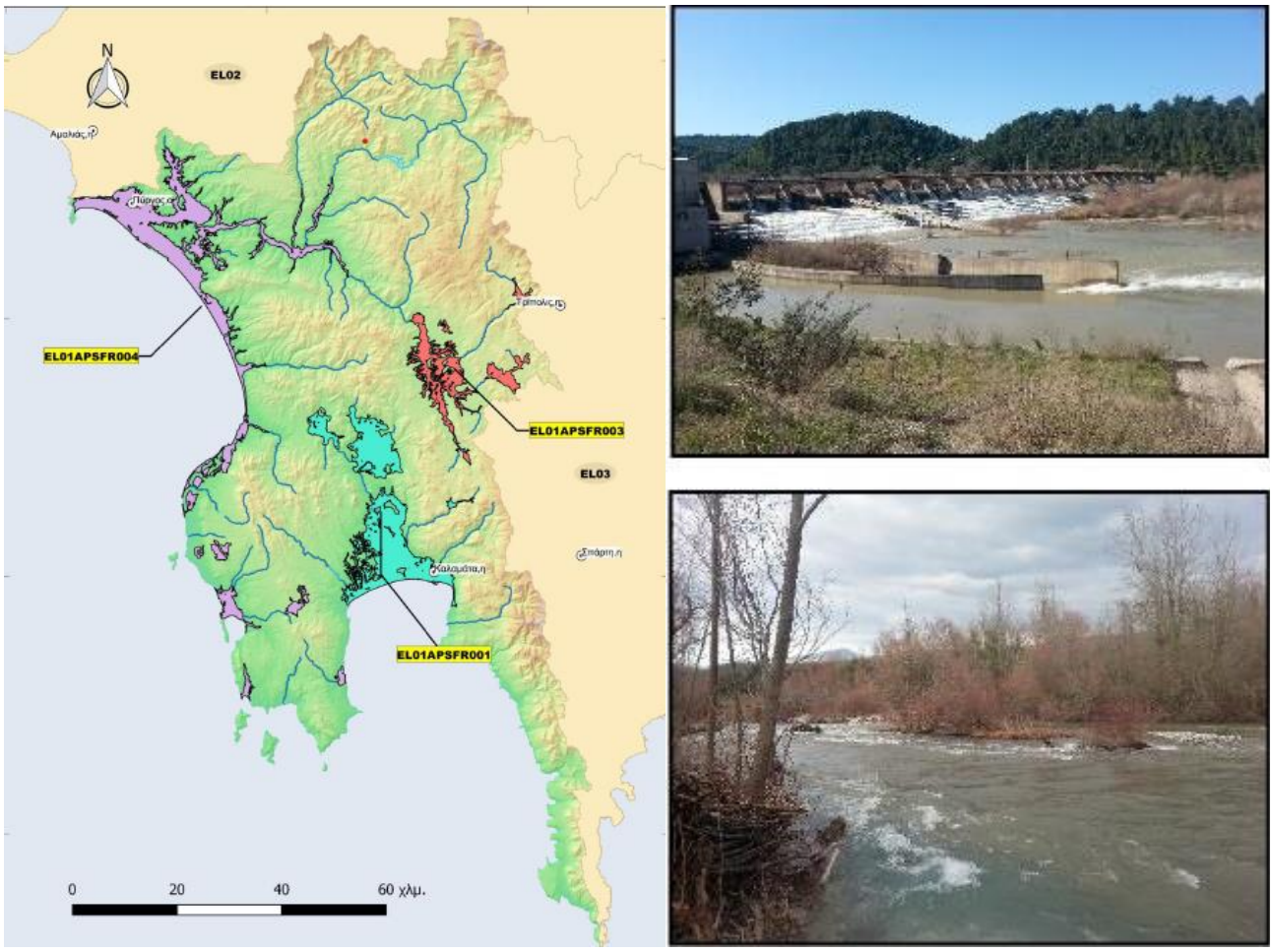
HELLENIC REPUBLIC

MINISTRY OF ENVIRONMENT & ENERGY

GENERAL SECRETARIAT FOR NATURAL ENVIRONMENT AND WATER

GENERAL DIRECTORATE FOR WATER



1st REVISION

OF FLOOD RISK MANAGEMENT PLANS

of the River Basins

of Western Peloponnese Water District (EL01)

Stage 2 - Deliverable 19

Translation into English of the summary reports of the methodologies and results of the Deliverables studies

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HELLENIC REPUBLIC
MINISTRY OF ENVIRONMENT AND ENERGY
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PROJECT NAME: 1st REVIEW OF FLOOD RISK MANAGEMENT PLANS OF THE RIVER BASINS OF WESTERN, NORTHERN AND EASTERN PELOPONNESE AND CRETE WATER DISTRICTS

JOINT VENTURE FOR THE 1ST REVISION OF FLOOD RISK MANAGEMENT PLANS OF PELOPONNESE AND CRETE

ADT OMEGA CONSULTING ENGINEERS TECHNICAL COMPANY
with the distinctive title: ADT OMEGA S.A.

