions and temporary sediment containment basins in intense torrentiality mountainous river basins.

This will include open barriers for sorting and temporary retention of sediments in order to stop massive sediment transfer (debris flows & Mud flows), the containment backwater effect, the temporary retention of sediments in basins, the control of the movement of sediments by sorting.

(C) Construction of dry detention ponds to contain flooding in mild torrentiality mountainous river basins.

Construction of dry detention ponds in the mountain stream beds to contain flooding. The action is applied only to mild torrentiality river basins or river basins whose torrentiality has been greatly absorbed and show normal debris & mud flow.

EL_12_31_01: Implementation of a forest engineering system for mountain water management structures and projects

The mountain water management projects will be implemented as a priority from upstream to downstream and in addition from the lower-order branches to the higher-order branches according to Strahler. Methods and materials compatible with the natural environment will be used in their construction.

In the context of the flood defences integrated design of the FRMP, it should be clarified that:

For areas where the implementation of a Masterplan is indicated as a measure (EL_12_35_02), projects falling under this measure will result from the Masterplan.

Exceptions to the above are:

1. Projects for which there is approved funding may proceed.
2. Projects that have at least one of the main characteristics (A and B) of the following Table may proceed, provided that they also meet the supplementary condition

A	*EMERGENCY SITUATIONS* *Projects covering an emergency need for the area's protection against floods, following natural disaster events (e.g. fire, significant floods, etc.) may proceed.*
B	*MULTIPLE FUNCTIONS* *Projects that serve multiple uses and functions may proceed.*
	SUPPLEMENTARY CONDITION: *The projects of the above categories A and B will proceed if there is evidence that they do not have a negative impact on the downstream, in terms of flood risk.*

The areas selected for the implementation of the measure are mountainous basins/sub-basins upstream of the APSFR where mountain water management structures will be constructed in suitable locations following a relevant forest engineering study.

EL_12_31_02: Natural water retention projects in the lowlands

The measure concerns natural water retention projects at the boundaries of the lowland bed of watercourses, as defined together with the mountain bed boundaries in the decisions of the former Prefects of the country and in accordance with the legislation in force, and as a priority in the 100-year flood zones within the APSFR (or upstream thereof) and/or in locations with high and very high risk (see Flood Impact Assessment Map).

The proposals for construction of NWRP projects will be developed according to the specifications during the preparation of flood protection project designs on the specific requirements and/or the preparation of Flood Protection Plans (Master Plan), where such plans are prepared.

The measure includes:

- floodplain restoration and management projects (N03) – "make room to river" - by removing artificial embankments to increase storage capacity and accelerate restoration after flood events.
- watercourse bed re-naturalisation (N05).
- re-meandering (N04) to increase storage capacity and buffer capacity.
- construction of offline dry detention basins and online ponds (N01) in the stream beds to contain flooding and lateral runoff/ and store flood flows.
- wetland restoration and management (N02) through riparian vegetation to increase storage capacity and slow the flow.
- restoration and reconnection of seasonal streams (N06) to increase storage capacity and drainage.
- Natural bank stabilization (N10) using bioengineering materials to increase drainage and reduce sediment delivery.

In the context of the flood defences integrated design of the FRMP, it should be clarified that:

For areas where the implementation of a Masterplan is indicated as a measure (EL_12_35_02), projects falling under this measure will result from the Masterplan. Exceptions to the above are:

1. Projects for which there is approved funding may proceed.
2. Projects that have at least one of the main characteristics (A and B) of the following Table may proceed, provided that they also meet the supplementary condition.

A	*EMERGENCY SITUATIONS* *Projects covering an emergency need for the area's protection against floods, following natural disaster events (e.g. fire, significant floods, etc.) may proceed.*
B	*MULTIPLE FUNCTIONS* *Projects that serve multiple uses and functions may proceed.*
	SUPPLEMENTARY CONDITION: *The projects of the above categories A and B will proceed if there is evidence that they do not have a negative impact on the downstream, in terms of flood risk.*

EL_12_31_03: Implementation of Natural Water Retention Measures (NWRM) / practical SUDs during the design of projects and activities under sub-category A1 and A2 of Law 4014/2011, as in force

During the design of projects and activities under sub-category A1 and A2 of Law 4014/2011, as in force, the implementation of Natural Water Retention Measures (NWRM) / practical SUDs should be considered as a priority, when flood defences are required, to limit surface runoff and contain flood flows.

EL_12_32_01: Multi-purpose reservoirs with a flood protection component

During the preparation of designs for new large dams that fall within the definition of Large Dams of the International Commission on Large Dams (ICOLD), i.e. dams with a height of 15 metres or greater from lowest foundation to crest or dams between 5 metres and 15 metres impounding more than 3 million cubic metres, used for irrigation or other functions, it is mandatory to consider the possibility of the dams operating for flood protection purposes in basins located upstream of APSFR. Flood protection requires additional storage volume and an appropriate reservoir operation schedule. Under these conditions, the reservoir can achieve flood containment, i.e. a reduction in the duration and magnitude of the flood peak. All planning must consider the multiple feasibility and requirements of environmental legislation and the Water Framework Directive 2000/60.

The planning of the projects should also take into account the provisions of the Dam Safety Regulation (Government Gazette B'4420/30.12.2016), and provide for the continuous improvement of the safety procedures for dams subject to this Regulation, as it falls within the remit of the Dams Administrative Authority (DMA) as a Commission operating under the General Secretariat for Infrastructure of the Ministry of Infrastructure and Transport.

EL_12_32_02: Use existing reservoir projects to contain flood flows

The measure includes actions to optimize the management of existing reservoirs so that, on the one hand, they meet the needs of the uses they serve in the best possible way and, on the other hand, they offer maximum flood protection downstream.

The reservoirs implementing the measure will be selected based on the results of the Flood Hazard and Flood Risk Maps and in particular the results of the flood risk assessment in the context of this review of the FRMP, downstream of existing or future Dams.

EL_12_33_01: Modernisation and restoration of drainage networks

The measure includes the following actions:

- Identifying problematic, in terms of drainage, lowland cultivated areas - assessment of the current situation.
- Checking the adequacy of drainage networks and E/M equipment in these areas.
- Drafting proposals and implementation of restoration projects/ upgrading of drainage works that may include:
  - clearing of existing trenches from vegetation and sediments
  - maintenance/replacement of technical structures for road crossings and flow control structures (gates, locks)

EL_12_33_01: Modernisation and restoration of drainage networks

- modernization of the existing E/M equipment (installation of an automatic adjustment and remote management system of the existing equipment for regulating the flow control structures).

