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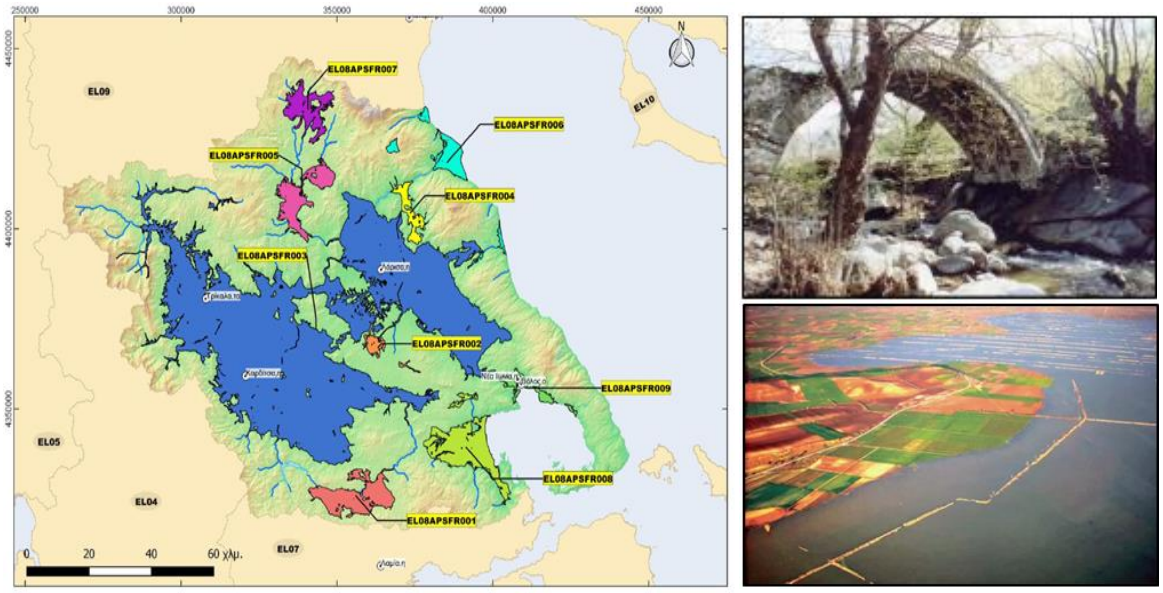

1st REVIEW OF THE

FLOOD RISK MANAGEMENT PLAN

of the river basins of the of the Water Department of Thessaly (EL08)

Phase 2 - Deliverable 19

TRANSLATION INTO ENGLISH OF THE SUMMARY REPORTS OF THE METHODOLOGIES AND RESULTS OF THE STUDIES OF THE DELIVERABLES

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GREEK REPUBLIC

MINISTRY OF ENVIRONMENT AND ENERGY

GENERAL DIRECTORATE FOR WATER

PROJECT: 1st REVIEW OF RIVER RISK MANAGEMENT PLANS FOR RIVER WASTEWATER DRAINAGE RIVERS OF THE WATER DISTRICTS OF EPIRUS, WESTERN CENTRAL GREECE AND THESSALY

PREPARATION OF THE 1st REVIEW OF THE FLOOD RISK MANAGEMENT PLAN FOR THE WATER DRAINS OF THE WESTERN WATER DISTRICT OF THESSALY

TRANSLATION INTO ENGLISH OF THE SUMMARY REPORTS OF THE METHODOLOGIES AND RESULTS OF THE STUDIES OF THE DELIVERABLES

Reviews:

Version	Date	Comments
Edition 1	20/12/2024	1st edition
Edition 2	31/05/2025	2nd edition

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1 Directive 2007/60/EC in Greece

- Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the **assessment** and **management** of **flood risk**.
- Incorporation into Greek legislation: Joint Ministerial Decision ΗΠ 31822/1542/E103/2010 (Government Gazette B' 1108/21.07.2010).
- Amendment by Joint Ministerial Decision 177772/924/2017 (Government Gazette B' 2140/22.06.2017).
- Amendment by the law n. 5037/2023 (Government Gazette A 78/29.03.2023).

Directive 2007/60/EC is implemented in Greece in three stages:

Stage 1: Preparation of the **Preliminary Flood Risk Assessment** for each river basin and the identification of the Areas of Potential Significant Flood Risk (APSFR)

Stage 2: Preparation of **Flood Hazard Maps** and **Flood Risk Maps**.

Stage 3: Preparation of **Flood Risk Management Plans**, including a **Programme of Measures,** for the Areas of Potential Significant Flood Risk.

The above shall be reviewed every **6 years.**

1st cycle of implementation of Directive 2007/60/EC

1. Preparation and submission to the EU of the Preliminary Flood Risk Assessment (PFRA) for the 14 River Basin Districts of Greece and identification of the Areas of Potential Significant Flood Risk (2012).
2. Preparation and submission to the EU of the initial Flood Hazard Maps and Flood Risk Maps (2017).
3. Preparation and submission of the initial Flood Risk Management Plan to the EU. The initial Flood Risk Management Plan of the RBD of Thessaly (EL08) was approved by Decision ΥΠΕΝ/ΓρΕΓΥ/41387/331/ Government Gazete Β' 2689/06.07.2018

2nd implementation cycle of Directive 2007/60/EC

1. Preparation and submission to the EU of the 1st Review of the Preliminary Flood Risk Assessment (1st PFRA) for the 14 River Basin Districts of Greece and Review of the Areas of Potential Significant Flood Risk (2020).
2. Following an open international tender, General Secretariat for Natural Environment and Water of the Ministry of Environment and Energy commissioned the:
    a. Preparation and submission of the initial Flood Hazard Maps and Flood Risk Maps in the Areas of Potential Significant Flood Risk (2023),
    b. Preparation of the 1st Review of the Flood Risk Management Plan (FRMP), which is currently under consultation.
    c. Preparation of the Strategic Environmental Impact Assessment (SEA) for the 1st Review of the FRMP.

Competent Authorities

The **Ministry of Environment and Energy / General Secretariat for Natural Environment and Water** formulates the policy for water protection and management and monitors its implementation. **The General**

Secretariats exercise the responsibilities of the Decentralised Administration for water protection and management including flood risk. For the River Basin District of Thessaly (EL08) the competent authorities are the Secretariat for Water of Thessaly.

2 The River Basin District of Thessaly EL08

The RBD of Thessaly consists of the river basins (**RB**) of **Pineios** (EL16) and **Almyros-Pelion streams** (EL17) and covers a total area of 13.377 km^2. The Pineios RB, with an area of approximately 9.500 km^2 includes Pineios river and its main tributaries as well as the basin of Lake Karla. The main tributaries of Pineios are: a) to the south: Enipeas (132 km), Farsaliotis (38 km), Sofaditis (in which the Smokovou dam is constructed) (56 km) and Kalentzis (which receives water from the river diversion of Tavropos through Plastira reservoir) (58 km) b) to the west-southwest: Pasimos (25 km) and Portaikos (24 km) c) in the north side: Lithaios (63 km), Neochoritis (27 km) and Titarisios (96 km). The Almyros-Pelion stream RB includes a lot of streams of which flow into Pagasetic Gulf.

In the RBD of Thessaly, the predominant land use is agriculture (45%). The district contains the largest plain in Greece, which is extensively cultivated and produces 14,2% of the country's primary sector products. According to the 2011 census, the population of the RBD reached 686.845, showing a decrease of 2,3% compared to the 2011 population.

The total estimated annual water abstractions in the Thessaly RBD (EL08) amount to approximately 1,287 hm^3. Of these, about 400 hm^3 (31%) are estimated to come from surface water bodies, and approximately 885 hm^3 (69%) from groundwater sources, through legal or illegal boreholes. Within the RBD, thirty-eight (38) Natura 2000 sites and two (2) National Parks have been identified.

Figure 2-1: Administrative Division at the level of Regional Units of the River Basin District of Thessaly EL08.

3 1st Review of the Preliminary Flood Risk Assessment

During the 1st Review of the Preliminary Flood Risk Assessment for all country's districts, the list of Historic Floods and Significant Historic Floods as well as the Areas of Potential Significant Flood Risk (APSFRs) have been reviewed and updated.

Between the PFRA and the 1st Review of PFRA, during 2012-2018, **23 flood events** were recorded in the EL08, resulting in **100 flood events** at an equal number of locations. Based on the processing of historical events, the areas where significant flooding has occurred in the past are the wider area of the Karditsa plain, the area around Lake Karla, and the city of Volos.

For the River Basin District of Thessaly, the final areas resulting from the above methodology are 9 in total. All this APSFR enlarged their areas.

Table 3-1: Revised APSFRs in the River Basin District of Thessaly (EL08)

Name of the APSFR*	Code	Area (km²)
Low areas of upper coarse of Epineas River, Xiniada moat	(EL08APSFR001)	174,7
Low area of basin of upper coarse of Kousmpasaniotiko stream	(EL08APSFR002)	30,3
Pineios river and its tributaries and closed basin of Lake Karla	(EL08APSFR003)	3420,0
Low areas of Kalochori closed basin	(EL08APSFR004)	54,5
Low area of medium coarse of Titarisios, Elassona region	(EL08APSFR005)	138,8
Pineios river delta, Kouloura-Palaiopirgos beach	(EL08APSFR006)	100,1
Low area of upper coarse of Titarisios region	(EL08APSFR007)	113,5
Low area of Almyros and Cholorema streams basins in Magnisia	(EL08APSFR008)	236,2
Low area of Xirias stream basin in Volos and other streams in the area of Volos	(EL08APSFR009)	47,7
TOTAL		**4.315,9**
Difference with PFRA 2012		**+3.2%**
Percentage in total RBD* **		**32,9%**

*** The area of the EL08 RBD is 13.137 km²

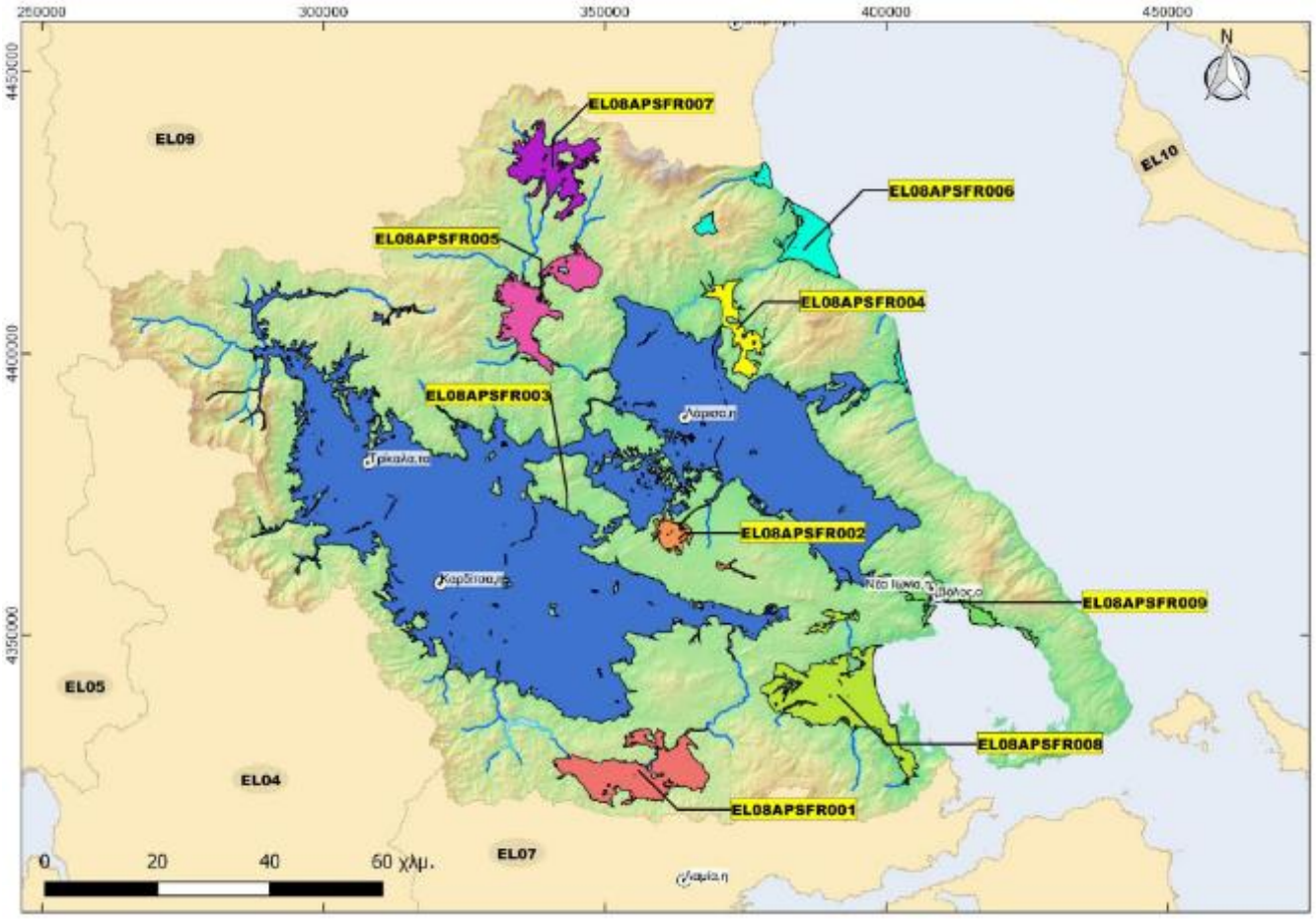

Figure 3-1: Revised APSFRs in the River Basin District of Thessaly (EL08).

4 Hydrology of River Basin District of the Thessaly(EL08)

In accordance with directive 2007/60/EC and the relevant Joint Ministerial Decision ΗΠ .31822/1542/E103/21.7.2010, which incorporates it into national law, it is foreseen for each stream that the hydrographs (average, favourable and unfavourable) are to be prepared for the following scenarios:

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

In the 1st PRMP Review ombrian curves were revised. This process was carried out for all the country. The ombrian curves are a parametric equation which connects the rain intensity with the period return for each rain duration. So, updated rainfall data of the River Basin District were used as well as point values of the created ombrian curves parameters.

The application of the methodology resulted in the following ombrian curve model for rainfall intensity x in mm/h, reference time scale k in h, return period T in years:

$$x = \lambda_* \frac{(T/\beta_*)^{\xi} - 1}{(1 + k/\alpha)^{\eta_*}} \qquad (.)41$$

with two uniform parameters in the whole country: the time scale parameter of the climacogram α = 0.18 h and the shape parameter (tail index) ξ = 0.18, and three spatially varying parameters: the rainfall intensity scale parameterλ_* (mm/h), the time scale parameter of the distribution β_* (years) and the persistence parameter. η_*

The spatially varying parameters in the River Basin District of Western Central Greece are available in 5 km scale (η, β and λ respectively) on the Secretariat website.

In relation to the ombrian curves of the initial FRMP and the average rainfall in the RBD EL08:

- For return periods T = 50 and 100 years, the average surface rainfall height is reduced by 29% and 28% respectively in the RBD.
- For return period T = 1000 years, the average rainfall height is reduced by 22% in the RBD, while it is observed a decrease in 11 and an increase in also 11 river basins.

The region studied includes the river basins of all big rivers of RBD of Thessaly and smaller streams of intermittent or torrential flow which cross some APSFR. **26 river basins**, divided to subbasin, are examined in total including Lake Karla basin. The biggest is Pineios river basin (9.500 km^2) as well smaller river basins of Almyros-Pelion streams which flow into Pagasetic Gulf are examined. The Pineios river basin is studied at two levels: a) the subbasin level, which concerns the hydrological and hydraulic modeling of the subbasins of its major tributaries and b) the integrated level, which concerns the hydraulic modeling of the main branch of Pineios river (see Figure below)

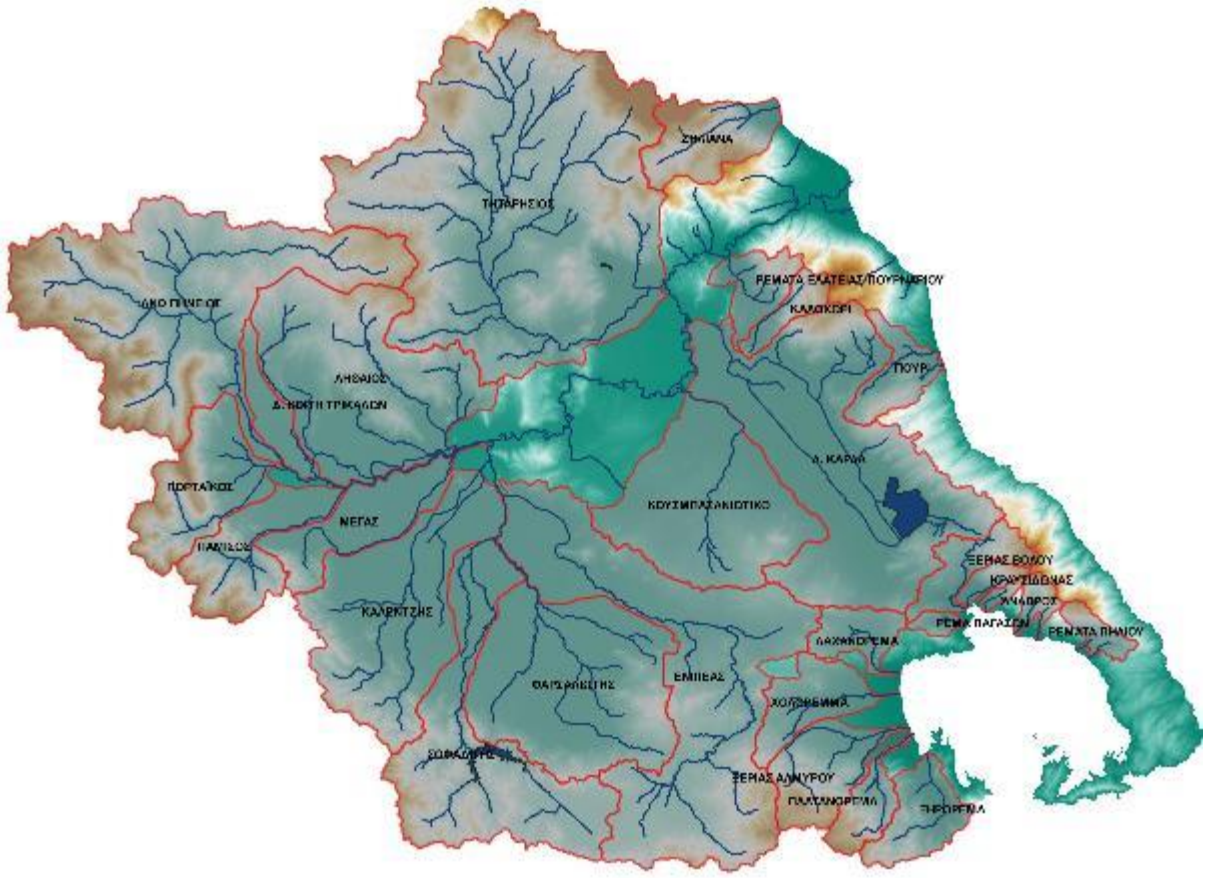

Figure 4-1: Map of the study area and river basins considered

The hydrological simulation considered the new Digital Elevation Model (DEM), based on the most recent 2mx2m resolution DEM of the Hellenic Cadastral, and extracted the morphometric - geometric characteristics of the river basins and sub-basins: area, maximum, mean and mean outlet elevation and the length of the main thalweg. Hyetographs (rain gauge) were prepared for design storms with return periods T = 50, 100, and 1000 years and rainfall duration D several times the basin concentration time, based on the revised rainfall and morphometric - geometric characteristics. Point precipitation was reduced to surface precipitation by means of surface runoff coefficient. The hyetographs were prepared as follows:

- By the alternating block method for floods of medium and high exceedance probability, i.e. with return periods of 100 and 50 years, respectively. (**alternating block method**)
- the method of the worst-case layout of the design hydrograph for floods of low exceedance probability, i.e. with return periods of 1000 years. (**worst profile**)

The active precipitation amount was estimated separately in each sub-basin, using the curve number (**CurveNumberCN**). The calculation was done for three types of soil moisture conditions, and recent fires were taken into account to increase the curve number per sub-basin with burnt areas. To convert the hyetograph (rainfall) to runoff (flow), the flood hydrograph of each rainfall event was estimated considering the time of accumulation, rainfall duration and the Monadic Hydrograph of each basin/sub-basin. The **Muskingum method and the lag time method** were used to **hydrologically channelize** the flood wave within each stream segment. The flood hydrographs were generated in the free software HECHMS 4.10 (HydrologicEngineeringCenter - HydrologicModelingSystem). HEC-HMS can be used to model all the hydrological processes (calculation of hydrological losses, transformation of active rainfall into direct runoff,

flood routing, etc.) that take place during the transformation of rainfall into runoff in dendritic basins. The following table shows the results of hydrological flood routing for the three considered return periods, for average moisture conditions:

Table 4-1: Summary results of hydrological modeling of EL08 river basin for average moisture conditions.