ADVANCED ENVIRONMENTAL STUDIES CONSULTING ENGINEERS S.A.
with the distinctive title: ADENS S.A.

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Issue	**Date**	**Observations**
Edition 1	27/08/2024	Original Version
Edition 2	19/12/2024	Incorporation of comments/feedback from the General Directorate for Water and the Technical Consultant (Protocol No. MoEE/ DfWSPaM/113875/18-10-2024)
Edition 3	22/05/2025	Incorporation of comments/feedback from the General Directorate for Water and the Technical Consultant (Protocol No. MoEE/DfWSPaM/7939/49/23-01-2025)

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- Floods Directive 2007/60/EC, of European Parliament and the Council of the 23rd of October 2007 for the flood **risk assessment** and **management**.
- Incorporation in the Greek Legislation: Joint Ministerial Decision No. 31822/1542/E103/2010 (Government Gazette Issue B' 1108/21.07.2010).
- Amendment by Joint Ministerial Decision No. 177772/924/2017 (Government Gazette Issue B'2140/22.06.2017).
- Amendment by Law 5037/2023 (Government Gazette Issue A' 78/29.03.2023).

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

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

Stage 2: Preparation of **Flood Hazard Maps** and **Flood Risk Maps** in Areas of Potential Significant Flood Risk – APSFRs

Stage 3: Preparation of **Flood Risk Management Plans**, including **Program of Measures**, for the Areas of Potential Significant Flood Risk – APSFRs.

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

1st implementation cycle of Directive 2007/60/EC

1. Preparation and submission to the EU of the Preliminary Flood Risk Assessment (PFRA) for the 14 Water Districts of Greece and identification of the Areas of Potential Significant Flood Risk – APSFRs (2012).
2. Preparation and submission to the EU of the 1st Flood Hazard Maps and Flood Risk Maps (2017).
3. Preparation and submission to the EU of the 1st Flood Risk Management Plans. The 1st Flood Risk Management Plans of the Western Peloponnese Water District (EL01) was approved with Decision MoEE/SSSfW/41346/322 / Government Gazette Issue B' 26 40/05.07.2018.

2nd implementation cycle of Directive 2007/60/EC

1. Preparation and submission to the EU of the 1st Revision of the Preliminary Flood Risk Assessment (1st PFRA) for the 14 Water Districts of Greece and review of the Areas of Potential Significant Flood Risk – APSFRs (2020).
2. Following the open international tender, the General Directorate of Water of the Ministry of Environment and Energy assigned the:
    a. Preparation of Flood Hazard Maps (FHP) and Flood Risk Maps (FRM) in the Areas of Potential Significant Flood Risk – APSFRs (2023),
    b. Preparation of the 1st review of the Flood Risk Management Plan (FRMP) which is under consultation

c. Preparation of the Strategic Environmental Assessment (SEA) for the 1st Revision of the FRMP.

Competent Authorities

The **Hellenic Ministry of Environment and Energy / General Directorate for Water** formulates the policy for water protection and management while also monitors its implementation. The **Water Directorates, under the** Decentralized Administration, are responsible for water protection and management, including flood risk. For the Western Peloponnese Water District (EL01), the competent authority is the Water Directorate of Peloponnese.

Table 1-1: River basins and the competent Decentralized Authorities of the Western Peloponnese Water District (EL01)

Water District	River Basin	Regions that fall geographically within the limits of the RB	Competent Decentralized Administration/ Water Directorate [1](according to Government Gazette 1383/B/2-9-10, Government Gazette 1572/B/28-9-10 and Government Gazette 87/A/7-6-2010)
Western Peloponnese	Alfeios (RB 29)	Peloponnese (54.48%) Western Greece (45.52%)	Decentralized Administration of Peloponnese, Western Greece and the Ionian Sea/ Peloponnese Water Directorate
Western Peloponnese	Pamisos – Nedon – Neda (RB 32)	Peloponnese (96.68%) Western Greece (3.32%)	Decentralized Administration of Peloponnese, Western Greece and the Ionian Sea/ Peloponnese Water Directorate

[1]*The Official Gazette refers to the former "state" Regions, whose responsibilities are exercised, according to Article 280 of Law 3258/2010 (Official Gazette 87/A/7-6-10), by the Decentralized Administrations, with the exception of the responsibilities that fall under Article 186 of the same law to the Elected Regions.*

2 The Western Peloponnese Water District EL01

The Western Peloponnese Water District (EL01) extends geographically in the western and south-western Peloponnese. To the north, it borders the Northern Peloponnese Water District (EL02), while to the east, the Eastern Peloponnese Water District (EL03). The total area of the Water District is 7,235 km ^{2}. From an administrative point of view, this area includes, in whole or in part, the Regional Units of Arcadia, Ilia, Achaia, Messinia and Laconia. As for the physical-geomorphological boundaries of the Water District, these are the mountain ranges of Erymanthos and Aroania to the north, the mountains of Artemision, Mainalo and Taygetos to the east, the Gulf of Messinia to the south and the Ionian Sea and the Gulf of Kyparissia to the west.