- Prioritization of scheduling
- Implementation of interventions.

EL_12_33_02: Flood Defences

This measure shall be implemented if it is not possible to adequately implement measure EL_12_31_02 of this 1st Review of the FRMP concerning natural water retention projects in the lowlands. The measure includes the construction of new flood defences and/or the completion/reinforcement of existing flood defences in the lowland beds of the watercourses (for restoration/ maintenance projects see measure EL_12_35_05), as a priority in the 100-year flood zones within the APSFRs and in locations with high and very high risk (see Flood Impact Assessment Map), which are

(A) Proposed in the context of this document, or

(B) planned to be studied as per the proposals for the maturation of future projects of the Flood Protection Plans (Master Plan), where these are being prepared or will be prepared (Measure EL_12_35_02).

In the context of the flood defences integrated design of the FRMP, it should be clarified that:

For areas where the implementation of a Masterplan is indicated as a measure (EL_12_35_02), projects falling under this measure will result from the Masterplan. Exceptions to the above are:

1. Projects for which there is approved funding may proceed.
2. Projects that have at least one of the main characteristics (A and B) of the following Table may proceed, provided that they also meet the supplementary condition.

A	*EMERGENCY SITUATIONS* *Projects covering an emergency need for the area's protection against floods, following natural disaster events (e.g. fire, significant floods, etc.) may proceed.*
B	*MULTIPLE FUNCTIONS* *Projects that serve multiple uses and functions may proceed.*
	SUPPLEMENTARY CONDITION: *The projects of the above categories A and B will proceed if there is evidence that they do not have a negative impact on the downstream, in terms of flood risk.*

Note that the reference to T=100 concerns the geographical effect of the measure and is not related to the design size of flood defences, which is defined based on the regulations applicable each time and the technical specifications of the designs of said projects.

The measure shall include, as appropriate, projects comprising one or more of the following:

EL_12_33_02: Flood Defences

1. River/torrent training projects to increase their drainage capacity and to protect the bed from erosion (shaping the cross-section with or without lining the bottom or the slopes, supporting the slopes, construction of individual groynes within watercourses).
2. Construction of terraces/cascades to reduce the longitudinal slope where required.
3. Construction or reinforcement of embankments along the watercourses
4. Replacement or construction of culverts and bridges at road crossings that interrupt the continuity of watercourses.
5. Stream confluence training and watercourse/river estuary technical structures.
6. Construction of an artificial watercourse branch.
7. Silt removal from an untrained section of watercourse.

EL_12_34_01: Modernisation/replacement, maintenance and completion projects for existing rainwater drainage networks

The measure includes replacement, reinforcement and completion projects of rainwater drainage structures (rainwater collection, transport and disposal to the available recipients), affording priority to areas of high residential needs and requirements within the Areas of Potentially Significant Flood Risk.

The measure is implemented in the following phases:

1. Phase one, mapping the existing rainwater drainage networks
2. Assessment of the adequacy of the existing infrastructure by competent bodies, to determine the type of interventions required, if any, (such as: maintenance, reinforcement, replacement, extension),
3. Project preparation and implementation during this or the next management period.

EL_12_35_02: Integrated Flood Planning (Master Plan) and construction of the proposed projects

The measure includes the following actions:

(A) Implementation of Flood Protection Plans (Masterplan) for selected areas, to identify and prioritize the required Projects:

- within the APSFRs and upstream basins to mitigate the effects in the areas included in the T=100 Flood Hazard and Risk Maps of this Plan.
- in the remaining part of the River Basin District where a Masterplan is required.

(B) Preparation of the required designs for project maturity

(C) Construction of proposed projects

The Master Plan must be consistent with the provisions of the Management Plans of Directive 2000/60/EC (River Basin District status, exceptions, etc.) and for this purpose it must have the assent of the competent Water Directorate.

EL_12_35_02: Integrated Flood Planning (Master Plan) and construction of the proposed projects

Note that the reference to T=100 concerns the implementation areas of the measure and is not related to the design size of flood defences, which is defined based on the regulations applicable each time and the technical specifications of the designs of said projects.

EL_12_35_03: Assessment and maintenance of existing mountain water management structures and projects

The measure includes the assessment of the status of existing Mountain Water Management Structures in torrent and river basins and their maintenance to mitigate the effects in the areas included in T=100 flood zones. Operations will be studied and planned by the Forest Directorates and Forestry Offices responsible for the maintenance of the structures in their area of responsibility.

EL_12_35_04: Land use management measures in the runoff basins of torrents

The pasture management plans, in accordance with the requirements of Law 4351/2015 (Government Gazette A' 164) and Joint Ministerial Decision 1058/71977/2017 (Government Gazette B' 2331/07.07.2017) and in areas upstream of the APSFRs that have not been excluded from grazing land (they have not been characterized as protective), shall consider the provisions of the FRMP and RBMP and apply hydronomic criteria to determine grazing intensity (grazing capacity).

EL_12_35_05: Maintenance and restoration of existing training structures and flood defences

The measure includes the following actions that should be carried out annually:

- Performing onsite visits and recording problems after the end of the wet (winter) period (e.g.: April)
- Identifying critical positions and techniques in need of maintenance/restoration and setting priorities
- Preparation of annual maintenance/restoration work programme by the Region's competent technical services, which will include:
  - Clearing sediment and removing silt from the bed of watercourses that hinder the free runoff of the watercourse
  - Repairs of slope retaining/lining structures
  - Repairs of bed protection/lining structures
  - Embankment repairs
  - Repairs of technical structures (terraces, culverts, crossings, etc.)
- Securing funds
- Implementation of interventions

EL_12_41_01: Development and operation of an operational flood early warning system.

Development of an Operational Early Flood Warning System (ESEPP) with priority to selected T100 flood zones. The system shall include:

(a) Design and development of an early warning system for floods, using the hydrometeorological data of the updated network specified in measure EL_12_24_01, other data/models and appropriate software, based on the specifications of the ESEPP implemented by the MoEE in

Evros and Axios rivers and with the possibility of interconnection with their operating platform (ESEPP developer: MoEE/GDW).

(b) Design and development of a communication protocol between the ESEPP operator and the body competent for timely notifying the public and activating the competent bodies (notification process, alerts, information transmission mechanisms/tools e.g. sms), based on ESEPP data (ESEPP operator: Independent Civil Protection Directorate of the relevant Region or Ministry Climate Crisis and Civil Protection/GSCP).