A/N	Code Basin code	Description	Area (km(2))	Q (m^3/s) T=50	Q (m^3/s) T=100	Q (m^3/s) T=1000	Rain Duration (hrs)
1	EL0816FL00001	Karla	1073.90	1164.9	1511.8	4821.4	48
2	EL0816FR00002	Kousmpasanotiko	592.9	930.2	1257.6	2969.5	48
3	EL0816FR00003	Enipeas	1140.5	1424.5	1893.2	4172.3	48
4	EL0816FR00004	Farsaliotis	718.9	783	1038.4	2177.7	48
5	EL0816FR00005	Sofaditis	648.1	746.5	959.3	2146.4	48
6	EL0816FR00006	Kalentzis	653.8	1286.2	1669.3	3581.1	48
7	EL0816FR00007	Megas	236.1	304.3	400.3	988.1	48
8	EL0816FR00008	Pamisos	247.7	997.6	1310.7	2994.9	24
9	EL0816FR00009	Portaikos	301.7	1283.1	1674	3678.6	24
10	EL0816FR00010	Upper coarse of Pineios	1130.2	2581.4	3327.9	6950.4	48
11	EL0816FR00011	West bed of Trikala	93.9	203.1	269.7	607.3	24
12	EL0816FR00012	Lithaios – Neochoritis	741.7	1003.5	1342.4	3524.6	48
13	EL0816FR00013	Titarisios	1872.9	2719.7	3613	7521.2	48
14	EL0816FR00014	Elatia – Pournaria streams	108.6	645.6	843.3	1889.2	24
15	EL0816FR00015	Kalochori	66.2	335.7	455.9	1094.2	12
16	EL0816FR00017	Ziliana	199.3	595.7	824.5	2407.6	24
17	EL0817FR00001	Xirorema	151.4	248.6	364	1185.7	24
18	EL0817FR00002	Platanorema	94.3	209.7	307	1031.4	24
19	EL0817FR00003	Xerias of Almyros	196.8	277.3	408.8	1486.9	24
20	EL0817FR00004	Holorema	156.8	378.1	511.7	1254.9	24
21	EL0817FR00005	Lachanorema	98.1	259.3	353.6	955.6	24
22	EL0817FR00006	Pagases stream	22.6	109.8	149	366.9	12
23	EL0817FR00007	Xirias of Volos	116.8	661.9	858.5	1922.7	24
24	EL0817FR00008	Krafsidonas	48.6	249.3	330.4	754.4	12
25	EL0817FR00009	Anavros	13.9	129.2	165.5	360.5	12
26	EL0817FR00010	Pelion streams*	86.1	308.4	395	821.7	12
27	EL0817FR00018	Pouri**	115.3	517.5	688.2	1522.1	24

* The peak discharge is referred to Vrichonas stream

**The peak discharge is referred to Pouri stream

5 Hydraulic simulation of the River Basin District of Thessaly (EL08)

During the 1st implementation cycle of Directive 2007/60/EC a total of 351 sub-basins and 189 streams were recorded. In the present **2nd** implementation **cycle 18** new **sub-basins** and **5 streams** are added and hydraulically resolved. Flood routing was carried out in the following streams:

- Rivers and streams of the lands added to the APSFRs in the 1st Review of the Preliminary Flood Risk Assessment,
- Rivers and streams within the APSFRs resulting from the 1st Implementation Cycle of Directive 2007/60/EC for which no flood hydrographs were produced during the 1st Implementation Cycle of Directive 2007/60/EC.
- Rivers and streams of the APSFR resulting from 1st Implementation Cycle to which new sections are added and which have not been taken into account in the production of their flood hydrographs.
- Rivers and streams of the APSFRs resulting from1st Implementation Cycle, in which significant changes have taken place (e.g. implementation of flood protection works).

For the hydraulic calculations of flood flow, both full two-dimensional (2D) hydraulic modeling and one-dimensional/two-dimensional (1D/2D) modeling were applied for large rivers, under unsteady flow conditions, as defined by the hydrographs developed during the hydrological analysis. The following inputs were used for the hydraulic simulation of flood routing:

- The Digital Elevation Model (DEM), based on the most recent 2x2 m resolution DEM from the Hellenic Cadastre, appropriately processed,
- Topographic data and technical works surveys,
- Hydrographs - Boundary conditions and hydrographs of transboundary basins - lakes, as derived from the hydrological analysis,
- Manning's roughness coefficient values based on recent land use data,
- Initial conditions and specific hydraulic simulation assumptions.

For the **hydraulic simulation**, the free-format software system HEC-RAS version 6.4.1 developed by the U.S. Army Corps of Engineers (USACE) was used. The software performs calculations under steady and unsteady flow conditions. It offers capabilities to analyze the results of surface water profile calculations on water characteristics such as depth, level and flow velocity for any time of the simulation as well as their maximum and minimum values; it also provides simulation capabilities for a wide range of civil engineering works, mainly bridges, culverts and spillways/weirs.

The following is a typical snapshot of the graphical interface of the HEC-RAS software during the input of an engineering project into a 2D simulation domain.

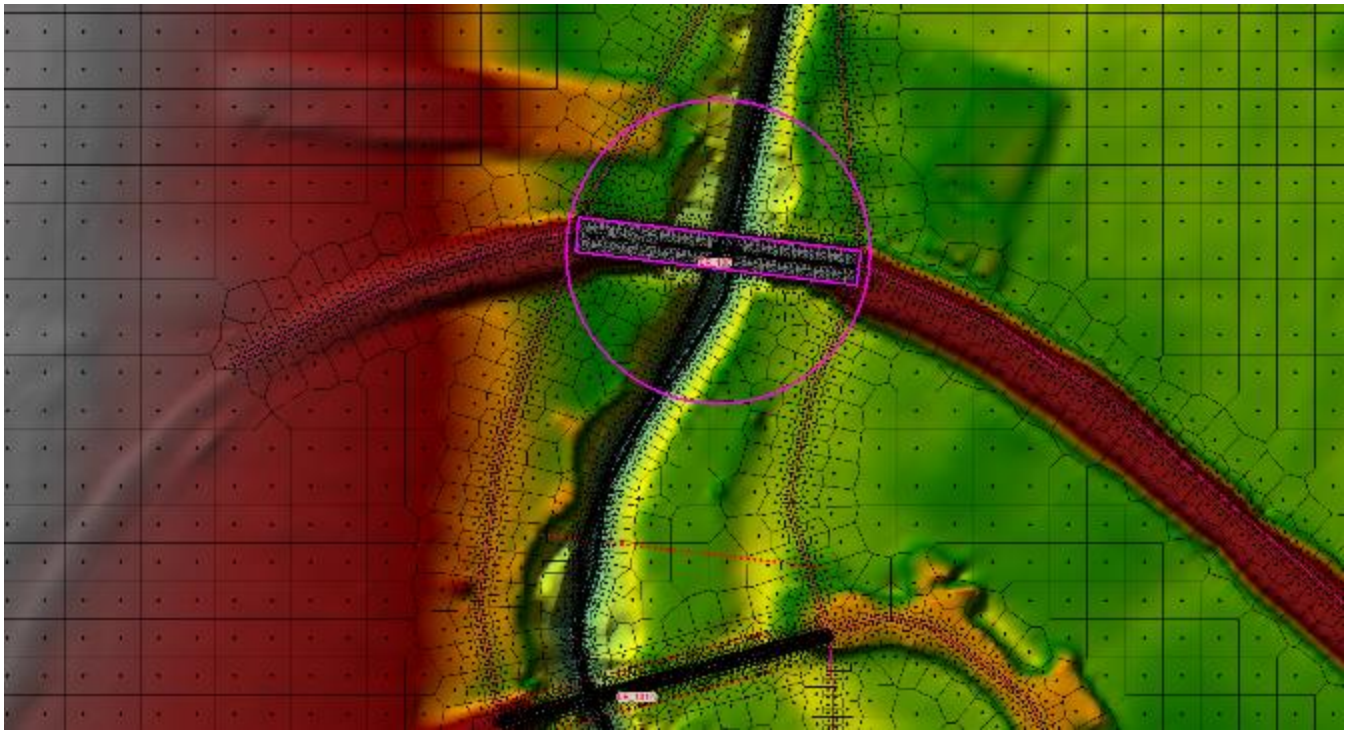

Figure 5-1: Snapshot of HEC-RAS 6.4.1 graphical environment, with the DEM background, the 2D solution grid and technical project perpendicular to the stream

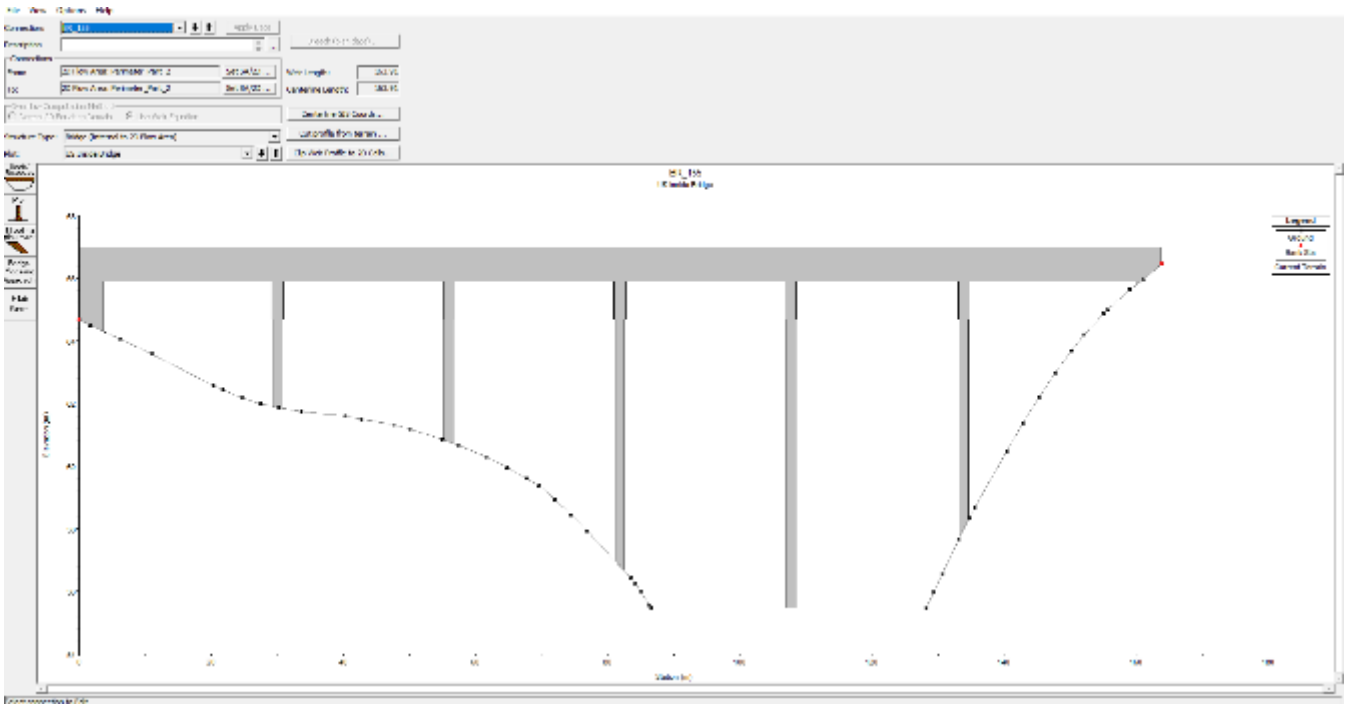

Figure 5-2: Snapshot of HEC-RAS 6.4.1 GUI, with the input of the geometric characteristics of the openings of the technical project, upstream to downstream view

Especially for Pineios river basin (EL08) two spatial scales of analysis are considered. The first level of analysis concerns the basins of the 13 major tributaries of Pineios, each of which is examined as an independent hydrological system. The second level of analysis involves the hydraulic simulation of the main riverbed (central section or main course) of Pineios river from the confluence with Portaikos river and extending downstream to its river estuaries. Therefore, along the main riverbed of Pineios, flood runoffs are routed from the subbasins, not simultaneously, but considering the flow times to their respective nodes of inflow (see Figure below). In the same hydraulic model, the closed basin of Lake Karla is included.

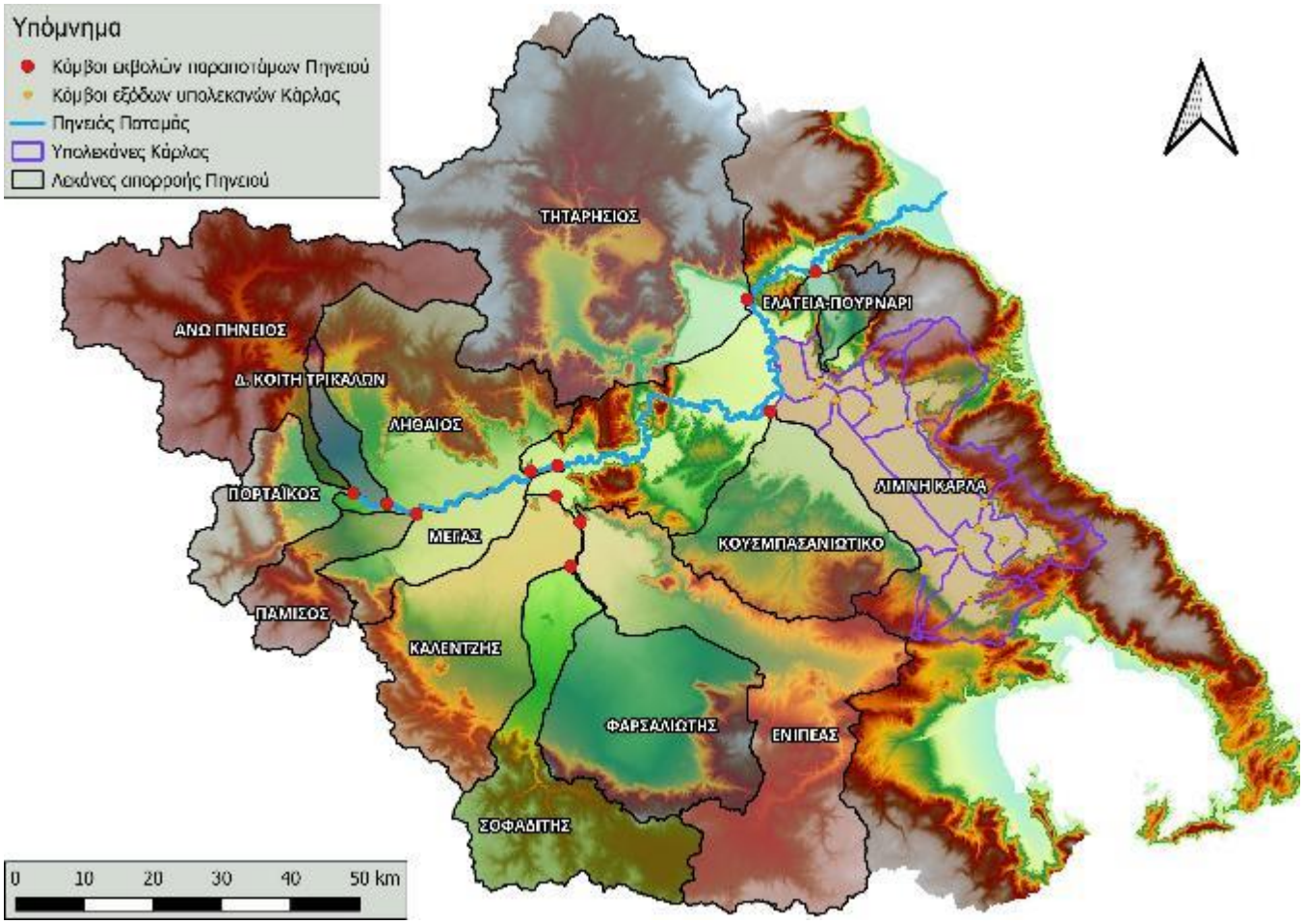

Figure 5-3: Main riverbed of Pineios and Lake Karla's basin

The hydraulic simulation of the main riverbed of Pineios (see Figure below) was based on the division of the central bed into 3 sub-models which serve as control points under real conditions due to the geomorphology of the terrain in these areas:

- The first sub-model has its control point downstream of Farkadona, where a natural narrowing occurs on both side of the riverbed. Up to this point the tributaries Ano Pineios, West riverbed of Trikala, Pamisos, Mega Rema, Kalentziz, Enipeas, Sofaditis, Farsaliotis, Lithaios flow into the main riverbed.
- The outflow hydrograph of the first sub-model at the control point downstream of Farkadona is used as an inflow hydrograph for the second sub-model which has its control point downstream of Rodias.

At this point the geomorphology presents bigger natural narrowing. The tributaries Koumpasaniotikos and Titarisios flow into the section up to Rodia control point.

- The outflow hydrograph of the second sub-model at the control point downstream of Rodia is used as the inflow hydrograph for the third sub-model, which extends up the river estuaries of Pineios. In this section, the Elateia-Pournari streams also contribute to the flow.

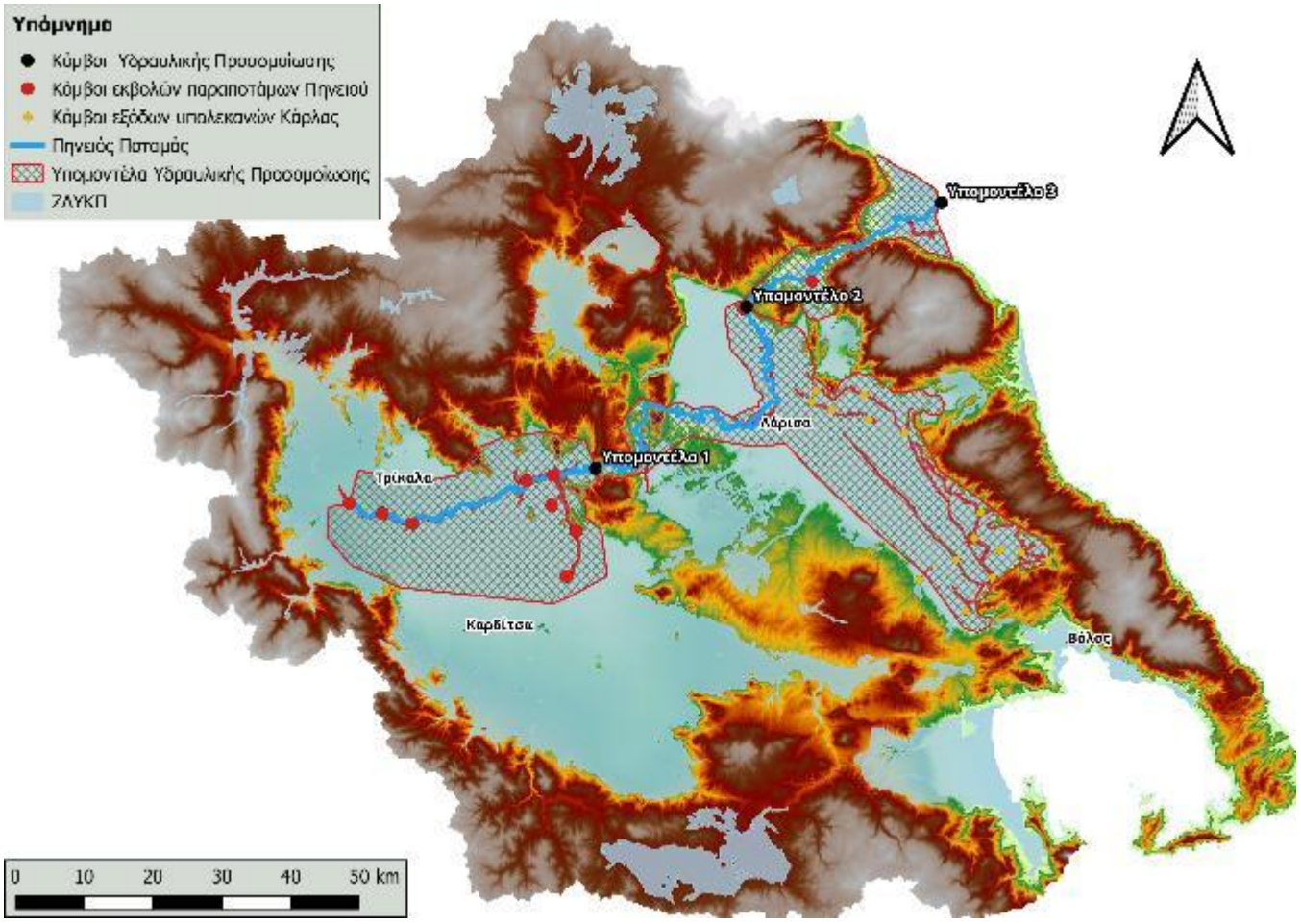

Figure 5-4: Main riverbed of Pineios and nodes of hydraulic simulation of sub-models.