The Western Peloponnese Water District consists of the following River Basins:

- Alfeios River Basin (EL0129) with an area of 3,810 km^2
- Pamisos – Nedon – Neda River Basin (EL0132) with an area of 3,425 km^2

Regarding the morphology of the Water District, the average altitude is 545.2 m and the average slope is 32.90%. 41.20% of the water district area is characterized as mountainous (altitude above 600m), 33.3% as semi-mountainous (altitude between 200m and 600m) while 25.5% as lowland (altitude less than 200m). The lowland areas have developed in the plain of Alfeios, in the coastal zone of Pyrgos - Pylos, in the plain of Messinia and in the plateau of Megalopolis. Important mountainous areas of EL01 include the Taygetos mountain range with the lower mountain of Tainaros (or Sangia) as well as Mount Lykeos, the Kyparissia mountains and Mount Lykodimo.

In Western Peloponnese, the dominant land use is agriculture, accounting for approximately 50%. According to the 2011 census, the total actual population in the Alfeios River Basin (EL0129) is 100,747 inhabitants, while for the Pamisos - Nedon - Neda River Basin (EL0132) it is 167,909 inhabitants. The general trend of population change for the Alfeios RB (EL0129) is estimated to be a decrease of approximately 24%, while for the Pamisos - Nedon - Neda RB (EL0132) it is estimated to be a decrease of approximately 10.3%, during the decade 2001 - 2011.

In the entire Western Peloponnese Water District (EL01), the total annual water needs for all activities and uses is estimated ~219.0 hm ^{3}. Agriculture (irrigation), which is the main water user, consumes ~78.1% (171.1 hm ^{3}) of the total water needs, industry ~8.6% (18.8 hm ^{3}), water supply ~12.6% (27.5 hm ^{3}) and livestock ~0.7% (1.5 hm ^{3}). As for the total estimated water withdrawals in the Western Peloponnese Water District (EL01), they amount to approximately ~355 hm^3 considering 30% network losses due to irrigation of private land. If the losses due to irrigation of private land are ignored, the total estimated water withdrawals are estimated to be approximately ~298 hm ^{3}.

Figure 2-1: Western Peloponnese Water District (EL01) and its River Basins

3 1st revision of the Preliminary Flood Risk Assessment

During the 1st revision of the PFRA, the following have been reviewed and updated: the Preliminary Flood Risk Assessment for all the Water Districts of the country, the list of Historical Floods and Significant Historical Floods as well as the Areas of Potential Significant Flood Risk (APSFRs).

Between the 1st PFRA and the 1st revision of the PFRA, during the period 2012 – 2018, **284 historical flood events were recorded** in the WD EL01, of which **268** are characterized as **significant historical flood events** since they had particularly large consequences in terms of either human casualties, financial compensation, or size of the flooded area. The areas where most floods have occurred are the lowland area of Pamisos river as well as the areas along the Alfeios river from Megalopolis to its mouth.

For the Western Peloponnese Water District, 3 Areas of Potential Significant Flood Risk (APSFRs) in total are identified according to the methodology applied. These 3 Areas of Potential Significant Flood Risk (APSFRs) resulted from the consolidation and expansion of the APSFR that were identified in the 2012 PFRA.

Table 3-1: Revised APSFR in the Western Peloponnese Water District EL01

no.	Name	Code	RB	Percentage of RB	Area (km ^{2})
1	Lowland areas near Pamisos river and other streams	EL01APSFR001	EL0132	7.9 %	271.47
2	Low-lying areas of the Megalopolis plateau	EL01APSFR003	EL0132	3.5 %	118.03
3	Low-lying areas of Alfeios river, torrents of the western coast of the Western Peloponnese WD and the Pylia peninsula	EL01APSFR004	EL0129	9.4 %	359.32
				TOTAL	**748.82**
				Difference with PFRA 2012	**+17.55%**
				Percentage of total WD* **	**10.3 0 %**