EL_12_42_01: Updating the Emergency Plans, and consolidation of emergency flood response actions/ Memorandum of Action at local level

According to the provisions of the General Civil Protection Plan "Xenocrates", in 2019 the Directorate of Planning and Emergency Response of the Ministry Climate Crisis and Civil Protection/GSCP, in cooperation with all involved agencies, issued the General Emergency Response Plan and Immediate/Short Term Management of Flood Consequences, which was sent to all involved agencies with document 8794/06.12.2019 of the Ministry of Climate Crisis and Civil Protection/GSCP ("DARDANOS 1"). In 2023, the Emergency Planning Directorate of the Ministry Climate Crisis and Civil Protection/GSCP, taking into account that the 1st version of the plan brought about administrative and organisational changes, which mainly concerned central government agencies, issued the 2nd General Emergency Response Plan and Immediate/ Short Term Management of Flood Consequences, named "DARDANOS 2".

When fulfilling the obligations regarding the preparation or updates of Emergency Plans, Action Plans - Memoranda of Action by the competent agencies, pursuant to the applicable institutional framework, the results of the risk analysis of this 1st Review of the FRMP should also be taken into account.

EL_12_42_03: Borrow pits for restoration/ maintenance of embankments in emergencies

In the T1000-year flood zone where embankments have been constructed or are about to be constructed, the following actions shall be taken :

1) Study for the selection and demarcation of borrow pits for prompt availability of materials for embankment restoration;
2) Environmental Impact Assessment and compliance with the licensing procedure of the applicable provisions. The activity is part of Group 5, Mining and Related Activities of the Joint Ministerial Decision as amended and in force, no. 5 Borrow pits for aggregates and earth or other soil materials exclusively for the needs of infrastructure projects.

If an emergency is declared in the area, the Technical Control Directorate may issue a decision on the right to grant material directly, provided steps 1 and 2 have been completed.

EL_12_42_04: Establishing alert levels in the critical watercourses of the River Basin District based on the provisions of Laws 4662/2020 and 5075/2023

According to article 6 of Law 4662/2020 "State of Preparedness Scaling" and Law 5075/2023, the National Mechanism is activated on a scale depending on the state of preparedness.

The measure includes the following actions, with a view to setting the alert limits corresponding to the four levels of mobilization defined in legislation:

- Hydraulic control of watercourses and determination of their conveyance capacity (maximum flow rate they can safely convey - with the required margin according to the specifications)
- Identifying critical positions on watercourses where it would be possible to monitor and record the flow of the river (bridge positions, positions with accesses, linear positions suitable for water measurements)
- Identifying critical positions in relation to the progression of the flood wave routing and the position/distance of the adjacent affected uses and mainly of the settlements and road access infrastructure.
- Defining the level and flow at the above positions for the four (4) preparedness levels included in the legislation.

Defining the water flow corresponding to all the above preparedness levels at critical selected positions of the level - absolute elevation values.

EL_12_42_05: Lowlands controlled flooding plan to protect settlements and critical infrastructure

The measure concerns planning controlled flooding of lowland areas that will be selected as a priority within or upstream of the T100 flood zones and with the aim of protecting the areas within the T100 flood zones or reducing the flood risk as a priority of areas with high flood risk (as defined in the relevant Flood Risk Assessment maps), in the context of a special design of controlled area flooding, either during the preparation of flood defences MasterPlan (see EL_12_35_02) or other relevant design.

Controlled flooding areas are an internationally recognized flood protection practice, more and more acknowledged as a method of adaptation to climate change. Such areas, usually land of low value, contribute to the protection of downstream areas against flooding by controlled channelling of part of the flood volume to riverside areas using appropriate manoeuvres (opening gates or breaking embankments) during a flood event.

Once the boundaries of the mountainous and lowland bed of the watercourses are defined under the applicable legislation, and the boundaries of the settlements and the critical infrastructure to be protected are determined, the hydraulic behaviour of the watercourses for various flood flows shall be reviewed to identify the potential flood volume discharge sites and protect the settlements and/or critical infrastructure, checking the hydraulic behaviour of each proposal. Furthermore, it is necessary to formulate proposals and establish the positions where the existing embankments will be broken in a controlled manner and, finally, to establish a mechanism for assessing the effectiveness of the options (if they actually contributed to addressing the risk), after each flood event and updating /adjusting the plan.

For the purposes of this measure, critical infrastructure means units relating to human health, the natural environment, transport networks, public interest projects (irrigation, drainage, flood

defences, etc.) and cultural heritage sites, and as otherwise defined following the harmonization of Greek legislation with Directive 2022/2557/EC.

In the context of the flood defences integrated design of the FRMP, it should be clarified that:

For areas where the implementation of a Masterplan is indicated as a measure (EL_12_35_02), projects falling under this measure will result from the Masterplan. Exceptions to the above are:

1. Projects for which there is approved funding may proceed.
2. Projects that have at least one of the main characteristics (A and B) of the following Table may proceed, provided that they also meet the supplementary condition.

A	*EMERGENCY SITUATIONS* *Projects covering an emergency need for the area's protection against floods, following natural disaster events (e.g. fire, significant floods, etc.) may proceed.*
B	*MULTIPLE FUNCTIONS* *Projects that serve multiple uses and functions may proceed.*
	SUPPLEMENTARY CONDITION: *The projects of the above categories A and B will proceed if there is evidence that they do not have a negative impact on the downstream, in terms of flood risk.*

EL_12_43_01: Flood risk awareness-raising actions for the public, local authorities and communities

The measure includes the implementation of information and awareness-raising actions for citizens and bodies about the flood risk in their area and the precautions to take in case of flood risk. Such actions may be: television, radio and internet broadcasts, events, educational workshops, presentations in schools, etc. The above will be implemented by the Ministry of Climate Crisis and Civil Protection, the Ministry of Education, the Ministry of Environment and Energy, the Civil Protection Directorate of the relevant Decentralized Administrations, the Independent Civil Protection Directorates of the relevant Regions and the Municipalities in cooperation with schools.

Actions may concern issues such as:

- information on the local Areas of Potentially Significant Flood Risk (APSFR)
- information on the provisions of the relevant FRMP and its programme of measures
- the importance of ensuring that rainwater and watercourse drainage systems are cleared and accessible
- the possibility and need for private/community protection measures
- information on Emergency Response Plans and the importance of their observance by the competent authorities
- on existing Irish crossings, the associated hazards and actions to be taken to avoid accidents
- protection of economic activities (agriculture, livestock breeding, etc.).