In Karla basin, flow is directed into the lake through four channels, which end at the respective inflow points represented by nodes J2, J3, J4 , J5, J6, J7, J8, J10, J11, J12 (see Figure below). The hydraulic simulation was carried out using two methodologies for the river basins which flow into Lake Karla and for the river basins which are drained by streams and collectors located outside the lakes embankment. The 2 pumping stations that supply water to Lake Karla from the external basins (24 m^3/s, 3.5 m^3/s), as well as the Karla Tunnel (8.5 m^3/s) discharging to Xirias River of Volos were also included in the hydraulic simulation.

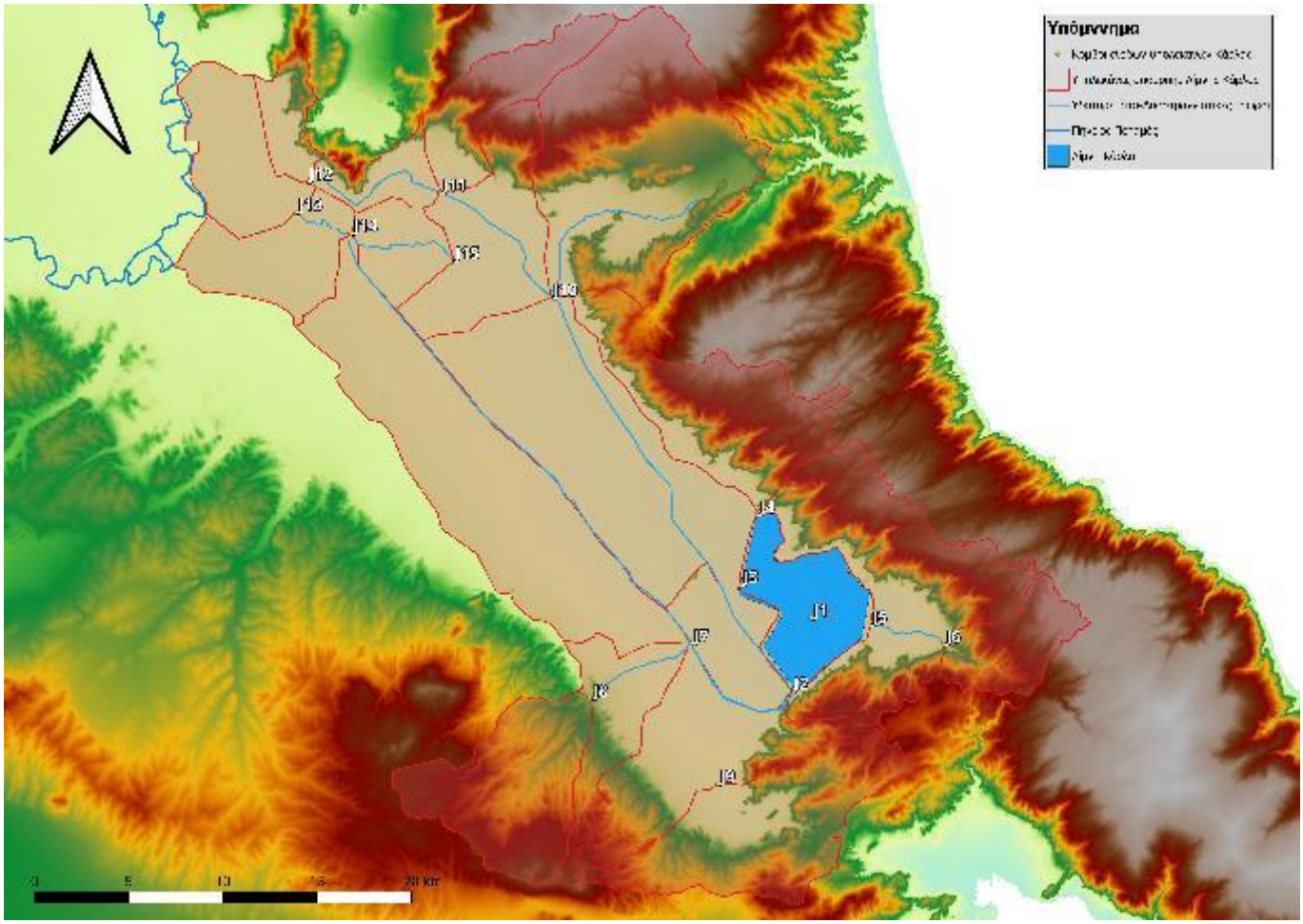

Figure 5-5: Map of the study area of Lake Karla, depicting the schematization of the nodes and reaches of the hydrographic network and the subbasins.

6 Flood Hazard Maps

The Flood Hazard Maps are presented at a scale of 1:25,000 for the three flooding scenarios, caused by fluvial and lake flooding, T=50, 100 and 1000 years, as listed above, and for the spatial distribution of the flood inundation area from the sea prepared corresponding to high probability flooding exceeding a 50-year return period and medium probability flooding exceeding a 100-year return period.

For the set of points of interest affected by the considered fluvial/lake flooding, the arrival and residence time of the flood wave has been calculated for flow depths ≥0.3 m. The fluvial/lake Flood Hazard Maps show the spatial distribution of both maximum depth and maximum water velocity for the three considered scenarios. The Flood Hazard Maps from sea level rise show the spatial distribution of maximum flow depth. These are presented in appropriate colour scales. **Flood Hazard Maps from river flows/lakes** additionally show:

- the locations and names of the settlements in the RBD EL08,
- the constructed technical works that affect the water flow and have been taken into account in the hydraulic simulation, such as bridges, culverts, dams, canals, etc.
- the locations, the unique code of each point of interest for which the arrival and residence time of the flood has been calculated.
- the Maximum Operating Water Level of lakes or reservoir level, which is noted under the name of the corresponding water body
- the position and code of the map in question in relation to the whole RBD EL08.

For RBD EL08 no overall sea level rise greater than 1 meter is expected, and no Flood Hazard Maps were developed based on sea level rise.

The total inundated areas across the entire River Basin District exceed one million decares even for the 50-year return period flood, while they approach two million decares for the 1,000-year event (millennium event). The areas are illustrated in the graph below.

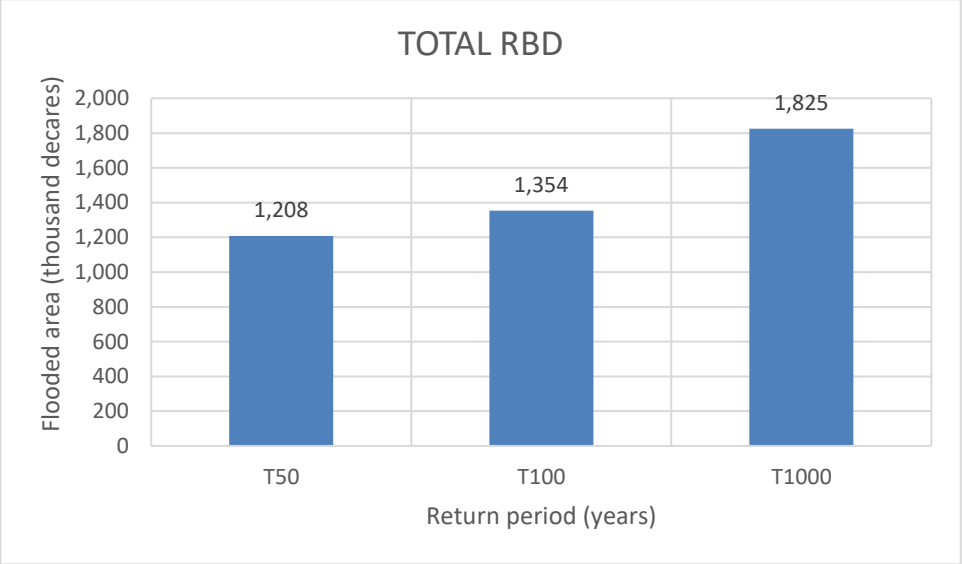

Figure 6-1: Flooded areas for the 50, 100 and 1000 year return period floods and for the 50 and 100 year return period marine floods

In summary, it is observed that for flood events of high and medium probability of exceedance (T = 50 and T = 100 years), the inundated areas do not show significant differences (1,208 and 1,354 thousand decares respectively). For low probability of exceedance events (T = 1,000 years), the inundated area is significantly larger, reaching 1,825 thousand decares. It is worth noting that most of these areas are in the Thessalian Plain.

In respect of the flood hazard maps from fluvial flow / lakes of the initial Flood Risk Management Plan the following is reported:

In APSFR **EL08APSFR001**, the simulation results are largely consistent with those of the initial Flood Risk Management Plan (FRMP) in terms of flood evolution and the affected areas. The inundated areas range from approximately 18.000 to 27.000 decares depending on the examined flood scenarios. According to simulation results flood events are show for all return periods, inundating mostly cultivating areas.

In ASPFR **EL08APSFR002** the hydraulic model results are also in agreement with those of the initial FRMP. The inundated areas range from approximately 150 to 200 decares depending on the examined flood scenarios. For all the examined scenarios a very small part, mostly of cultivating areas, is inundated into the APSFR on both sides of the upper coarse of Kousmpasaniotikos river.

For ASPFR **EL08APSFR003** the inundated areas range from approximately 1.030 to 1.570 decares depending on the examined flood scenarios. To derive results for the inundated areas through the entire APSFR EL08APSFR0003, an initial autonomous hydraulic simulation was conducted for 12 tributaries of Pineios. Based on the results of their outlets a hydraulic simulation of the main riverbed of Pineios was carried out from the Ali Efendi area to the river's estuaries, also including Lake Karla. Additionally, a separate modelling of Lake Karla basin was performed. From all the hydraulic models it is observed that significant parts of the major cities of Thessaly located into the APSFR and numerous settlements are affected by flood events. More specifically the affected areas are: a) from **Enipeas** river: the settlements of Lofos, Pyrgakia, Ypereia, Orfana Fyllon, Astritsa, Ampelonas, and Ilias b) from **Farsaliotis** river: the settlements of Petrelia, Sofiada, Vardali, Neo Monastiri, Stavros, Anochori, Katochori, Kypseli, Astritsa, and Ermis c) from **Sofaditis** river: the settlements of Sofades, Markos, Kalyvakia, Pyrgos Kieriou and Moscholouri d) from **Kalentzis**

river: the city of Karditsa and the settlements of Myrina, Makrichori, Koskinas, Metamorfosi, Psathochori, Artesiano, Paragogiko and Agioi Apostoloi e) from **Pamisos** river: the settlements of Palaiochori, Agnantero, Megalia Kanalia, Agia Triada, Rizovouni, Servota, Magoulitsa, Magoula, Megala Kalyvia, Krania, Gelanthi, f) from Portaikos river: the settlements of Ammoudia, Parapotamos, Drosero, Kato Elati, Mesiaka, Lili, Valtino, Matsoukiotika, Meligos, Dilofos, Fiki, Elefterochori, Pyli g) from P**ineios upper coarse**: the settlements of Megachari, Dialechto, Dipotamos, Rogkia, Valtino, Matsoukiotika, Meligos, Fotada, Valamandri, Kato Elati, Mesiaka, Ammoudia, Parapotamos, Trikala, Flamouri, Agia Kyriaki, Sarakina h) from **Lithaios** and **Nochoritis** rivers: the urban complex of Trikala city i) from Titarisios river: the city of Tyrnavos and the settlements of Ampelonas and Deleria. The hydraulic model of the central bed river of Pineios showed that flood events affect Larissa city and the settlements of Flamouli, Agia Kyriaki, Loggos, Megala Kalyvia, Paliochori, Agnatero, Kalogriana, Agia Triada, Glinos, Petroporos, Georganades, Klokotos, Astritsa, Palamas, Metamorfosi, Vlochos, Keramidi, Pineiada, Koutsocheiro, Kastro, Melissochori, Fallani, Dasochori, Koulouri, Tempi, Stomio, Alexandrini, Palaiopyrgos, Kouloura, Nea Mesagkala, and Kastri.

For APSFR **EL08APSFR004** the inundated areas range from approximately 18.000 to 23.300 decares depending on the flood scenarios examinated. The hydraulic simulation results show that the settlement of Tempi and the biggest part of Pournari settlement are affected for all the three flood scenarios.

For APSFR **EL08APSFR005**, the results of the 1st Review of the Flood Risk Management Plan (FRMP) indicate a flood extent of similar scale to that identified in the original FRMP, with inundated areas ranging from approximately 36,000 to 49,000 decares. Based on the modeling results for the middle coarse of Titarisios river and its tributary, Elassonititikos, the flood affects settlements as Elassona and Tsaritani as well as smaller parts of minor settlements (Sykea, Magoula, Mesochori, Vlachogianno, Praitorio).

Regarding APSFR **EL08APSFR006** to which Ziliana, Pouri and Mpourmpoulithras streams were added, the inundated areas range approximately from 29.000 to 59.000 decares depending on the flood scenarios exanimated. According to the modelling results severe flooding phenomena occur consistently along the main riverbed of Pinios River across all return periods, affecting various settlements in the area (Stomio, Alexandrini, Palaiopyrgos, Kouloura, Nea Mesagkala, Kastri).

In APSFR **EL08APSFR007**, the inundated areas range from approximately 4,250 to 5,500 decares. The hydraulic models showed that in certain river branches, floodwaters exceed the riverbanks, primarily affecting limited agricultural lands.

In APSFR **EL08APSFR008**, the inundated areas range from approximately 21.000 to 43.000 decares. Based on the hydraulic simulation results for all 5 streams within the APSFR flood events occur for all return periods, with water generally exceeding the boundaries of streambeds over large sections. As a result, part of Sourpi settlement is inundated. The situation worsens for return periods T = 100 and 1000 years affecting even larger parts of the coastal area, larger cultivated lands and the settlement of Nea Agchialos.

Finally, for APSFR **EL08APSFR009**, to which streams of Pelion were added, the inundated areas range from approximately 9.500 to 14.400 decares depending on the exanimated flood scenarios. The hydraulic simulation results show that all eight streams (Pagases, Xirias of Volos, Krafsidonas, Anavros, Vrychonas, Platanidia, Kala Nera and Platanorema) within the APSFR flood due to the intense hydraulic stress imposed by technical structures under the selected return periods. For the three streams within the urban complex of Volos (Xirias of Volos, Krafsidonas and Anavros) the floodwaters exceed the boundaries of streambed. At the estuaries of the stream the floodwaters spread outside of streambed and within the urban complex of Volos. The hydraulic model of Pagases stream shows that the flood affects part of the coastal area, cultivated area and the settlement of Nees Pagases. For Pelion streams, the floodwaters exceed the boundaries of streambed in various locations of the examined subbasins spreading into settlement on the both sides of streams. The

affected settlements are Kato Lechonia, Vrochia, Platanidia, Kala Nera, Koropi, Ano Lechonia and Agios Apostolos.

The following is a breakdown of the river/lakes HEPs, which are common to the Flood Risk Maps (FRMs) presented below. In addition, footnotes of the maximum depth and maximum flow velocity HEPs and sample HEP spatial distribution of maximum depth and maximum velocity HEP maps for the EL08APSFR003 and EL08APSFR009 Flood Zones are provided.

The following sets out the distribution of Flood Hazard Maps for fluvial / lake flooding, which are common to the Flood Risk Maps presented below. Additionally, the Flood Hazard Maps legends for the maximum depths and maximum flow rates and representatives Flood Hazard Maps showing maximum flood depth and rate distribution for APSFR EL08APSFR003 and EL08APSFR009 are presented.

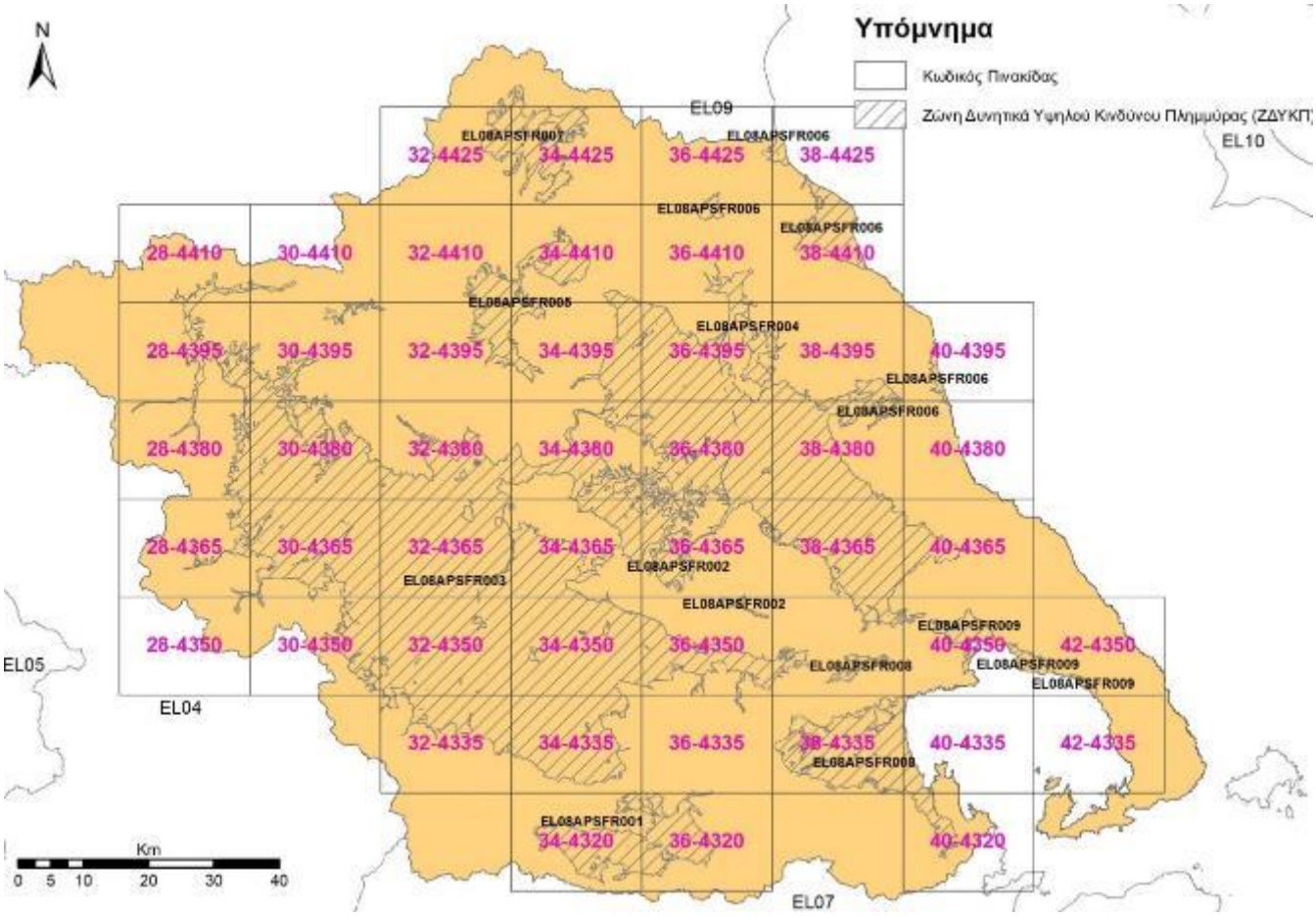

Figure 6-2: Tiles flood hazard maps and flood risk maps distribution from fluvial flow/lakes