***The total area of the WD EL01 is 7,235 km ^{2}

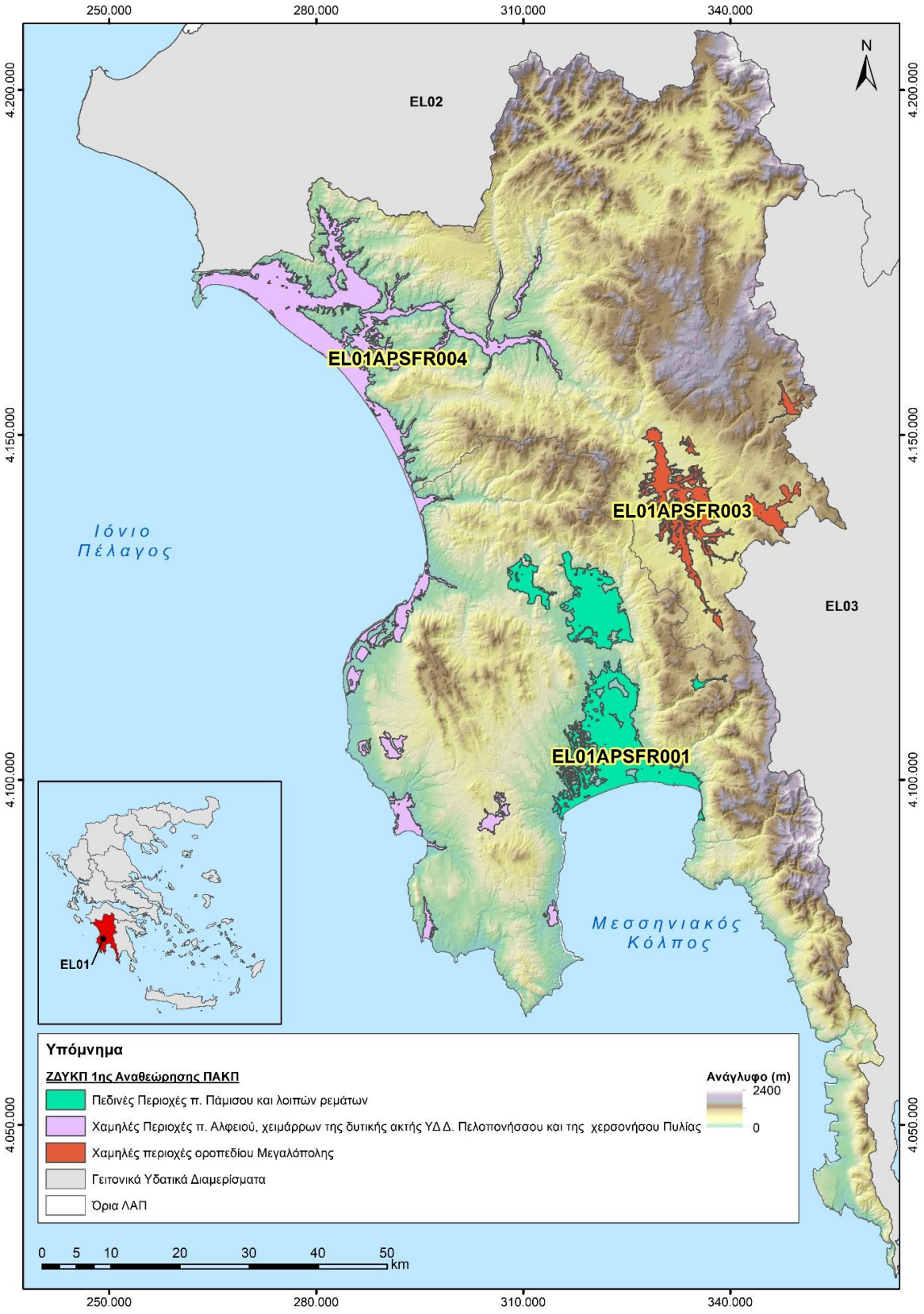

Figure 3-1: Revised APSFRs of the Western Peloponnsese Water District (EL01)

4 Hydrology of the Western Peloponnese Water District (EL01)

According to the Floods Directive 2007/60/EC and the relevant Joint Ministerial Decision No. 31822/1542/E103/21.7.2010 which incorporates the Directive into the National Law, it is foreseen that for each watercourse the hydrographs (average, favorable and unfavorable conditions) are carried out for the following scenarios:

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

During the 1st revision of the FRMP, the rainfall curves are revised. This work is carried out for the entire country. The rainfall curves are a parametric relationship that connects the intensity of rainfall with the return period for each rainfall duration. As for the design rainfall (ΔH) and the peak flow (ΔQ) in the WD EL01, the following are observed:

Design Rainfall (ΔH)

- For T=50 years return period, the variations in design rainfall are small. Mostly small negative variations appear, meaning decrease of rainfall in the largest part of the Western Peloponnese Water District (EL01).
- For T=100 years return period, the variations in design rainfall are small and mostly small positive variations appear, meaning increase of rainfall in the largest part of the Western Peloponnese Water District (EL01).
- For T=1000 years return period, the changes of the design rainfall are moderate while in some cases are larger. Generally, mostly moderate to large positive variations appear meaning increase of rainfall in the largest part of the Western Peloponnese Water District (EL01).