EL_12_43_02: Information system to avoid use of Irish crossings due to flood events

The purpose of the measure is to enhance the preparedness of citizens and involved agencies to limit accidents during the transverse crossing of streams and rivers through Irish Crossings.

The object of the measure is the installation of a system consisting of, at least, warning signs and a level rods with depth markings at Irish Crossings within the River Basin District, in order to provide clear information and support the prevention of vehicles passing during floods.

This measure will be implemented on the one hand at all Irish Crossings within T=100-year flooding areas, according to the calculations of this 1st Review of the FRMP, and on the other hand at any other Irish Crossings that studies or data of the Competent Bodies show that they must be marked immediately.

The specifications of the warning system will be established by the Technical Services and the Civil Protection Directorates before tendering the projects. The specifications will cover the content and dimensions of the signs, the colours and markings of the level rods, whether or not the signs will provide and alternative route, whether or not bars will be installed to prevent passage through critical crossings, any required telemetry functionality or other bar handling devices, etc.

EL_12_44_01: Drafting of a regulation of required actions for stream bed conveyance capacity restoration, riparian vegetation maintenance and management

This measure includes the preparation of a regulation/specifications for the periodic actions of watercourse cleaning, and riparian vegetation maintenance and management. The regulation/specifications shall be formulated taking into account the specific characteristics of these watercourses (geomorphological and hydraulic characteristics, type of watercourse, ecological elements, etc.) as well as the protection status of the area over which they extend.

The regulation/specification(s) shall concern at least the following:

- The body responsible for cleaning operations, etc., based on the legislation applicable each time (in Natura areas, forests, etc.)
- the cleaning method applied
- the time and frequency of cleaning operations
- the position(s) to be cleaned
- the areas for disposal of cleaning materials or the recovery thereof
- the procedure to be followed such as environmental permits and/or informing authorities
- detailed instructions for the appropriate handling of riparian vegetation in the various parts of the hydrographic network (small mountain streams, tributaries, large rivers in floodplains) and the use of means that will not cause damage to the river ecosystem.
- the methodology for keeping a record of the interventions carried out

In any case, the cleaning of watercourses should be carried out where absolutely necessary, in a way that does not conflict with the objectives of the River Basin Management Plans of Directive 2000/60/EC.

Where bodies of water related to "Areas designated for the protection of habitats or species" of the Protected Areas Register of the approved RBMP fall within the area of application of the measure, ensure timely cooperation with the competent Management Unit of OFYPEKA to include terms and

EL_12_44_01: Drafting of a regulation of required actions for stream bed conveyance capacity restoration, riparian vegetation maintenance and management

conditions in the proposed regulation in order to address their potential impact on the object meriting protection.

EL_12_51_01: Restoration of infrastructure damage from recent flood events

The measure aims to restore infrastructure damage due to intense flood events that have occurred. This infrastructure includes, but is not limited to: Road and Railway Network, Irrigation and Drainage Projects, Flood Defences (Embankments, Trainings, Transverse Projects), Projects of cultural interest, Health Units, etc.

The project includes:

(a) recording losses,

(b) preparing relevant studies depending on the type of infrastructure, which will include, inter alia:

1. Resizing of the structures according to the updated flood sizes
2. Analysis of flood mechanisms that led to the failure of the infrastructure during occurrence of the flood event, to be taken into account during the redesign
3. Proposals for alternative interventions based on milder operations. And,

(c) restoration of damaged infrastructure.

EL_12_52_01: Siting of sedimentation basins for the (temporary or permanent) deposition of sediments

The scope of the measure is to determine the procedure for selecting the optimal sediment management process after each flood event. There are 2 distinct cases:

- Case 1: Sediments that contain no pollutants hazardous for public health. The measure in question establishes areas that can be used as temporary or permanent sediment deposition sites. For example, but not limited to: disposal as a soil coating material in sanitary landfills or quarries for rehabilitation. The possibility of using these materials by sorting and processing will be investigated at a later stage.
- Case 2: the sediments have been contaminated by pollutants hazardous for public health (including but not limited to: sewage, petroleum products, etc.). In this case, a sediment management study is required to define the separation, transportation and deposition process (including, but not limited to: disposal to sanitary landfill, hazardous waste landfill, etc.). Cooperation with the Sanitary Landfill or Waste Treatment Unit project owner (Municipality or FODSA (Solid Waste Management Agency)) is required.

The measure will consider the flooding areas as they result from the Flood Hazard and Risk Maps as well as the soil erosion maps drawn up under this 1st Review of the FRMP, in conjunction with the lists of diffuse and point source pollution prepared under the 2nd Review of the RBMP for the River Basin District (the spatial distribution of which is available in shapefiles) to enable assessment in advance of the sediment deposition sites and the sedimentation basins, for the different flood return periods under review.

10.5 Prioritization of the measures of the 1ST FRMP Review of the Thrace RBD (EL12)

The measures of the 1st Review of the FRMP of the Eastern Macedonia and Thrace RBD (EL12) are prioritized according to their economic effectiveness. The purpose of the prioritization is to highlight the measures that achieve a flood damage reduction (benefit) at the lowest cost.

All measures are complementary to each other and there is no question of choosing a measure with high cost-effectiveness index over another with a low index. Therefore, cost-effectiveness analysis makes sense mainly as an indication of the implementation priority of measures, taking into account the scarcity of available funds which dictates that high cost-effectiveness measures are to be promoted immediately.

The applied methodology for assessing the measures of the 1st Review of the FRMP of the Eastern Macedonia and Thrace RBD is a modification of the methodology applied in the 1st Implementation Cycle of the Floods Directive. The adopted steps are:

- The proposed measures are divided into two categories: the measures that indirectly contribute to the prevention of damage (Category 1) and the measures that directly contribute to the prevention/addressing of damage (Category 2).
- Assessment of the expected benefit of each measure in the two categories
- Assessment of the nature/line of action of the measure (Prevention, Protection, Preparedness, Restoration)
- Correlation with other policies (climate change, RBMP)
- Multi-criteria analysis of the overall benefit index of each measure
- Estimation of the total cost of each measure (investment cost, operating cost)
- Calculation of the cost-effectiveness index of each measure and prioritization of measures

The measure "Restoration of infrastructure damage from recent flood events" EL_12_51_01, is excluded from the prioritization process, as it is considered to be implemented by the competent authorities to restore the pre-event state, and indeed considering the failure mechanisms of each event, thus enhancing flood protection planning and infrastructure resilience.