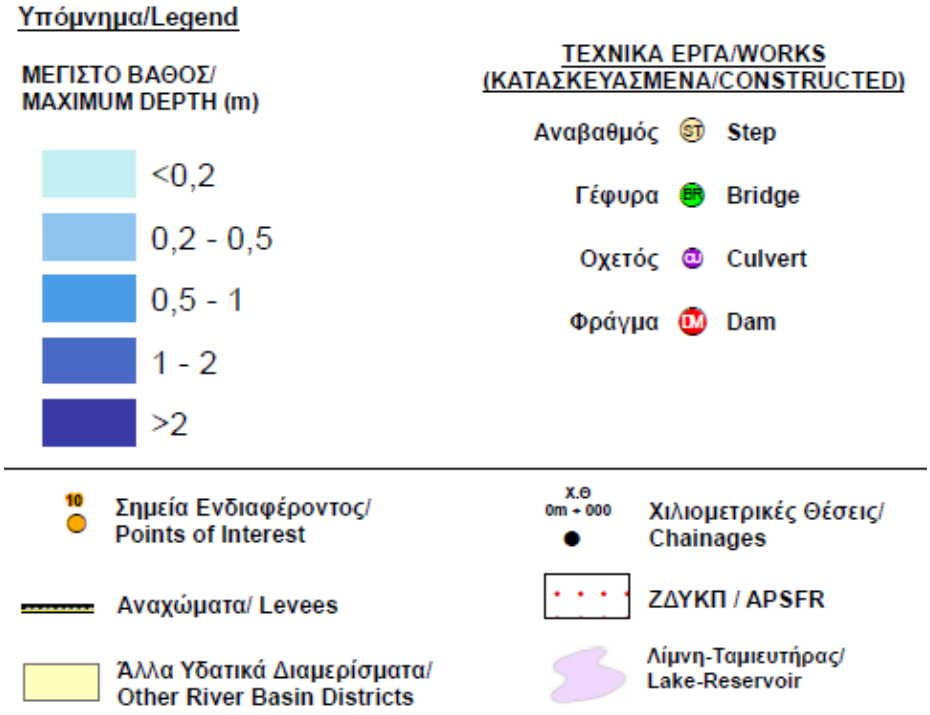

Figure 6-3: Memorandum of Flood Hazard Maps of streams/closed basins for maximum flow depths

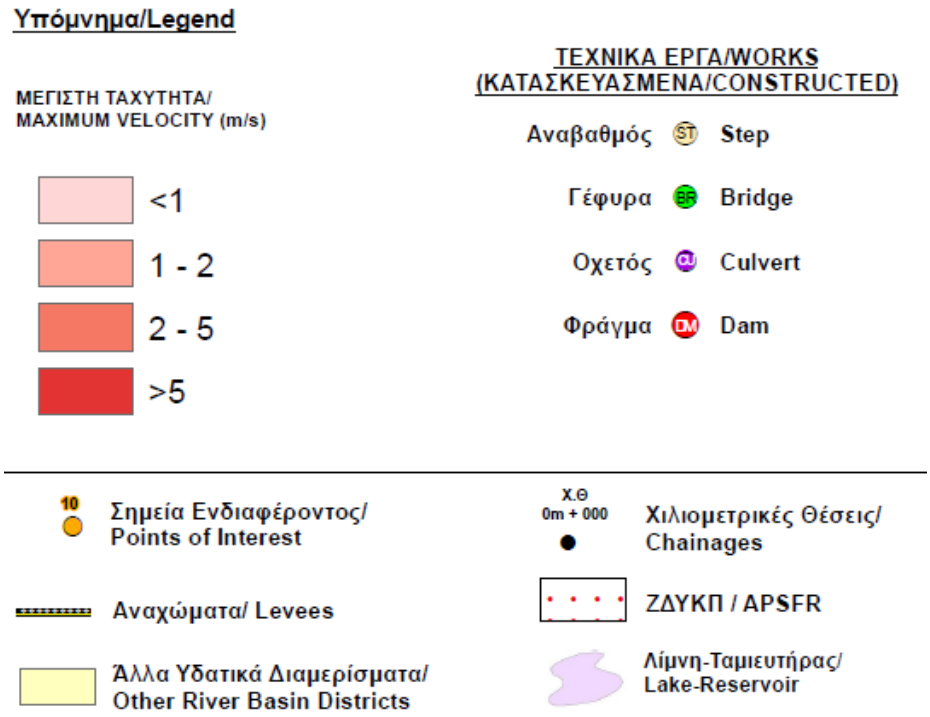

Figure 6-4: Memorandum of Flood Hazard Maps of streams/closed basins for maximum flow velocities

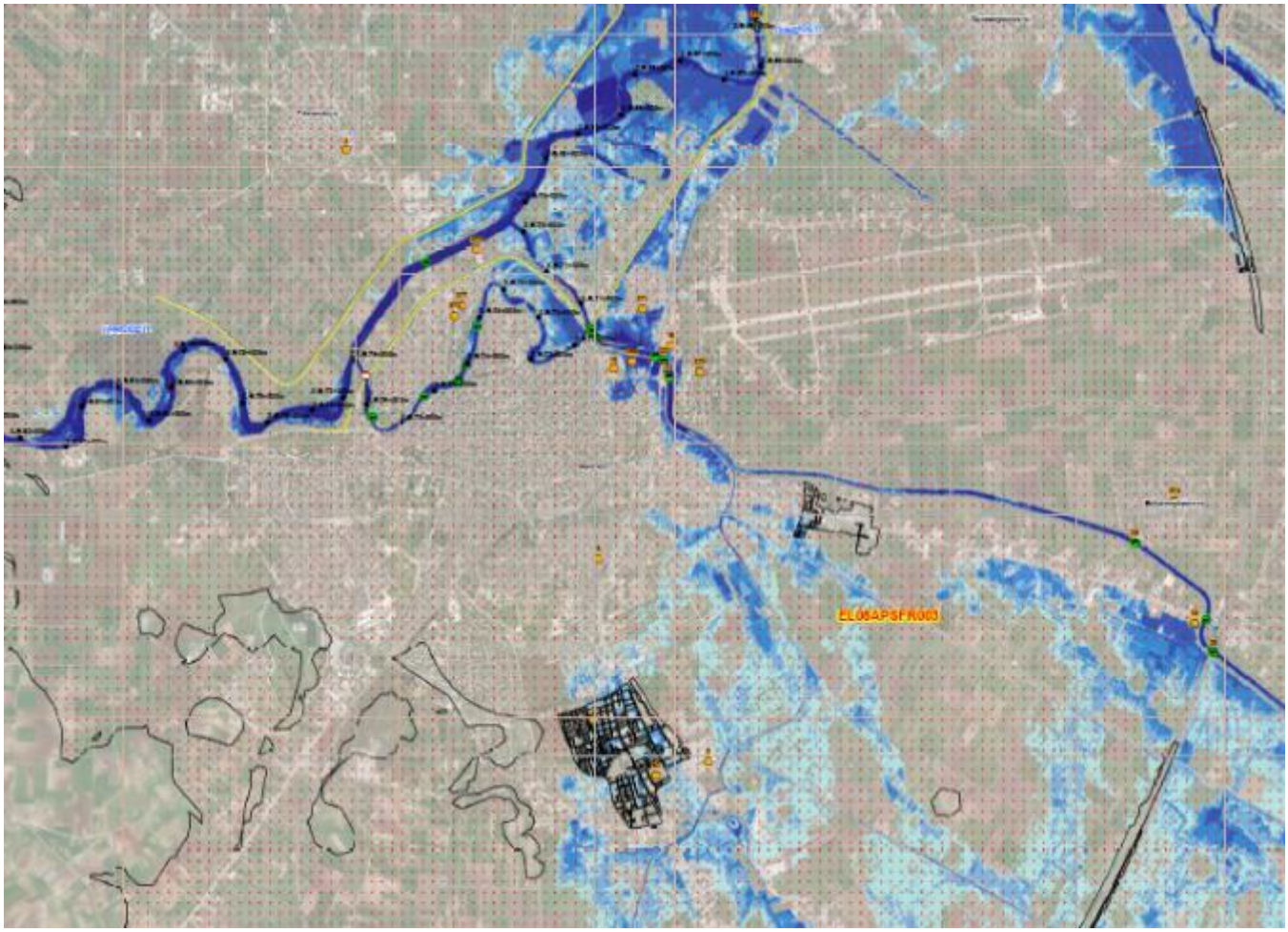

Figure 6-5: Section of the Flood Hazard Maps in the Larissa, APSFR EL08APSFR003 with color grading of maximum flow depths, for T=100 years

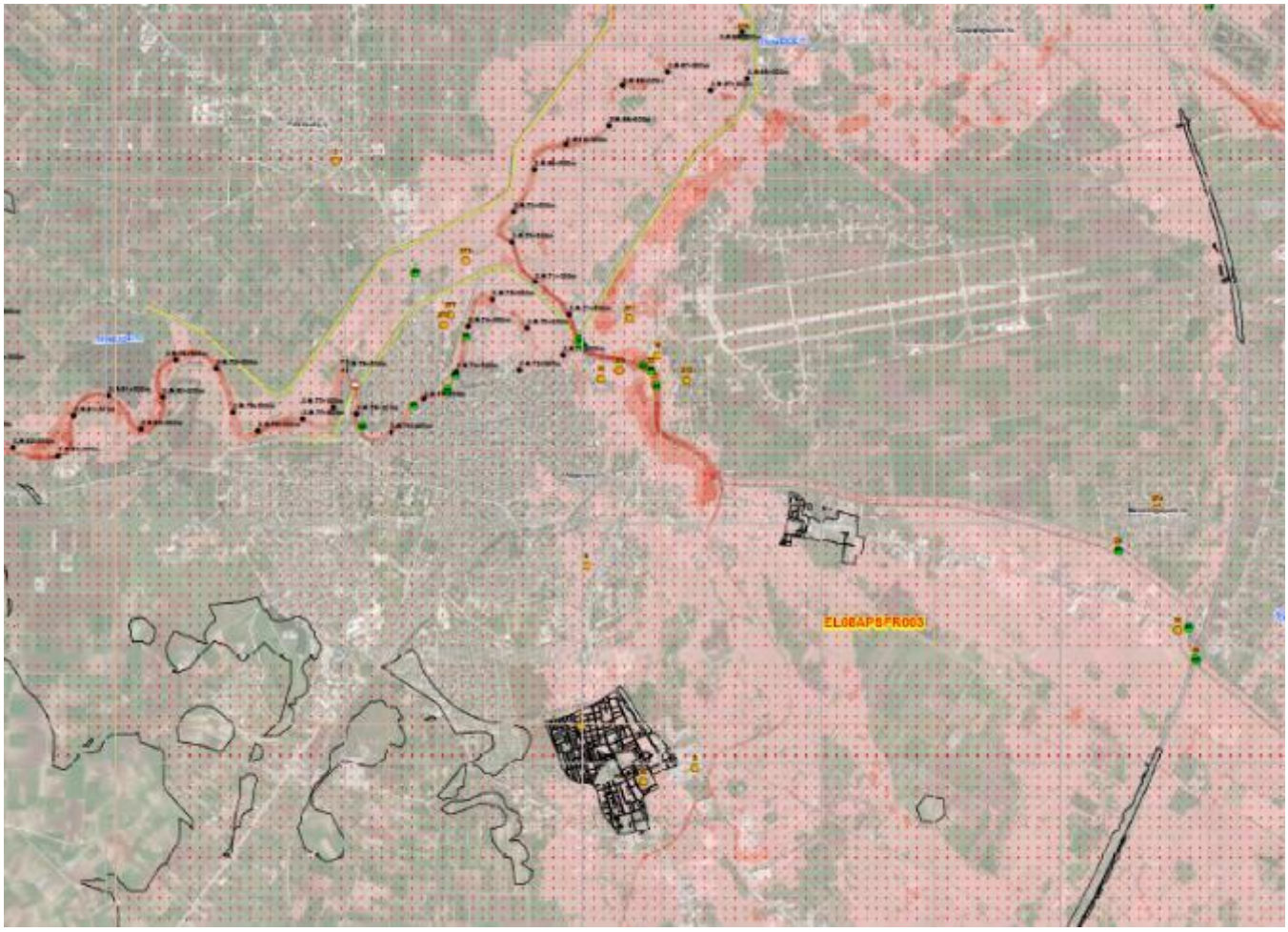

Figure 6-6: Section of the Flood Hazard Map in Larissa, APSFR EL08APSFR003 with colour grading of maximum flow rates, for T=100 years

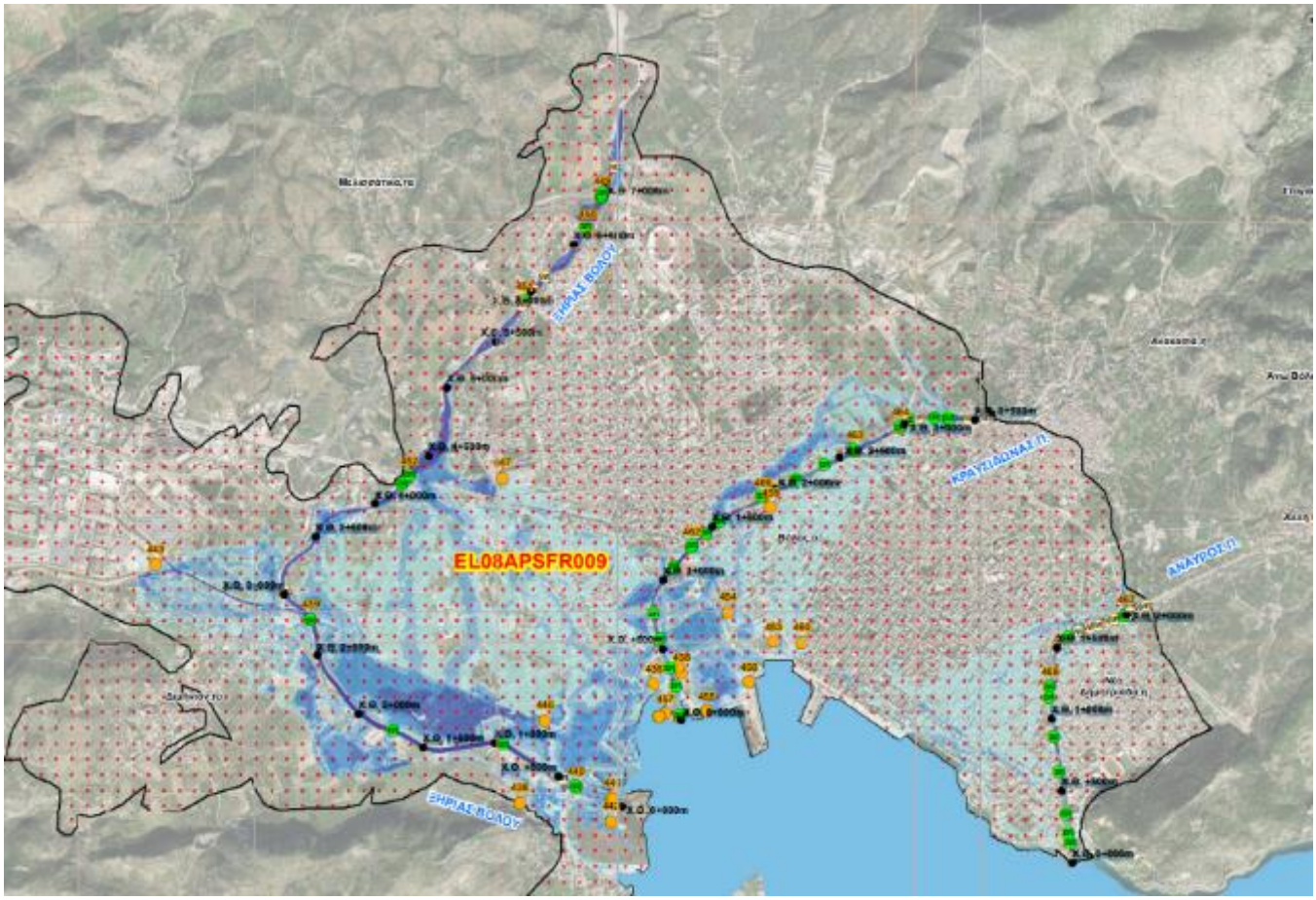

Figure 6-7: Section of the Flood Hazard Map in Volos, APSFR EL08APSFR009 with colour grading of maximum flow depths, for T=100 years

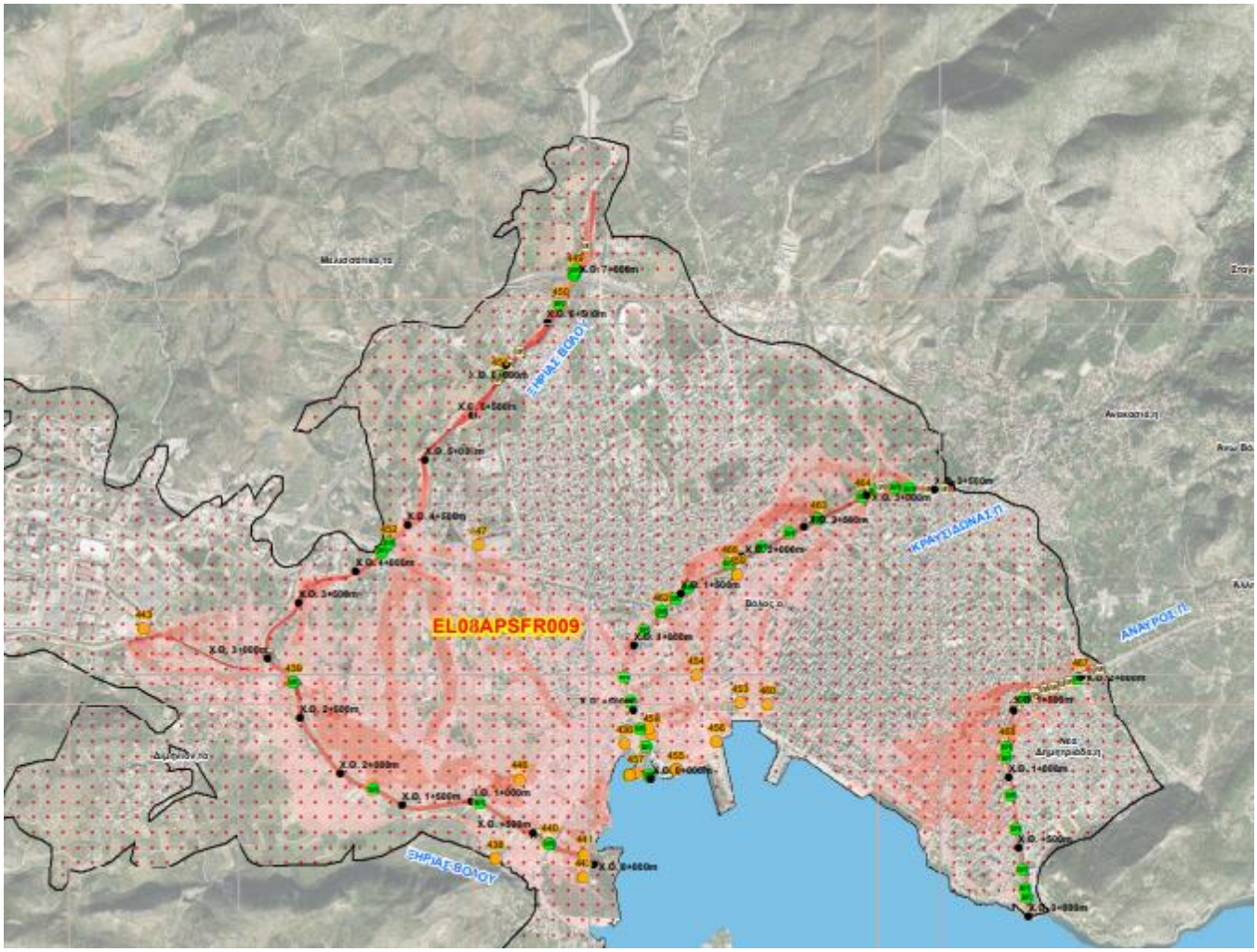

Figure 6-8: Section of the Flood Hazard Map in Volos, APSFR EL08APSFR009 with colour grading of maximum flow rates, for T=100 years

7 Flood Risk Maps

The Flood Risk Maps are presented at a scale of 1:25,000 for the three fluvial/lake flooding scenarios, T=50, 100 and 1000 years, and for the two sea flooding scenarios, T=50 and 100 years. The maps depict the land uses, economic activities, protected areas and cultural heritage sites that fall within the flood zones and are bounded by the flood boundaries.