Peak Flow (ΔQ)

- for T=50 and 100 years return period, the variations in discharges are small to moderate either positive (increased discharge compared to the 1st cycle of the FRMPs) or negative (reduced discharge compared to the 1st cycle of the FRMPs) in the largest part of the Western Peloponnese Water District (EL01). Increased discharges mainly appear in the sub-basins of Pamisos and Alfeios rivers as well as in the Kyparissia region compared to the 1st implementation cycle. On the other hand, reduced discharges mainly appear in Neda river and in eastern sub-basins of Alfeios river.
- For a return period of T=1000 years, changes in discharges are generally moderate, with some cases showing large changes (notably in the upper basins of the Alfeios and Pamisos rivers). In most areas of the Western Peloponnese Water District (EL01), these changes tend to be moderate to large positive increases.

For the hydrological simulation the new Digital Terrain Model is used, which is based on the latest 2m x 2m resolution DTM of the Hellenic Cadastre. Thus, the morphometric-geometric characteristics of the basins and sub-basins are extracted: area, maximum, average and outlet elevation as well as the length of the main river reach. Hyetograph are calculated for design storms with return periods T = 50, 100, and 1000 years and rainfall duration D, multiple of the basin concentration time, based on the revised rainfall curves and the morphometric-geometric characteristics. The point precipitation is converted to surface precipitation, through a surface runoff coefficient. The hyetograph are calculated as follows:

- with the **alternating block method** for moderate and high probability of flood occurrence, i.e. with return periods of 100 and 50 years, respectively
- with the method of the least favorable order of design hyetogram for low probability floods, i.e. with return periods of 1000 years (**worst profile**)

The effective precipitation is estimated separately in each sub-basin, using the curve number (**CN**). The estimation is made for three types of soil moisture conditions. In addition to that, the burnt areas are taken into consideration to increase the curve number in each sub-basin. To convert the hyetograph (rainfall) into runoff (discharge), the flood hydrographs of each rain event are estimated taking into account the concentration time, the duration of rainfall and the Unit Hydrograph of each basin / sub-basin. For the **hydrological routing** of the flood wave within a stream reach, the **Muskingum method and the lag time method** are used. The flood hydrographs are generated using the free of charge software HEC - HMS 4.10 (Hydrologic Engineering Center – Hydrologic Modeling System). With HEC - HMS it is possible to model all the hydrological processes (calculation of hydrological losses, transformation of active precipitation into direct runoff, hydrological routing, etc.) that happen during the transformation of precipitation into runoff in dendritic- type basins.

The following table contains the results of the hydrological simulation for the three return periods considered and for average humidity conditions:

Table 4-1: Overview of the hydrological simulation results per basin for average humidity conditions

no	Basin Code	Description	Surface area (km ^{2})	Q (m^3/s) T=50	Q (m^3/s) T=100	Q (m^3/s) T=1000	Duration (hrs)
1	EL0132FR00F17	Kyparissia N#	4.03	2.50	5.00	39.00	12
2	EL0132FR00F21	Koryas R.	65.75	179.10	251.80	756.20	12
3	EL0132FR0003	Velika R.	148.58	295.70	424.60	1375.90	24
4	EL0129FR00F1	Crab#	28.66	81.40	105.70	237.20	48
5	EL0129FR00F2	Paliopotamos#	65.63	233.90	306.00	705.70	24
6	EL0129FR0002	Alpheios P.	3473.70	5047.50	6878.20	17777.80	48
7	EL0132FR0015	Neda P.	287.15	409.60	621.30	2420.60	24
8	EL0132FR00F10	Kaminia R.	4.27	6.20	11.50	75.00	12
9	EL0132FR00F11	Bokiniotis R.	2.98	8.40	13.70	64.30	12
10	EL0132FR00F12	Parasporia R.	4.95	12.10	19.30	86.70	12
11	EL0132FR0011	Good Water R.	181.89	322.00	471.70	1624.20	24
12	EL0132FR00F14	Black Lake R.	4.29	9.30	15.00	69.80	12
13	EL0132FR00F15	Tabs R.	14.79	20.60	34.00	171.90	12