Of the 30 measures of the FRMP that are prioritized :

- 17 are classified in Category 1 (measures that indirectly contribute to the prevention of damage and their implementation is expected to help the application of Category 2 measures); and
- 13 are classified in Category 2 (measures that directly contribute to the prevention/addressing of damage).

The following tables show the final prioritization of measures.

Table 10.5: Prioritization of the measures of the 1st Review of the FRMP for RBD EL12, by priority group for Category 1 (indirect contribution to flood risk) based on the cost-efficiency index

no.	MEASURE TITLE	MEASURE CODE	TYPE OF MEASURE	LINE OF ACTION	Priority Group
1	Development of a Monitoring System for the FRMP's Programme of Measures	EL_12_61_01	Obtaining, supplementing and improving information	Prevention	1st
2	Harmonization of first level Urban Plans with the FRMPs	EL_12_21_01	Legislative/ Administrative arrangements	Prevention	1st
3	Construction and building arrangements within the 100-year flood zone	EL_12_21_02	Legislative/ Administrative arrangements	Prevention	1st
4	Adaptation of first level Urban Plans in the areas of controlled flooding to contain flooding (retarding basins)	EL_12_21_03	Legislative/ Administrative arrangements	Prevention	1st
5	Prevention and protection actions for Rural Development within the APSFR	EL_12_21_04	Obtaining, supplementing and improving information	Prevention	1st
6	Restructuring and modernisation of meteorological and hydrometric data collection network	EL_12_24_01	Obtaining, supplementing and improving information	Prevention	1st
7	Collection and digitization of watercourse demarcation data and flood defences data	EL_12_24_02	Obtaining, supplementing and improving information	Prevention	1st
8	Creation of a National Flood Register (NFR) and development of a relevant interactive online platform	EL_12_24_03	Obtaining, supplementing and improving information	Prevention	1st
9	Implementation of Natural Water Retention Measures (NWRM) / practical SUDs during the design of projects and activities under sub-category A1 and A2 of	EL_12_31_03	Legislative/ Administrative arrangements	Protection	1st

no.	MEASURE TITLE	MEASURE CODE	TYPE OF MEASURE	LINE OF ACTION	Priority Group
	Law 4014/2011, as in force.				
10	Integrated Flood Planning (Master Plan) and construction of the proposed projects	EL_12_35_02	Technical Flood Defences	Protection	1st
11	Land use management measures in the runoff basins of torrents.	EL_12_35_04	Measures of an environmental nature	Protection	1st
12	Flood risk awareness-raising actions for the public local authorities and communities	EL_12_43_01	Education/information measures	Preparedness	1st
13	Drafting of a regulation of required actions for stream bed conveyance capacity restoration, riparian vegetation maintenance and management	EL_12_44_01	Legislative/ Administrative arrangements	Preparedness	1st
14	Updating the Emergency Plans, and consolidation of emergency flood response actions/ Memorandum of Action at local level	EL_12_42_01	Obtaining, supplementing and improving information	Preparedness	2nd
15	Borrow pits sites for restoration/ maintenance of embankments in emergencies	EL_12_42_03	Measures of an environmental nature	Preparedness	3rd
16	Establishing alert levels in the critical watercourses of the River Basin District based on the provisions of Laws 4662/2020 and 5075/2023	EL_12_42_04	Non-structural intervention	Preparedness	3rd
17	Siting of sedimentation basins for the (temporary or permanent) deposition of sediments	EL_12_52_01	Measures of an environmental nature	Restoration	3rd

Table 10.6: Prioritization of the measures of the 1st Review of the FRMP for RBD EL12, by priority group for Category 1 (direct contribution to flood risk) based on the cost-efficiency index

no.	MEASURE TITLE	MEASURE CODE	TYPE OF MEASURE	LINE OF ACTION	Priority Group
1	Measures to protect the water supply boreholes of water utilities against flooding	EL_12_23_01	Legislative/ Administrative arrangements	Prevention	1st
2	Multi-purpose reservoirs with a flood protection component	EL_12_32_01	Technical Flood Defences	Protection	1st
3	Use existing reservoir projects to contain flood flows	EL_12_32_02	Technical Flood Defences	Protection	1st
4	Modernisation and restoration of drainage networks	EL_12_33_01	Technical Flood Defences	Protection	1st
5	Development and operation of an operational flood early warning system	EL_12_41_01	Obtaining, supplementing and improving information	Preparedness	1st
6	Lowlands controlled flooding plan to protect settlements and critical infrastructure	EL_12_42_05	Technical Flood Defences	Preparedness	1st
7	Information system to avoid use of Irish crossings due to flood events	EL_12_43_02	Non-structural intervention	Preparedness	1st
8	Implementation of a forest engineering system for mountain water management structures and projects	EL_12_31_01	Measures of an environmental nature	Protection	2st
9	Natural water retention projects in the lowlands	EL_12_31_02	Measures of an environmental nature	Protection	2st
10	Assessment and maintenance of existing mountain water management structures and projects	EL_12_35_03	Technical Flood Defences	Protection	2nd
11	Maintenance and restoration of existing training structures and flood defences	EL_12_35_05	Technical Flood Defences	Protection	2st
12	Flood Defences	EL_12_33_02	Technical Flood Defences	Protection	3rd
13	Modernisation/replacement, maintenance and completion projects for existing rainwater drainage networks	EL_12_34_01	Technical Flood Defences	Protection	3rd

Applying the methodology for prioritization of measures based on the cost-efficiency index reveals the following :

For Category 1 measures (indirect contribution to flood risk) presented in Table 10.5:

- 13 measures are in the 1st priority group;
- 1 measure is in the 2nd priority group; and
- 2 measures are in the 3rd priority group.

For Category 2 measures (direct contribution to flood risk) presented in Table 10.6:

- 7 measures are in the 1st priority group;
- 4 measures are in the 2rd priority group; and
- 2 measures are in the 3rd priority group.

The total initial investment cost of the programme of measures is estimated at ~€155.15 million (see Table 10.7). The measures of the flood protection line of action account for the largest share of the total cost, approx. ~ €147 million. The balance of ~€8.2 million relates to the remaining three lines of action (Prevention, Preparedness and Restoration). The measure "Restoration of infrastructure damage from recent flood events" EL_12_51_01 does not participate in the cost calculation.