In more detail, the following flood-affected features are depicted in the Flood Risk Maps: Indicative affected population, health infrastructure, social infrastructure, water infrastructure, energy infrastructure, civil protection infrastructure, rural areas, livestock units, tourist concentrations, industrial concentrations, industries outside industrial concentrations, road network, railway network, airports, sewage treatment plants, municipal solid waste management and disposal sites, protected areas, monuments, archaeological sites, water bodies designated as recreational waters and settlements.

The Flood Risk Maps are also accompanied by the following maps:

- **Soil Erosion Vulnerability Map**, at a scale of 1:300,000, showing soil erosion classes with appropriate colour grading at 5 levels.
- **Maps** (1 for fluvial/lake flooding and 1 for sea-level rise) **of Maximum Potential Flooding Impact**, at a scale of 1:300,000 and 1:100,000, showing vulnerability classes with appropriate colour grading at 5 levels.
- **Maps** (3 for fluvial/lake flooding and 1 for sea-level rise) **of Flood Degree of Influence**, at a scale of 1:300,000 and 1:100,000, showing the categories of degree of influence with appropriate colour grading at 5 levels.
- **Flood Impact Assessment maps** (3 for fluvial/pond flooding and 1 for elevation of NSTs), at a scale of 1:300,000 and 1:100,000, depicting risk categories with appropriate colour grading at 5 levels.

From the Flood Risk Assessment in the RBD EL08, it can be seen that very high flood risk for **T=50 years** is recorded in:

- extended parts of Trikala city due to the overflow of Lithaios river, part at the east of the center of Larissa city between Larissa airport and Iroon Polytechneiou street, Tynravos city due to the overflow of Titarisios river. (**EL08APSFR003**),
- parts near Pineios riverbed, downstream of the confluence of Paliokarya and Pournari streams, up to Perataria stream (**EL08APSFR004**),
- estuaries of Krafsidonas stream, commercial port of Volos (**EL08APSFR009**)

Very high risk is recorded for T = 100 years also in the following regions:

- parts within Karditsa city due to the overflow of Kalentzis river and in Farkadona settlement. (**EL08APSFR003**)
- upstream of the commercial port of Volos (**EL08APSFR009**)

Finally, as well to the areas mentioned above for T=50 and 100 years, very high risk is observed for T = 1000 years in:

- the northern part of Larissa city, settlements of Dialekto, Sofades, Vlochos and Ampelonas, confluence of Highway 1 with Larissa-Sykouriou National Road, northeast of Larissa **(EL08APSFR003**),
- danger in the sub-station of the Public Power Corporation (DEH) near Chorostasi settlement, which is within the area of inundation from the overflow of Platanorema stream (**EL08APSFR008**)
- more parts of Volos city, in both sides of Krafsidonas stream, downstream of the Volos ring road, up to the estuaries of the stream in the commercial port, in the coastal area of Volos which is within the flood field from the overflow of Anavros stream as well as the neighborhood of Pedion Areos in the estuaries of Xirias (**EL08APSFR09**).

The areas presenting high, medium and low flood risk for all return periods and flood sources considered are presented in detail within the Draft FRMP for Thessaly. As an indication, the following figure shows the percentage distribution of the river/lakes flood risk categories in the RBD EL08.

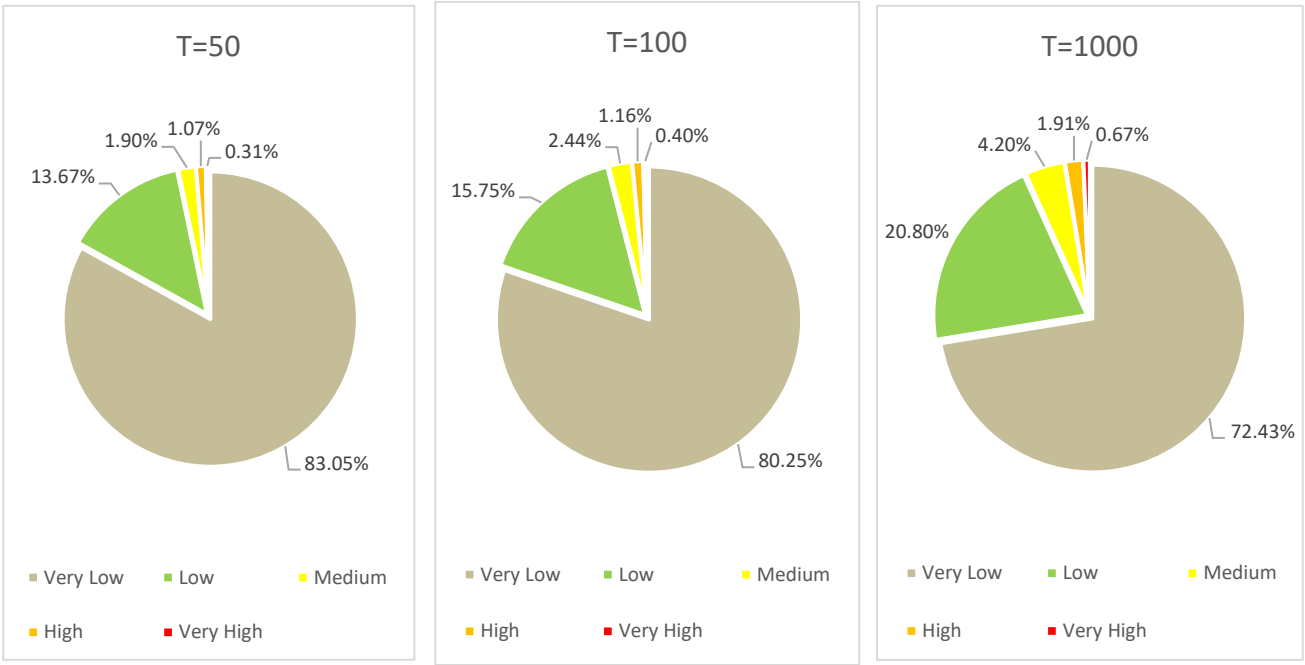

Figure 7-1: Areas by flood risk category in the RBD EL08 for T50, T100 and T1000

The tables below summarise the potentially affected economic activities as well as important infrastructure within the flooded areas for the three return periods considered in the average conditions. for the whole River Basin District of Thessaly. At the same time, the potentially affected population per APSFR and recovery period is presented.

Table 7-1: Land use areas within the inundation area of the RBD of Thessaly by return period. All areas in decares

Land use	T50	T100	T1 000
Densely populated urban areas	4,624	5,536	8,257
Sparsely populated urban areas / suburban areas	39,828	49,511	80,687
Rural areas with greenhouses	1,786	1,568	2,567
Agricultural land	736,972	830,127	1,113,451

Land use	T50	T100	T1 000
Developed and developing tourist areas	181,393	201,296	298,723
Industrial Zone Areas	17	21	34
Protected ecological areas	390,975	212,631	262,481
Culturally significant areas	19,224	20,557	27,476

Table 7-2: Areas are in hectares Infrastructure and economic activities within the floodplain of the Thessaly RBD by return period.

Infrastructure - Economic Activity	T50	T100	T1 000
Settlements	175	187	212
Educational facilities	176	232	348
Civil protection facilities	6	8	9
Healthcare facilities	17	21	27
Cultural heritage monuments	69	80	106
Sports facilities	57	68	101
Electricity substations	6	6	7
Livestock units	740	887	1,458
Industrial facilities	97	108	155
Boreholes	14	15	20
Wastewater Treatment Plants	5	7	10
Cultivated agricultural areas	736,972	830,127	1,113,451

Table 7-3: Potentially affected population, by APSFR and return period

Zone	T50	T100	T1000
EL08APSFR001	34	39	60
EL08APSFR002	0	0	0
EL08APSFR003	79.891	96.828	147.520
EL08APSFR004	70	78	141
EL08APSFR005	1.012	1.115	1.483
EL08APSFR006	346	447	1.459
EL08APSFR007	9	11	19
EL08APSFR008	810	875	1.500
EL08APSFR009	27.381	32.630	43.376
TOTAL	**109.553**	**132.023**	**195.558**

Typical samples of a Flood Risk Maps of APSFR EL08APSFR003 and EL08APSFR009 as their legend are presented below.

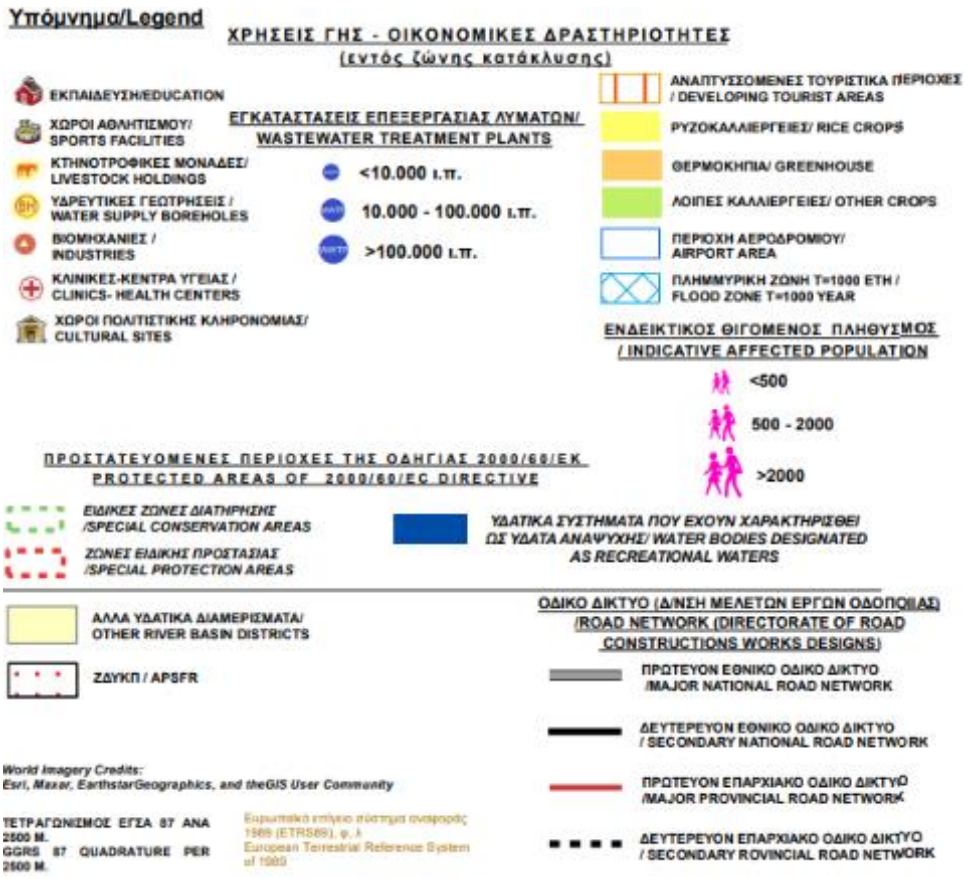

Figure 7-2: Memorandum of the Flood Risk Maps

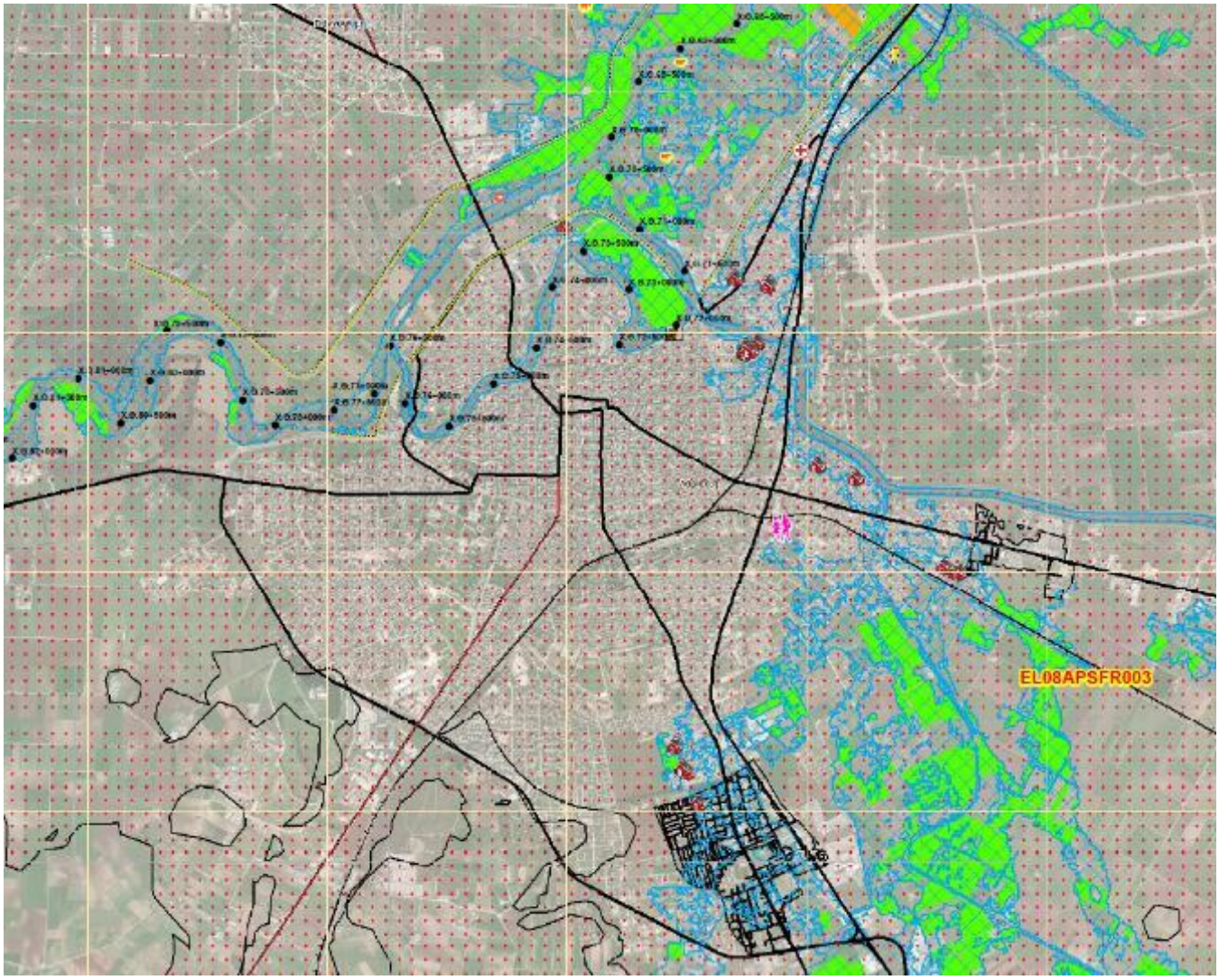

Figure 7-3: Part of the Flood Risk Map of Larissa, APSFR EL08APSFR003 presenting the affected areal and point-based land uses, for T=100 years

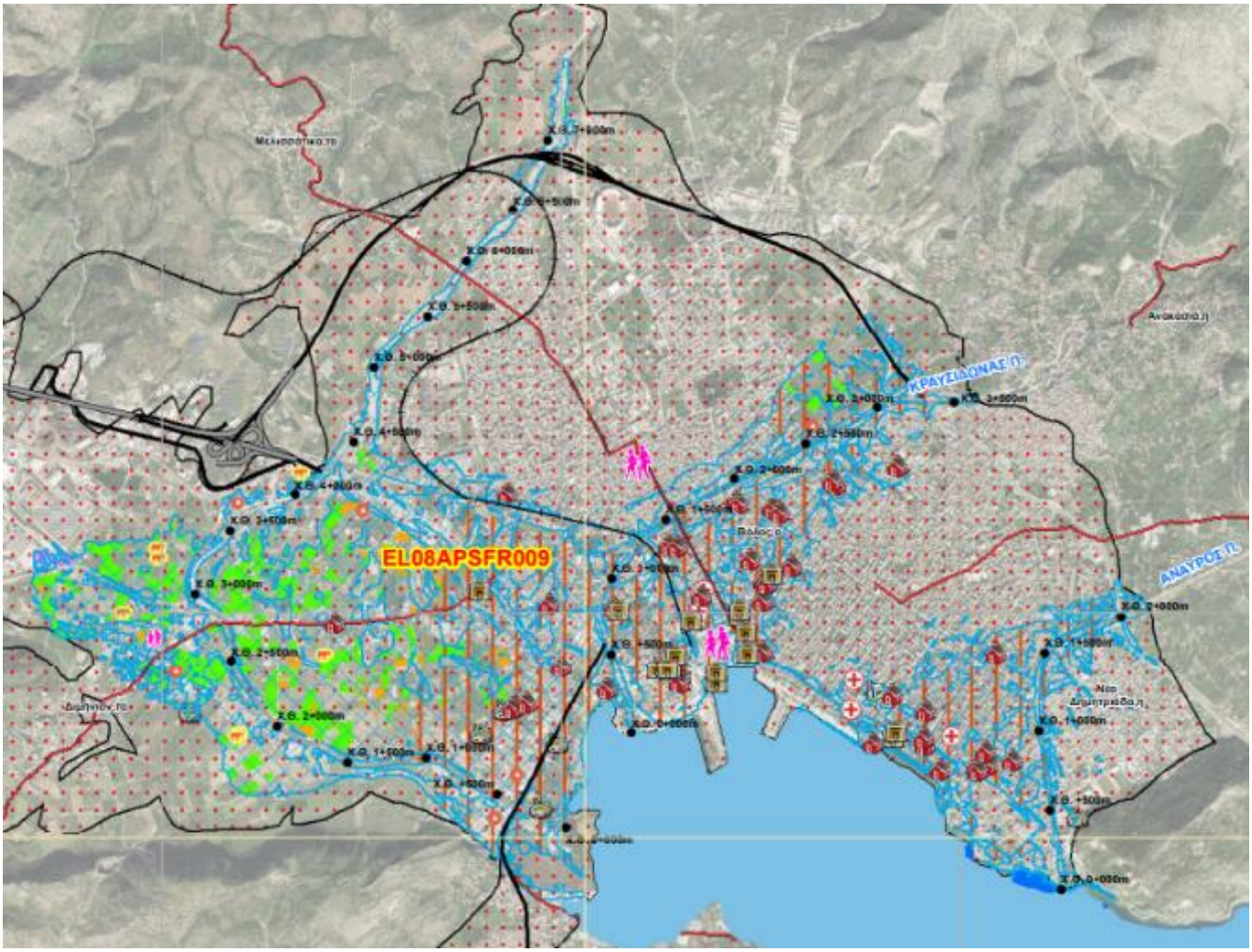

Figure 7-4: Part of the Flood Risk Map of Volos, APSFR EL08APSFR009 presenting the affected areal and point-based land uses, for T=100 years

8 Climate Change Investigation of the 1st Review of the FRMP

The EU recognises that changes in the intensity and frequency of extreme rainfall events, combined with changes in land use, are expected to increase the risk of flooding across Europe. This 1st Review investigates the potential impact of climate change on the frequency of flood events. More specifically, the reduction or increase in the return period of a flood event, which under present climatic conditions and data corresponds to an event with T = 50, 100 or 1000 years, is investigated.

According to the applied methodology, to assess the influence of climate change on the frequency of flood events based on precipitation intensities, climate projection data for 675 locations of precipitation stations in the country are used. These data were developed under the SWICCA (Service for Water Indicators in Climate Change Adaptation, 2015-2018) project and are derived from 9 combinations of Global Circulation Models (GCMs), Regional Climate Models (RCMs) and Representative Concentration Pathways (RCPs) scenarios.

For each point location of rainfall runoff curves, the determination of the new frequency of recurrence of the design floods of this 1st Review FRMP as modelled according to the climate projections, is made for **two future climate periods:**

- Mid-Century (2041-2070 or 2050s) and
- The end of the century (2071-2100 or 2080s).

For the **entire RBS EL08**, there is a halving (doubling) of the return periods (frequency) of extreme rainfall events. This indicates that in the future climate, rainfall intensities associated with a given period return will increase, or equivalently, the frequency of historically observed flood events will rise. Consequently, the future climate is expected to be more adverse with respect to flood phenomena at the RBD, especially concerning medium and large hydraulic infrastructure.