no	Basin Code	Description	Surface area (km ^{2})	Q (m^3/ s) T=50	Q (m^3 / s) T=100	Q (m^3 / s) T=1000	Duration (hrs)
14	EL0132FR00F16	Kyparissia B#	5.23	2.90	5.90	49.40	12
15	EL0132FR00F18	Terpsithea#	11.93	10.30	18.80	122.80	12
16	EL0132FR00F19	Cave#	7.84	34.80	47.80	132.40	12
17	EL0132FR00F20	Black Lake R.	29.64	113.80	155.80	424.10	12
18	EL0132FR0009_1	Filiatrino R.	51.57	113.90	156.80	396.30	12
19	EL0132FR00F13	Prazeris R.	11.25	19.50	32.40	166.70	12
20	EL0132FR00F23	Mourtias R.	60.12	271.80	362.00	774.60	24
21	EL0129FR00F3	Vourlia R.	50.65	178.30	238.20	589.90	24
22	EL0129FR00F4	Xirochoritiki Grana R.	25.03	89.80	127.40	384.80	12
23	EL0129FR00F5	Zachareikou R.	68.29	158.90	236.10	857.70	12
24	EL0129FR00F6	Glatsitiko R.	27.34	43.20	71.20	352.70	12
25	EL0129FR00F7	Alysiva R.	6.27	18.40	27.40	98.50	12
26	EL0129FR00F9	Tholou R.	28.62	46.70	75.30	364.80	12
27	EL0129FR00F8	Voulgremo R.	4.75	11.40	18.50	88.70	12
28	EL0132FR00F24	Ryakas R.	31.59	112.40	148.80	356.70	24
29	EL0132FR0002_2	Aris P.	193.17	406.00	608.00	2089.50	24
30	EL0132FR00F25	Kalamata#	14.64	47.30	73.50	308.00	12
31	EL0132FR0017	Nedon P.	124.19	212.90	327.80	1363.90	12
32	EL0132FR00F26	Vathy Langadi R.	22.11	71.70	108.20	411.10	12
33	EL0132FR00F28	Bad Langadi R.	3.56	10.10	17.20	85.00	12
34	EL0132FR00F27	Xerilas R.	26.08	20.80	40.10	321.00	12
35	EL0132FR00F22	Blind R.	42.38	187.90	254.00	656.80	12
36	EL0132FR0002_1	Pamisos P.	564.83	2006.20	2696.00	6100.40	48
37	EL0132FR0009_2	Selas R.	92.64	350.60	469.30	1169.20	12
38	EL0132FR00F29	Filiatra#	4.07	18.80	27.10	88.90	12
39	EL0132FR00F30	St. Sunday#	9.63	42.00	59.30	178.20	12
40	EL0132FR00F32	Vatias#	8.02	28.70	42.20	149.10	12
41	EL0132FR00F31	Put#	6.65	29.90	42.10	126.00	12
42	EL0132FR00F35	Black Poros R.	12.86	65.30	87.60	220.30	12
43	EL0132FR00F33	Marathopoli#	3.79	26.30	35.30	90.80	12
44	EL0132FR00F38	Koumaria R.	3.69	7.30	12.20	62.60	12
45	EL0132FR00F37	Xerias R.	48.46	127.10	180.40	565.20	12
46	EL0132FR0007	Giannouzagas R.	46.83	179.20	241.20	615.70	12
47	EL0132FR00F36	Xerolagado R.	36.56	139.20	186.90	470.80	24
48	EL0132FR0005	Cleistocaudal R.	65.59	154.70	219.90	681.50	12
49	EL0132FR00F39	Methoni#	51.00	141.90	198.50	575.00	24
50	EL0132FR00F40	Kalorrema R.	66.48	238.20	326.60	910.50	12
51	EL0132FR00F34	Gargalianoi#	1.17	2.80	4.50	20.70	12

5 Hydraulic Simulation of the Western Peloponnese Water District (EL01)

During the **1st implementation cycle** of the Directive 2007/60/EC, 51 river basins and 1292 watercourses were identified. In the present **2nd implementation cycle,** 3 of the 51 river basins are revised **while 15** new **river basins** and **93 watercourses** are added. Hydraulic simulation is carried out for the following watercourses:

- Rivers, streams and torrents that are added in the APSFRs according to the 1st review of the PFRA,
- Rivers, streams and torrents within the APSFRs, since the 1st implementation cycle of the 2007/60/EC Directive, and had not been included in the hydraulic simulation
- Rivers, streams and torrents within the APSFRs since the 1st implementation cycle but with newly added reaches in the present cycle
- Rivers, streams and torrents within the APSFRs since the 1st implementation cycle that underwent significant changes (e.g. implementation of flood protection structures).

For the hydraulic simulation, **2D model analysis is performed** with non-steady conditions, using the hydrographs derived from the hydrological analysis. The i**nput data for** the hydraulic simulation consist of the following:

- The Digital Terrain Model, based on the latest 2m x 2m resolution DTM of the Hellenic Cadastral, processed adequately,
- Topographic data and site inspections of existing structures,
- Hydrographs – Boundary conditions and hydrographs for cross-border basins–lakes, as derived from the hydrological analysis,
- roughness of the Manning coefficient based on the latest land use data,
- Initial conditions and assumptions for the sake of the hydraulic simulation.

For the **hydraulic simulation,** the free-of-charge HEC - RAS software version 6.4.1 created by the U.S. Army Corps of Engineers (U.S. Army Corps of Engineers), is used. The software can be used both for steady and unsteady flow conditions and calculates the water characteristics such as depth, level and flow velocity any time during the simulation as well as their maximum and minimum values. Finally, it can simulate a wide range of structures, including bridges, culverts and spillways/elevators.

In the following figure, a snapshot of the HEC - RAS 6.4.1 graphical environment while adding a bridge into a 2D model is presented.