Table 10.7: Number of measures per line of action and total initial investment cost

LINE OF ACTION	No. of Measures	Cost of initial investment (€ mil)
Prevention	9	~3,150,000
Protection	12	~147,000,000
Preparedness	8	~4,000,000
Restoration	2	1,000,000
TOTAL	**31**	**~155,150,000**

11 MONITORING THE APPLICATION OF THE 1ST FRMP REVIEW

11.1 Priorities and how application of the plan will be monitored

Monitoring the application of the FRMP and recording and evaluating the implementation progress of the Programme of Measures, in accordance with the existing institutional framework, is performed, at national level, by the General Directorate for Water and, at regional level, by the competent Water Directorate of the relevant Decentralized Administration. The implementing agencies of the Measures come from all three levels of Administration (Central/ Executive Services, Decentralized Administration, Local Government Organizations (LGOs)).

Specifically, according to Article 3 of Joint Ministerial Decision 31822/1542/31822/1542/E1032010 21-07-2010 (Government Gazette 1108 B'/2010), as in force, as well as Article 26 (1) of Chapter A' and Article 36 (c) of Chapter C 'of Law 5037/78 A/28-3-2023, the General Directorate for Water "prepares annual reports on the implementation, evaluation and application control of the previous period's national flood risk management programme, based on the annual reports of the Water Directorates of the Decentralized Administrations and submits them to the Minister of Environment and Energy". In this context, there is a provision for measure EL_12_61_01 "Development of a Monitoring System for the Flood Risk Management Plan's Programme of Measures", which is about the development of a database for collecting and monitoring the information required by all actors involved in the implementation of the Programme of Measures and receiving advisory services by qualified staff.

The Annual Progress Reports are a key tool for monitoring application of the FRMP and its implementation progress. To optimize the management of the information collected from these reports and therefore to more effectively monitor the application of the Programme of Measures, it was considered appropriate to develop, in the context of the 1st Review, specific indicators related to the implementation of each measure. These indicators concern both the very process of monitoring their implementation and the impact of the measures on the application of the FRMP objectives and are described below.

11.2 Indicators Monitoring the Application of Measures

Indicators monitoring the application of measures process are defined per measure based on the progress of its physical object. The reference point for such monitoring indicators is the **area of application of each measure** (e.g. 100-year zone, APSFR, River Basin District, etc.).

Essentially, monitoring indicators attempt to quantify the progress of application of a measure, usually per implementation stage, in an easy-to-understand and comprehensible way both for the competent monitoring services and for wider audiences.

These monitoring indicators are always accompanied by a target value for each measure. For percentage indicators (e.g. % of projects per implementation stage, out of all projects required) this value is usually set at 100%, which corresponds to the full completion of the physical object of the measure.

The selected monitoring indicators of the measures' application process and associated target values per measure are shown in the management action sheet of each measure.

11.3 Measure Impact Monitoring Indicators

The **impact monitoring indicators** are determined per measure and relate to the quantification of the positive impact of each measure. The reference point for such monitoring indicators is the **impact area of each measure** (e.g. APSFR, River Basin District, etc.).

Essentially, the impact monitoring indicators attempt to quantify the contribution of the measure's application to the reduction of the flood risk. By extension, the application of impact indicators relates to and helps quantify the achievement of the specific objectives developed in the 1st Review from the General Objectives established in the 1st FRMP, in order to identify, distinguish and explain the individual aims that together will effectively cover the achievement of each General Objective, in correlation both with the lines of action of the programme of measures and with the proposed measures.

Like the monitoring indicators of the measures' application process, the impact indicators are related to a target value, which is a very important element of the indicator. The target value is linked to the specific nature of each measure and expresses the measure's contribution to the reduction of the flood risk and ultimately to the achievement of the Specific Objective.

The selected impact monitoring indicators and associated target values per measure are shown in the management action sheet of each measure.

12 Public consultation of the 1ST FRMP Review of the Thrace RBD (EL12)

To inform the public and the Bodies and Institutions involved, a sufficient number of meetings were organized where the Draft Flood Risk Management Plans were published for consultation. The consultations were held both at local/regional level and at central level and aimed on the one hand at the active participation of involved parties either by attending the events or by submitting proposals on the issues in consultation.

During the implementation of the consultation and communication actions, the following was carried out:

- In the first 4 months, onsite visits to the study area were organised along with meetings with institutions and services and a report was submitted on the special areas outside the Areas of Potentially Significant Flood Risk.
- Subsequently, the Flood Hazard Maps and the corresponding accompanying Technical and Non-Technical Reports were posted on the website of the GDW of the Ministry of Environment and Energy https://floods.ypeka.gr/.
- Then, the Flood Risk Maps and the corresponding accompanying Technical and Non-Technical Reports were posted on the website of the GDW of the Ministry of Environment and Energy https://floods.ypeka.gr/.
- The Draft Flood Risk Management Plans and the Strategic Environmental Assessments (SEA) were posted on the website of the GDW of the Ministry of Environment and Energy https://floods.ypeka.gr/consultation/2round-consultation/.
- A form for submitting remarks and corrections to the Draft was posted on the website of the GDW of the Ministry of Environment and Energy https://floods.ypeka.gr/2round-consultation-el12/.
- The Invitation and Agenda of the Consultation Day in Komotini on the 1st Review of the FRMP of the Thrace River Basin District (EL12) were posted.
- The List of Social Partners for the 1st Review of the FRMP of the Thrace River Basin District (EL12) was posted.
- Questionnaires were posted whereby stakeholders and the public could participate in the consultation, briefly expressing their views. The questionnaires were digital and available via the website of the Ministry of Environment and Energy (https://floods.ypeka.gr/consultation/consultation-events/). The questionnaire is also included in the Documentation text : "Report on the Consultation Results".
- On Tuesday, July 02, 2024, a Consultation Day was held in Komotini for the 1st Review of the FRMP of the Thrace River Basin District (EL12), and the following was provided in printed and/or electronic form:
  - ✓ Brief Draft Flood Risk Management Plan for the Thrace RBD
  - ✓ Questionnaire on the consultation issues of the Thrace RBD.

  The Consultation Day in Komotini was a hybrid event, with more than 190 people participating both in-person and remotely via live or video broadcast.

Overall, the consultation for both the Draft Flood Risk Management Plan and the SEA of the 1st Review of the Flood Risk Management Plan for the Thrace RBD (EL12) lasted for more than 7 months.

The list of social partners of the Thrace River Basin District who were informed about the consultation of the 1st Review of the Flood Risk Management Plan, includes 714 bodies, at National, Regional and Local level. Of all the bodies identified, 255 are **decision-making bodies**, 39 are **management bodies**, 60 are **Experts / Specialists**, 12 are **Flood Response Bodies**, 49 are **Users/Consumers** and 299 are **Media - News agencies**.