- At the RBD average level, differences are observed between the climate periods 2041–2070 (2050s) and 2071–2100 (2080s) across all return periods, with the end-of-century period producing more adverse results.
- The following tables present the change of the average return periods of the river basins of the RBD EL08 during the future periods 2041-2070 (2050s) and 2071-2100 (2080s)

Table 8-1: Expected values of the average return period of the RBD EL08 in the future periods 2050s and 2080s

A/N	RB	$T^{(hist.)}(T)$ (1) (0) 2041 - 2070 (2050s)	$T^{(hist.)}(T)$ (T) (50) 2041 - 2070 (2050s)	$T^{(hist.)}(T)$ (100) 2041 - 2070 (2050s)
1	PINEIOS	8	25	46
2	ALMYROS-PELION	8	31	63
A/N	**RB**	$T^{(hist.)}(T)$ (1) (0) **2071 - 2100 (2080s)**	$T^{(hist.)}(T)$ (5) (0) **2071 - 2100 (2080s)**	$T^{(hist.)}(T)$ (100) **2071 - 2100 (2080s)**
1	PINEIOS	7	20	33
2	ALMYROS-PELION	8	24	43

9 Differences compared to the initial FRMP for RBD EL08

The most important variations compared to the 1st Implementation Cycle of Directive 2007/60/EC concern:

- Expansion of boundaries of Areas of Potential Significant Flood Risk (APSFRs) in the River Basin District of Thessaly (EL08) during the 1st Review of the Preliminary Flood Risk Assessment.
- The use of a new Digital Elevation Model (DEM), based on the most recent 2x2 m resolution DEM from the National Cadastre, developed during 2015–2016 for the orthorectification and production of LSO25 orthophotos maps. Necessary correction and enhancement processes were applied to the DEM incorporating field survey data, as detailed in Deliverable P1: “Production of High-Resolution and High-Accuracy DEMs for Areas with Mild Relief and APSFRs.”.
- Changes in land use, economic activities, and infrastructure within the APSFRs of RBD EL08.
- The differentiation of rainfall data and ombrian curves used for the preparation of the flood hydrographs and, consequently, the use of new hydrographs for all three return periods, based on the hydrological analysis presented in Deliverable P4 "Flood Hydrographs".
- The addition of new streams and sections of streams and rivers for flood routing, as presented in detail in Deliverable P2 "Analysis of area characteristics and flood mechanisms".
- Based on the above observations, the total maximum inundation area shows a decrease of 8% compared to the original SWMP. Similarly, the calculated flood risk areas also show a proportional percentage decrease.

10 Preparation of the Programme of Measures for the 1st Review of the FRMP of the River Basin District of Thessaly EL08

10.1 Objectives of the 1st Review of the FRMP of Thessaly (EL08)

The **general objectives** in the framework of the preparation of the initial FRMP for the RBD of Western Central Greece (EL04) were defined as follows:

- Mitigation of flood exposure (Management Objective O1)
- Reduction of the probability of flooding (Management Objective O2)
- Enhancing preparedness for flooding (Management Objective O3)
- Improve the rehabilitation mechanisms of the affected areas (Management Objective O4)

The above General Objectives correspond to the four action lines of Flood Risk Management (Prevention, Protection, Preparedness, Recovery) and are of a strategic nature. In the present 1st Review of the **FRMP**, the above General Objectives are maintained and further specified in Specific Objectives which are set in order to identify, distinguish and explain the individual objectives which together will effectively cover the achievement of each general objective.

In order to achieve the **General Objective O1 to mitigate flood exposure to** human health, the environment, cultural heritage and economic activities, the following sub-specific objectives are defined:

- O1.1: implementation of actions and measures to acquire, complete, organise and improve available information
- O1.2: implementation of training/information actions and measures, modernisation and organization of a network of meteorological and hydrometric data, in order to improve the level of knowledge of flood prevention.
- O1.3: implementation of actions and measures to adopt appropriate conditions and restrictions, to be set in accordance with the FRMP.

In order to achieve the **General Objective O2 to reduce the likelihood of flooding** and thereby increase the level of protection of human health, the environment, cultural heritage and economic activities, the following specific sub-objectives are defined:

- O2.1: implementation of actions and measures of an environmental nature for the containment, shaping and management of the flood zone of upland streams, as well as for the reduction of flood risk through natural water retention in lowland areas.
- O2.2: implementation of actions and measures for the utilisation of impoundment, modernisation, rehabilitation and construction of drainage networks, stormwater management and flood protection works, to reduce flood risk by other means.
- O2.3: implement actions and measures to enhance flood risk management practices at the protection stage by promoting strategic planning of flood protection and stormwater projects, while promoting natural retention or controlled inundation solutions to improve runoff management through appropriate legislative/administrative arrangements.

To achieve General **Objective O3 to enhance flood preparedness** and mitigate the impacts of the flood event on human health, the environment, cultural heritage and economic activities, the following sub-specific objectives are defined:

- O3.1: implement actions and measures to develop flood early warning tools and organize and authorize actions for the restoration/maintenance of embankments, in order to increase the level of preparedness against flood risk.
- O3.2: implementation of non-structural interventions, actions and measures for education/information and awareness-raising of the public and stakeholders, actions for the prior identification of alert thresholds and marking/warning of flood risk areas, in order to improve the level of knowledge of flood preparedness.
- O3.3: implement actions and measures to develop action plans and regulations to organize and strengthen flood risk management practices at the preparedness stage, through appropriate non-structural interventions and legislative/administrative arrangements.

In order to achieve the **General Objective O4 to improve the rehabilitation mechanisms of the affected areas** (people, environment, cultural heritage and economic activities), the following specific sub-objectives are defined:

- O4.1: Implementation of economic and legislative/administrative actions and measures to regulate procedures and responsibilities for damage assessment, aiming to improve the evaluation and compensation mechanism following a flood.
- O4.2: Implementation of environmental actions and measures to define methods and emergency restoration activities after flood events, aiming to improve preparedness for restoration work execution.
- O4.3: Implementation of economic and legislative/administrative actions and measures to support those affected by flood events, aiming to improve the post-flood recovery mechanism

10.2 Preliminary assessment of a set of measures

In the context of this 1st Review of the FRMP, a Preliminary Assessment of a broader - the proposed - set of measures has taken place. Out of the total of 40 measures (initial pool of measures), which were assessed:

- 6 of which were not included in the present FRMP as complete,
- 2 measures were proposed to be reviewed in the next cycle of the FRMP,

Thus, following the Preliminary Assessment, out of the total of 40 measures considered (initial pool of measures), 32 measures are qualified for further investigation of their applicability in the EL08 RBD and 8 measures are withdrawn. However, it is noted that following the consultation process the measure was also removed: *"Provide incentives for private flood insurance"* although according to the methodology of the Preliminary Assessment it would have qualified. This measure was removed as part of the consultation and the documentation for its removal is included in the documentation document: *'Consultation Results Report'.*

Thus, of the 32 measures of the Water Region of Thessaly (EL08) that were qualified by the Preliminary Assessment and put out for consultation**, a total of 31 measures are finally proposed**, 9 of which relate to Prevention, 12 to Protection, 8 to Preparedness and 2 to Restoration (see table below) which follow in the metrics.

Table 10-1: Number of measures per action axis in the Thessaly RBD

Measure axis	Total number of measures considered by the Preliminary Assessment	Total number of measures after completion of the preliminary assessment and public consultation procedures
Prevention	11	9
Protection	14	12
Readiness	10	8
Restoration	5	2
Total	**40**	**31**

Therefore, a total of 32 measures have been selected and included in the present FRMP, of which 9 are related to General Objective O1, 2 to General Objective O2, 8 to General Objective 03 and 3 to General Objective 04.Finally, 26 of the 32 measures are applied in total, either in the EL08 RBD or in the APSFR. The remaining 6 measures are applied per APSFR in selected locations, as derived from the available data and calculations of the present FRMP.

10.3 Programme of measures of the FRMP of Thessaly RBD EL08

As in the 1acycle of implementation of the FRMP, in the 1st Review of the FRMP, the Measures are divided into **types** according to their content. In particular, the following types of Measures are distinguished:

- Legislative/Administrative Regulations: Refers to administrative regulatory decisions
- Economic Measures: Refers to measures and interventions aimed at better assessing flood damages and financial tools for managing flood impacts.
- Education/Information Measures: Refers to actions for education, public awareness, and information dissemination.
- Non-structural Interventions: Refers to regulatory provisions (e.g., land use control, zoning) and non-structural works (such as early warning systems).
- Data Acquisition, Completion and Improvement: Refers to the creation/completion of databases, field data collection, primarily topographic surveys of infrastructure and stream geometry data.
- Green infrastructure: Refers to measures and interventions for the protection of environmentally sensitive areas.
- Technical Flood Protection Measures: Refers to structural flood protection works and the studies required for their implementation.

The number of measures of the 1st Review of the FRMP by type of measure according to their content are given in the table below.

Table 10-2 Number of proposed measures by type

Type of measure	Number of measures
Legislative/Administrative Regulations	6*
Economic Measures	1
Education/Information Measures	1
Non-structural Interventions	2
Data Acquisition, Completion and Improvement	7
Green infrastructure	7
Technical Flood Protection Measures	7
TOTAL	**31**

** Two (2) of the measures of the type "Legislative/Administrative Regulations" include Technical Flood Protection Measures*

Among the new measures proposed are new Natural Water Retention Measures. The European Commission's Directorate-General for Environment is promoting the integration of Natural Water Retention Measures (NWRMs) into Flood Risk Management. NWRMs are multifunctional measures that aim to protect and manage water resources using natural means and processes, creating green infrastructure, for example by restoring ecosystems and changing land use. NWRMs are given specific coding based on European guidance documents **(http://nwrm.eu/)** depending on the area of application.

The table below shows the number of proposed measures per General and Specific Objective served.

Table 10-3 Number of proposed measures per General and Specific Flood Risk Management Objective

General Objective	Specific Objective	Number of measures
O1: Mitigation of exposure to flooding	O1.1 Organisation and improvement of available information	3
	O1.2 Improvement of knowledge on flood prevention	1
	O1.3 Adoption of appropriate terms and restrictions, consistent with the FRMP	5
O2: Flood likelihood reduction	O2.1 Reduction of flood risk through natural water retention	3
	O2.2 Flood risk reduction by other means	6
	O2.3 Enhancing flood risk management for protection	3
O3: Enhancing flood preparedness	O3.1 Develop flood risk preparedness tools	2
	O3.2 Improvement of knowledge on flood preparedness	3
	O3.3 Strengthening flood risk management for preparedness	3

General Objective	Specific Objective	Number of measures
O4: Improving the restoration mechanisms of affected areas	O4.2 Improvement of preparation of rehabilitation works	1
	O4.3: Recovery from recent flood events	1

In addition, the dendrogram logic diagram below shows all the Measures of the 1st Review of the PRSP by General and then by Specific Objective.

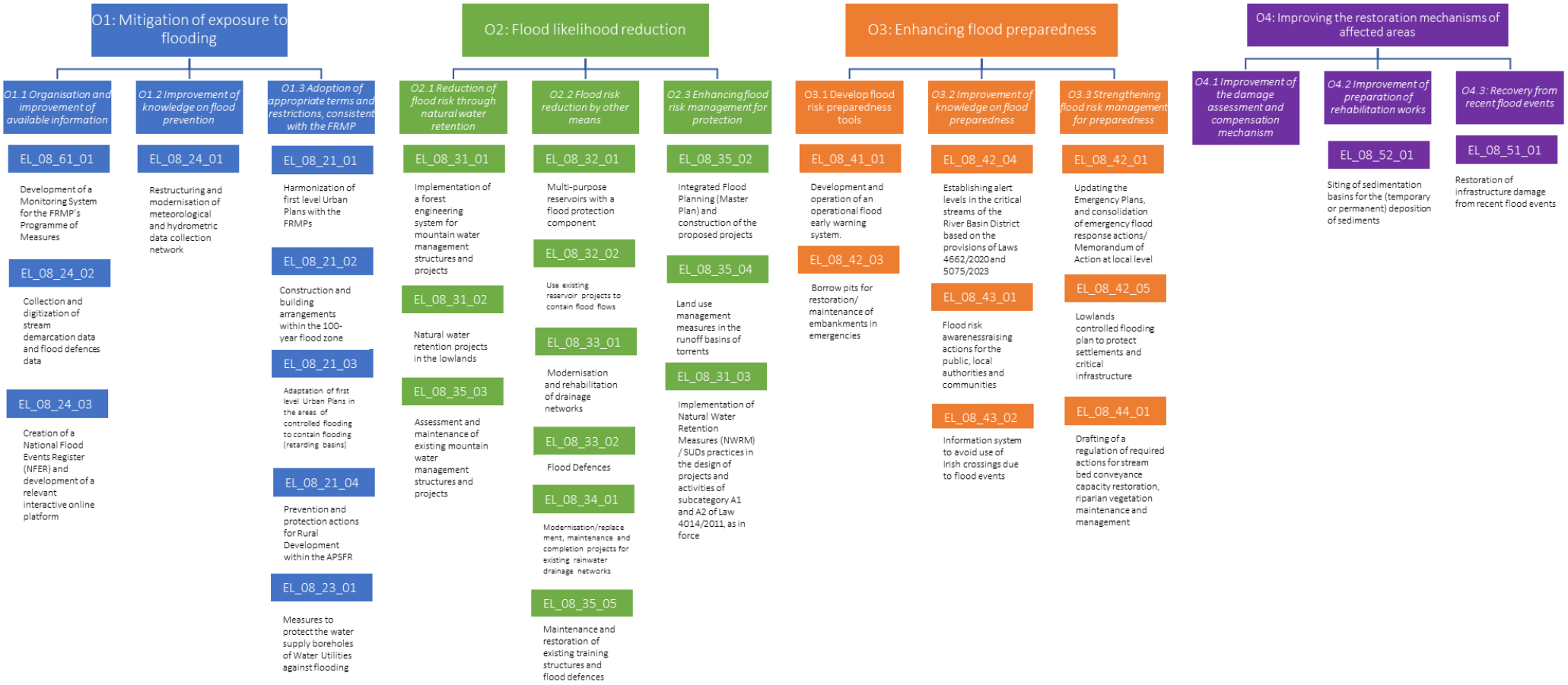

Figure 10-1: Tree diagram of measures of the 1st FRMP Review for the RBD EL08 by General and Specific Objective

The above Measures provide for actions and arrangements to address the risks in the APSFRs and in particular in the **geographical areas defined in the Flood Hazard Maps for a 100 year return period (average exceedance probability scenario)**. Administrative measures and horizontal actions are implemented at the river basin district level. The scope of the Measures is detailed in the description of the Measures below.

The proposed Measures are, where feasible, specified per ASPFR, taking into account both the results of the Flood Hazard Maps and Flood Risk Maps for the Western Central Greece River Basin District, the proposed measures of the 1st FRMP, the measures of the 2nd Review of the River Basin Management Plans and the proposals and measures of other bodies and consultants, which have been assessed in the context of the present document. In particular, 23 measures are implemented at the level of the RBD, while 8 measures are specified in individual APSFRs.

Below, **an indicative metric** is listed. Each metrosheet is coloured according to the General Objective it performs: Blue for O1, Green for O2, Orange for O3 and Purple for O4. Under each metric, the documentation of the necessity of the measure and its link to the calculations of the present FRMP is provided. It should be noted that, compared to the metric of the first FRMP, some old fields have been changed and new fields have been added to facilitate the understanding of the content and the implementation and monitoring of each measure. For the measures that are implemented in specific APSFRs, the relevant metrics per specific APSFR are presented.

Table 10-4 Specific Measure Description Form

NAME OF MEASURE	Include the name of the measure
MEASURE CODE	Measures, coded as follows: EL_XX (MD code)_XX (Measure Type according to WISE) _XX (Measure Serial Number)
CORRELATION WITH MEASURE OF THE 1TH PLAN	Continued from the 1st Project or New Measure
AXIS	Prevention, Protection, Preparedness, Recovery
GENERAL OBJECTIVE	Indicate the general objective of the CI to which the measure relates (O1, O2, O3, O4)
TYPE OF FLOOD RISK MANAGEMENT MEASURE	The FRM type reference of the measure and its description
TYPE OF PHYSICAL WATER RETENTION MEASURE	The code of the type of Natural Water Retention measure and its description is given, according to the 'EU policy document on Natural Water Retention Measures' and the list https://www.nwrm.eu/measures-catalogue
SPECIFIC OBJECTIVE	Indicate the specific objective of the CI 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, O4.3)

NAME OF MEASURE	Include the name of the measure
TYPE OF MEASURE	Legislative/Administrative arrangements Measures of an economic nature Education/information measures Non-structural interventions Exercising, completing and improving information Environmental measures (green infrastructure) Technical flood protection measures
DESCRIPTION OF THE MEASURE	Includes the detailed description of the measure
IMPLEMENTING BODIES	Indication of the Competent Authority responsible for the implementation, application and coordination of the proposed measure at national, regional and local level as well as other bodies involved in its implementation
AREA OF APPLICATION OF THE MEASURE	Water Domain, APSFR, River Basin, Water System, Place name, etc..
INDICATOR FOR MONITORING THE PROCESS OF IMPLEMENTATION OF THE MEASURE	Varies according to the measure
TARGET PRICE	Varies according to the measure
AREA OF IMPACT OF THE MEASURE	River Basin District, APSFR , river basin, water system, place name, etc.
INDICATOR FOR MONITORING THE IMPACT OF THE MEASURE	Varies according to the measure
TARGET PRICE	Varies according to the measure
RESILIENCE TO CLIMATE CHANGE	The resilience of the measure to climate change is given. The performance is assessed as Critical, High, Medium, Low.
CORRELATION WITH CLIMATE CHANGE OBJECTIVES AND MEASURES	The correlation of the Measure with the objectives and actions of the National Strategy for Climate Change Adaptation (2016), the Regional Plan for Climate Change Adaptation of Western Greece (2022), the Climate Law and the EU Specifications is given.
CORRELATION WITH TARGETS AND MEASURES OF THE RIVER BASIN MANAGEMENT PLANS	Commentary on the synergy of the measure with the objectives and measures of the River Basin Management Plans

NAME OF MEASURE	Include the name of the measure
STAGE OF IMPLEMENTATION	Not Started No tender In Preparation In a tendering or proc urement procedure On going construction
DURATION OF IMPLEMENTATION	Short term : 0-2 years Medium term : 2-6 years Long-term : > 6 years
PROPOSED TIMETABLE FOR IMPLEMENTATION (MILESTONES)	Summary timetable for the implementation of the measure, indicating its main stages (milestones)
ORDER OF PRIORITY	Indicate the Priority Group (1, 2 or 3) to which the measure is assigned on the basis of the results of the application of the methodology for prioritising measures
ESTIMATED COST	An estimate of the cost of the measure is given
INDICATIVE FINANCIAL INSTRUMENT	Indicate the bodies/programmes which may be sources of funding for the measure

It is recalled that, irrespective of the individual competent authorities related to the implementation of specific Measures, the general supervision of the implementation of the management plan belongs to the competent Secretariat for Water of the relevant Decentralised Administration. Finally, the General Secretariat for Water of the Ministry of Environment and Energy is coordinating the flood directive 2007/60EC at national level.

Finally, submitting a well-documented proposal to the relevant funding instrument, projects and actions included in the Program of Measures of the Flood Risk Management Plan (FRMP) may be financed even in areas that are not designated as Areas of Potential Significant Flood Risk under the Preliminary Flood Risk Assessment, provided that: a) A major flood event and/or a significant forest fire has occurred in these areas and/or in their upstream/downstream b) The proposed works/actions are compatible with the objectives of Directive 2007/60/EC on the assessment and management of flood risks c) They do not contradict the provisions of the relevant FRMP and its associated Program of Measures

The measures included in the 1^{h}Review of the FRMP are shown in the table below.

Table 10-5: Summary presentation of the measures for the 1st Review of the FRMP of Thessaly (EL08).