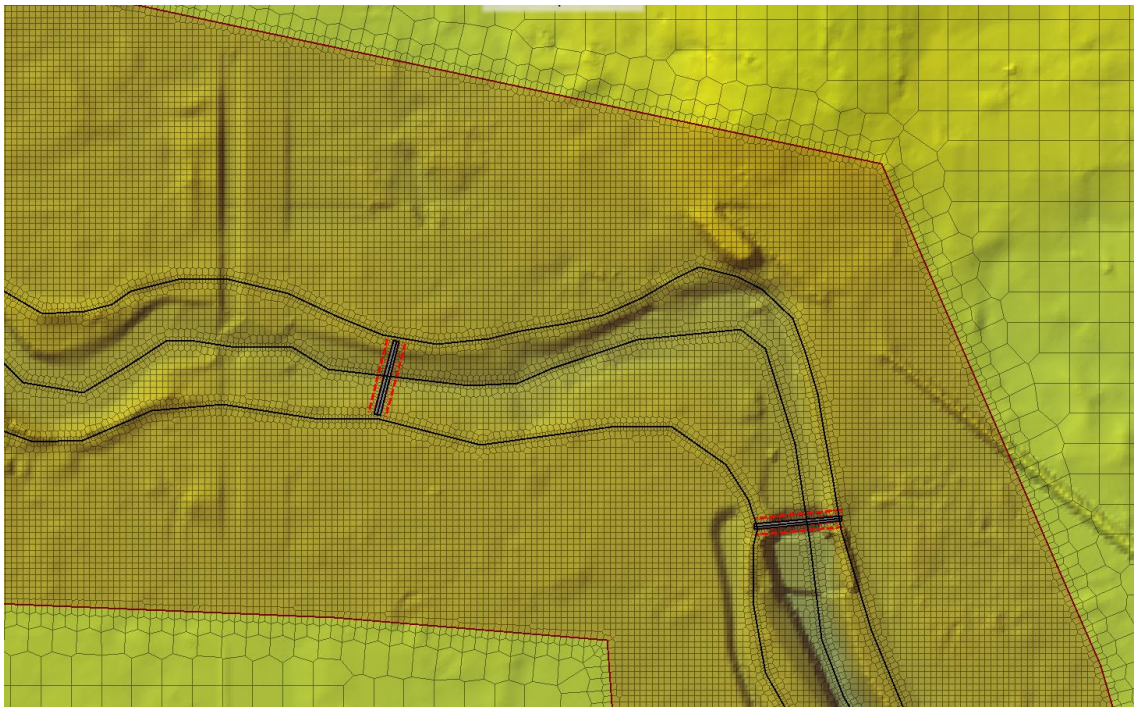

Figure 5-1: Snapshot of the HEC - RAS 6.4.1 graphical environment showing the DTM, the 2D grid and structures perpendicular to the stream flow.

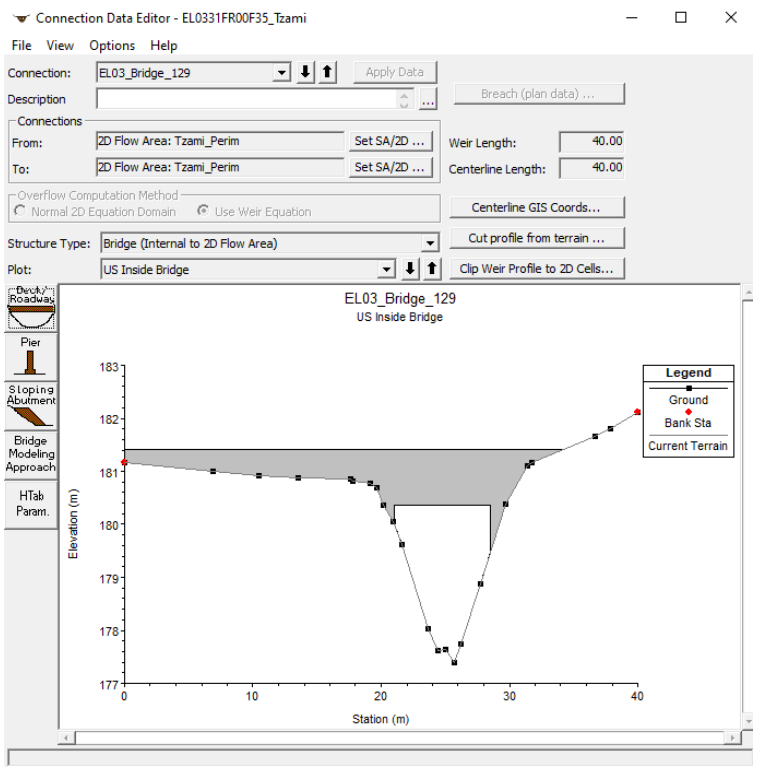

Figure 5-2: Snapshot of the HEC - RAS 6.4.1 graphical environment showing the geometric characteristics of the bridge when inputting it in the 2D model

6 Flood Hazard Maps – FHMs

The FHMs are presented at a scale of 1:25,000 for the three return period scenarios (T=50, 100 and 1000 years) for flooding due to river/lakes. Same scale, 1:25,000, is also used for the FHM due to sea flooding which is calculated for high exceedance probability (T=50-year return period) and medium exceedance probability (T=100-year return period).