In the context of the consultation procedure, in accordance with article 7 para. 4.1 and 4.2 of Joint Ministerial Decision no. ΥΠΕΧΩΔΕ/ΕΥΠΕ/οικ.107017/06 (Β' 1225), as amended and in force by Joint Ministerial Decision No. 40238/17 (Β' 3759), as in force, the file of the Strategic Environmental Assessment (SEA) of Flood Risks for the River Basins of River Basin District EL12 was posted on the website of the Ministry of Environment and Energy: Consultation – Strategic Environmental Assessments (1st Review) – Thrace RBD (EL12) – Flood Risk Management Plans. The competent departments were asked to express their opinion, within their remit, and any comments by sending them to the following email address sec.dipa@prv.ypeka.gr.

The consultation process is considered successful as it contributed to informing local bodies and the public about the 1st Review of the FRMP, highlighted issues and problems faced by bodies regarding flood risk management and local specificities to be taken into account, conveyed the experience of bodies from the implementation of the first FRMP and the main problems they face, demonstrated the need for amendments and ultimately contributed to the final formulation of the 1st Review of the Flood Risk Management Plan for the Western Macedonia River Basin District (EL12).

Considering the comments, observations and suggestions made during the Consultation of the Draft Flood Risk Management Plan of the Thrace River Basin District and the SEA, the main conclusions are the following:

- The need to monitor the effectiveness of the implementation of the measures and to make a meaningful assessment of the overall implementation progress of the FRMP.
- The need to support the bodies implementing the measures for application of the FRMP.
- The need for coordination among the authorities and services involved in the implementation of the programme of measures, since there appears to be an implementation gap, both procedural and content-wise, between the strategic design of the FRMPs (responsibilities of the Ministry of Environment and Energy and the Decentralized Administration) and the selection, maturation and implementation of projects (Regions, Municipalities, Ministry of Infrastructure and Transport).
- Reservations as to the immediate applicability of urban-planning measures and the need to provide for transitional provisions until the implementation of urban-planning measures.
- The need to manage Vistonida lake, so that it does not become a marsh, and to take measures to contain sediments in the basins that feed into the lake (prioritization of mountain water management projects in the basins that feed into Vistonida lake)
- The need to repair and maintain the existing sewerage pumping stations which are currently abandoned and underperforming.
- The need to implement the designed dams in the Thrace RBD to ensure effective control of flood flows and utilize surface runoff for irrigation.
- The need to use reservoirs to contain flood flows (measure EL_12_32_02 "Use existing reservoir projects to contain flood flows"). Reservations on the part of PPC regarding the application of the measure to PPC dams whose main purpose is the production of electricity.

- The need to apply measure EL_12_35_04 "Land use management measures in runoff basins of torrents" especially on the island of Samothrace, as well as measure EL_12_42_03 "Borrow pits for restoration/ maintenance of embankments in emergencies".
- The need to draw up specifications on how watercourses should be cleared in the context of implementing measure EL_12_44_01, so that, on the one hand, they continue to operate as flood defences, and, on the other hand, ensuring that clearing does not affect biodiversity and does not risk erosion of their bed.
- The need to implement the mountain water management projects in a way that will not affect fish fauna in the mountain torrents.
- The need to prioritize Natural Water Retention projects over traditional flood defences.
- The need to draw up specifications for natural water retention measures in the lowlands (measure code EL_12_31_02) to provide appropriate and binding guidelines to public bodies implementing flood defences (e.g. technical services of the Regions) but also to designers to incorporate these approaches into their designs.
- Reservations regarding the direct applicability of Measure EL_12_21_04 "Prevention and protection actions for Rural Development within the APSFR"
- The need to ensure that the flood defences to be constructed will be implemented in a way that causes minimum environmental impact, so that they do not cause more problems than those they attempt to solve.
- The need to prioritize flood defences in the context of MASTER PLANS, favouring environmentally friendly projects, natural water retention projects and mountain water management projects.
- Update information on highland and lowland beds to enable the performance of water management projects at country level, and staff the forestry services with all engineering expertise required to implement the FRMP measures.

13 CROSS-BORDER COOPERATION

13.1 General

In the Thrace River Basin District (EL12), Greece shares with its neighbouring countries the Nestos river basin (with Bulgaria), and the Evros river basin (Evros, Ardas and Erythropotamos with Bulgaria, and Evros with Turkey).

The cross-border cooperation for the management of transboundary water resources includes the following intergovernmental agreements between Bulgaria and Greece:

(a) 1964 agreement between Greece and Bulgaria on cooperation in the use of the waters of the rivers flowing through the territories of the two countries (Legislative Decree 4393/1964, Government Gazette 193 A), and

(b) Agreement between Greece and Bulgaria on the waters of Nestos River (1995), which was ratified by Greece with Law 2402/1995 (Government Gazette A'98); Article 1 of the Agreement stipulates that Greece's level of rights of use shall be determined as a percentage of the river's waters formed in Bulgarian territory, based on the multi-year total Average Natural Runoff. This percentage is set at 29%.

Figure 13.1: The transboundary Nestos basin

Figure 13.2: The transboundary Evros basin

13.2 Data exchange with Bulgaria

Bulgaria, as a member of the EU since 2007, has an obligation to fully apply Directive 2007/60/EC.

On July 27, 2010, a Joint Declaration was signed between the (then) Minister of Environment, Energy and Climate Change of Greece and the Minister of Environment and Water of Bulgaria "on understanding and collaboration in the field of the use of water resources on the respective territories of the shared river basins" of the two countries. On 16 May 2011, on the basis of this Joint Declaration, a meeting was held in Drama between national delegations, where a Joint Expert Working Group was established focusing on cooperation on water and environment issues in transboundary basins. The objectives of the Working Group include cooperation on addressing flood risks in the context of application of Directive 2007/60/EC.

The Working Group had the following composition:

On the Bulgarian side:

The Director of RBD BG3, as National Representative
The Director of RBD BG4, as National Representative
One (1) position of Deputy National Representative is provided for.
Six (6) other full members

On the Greek side:

The Secretary General of Natural Environment and Water, Head of the Greek Delegation
One (1) position of Deputy National Representative is provided for
Three (3) members from the Ministry of Environment and Energy
One (1) member from the General Secretariat for Civil Protection
One (1) member from the Eastern Macedonia – Thrace Water Directorate
One (1) member from the Central Macedonia Water Directorate
One (1) member from the Ministry of Foreign Affairs

It is also possible for experts on various topics related to the scope of the Working Group to assist the work of the Group, as necessary. Three sub-working groups were established on: a) pricing policies, b) administrative and legislative issues, and c) technical data.