Measure Code	Name of Measure	General objective	Total APSFR/River Basin District EL04	Specific APSFR	Implementing bodies
EL_08_61_01	Development of a Monitoring System for the FRMP's Programme of Measures	**O1. Mitigation of exposure to flooding**	✓		DECENTRALISED ADMINISTRATION OF THESSALY – CENTRAL GREECE/ SECRETARIAT FOR WATER OF THESSALY
EL_08_21_01	Harmonization of first level Urban Plans with the FRMPs		✓		MINISTRY OF THE ENVIRONMENT AND ENERGY (General Secretariat for Spatial Planning and Urban Environment)
EL_08_21_02	Construction and building arrangements within the 100-year flood zone		✓		MINISTRY OF THE ENVIRONMENT AND ENERGY (General Secretariat for Spatial Planning and Urban Environment)
EL_08_21_03	Adaptation of first level Urban Plans in the areas of controlled flooding to contain flooding (retarding basins)		✓		MINISTRY OF THE ENVIRONMENT AND ENERGY (General Secretariat for Spatial Planning and Urban Environment)
EL_08_21_04	Prevention and protection actions for Rural Development within the APSFR		✓		MINISTRY OF RURAL DEVELOPMENT AND FOOD
EL_08_23_01	Measures to protect the water supply boreholes of Water Utilities against flooding			EL08APSFR003 EL08APSFR005 EL08APSFR007 EL08APSFR008	(1) Water supply service providers (2) DECENTRALISED ADMINISTRATION OF THESSALY - CENTRAL GREECE (SECRETARIAT FOR WATER OF THESSALY)
EL_08_24_01	Restructuring and modernisation of meteorological and hydrometric data collection network		✓		MINISTRY OF THE ENVIRONMENT AND ENERGY (General Secretariat for Water)
EL_08_24_02	Collection and digitization of stream demarcation data and flood defences data		✓		MINISTRY OF THE ENVIRONMENT AND ENERGY (Technical Chamber of Greece) and MINISTRY OF INFRASTRUCTURE AND TRANSPORT

Measure Code	Name of Measure	General objective	Total APSFR/River Basin District EL04	Specific APSFR	Implementing bodies
EL_08_24_03	Creation of a National Flood Events Register (NFER) and development of a relevant interactive online platform		✓		MINISTRY OF THE ENVIRONMENT AND ENERGY (General Secretariat for Water)
EL_08_31_01	Implementation of a forest engineering system for mountain water management structures and projects	**O2. Flood likelihood reduction**		EL08APSFR001 EL08APSFR003 EL08APSFR004 EL08APSFR005 EL08APSFR006 EL08APSFR007 EL08APSFR009	MINISTRY OF ENVIRONMENT AND ENERGY (Directorate of Forests and Forest Environment of Larissa, Directorate of Forests and Forest Environment of Magnesia, Directorate of Forests and Forest Environment of Fthiotida), Forestry Departments (Forestry Department of Almyros, Forestry Department of Lamia, Forestry Department of Larissa)
EL_08_31_02	Natural water retention projects in the lowlands			EL08APSFR002 EL08APSFR003 EL08APSFR006 EL08APSFR008	MINISTRY OF INFRASTRUCTURE AND TRANSPORT (Department of Flood and Drainage Projects D19), REGION OF THESSALY (Directorate of Technical Works/ Sub-Directorates of Technical Works of the Regional Unit), Municipalities
EL_08_31_03	Implementation of Natural Water Retention Measures (NWRM) / SUDs practices in the design of projects and activities of subcategory A1 and A2 of Law 4014/2011, as in force		✓		Project Implementing Entity
EL_08_32_01	Multi-purpose reservoirs with a flood protection component		✓	EL08APSFR003 EL08APSFR004 EL08APSFR005 EL08APSFR006	Project owner
EL_08_32_02	Use existing reservoir projects to contain flood flows			EL08APSFR003 EL08APSFR008	Reservoir management bodies

Measure Code	Name of Measure	General objective	Total APSFR/River Basin District EL04	Specific APSFR	Implementing bodies
				EL08APSFR009	
EL_08_33_01	Modernisation and rehabilitation of drainage networks			EL08APSFR003	MINISTRY OF INFRASTRUCTURE AND TRANSPORT (Department of Flooding and Drainage Projects D19), Hellenic REGION OF THESSALY (Directorate of Technical Works/ Sub-Directorates of Technical Works of the Regional Unit), OEB Farmer (regional/local) associations
EL_08_33_02	Flood Defences			EL08APSFR003 EL08APSFR004 EL08APSFR005 EL08APSFR006 EL08APSFR008 EL08APSFR009	MINISTRY OF INFRASTRUCTURE AND TRANSPORT (Directorate of Flood and Drainage Works D19), REGION OF THESSALY (Directorate of Technical Works/ Sub-Directorates of Technical Works of the Regional Unit), Municipalities
EL_08_34_01	Modernisation/replace ment, maintenance and completion projects for existing rainwater drainage networks			EL08APSFR003 EL08APSFR005 EL08APSFR009	REGION OF THESSALY (Directorate of Technical Works/ Sub-Directorates of Technical Works of the Regional Unit), Municipalities, MUNICIPAL ENTERPRISE FOR WATER SUPPLY AND SEWERAGE, Road maintenance bodies
EL_08_35_02	Integrated Flood Planning (Master Plan) and construction of the proposed projects		✓		Action [A]: MINISTRY FOR CLIMATE CRISIS AND CIVIL PROTECTION (Technical Chamber of Greece) Action [B] & Action [C]: To be determined by the Master Plan (see description for Actions [A], [B], [C])
EL_08_35_03	Assessment and maintenance of existing mountain water management structures and projects			EL08APSFR003	MINISTRY OF ENVIRONMENT AND ENERGY (Directorate of Forests and Forest Environment of Trikala), Forestry Departments (Forestry Departments of Trikala), Forest Policy

Measure Code	Name of Measure	General objective	Total APSFR/River Basin District EL04	Specific APSFR	Implementing bodies
					Implementation Inspectorate of Thessaly – Central Greece
EL_08_35_04	Land use management measures in the runoff basins of torrents		✓		MINISTRY OF RURAL DEVELOPMENT AND FOOD (based on Law no. 5184/2025 (A' 34))
EL_08_35_05	Maintenance and restoration of existing training structures and flood defences		✓		REGION OF THESSALY (Directorate of Technical Works/ Sub-Directorates of Technical Works of the Regional Unit)
EL_08_41_01	Development and operation of an operational flood early warning system.	**O3. Enhancing flood preparedness**	✓		Developer: MINISTRY OF ENVIRONMENT AND ENERGY
EL_08_42_01	Updating the Emergency Plans, and consolidation of emergency flood response actions/ Memorandum of Action at local level		✓		REGION OF THESSALY (Independent Directorate of Civil Protection), REGION OF CENTRAL MACEDONIA (Independent Directorate of Civil Protection for the Eastern Olympus District of the Regional Unit of Dios-Olympos), Municipalities (Civil Protection Offices), DECENTRALIZED ADMINISTRATION OF THESSALY- CENTRAL GREECE (Civil Protection Directorate), DECENTRALIZED ADMINISTRATION OF MACEDONIA - THRACE (Civil Protection Directorate for the Department of Eastern Olympus of the Municipality of Dios-Olympus)
EL_08_42_03	Borrow pits for restoration/ maintenance of embankments in emergencies		✓		REGION OF THESSALY (Directorate of Technical Works/ Sub-Directorates of Technical Works of the Regional Unit), Independent Civil Protection Department

Measure Code	Name of Measure	General objective	Total APSFR/River Basin District EL04	Specific APSFR	Implementing bodies
EL_08_42_04	Establishing alert levels in the critical streams of the River Basin District based on the provisions of Laws 4662/2020 and 5075/2023		✓		REGION OF THESSALY (D / Directorate of Technical Works/ Sub-Directorates of Technical Works of the Regional Unit), Independent Department of Civil Protection)
EL_08_42_05	Lowlands controlled flooding plan to protect settlements and critical infrastructure		✓		MINISTRY OF INFRASTRUCTURE AND TRANSPORT (Directorate of Flood Control and Improvement Works D19), REGION OF WESTERN GREECE (Directorate of Technical Works/ Sub-Directorates of Technical Works of the Regional Unit), REGION OF THESSALY (Directorate of Technical Works/ Sub-Directorates of Technical Works of the Regional Unit), MINISTRY FOR CLIMATE CRISIS AND CIVIL PROTECTION (General Secretariat of Civil Protection)
EL_08_43_01	Flood risk awarenessraising actions for the public, local authorities and communities		✓		MINISTRY FOR CLIMATE CRISIS AND CIVIL PROTECTION, MINISTRY OF EDUCATION, MINISTRY OF THE ENVIRONMENT AND ENERGY, DECENTRALIZED ADMINISTRATION OF LOCAL ADMINISTRATION OF THESSALY – CENTRAL GREECE (Directorate of Civil Protection Civil), REGION OF THESSALY (Independent Civil Protection Department), Municipalities in cooperation with the administration of the schools
EL_08_43_02	Information system to avoid use of Irish crossings due to flood events		✓		Road network operator
EL_08_44_01	Drafting of a regulation of required actions for stream bed conveyance capacity		✓		Ministry of Environment and Energy in cooperation with relevant bodies

Measure Code	Name of Measure	General objective	Total APSFR/River Basin District EL04	Specific APSFR	Implementing bodies
	restoration, riparian vegetation maintenance and management				
EL_08_51_01	Restoration of infrastructure damage from recent flood events	**O4. Improving the restoration mechanisms of affected areas**	✓		MINISTRY OF INFRASTRUCTURE AND TRANSPORT (General Directorate for the Restoration of Natural Disaster Impacts), MINISTRY OF THE INTERIOR, MINISTRY OF ECONOMY AND FINANCE, REGION OF THESSALY, MUNICIPALITIES
EL_08_52_01	Siting of sedimentation basins for the (temporary or permanent) deposition of sediments		✓		REGION OF THESSALY (Directorate of Technical Works/ Sub-Directorates of Technical Works of the Regional Unit, Independent Civil Protection Department)

10.4 Final Description of Measures

The following are the summary descriptions of the measures of the 1st Review of the FRMP of the RBD of Thessaly (EL08).

EL_08_61_01: Development of a Monitoring System for the FRMP's Programme of Measures
The measure concerns: (1) development of a database and interactive platform for the collection and monitoring of the required information from all stakeholders involved in the implementation of the Programme of Measures; and, (2) obtaining consultancy services for this purpose from specialized staff. The provision of advisory services will be indicatively related to: (a) monitoring the implementation of the measures of the FRMP of the RBD; (b) drafting studies and regulatory decisions; (c) coordinating the involved agencies in the implementation of the measures; (d) recording and analysing data related to measures/actions of the FRMP, (e) drafting methodological documents and technical specifications for the implementation of measures of the FRMP; (f) actions to collect/update key data and information used in the preparation of the FRMP; (g) support in the review of the Flood Risk Management Plan and participation in working groups to be established in the context of the needs of the Secretariat for Water.

EL_08_21_01: Harmonization of first level Urban Plans with the FRMPs
The measure concerns the adoption of a Circular Guidance on the indication of data to be drawn from the FRMP during the Analysis Stage/Diagnosis Section of the studies of the first level urban planning studies (Local Urban Plans/Special Urban Plans), for the formulation of documented Proposals for the reduction of disaster risk, in accordance with the qualitative urban planning guidelines of the new Urban Planning Standards (Ministerial Decision ΥΠΕΝ/ΔΝΕΠ/32892/1414/2024, Government Gazette D' 200Y).

EL_08_21_02: Construction and building arrangements within the 100-year flood zone
Formulate specific provisions in the Building and Construction Regulations to reduce the vulnerability of constructions/instalations and structures within the 100-year Flood Zone due to their exposure to flood risk, with the aim of reducing the risk of disaster.

EL_08_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 areas of controlled flooding, in order to propose allowable land uses and restrictions within these zones. The controlled flooding areas are defined in the specific study of measure EL_08_42_05.

EL_08_21_04: Prevention and protection actions for Rural Development within the APSFR

This measure concerns actions as they will be developed in an action/intervention plan, which will include indicatively and not exclusively the following elements:
(a) Identification of crops and locations which are damaged by systematic floods. That depends on the season and the duration of the flooding. It is known that floods in some cases (short duration of flooding in winter or spring) can be beneficial for some corps. In these cases, there is no compensation from Hellenic Agricultural Insurance Organization (ELGA), so special attention should be paid to the data collection from multiple sources (apart from ELGA).
(b) Identification and documentation of point, local or generalized issues in artificial or natural drainage networks and their electromechanical equipment, which exacerbate flood damages. The improvement/rehabilitation of these systems will reduce damages and restoration works will be proposed under measure EL_08_33_01 " "Modernisation and restoration of drainage networks".
(c) Mapping of livestock and poultry units systematically affected by flooding (supported by validated data from Integrated Administration and Control System). A clear distinction should be made between temporary shelters (as per Law 4056/2012, as in force) and permanent stable facilities.
(d) Highlighting crop and livestock installations that, on a priority (but not exclusive) basis, require flood protection.
(e) Exploration of alternative crops and/or varieties that are effective, immediately applicable, and capable of yielding agricultural income equivalent to existing crops. This should consider soil and climate suitability, the know-how of local producers, and the availability of agricultural equipment and infrastructure. Additionally, investigation of irrigation potential for such crops (which are water-intensive) through existing/new land improvement projects construction of land improvement works for the retention and provision of irrigation and/or floodwaters, irrigation boreholes, irrigation networks, etc., particularly during periods of water scarcity or drought.
(f) Recommendations for alternative agricultural practices (e.g., sowing time, fertilization, harvesting, grazing locations), taking into account the seasonality of flood events and identifying possible economic or other impacts from modifying such practices
(g)Proposals for financial and other incentives to support crop conversion and/or relocation of livestock units

EL_08_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

EL_08_24_01: Restructuring and modernisation of meteorological and hydrometric data collection network

The measure concerns the upgrade and modernization of the existing analogue hydrometeorological station network operated by the Ministry of Environment and Energy. Its implementation indicatively includes the following actions
(a) the replacement of analogue hydrometeorological stations with digital telemetric stations throughout the country, and extension of the network where required
(b) the creation of a digital platform for recording and telemetric and meteorological information.
The measure will be implemented in cooperation with the Secretariats for Water of the relevant Decentralized Administrations.

EL_08_24_02: Collection and digitization of stream demarcation data and flood defences data

The measure concerns the creation and maintenance of a database with the collection and digitisation of information at the level of the APSFR, on:

- Data on existing and new stream demarcation files per River Basin District (RBD), as well as other relevant information for the preparation of demarcation studies.
- Already demarcated streams (geospatial elements of demarcation lines)
- Technical data on flood protection infrastructure affecting water flow, including topographic surveys of existing works carried out within the context of the FRMPs, as well as from other studies and available information from other authorities' records and designs.

EL_08_24_03: Creation of a National Flood Events Register (NFER) and development of a relevant interactive online platform

This involves the design and development of a National Flood Event Register and a related interactive web platform through 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 Ministry of Environment and Energy.
This is intended to enable the availability and use of uniformly formulated damage and impact assessment data from extreme flood events by each stakeholder, supporting management plans and flood risk assessments.

EL_08_31_01: Implementation of a forest engineering system for mountain water management structures and projects

The measure concerns natural water retention projects in mountain areas.

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

1. Horticultural works to create normal hydrogeomorphic 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 works (grading, scrapings of slopes, drainage, trenches, dry-stone mansory, wattle, log erosion barriers etc.) designed to damp out pockets of sediment production or to temporarily retain rainwater.
3. Hydraulic engineering works including a variety of engineering structures 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. 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 FRMP, in areas where Masterplan (EL_08_35_02) is planned, projects falling under this measure will be derived 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 basic characteristics (A and B) in the following Table may proceed, provided they also meet the additional condition

A	**EMERGENCY CONDITIONS** Projects may be carried out to meet an emergency need for flood protection in the area following natural disasters (e.g. fire, major flooding, etc.)
B	**MULTIPLE FUNCTIONS** Projects that serve multiple uses and functions may proceed.
	ADDITIONAL REQUIREMENT: Projects in the above A or B categories may only proceed if documented evidence exists that they will not negatively impact downstream areas in terms of flood risk or affect existing or planned infrastructure.

EL_08_31_02: Natural water retention projects in the lowlands

This measure concerns natural water retention works along the boundaries of lowland streambeds, as defined together with the mountainous streambed limit by former Prefectoral Decisions and in accordance with the current legislation. Priority is given to 100-years flood zones within APSFR (or upstream of them) and in locations with high or very high flood risk (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:

- Restoration and management of floodplain areas (N03) – «make room to river» - by removing artificial embankments to increase storage capacity and facilitate post-flood recovery.
- Restoration of streambeds to their natural state (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 the areas where the implementation of a Masterplan (EL_08_35_02) is declared as a measure, 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 basic characteristics (A and B) in the following Table may proceed, provided they also meet the additional condition

A	**EMERGENCY CONDITIONS** Projects may be carried out to meet an emergency need for flood protection in the area following natural disasters (e.g. fire, major flooding, etc.)
B	**MULTIPLE FUNCTIONS** Projects that serve multiple uses and functions may proceed.
	ADDITIONAL REQUIREMENT: Projects in the above A or B categories may only proceed if documented evidence exists that they will not negatively impact downstream areas in terms of flood risk or affect existing or planned infrastructure.

EL_08_31_03: Implementation of Natural Water Retention Measures (NWRM) / SUDs practices in the design of projects and activities of subcategory 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_08_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 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_08_32_02: Use existing reservoir projects to contain flood flows

This measure includes actions to optimize the management of the existing reservoir in order to a) to optimally fulfill the need of the uses they serve, b) offer the maximum possible flood protection downstream.

The reservoirs, in which the measure is going to be applied, would be chosen based on the results of Flood Hazard Maps of this review of FRMP, downstream of the existing dams or upstream of future dams.

EL_08_33_01: Modernisation and rehabilitation of drainage networks

The measure includes the following actions:

- Identification of drainage problematic lowland agricultural areas - assessment of the existing situation.

- Checking the adequacy of the drainage networks and electrical and mechanical equipment in these areas.

- Formulation of proposals and implementation of drainage rehabilitation/upgrading projects which may include works:

- Clearing of existing trenches from vegetation and sediments

- maintenance/replacement of road crossing structures and flow control structures (gates, locks)

- modernisation of existing electrical and mechanical equipment (installation of an automatic adjustment and remote management system of the existing equipment for regulating the flow control structures)

- Prioritisation of scheduling

- Implementation of interventions.

EL_08_33_02: Flood Defences

This measure shall be implemented if it is not feasible or sufficient to implement measure EL_08_31_02 of this FRMP concerning natural water retention projects in lowland areas.

The measure includes the construction of new flood defences and/or the completion/reinforcement of existing flood defences in the lowland beds of the streams (for restoration/ maintenance works see measure EL_08_35_05), as a priority in the 100- year flood zones within the APSFRs and in locations with high and very high risk (see Map of Assesment of Impacts of Flooding), which are:

(A) Are proposed under this document or

(B) Planned to be studied in accordance with proposals for maturity of future projects of the Flood Protection Plans (Master Plan), where these are being prepared or will be prepared (Measure EL_08_35_02).

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

i. River/torrent training works 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 streams)

ii. Construction of weirs/downslopes to reduce the longitudinal slope where necessary.

iii. Construction or reinforcement of flood protection embankments along streams

iv. Replacement works or construction of culverts and bridges at road crossing locations that interrupt the continuity of streams.

v. Stream confluence adjustment works and technical works of estuaries of streams/rivers to the sea/lakes

vi. Construction of an artificial stream branch

vii. Silt removal from an untrained section of stream.

In the context of integrated flood protection planning of the FRMP it is clarified that:

For areas where the implementation of a Masterplan (EL_08_35_02) is declared as a measure, 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 which have at least one of the basic characteristics (A and B) of the following Table may proceed, provided that they also meet the additional condition

A	**EMERGENCY CONDITIONS** Projects may be carried out to meet an emergency need for flood protection in the area following natural disasters (e.g. fire, major flooding, etc.)
B	**MULTIPLE FUNCTIONS** Projects that serve multiple uses and functions may proceed.
	ADDITIONAL REQUIREMENT: Projects in the above A or B categories may only proceed if documented evidence exists that they will not negatively impact downstream areas in terms of flood risk or affect existing or planned infrastructure.