Following its establishment on 16 May 2011, the Joint Working Group has met on 12 October 2011 in Sofia, on 23 April 2013 in Thessaloniki, on 8 May 2014 in Athens, on 13 May 2016 in Sandanski and on 21 June 2017 in Kavala. At the 2nd meeting in Sofia, the Joint Working Group set up three sub-working groups on: a) pricing policies, b) administrative and legislative issues and c) technical data required for the application of Directives 2000/60/EC and 2007/60/EC.

The sub-working group on technical data has since met five times, on 26 April 2012 in Kavala, on 25-26 July 2013 in Blagoevgrad, on 23 June 2015 in Athens, on 15 February 2018 in Sofia and online on 1st December 2021.

In addition to the legal framework, the collaboration between the two countries also includes initiatives and collaborations in programmes (research, development, territorial cooperation, etc.) related to transboundary basins. Specifically:

i. as regards the Nestos transboundary basin, the “AutoNest- Automated Telemetric Applications for the Operational Monitoring of the Nestos River Basin" programme was launched in 2011. The project was funded by the Cross-Border European Territorial Cooperation Programme "Greece Bulgaria 2007-2013”, which is co-funded by the European Regional Development Fund (ERDF) and national funds of the participants.

   This programme aimed to :

   - Improve infrastructure and build capacity among competent authorities, in relation to the monitoring and management of water resources.
   - Create telemetry networks for monitoring water quality in Greece and Bulgaria, and develop a common data management framework to collect comparable, reliable and operational telemetry data.
   - Ensure protection against water pollution.

   The project partnership consisted of the Central Macedonia Water Directorate of the Macedonia Thrace Decentralized Administration (Lead Partner), the Inter-Balkan Environment Centre and the "Economika 2000” Club, Bulgaria.

ii. as regards the transboundary Evros basin, there was collaboration in the framework of the Greek-Bulgarian programme "Flood warning system establishment in Arda river basin for minimizing the

risk in the cross border area"/"ARDAFORECAST", on the creation of a flood early warning system in the Arda river basin.

This programme was implemented by the Regional Development Fund of the Region of Eastern Macedonia and Thrace in collaboration with the National Institute of Meteorology and Hydrology (Lead Partner), East Aegean River Basin Directorate, and the Democritus University of Thrace (Department of Civil Engineering), in the framework of the European Territorial Cooperation Programme, Greece – Bulgaria 2007-2013.

The project was dedicated to creating, installing and preparing in real time a flood early warning system, flood prevention and flood mitigation measures. The technical line of the project's development was the utilization of all the information about the river basin in computational flood forecasting tools.

The overall objectives of the project were to improve flood risk management in the border area, to increase the effectiveness of flood mitigation measures and, finally, to define flood prevention policies or measures to improve safety and quality of life.

Data developed in the context of ARDAFORECAST were used in the preparation of the FHMs in the 1st implementation cycle of Directive 2007/60/EC at the Evros river basin, with the most important being the much improved DTM of the Greek part of the Ardas basin, which was based on the enrichment of the existing backgrounds with data digitized from small-scale maps and on-site mapping of critical points. Moreover, to create FHM in the 1st FRMP, measurement data were provided by the Bulgarian side through the ARDAFORECAST programme from certain hydrometric stations located on the Evros river in Bulgaria .

iii. As regards the transboundary basins shared by Greece and Bulgaria, there is currently collaboration between the competent bodies of Greece and Bulgaria in the framework of the FLOODGUARD project "Integrated Actions for Joint Coordination and Responsiveness to Flood Risks in the Cross-Border Area", which is carried out under the Cooperation Programme Interreg V-A "Greece-Bulgaria 2014-2020". The aim of the project is to help capacity-building of the authorities to ensure effective, integrated joint coordination and response to flood risks in the Greece-Bulgaria cross-border area.

iv. Also, in the context of the FRMP review, the Bulgarian side provided information on the flow rates from the neighbouring Bulgarian stations located in Evros river (except Dolno Lukovo) at hourly intervals, from the hydrological year 2008-09 onwards, until the summer of 2022 and in Fr. Ardas at the border with Greece from the hydrological year 2013-14 until the summer of 2022. Data analysis was performed at quite a small scale and allowed the creation of a sample of maximum annual peaks at each station up to hydrological year 2021-22, data which updated the available time series established in the 1st FRMP. Utilizing these data, real flood hydrographs of historical floods are generated in certain positions to be used in the compilation of composite flood hydrographs for the input floods of the hydraulic model, regarding all periods of return of interest.

13.3 Data exchange with Turkey

The case of Turkey is different, as the country is not a member of the EU and therefore has no obligation to apply Directive 2007/60/EC. Nevertheless, cooperation in water resources management is desirable

on both sides. Besides, the Directive provides that in the case of transboundary river basins of EU Member States with third countries, every effort must be made by the MS to provide a platform for cooperation with the third country or countries on water management in such a way as to serve as far as possible the Directive's objectives.

It is worth mentioning that both the Greek and Turkish sides place great emphasis on the issue of a common response to the problem of the Evros floods, an issue that is also related to the application of the respective Directive 2007/60/EC. On 20.06.1934 the Agreement "on the regulation of hydraulic structures on both banks of the Maritsa-Evros river" was signed and ratified by L. 225/1936 (Government Gazette 474 A).

On 14 May 2010, a Joint Declaration was signed in Athens between the then Minister of Environment, Energy and Climate Change of Greece and the Ministry of Environment and Forests of the Republic of Turkey "for the implementation of a system of permanent cooperation for the sustainable development of the Evros basin". On the basis of the Joint Declaration, an Ad Hoc Joint Committee was established on cooperation issues for the Evros River, which held its first meeting on 30 May 2011; moreover an Ad hoc Working Group was established within this framework, which held a meeting in Alexandroupolis on 08.09.11.

So far, information has been exchanged on the available monitoring stations (meteorological, rainfall and hydrometric) on the territory of the two countries.

During the preparation of the FRMP for the Evros river basin, in the 1st implementation cycle of Directive 2007/60/EC, Turkey provided hydrometric data from 2005 onwards from various positions on Evros river and its tributaries. These data were used in the hydrological analysis for the preparation of the Flood Hazard and Flood Risk Maps of the Evros basin.