EL_08_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 shall be implemented in the following phases:

1. In the first phase, existing stormwater drainage networks are inventoried

2. Firstly, the adequacy of the existing infrastructure is assessed by the competent bodies in order to determine the type of interventions required (such as: maintenance, reinforcement, replacement, extension),

3. The corresponding works are planned and implemented during the current or the next management period.

EL_08_35_02: Integrated Flood Planning (Master Plan) and construction of the proposed projects

(A) Implementation of Flood Protection Plans (Masterplan) for selected areas, with the aim of identifying and prioritizing the required projects, in order of priority:

- Within APSFRs and upstream river basins to mitigate the effects in the areas included in the Flood Hazard Maps and Flood Risk Maps of this Plan with T=100.

- In the remaining portion of the area where a Master Plan is required.

It is noted that:

(a) the need for Masterplans (number and spatial qualification) are defined within this measure

(b) Within the Masterplan, projects of the categories included in measures EL_08_31_01, EL_08_31_02, EL_08_33_02 and EL_08_42_05 are specified and do not include rehabilitation and maintenance works.

(B) Preparation of the required maturity studies

(C) Construction of proposed works

The Master Plan must be in line with the provisions of the Management Plans of Directive 2000/60/EC (River Basin District status, exemptions, etc.) and for this purpose must have the agreement of the competent Secretariat for Water.

It should be noted that the reference to T=100 refers to the area of application of the measure and is not related to the design size of the flood protection works, which is defined on the basis of the regulations in force and the technical specifications of the design of the works in question.

EL_08_35_03: Assessment and maintenance of existing mountain water management structures and projects

The measure includes the assessment of the condition 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. The works will be studied and planned by the Forestry Departments and Forestry Offices responsible for the maintenance of the works in their area of responsibility.

EL_08_35_04: Land use management measures in the runoff basins of torrents

Pasture management plans, in accordance with the requirements of Law 4351/2015 (A' 164) and Joint Ministerial Decision 1058/71977/2017 (Government Gazette B 2331/ 7-7-2017), and in areas upstream of the APSFRs that have not been excluded from grazing land (not classified as protected land), take into account the provisions of the FRMP and RBMP and apply hydrological criteria in determining the grazing intensity (grazing capacity).

EL_08_35_05: Maintenance and restoration of existing training structures and flood defences

The measure includes the following actions to be carried out anually:

- Performing onsite visits and recording problems after the end of the wet (winter) period (e.g.: April)

- Identification of critical positions and techniques in need of maintenance/restoration and prioritisation

- Development of an annual maintenance/restoration work plan by the Region's competent technical services, which will include:

  - Clearing of debris and removal of stream bed that impede free flow of water from the stream
  - Repairs of slope retaining/lining structures
  - Repairs of bed protection/lining works
  - Embankment repairs
  - Repairs of technical structures (terraces, culverts, crossings, etc.)

-Securing funds

- Implementation of interventions

EL_08_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 a flood early warning system, utilizing the hydro-meteorological data of the updated (depending on the wording of the respective measure) hydro-meteorological network specified in measure EL_08_24_04, other data/models and appropriate software, based on the specifications of the ESEPP implemented by the Ministry of Environment and Energy in Evros and Axios rivers and with the possibility of interconnection with their operating platform (ESEPP developer: Ministry of Environment and Energy).

(b) Design and development of a communication protocol between the operating body of the ESEPP and the competent body for timely information of the public and activation of the competent bodies (information procedure, warning bulletins, mechanisms/tools for information transmission e.g. sms), based on the data of the ESEPP (operating body of the ESEPP: Independent Directorate of Civil Protection of the relevant Region or the MINISTRY OF CLIMATE CRISIS AND POLITICAL PROTECTION/GENERAL SECRETARIAT FOR CIVIL PROTECTION).

EL_08_42_01: Updating the Emergency Plans, and consolidation of emergency flood response actions/ Memorandum of Action at local level

In accordance with the provisions of the General Civil Protection Plan "Xenocrates", in the year 2019, the Directorate of Planning and Emergency Response of the Ministry of Climate Change and Civil Protection/General Secretariat for Civil Protection, in cooperation with all stakeholders, 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/General Secretariat for Civil Protection ("DARDANOS 1"). In 2023, the Emergency Planning Directorate of the Ministry Climate Crisis and Civil Protection/ General Secretariat for Civil Protection, 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".

According to this, it is required from the first and second level local authorities to prepare or update the Regional or Local Emergency Plans. In addition to the administrative changes that have taken place, the results of the risk analysis of this 2nd EAP should be taken into account.

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_08_42_03: Borrow pits for restoration/ maintenance of embankments in emergencies

In the T1000 year flood zone where flood protection embankments have been constructed or are 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_08_42_04: Establishing alert levels in the critical streams 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 the aim of setting the alert thresholds corresponding to the four levels of mobilization laid down by the legislation:

- Hydraulic testing of streams and determination of their drainage capacity (maximum flow rate that they can safely drain - with the required free margin according to the specifications)
- Determination of critical positions on the streams where it is possible to monitor and record the river flow (bridge positions, positions with access, linear positions suitable for water measurements)
- Identification of critical positions in relation to the evolution of the flood wave routing and the position/distance of the adjacent affected uses and mainly of the settlements and road access infrastructure.
- Determination of level and flow at the above positions for the four (4) levels of preparedness required by law.
- Defining the water flow corresponding to all the above preparedness levels at critical selected positions of the level - absolute elevation values

EL_08_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 maps of Assessment of Impacts Flooding), in the context of a special design of controlled area flooding, either during the preparation of flood defences MasterPlan (see EL_08_35_02) or other relevant design.

Controlled floodplains are an internationally recognised and growing practice of flood protection as a method of adaptation to climate change. Such areas, usually of low land value, contribute to flood protection downstream by channelling part of the flood volume into riparian areas in a controlled manner by appropriate manipulation (opening of gates or breaking embankments) during flood events.

Once the boundaries of the mountainous and lowland bed of the streams have been defined under the applicable legislation, and the boundaries of settlements and critical infrastructure to be protected have been determined, the hydraulic behavior of the streams for various flood flows shall be examined in order to identify the potential flood volume discharge sites and protect the settlements and/or critical infrastructure, checking the hydraulic behaviour of each proposal. In addition, it is necessary to formulate proposals and define 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 is defined as units relating to human health, the natural environment, transport networks, works of public interest (irrigation, drainage, flood protection, etc.) and cultural heritage sites, and as otherwise defined following the harmonisation of Greek legislation with Directive 2022/2557/EC.

For areas where the implementation of a Masterplan is declared as a measure (EL_08_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 basic characteristics (A and B) in the following Table may proceed, provided they also meet the additional condition

A	EXCEPTIONAL CIRCUMSTANCES Projects may be carried out to meet an emergency need for flood protection in the area following natural disasters (e.g. fire, major flooding, etc.)
B	MULTIPLE FUNCTIONS Projects that serve multiple uses and functions may proceed.
	ADDITIONAL CONDITION: Projects in Categories A and B above will proceed if documentation is provided that they do not have adverse downstream impacts on flood risk and existing and planned projects.

EL_08_43_01: Flood risk awarenessraising actions for the public, local authorities and communities

The measure includes the implementation of information and awareness-raising actions for citizens and stakeholders on the flood risk in their area and the precautions to take in case of flood risk.

Such actions may include: television, radio and internet programmes, organisation of events, training workshops, presentations in schools, etc.

The above will be implemented by the Ministry of Education, the Ministry of the Environment and Energy, the Ministry of Climate Change and Civil Protection General/Secretariat for Civil Protection, the Civil Protection Directorate of the relevant Decentralized Administrations, the Civil Protection Directorate of the relevant Regions and the Municipalities in cooperation with the school administration.

The actions may relate to 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 streams drainage systems are cleared and accessible
- the possibility and need for private/community protection measures
- information on Emergency Response Plans and the importance of compliance with them by the competent authorities.
- the existing Irish crossings, their danger and the actions to be taken to avoid accidents.

EL_08_43_02 Information system to avoid use of Irish crossings due to flood events

The aim of the measure is to enhance the preparedness of citizens and stakeholders to reduce accidents when vehicles cross streams and rivers via Irish Crossings.

The object of the measure is the installation of a system consisting, as a minimum, of warning signs and depth-indicating posts at Irish Crossings within the River Basin District, in order to provide clear information and support the prevention of vehicle crossings during flood events.

The locations of the measure are defined as all Irish Crossings within flood areas for T=100 years as calculated from the calculations of this 1st review of the FRMP, and any other Irish Crossings that are documented by studies or by the Competent Authorities as requiring immediate marking.

EL_08_44_01: Drafting of a regulation of required actions for stream bed conveyance capacity restoration, riparian vegetation maintenance and management

The measure includes the preparation of a regulation/specifications for the periodic actions of stream cleaning, maintenance and management of riparian vegetation. The regulation/specifications shall be formulated taking into account the specific characteristics of the streams concerned (geomorphological and hydraulic characteristics, type of stream, ecological elements, etc.) and the protection status of the area over which it extends.

The regulation/specifications will cover at least:

- the body responsible for cleaning operations, etc., based on the legislation applicable each time (in Natura areas, forests, etc.) the method of implementation of the clean-up
- the time and frequency of the cleaning operation
- the position(s) to be cleaned
- the designation of disposal sites for the cleaning materials or their exploitation
- the procedure to be followed, such as environmental permits and/or information to be provided to 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 interventions carried out

In any case, the cleaning of streams 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 Natural Environment and Climate Change Agency to include terms and conditions in the proposed regulation in order to address their potential impact on the object meriting protection.

EL_08_51_01: Restoration of infrastructure damage from recent flood events

The measure aims at restoring damage to infrastructure due to intense flood events that have occurred. This infrastructure concerns indicatively: Road and Railway Network, Irrigation and Drainage Works, Flood Defences (Embankments, Trainings, Transverse Works), Works of Cultural Interest, Health Facilities, etc. The measure concerns:

(a) recording losses,

(b) preparation of 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 flooding mechanisms that led to infrastructure failure during the flood event to be taken into account in the redesign
3. Proposals for alternative interventions based on milder operations

And, (c) restoration of damaged infrastructure

EL_08_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 Solid Waste Management Agency) is required.

e 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 Prioritisation of measures of the 1st Review of the FRMP

The prioritization of measures is done through the assessment of their economic effectiveness. The purpose of the prioritization is to identify the measures that achieve flood damage reduction (benefit) at the lowest cost.

All measures are complementary to each other and there is no question of choosing one measure with a high cost-effectiveness ratio over another with a low ratio. The cost-effectiveness analysis is therefore meaningful mainly as an indication of the time priority for the implementation of measures, taking into account the scarcity of financial resources, which requires the immediate promotion of measures with a high cost-effectiveness ratio.

The chosen steps in the prioritization methodology are as follows:

- distinguishing the proposed measures into two categories: those that contribute indirectly to preventing damage (Category 1) and those that contribute directly to preventing/responding to damage (Category 2)
- Estimation of the expected benefits of each of the two categories of measures
- Evaluation of the nature/axis of the measure (prevention, protection, preparedness, rehabilitation)
- Correlation with other policies (climate change, RBMP)
- Multi-criteria analysis of the overall benefit index of the measure
- Estimation of the total cost of each measure (investment costs, operational costs)
- Calculation of the cost-effectiveness ratio of the measure and prioritization of measures

Based on the calculation of the total benefit and cost index for each measure and their comparison, a cost-effectiveness index is estimated, according to which the measures are classified into three (3) priority groups.

The tables below present the results of the application of the prioritization methodology for the measures in Category 1 and Category 2 measures.

Table 10-6 EL08 - Prioritisation of Tier 1 measures with indirect contribution to damage prevention

MEASURE	D11: Overall benefit index	D16: Total annualised costs	Ranking of measures		RATING (RANKING)	Priority groups (1, 2, 3)
			ND11	ND16		
Harmonization of first level Urban Plans with the FRMPs	70,83	0,00	10	13	0,77	1
Construction and building arrangements within the 100-year flood zone	70,83	0,00	10	13	0,77	1
Adaptation of first level Urban Plans in the areas of controlled flooding to contain flooding (retarding basins)	70,83	0,00	10	13	0,77	1
Measures to protect the water supply boreholes of Water Utilities against flooding	97,50	427.634,95	3	3	1,00	1
Application of Natural Water Retention Measures (NWRM) / SUDs practices in the design of projects and activities of subcategory A1 and A2 of Law 4014/2011, as in force	71,00	0,00	9	13	0,69	1
Maintenance and restoration of existing training structures and flood defences	73,67	0,00	8	13	0,62	1
Drafting of a regulation of required actions for stream bed conveyance capacity restoration, riparian vegetation maintenance and management	74,33	0,00	7	13	0,54	1
Prevention and protection actions for Rural Development within the APSFR	91,83	125.774,99	5	5	1,00	1
Restructuring and modernisation of meteorological and hydrometric data collection network	97,50	143.383,48	3	4	0,75	1
Development of a Monitoring System for the FRMP's Programme of Measures	100,00	1.119.299,83	1	1	1,00	1

MEASURE	D11: Overall benefit index	D16: Total annualised costs	Ranking of measures		RATING (RANKING)	Priority groups (1, 2, 3)
			ND11	ND16		
Flood risk awarenessraising actions for the public, local authorities and communities	75,00	30.186,00	6	8	0,75	1
Integrated Flood Planning (Master Plan) and construction of the proposed projects	99,50	932.749,86	2	2	1,00	1
Updating the Emergency Plans, and consolidation of emergency flood response actions/ Memorandum of Action at local level	69,33	12.577,50	14	10	1,40	2
Collection and digitization of stream demarcation data and flood defences data	70,17	12.577,50	13	10	1,30	2
Siting of sedimentation basins for the (temporary or permanent) deposition of sediments	46,67	12.577,50	18	10	1,80	3
Creation of a National Flood Events Register (NFER) and development of a relevant interactive online platform	50,50	50.309,99	17	7	2,43	3
Borrow pits for restoration/ maintenance of embankments in emergencies	51,67	25.155,00	16	9	1,78	3
Establishing alert levels in the critical streams of the River Basin District based on the provisions of Laws 4662/2020 and 5075/2023	68,67	125.774,99	15	5	3,00	3

Priority 1 measures
Priority 2 measures
Priority 3 measures

Table 10-7 EL08 - Prioritisation of Category 2 measures with a direct contribution to preventing damage

MEASURE	D11: Overall benefit indicator	D16: Total annualised costs
Implementation of a forest engineering system for mountain water management structures and projects	94,65	13.716.448,13
Natural water retention projects in the lowlands	93,86	889.138,82
Multi-purpose reservoirs with a flood protection component	90,25	2.714.197,81
Use existing reservoir projects to contain flood flows	20,98	24.209,35
Land use management measures in the runoff basins of torrents	19,39	113.527,72
Development and operation of an operational flood early warning system.	91,17	237.103,68
Lowlands controlled flooding plan to protect settlements and critical infrastructure	30,89	-
Assessment and maintenance of existing mountain water management structures and projects	13,82	142.262,21
Information system to avoid use of Irish crossings due to flood events	12,80	36.840,32
Modernisation and rehabilitation of drainage networks	33,33	10.809.288,29
Flood Defences	82,76	4.523.663,01
Modernisation/replacement, maintenance and completion projects for existing rainwater drainage networks	29,83	2.053.160,90

11 Public consultation on the 1st review of the FRMP

A sufficient number of meetings were organized to inform the stakeholders where the Draft Flood Risk Management Plans were published for consultation.

The consultations were mainly held at local/regional level and aimed to the active participation of stakeholders either by attending the events or by submitting their suggestions on the issues to be consulted.

During the implementation of consultation and communication activities, a combination of some or all of the actions described in the following paragraphs may be carried out:

- In the first 4 months after the signing of the contract, autopsies were carried out in the study area, meetings with institutions and services were held and an autopsy report was submitted for the specific areas outside the Areas of Potential Significant Flood Risk
- Subsequently, the Flood Hazard Maps and their accompanying Technical and Non-Technical Reports were uploaded on the website of the Secretariat for Water of the Ministry of Environment and Energy: https://floods.ypeka.gr
- Thereafter, the Flood Risk Maps and their respective Technical and Non-Technical Reports were also published on the General Secretariat for Water of Ministry of Environment and Energy website: http://floods.ypeka.gr
- The Draft Flood Risk Management Plans were later made available on the General Secretariat for Water of Ministry of Environment and Energy consultation website:https://floods.ypeka.gr/consultation/2round-consultation/
- A form for submitting comments and corrections on the Draft Plans was published on the consultation subpage of the General Secretariat for Water of Ministry of Environment and Energy: https://floods.ypeka.gr/2round-consultation-el04/
- The Invitation and Programme for the Public Consultation Workshop, held in Larissa for the 1st Review of the Flood Risk Management Plan (FRMP) of the Thessaly River Basin District (RBD EL08), were also uploaded.
- The List of Social Partners for the 1st Review of the FRMP of the Thessaly RBD (EL08) was published
- Questionnaires were uploaded to facilitate participation in the consultation process, allowing stakeholders and the general public to briefly express their views. The questionnaires were made available online via the official website of the Ministry of Environment and Energy: https://floods.ypeka.gr/consultation/consultation-events/
  The questionnaire was also included in the documentation report: *"Consultation Results Report."*
- On Wednesday 17 July 2024, the Public Consultation Workshop was held in Larissa for the 1st Review of the FRMP of the Thessaly RBD (EL08), during which the following materials were distributed:
  - ✓ Summary Draft of the Flood Risk Management Plan for the Thessaly RBD
  - ✓ Questionnaire on the consultation topics of the Thessaly RBD

The Consultation Workshop in Larissa, was held in a hybrid way, with both live participation of more than 50 people and remote participation of more than 350 people via direct broadcast or a recorded broadcast of the workshop at the link: https://www.youtube.com/watch?v= QqPd_fWiONQ&t=11s.

The consultation on the Draft Flood Risk Management Plan and the SEA of the 1st Review of the Flood Risk Management Plan of the River Basin District of Thessaly (EL08) lasted more than 7 months.

In particular, the conclusions of the consultation process can be summarised as follows:

1. The urgency of the immediate launch/promotion of the measures of the Flood Risk Management Plan.
2. The necessity for an integrated design of flood protection works at the river basin level, taking into account the results of flood hazard and risk assessment from the Flood Risk Management Plan (FRMP), Directive 2000/60/EC, current environmental, spatial planning and urban planning legislation, as well as all alternative flood runoff management options.
3. The need for developing technical specifications for the construction of mountain water management structures mountain and works, riverbed cleaning, and natural sediment retention measures in lowland areas.
4. The need to prioritize nature-based solutions and natural flood retention measures.
5. The need to modernise, maintain and clean the existing network of drainage ditches.
6. The impact of climate change on the return period of flood events and the necessity to correlate the proposed measures with the objectives and actions defined in the Regional Climate Change Adaptation Plans
7. The update of ombrian curves and its impact on ongoing projects and studies
8. The alignment with the most recent administrative levels according to Ministerial Decision 64436/2023 (Government Gazette B 4821/01-08-2023).
9. The influence of recent wildfires on the intensity or even the triggering of flood events.
10. The need to improve the completeness and accuracy of information related to flood risk assessment (basemaps, hydrometeorological data, historical flood event records, technical project registers, human activities).
11. The need to update the list of competent authorities involved in the Programme of Measures.
12. The need for modifications in several fields of the measure sheets of the Programme of Measures, or even the removal of measures.
13. The need to update and supplement Ministerial Decisions, Presidential Decrees, Government Gazette publications, etc.
14. The necessity to further utilize local knowledge and experience from various stakeholders and authorities in assessing and managing the impacts of flood events
15. The necessity of further detailing certain measures from the FRMP to allow for their implementation at the local level.
16. The prioritization of roles and responsibilities among involved stakeholders, considering the applicable legal framework, to enable effective use of the FRMP results—particularly as multiple interdependent agencies are involved across all stages of flood Prevention / Preparedness / Response.
17. The difficulties in utilizing FRMP results by the Public Administration due to insufficient staffing and lack of appropriate technical expertise among competent authorities.
18. The irrational urban planning model, which in most Greek cases follows development rather than guiding it proactively.
19. The complex legislative framework and the fragmentation of responsibilities among state agencies, which hinders the timely and effective resolution of arising issues.

20. The lack of public education on natural disaster preparedness and the overall deficiency in environmental education and awareness.

21. The importance of synergy between some of the measures of the Flood Risk Management Plans and some of the measures of the River Basin Management Plans. The importance of synergy between certain FRMP Measures and specific measures from the River Basin Management Plans.