For all the points of interest affected by river/lake flooding, the arrival and residence time of the flood wave are calculated for flow depths ≥0.3 m. The FHMs from river/lake flooding present the spatial distribution of both the maximum depth and the maximum water velocity for the three return period scenarios. The FHMs from the average sea level rise present the spatial distribution of the maximum flow depth. The above-mentioned are presented in the appropriate color scales. The FHMs from river/lake flooding additionally present:

- The points of interest
- The arrival and residence time of the flood wave at the points of interest in the form of table
- the boundaries of the APSFRs as determined at the 1st revision of the Preliminary Flood Risk Assessment (PFRA)
- The names of local city/towns
- Existing structures (bridges, culverts, dams, embankments, terraces). It is noted that structures also include the site inspections carried out to ensure the dimensions of the most important structures along the streams to be considered in the hydraulic simulation.
- Inundation surface due to sea level rise for T=50 and T=100 years return period
- Coastline
- The axis and the chainage (every 500 or 1000 meters from downstream to upstream) of the rivers that are simulated
- the boundaries of neighboring Water Districts
- Points showing
    - ✓ small settlements or places within cities
    - ✓ locations of important projects (bridges, embankments, culverts, dams, etc.)
    - ✓ important land uses (archaeological sites, industries, WWTP, WTP, etc.)

For the EL01 WD, mean sea level rise is estimated to be more than 1m and therefore, **FHMs for Sea Flooding (SF) are created.**

Comparing the FHMs from river/lake flooding of the 1st implementation cycle with the ones of the 2nd implementation cycle of the 2007/60/EC Directive, the following are observed:

In the present implementation cycle of the FRMPs, an increase in the total area is observed for all three (3) return periods scenarios, compared to the 1st implementation cycle of the FRMPs. More specifically, for T=50 years and T=100 years return period, the total area is increased approximately 50%, while for T=1000 years return period is increased approximately 40%. As for the flood hazard results, although

all five (5) classes of flood intensity are observed both in the present 1st revision and in the 1st implementation cycle of the FRMPs, the class of very low flood intensity is almost zero in the present 1st revision of the FRMPs. More specifically, in the 1st Revision of the FRMs for T=50 years return period, the area with very low flood intensity is reduced by 99.7%, the area with low flood intensity is increased approximately by 60%, the area with moderate flood intensity is increased by 100%, the area with high flood intensity is increased by 60% and the area with very high flood intensity is increased by 600%, compared to the 1st implementation cycle of the FRMs. For T=100 years return period, in the 1st revision of the FRMPs, the area with very low flood intensity is reduced by 99.7%, the area with low flood intensity is increased approximately by 40%, by 60% for moderate flood intensity, by 50% for high flood intensity and by 600% for very high flood intensity, compared to the 1st implementation cycle of the FRMPs. Finally, for T=1000 years return period in the 1st revision of the FRMPs, the area with very low flood intensity is reduced by 99.9%, the one with low flood intensity is reduced by 60%, by 50% for moderate flood intensity, by 3% for high flood intensity and by 500% for very high flood intensity, compared to the 1st implementation cycle of the FRMPs.

Accordingly, comparing the FHMs from sea flooding of the 1st implementation cycle with the ones of the 2nd implementation cycle of the 2007/60/EC Directive, the following are observed:

There is an almost negligible increase (2%) in the total area in the present 1st revision compared to the 1st implementation cycle of the FRMPs. However, there is a large variation in the distribution of the flood intensity classes. Regarding the flood hazard results, it is observed that all five (5) classes of flood intensity are observed both in the present 1st revision and in the 1st implementation cycle of the FRMPs. However, as mentioned above, there is a large variation in the distribution of the flood intensity classes present 1st revision of the FRMPs. More specifically, in the 1st revision of the FRMPs, the area with very low flood intensity is reduced by approximately 70%, with low flood intensity is increased by 20%, with moderate flood intensity is reduced by 45%, with high flood intensity by 40% and with very high flood intensity is increased by 450% compared to the 1st implementation cycle of the FRMPs.

The next figure shows the distribution of the Flood Hazard Maps (FHM) for river/lake flooding and for sea flooding, which is also the same for the Flood Risk Maps (FRMs) that are presented in Chapter 7. Following, a Flood Hazard Map (FHM) showing the spatial distribution of maximum depths and maximum velocities within APSFR EL01APSFR001 is presented indicatively both for river/lake flooding and sea flooding.

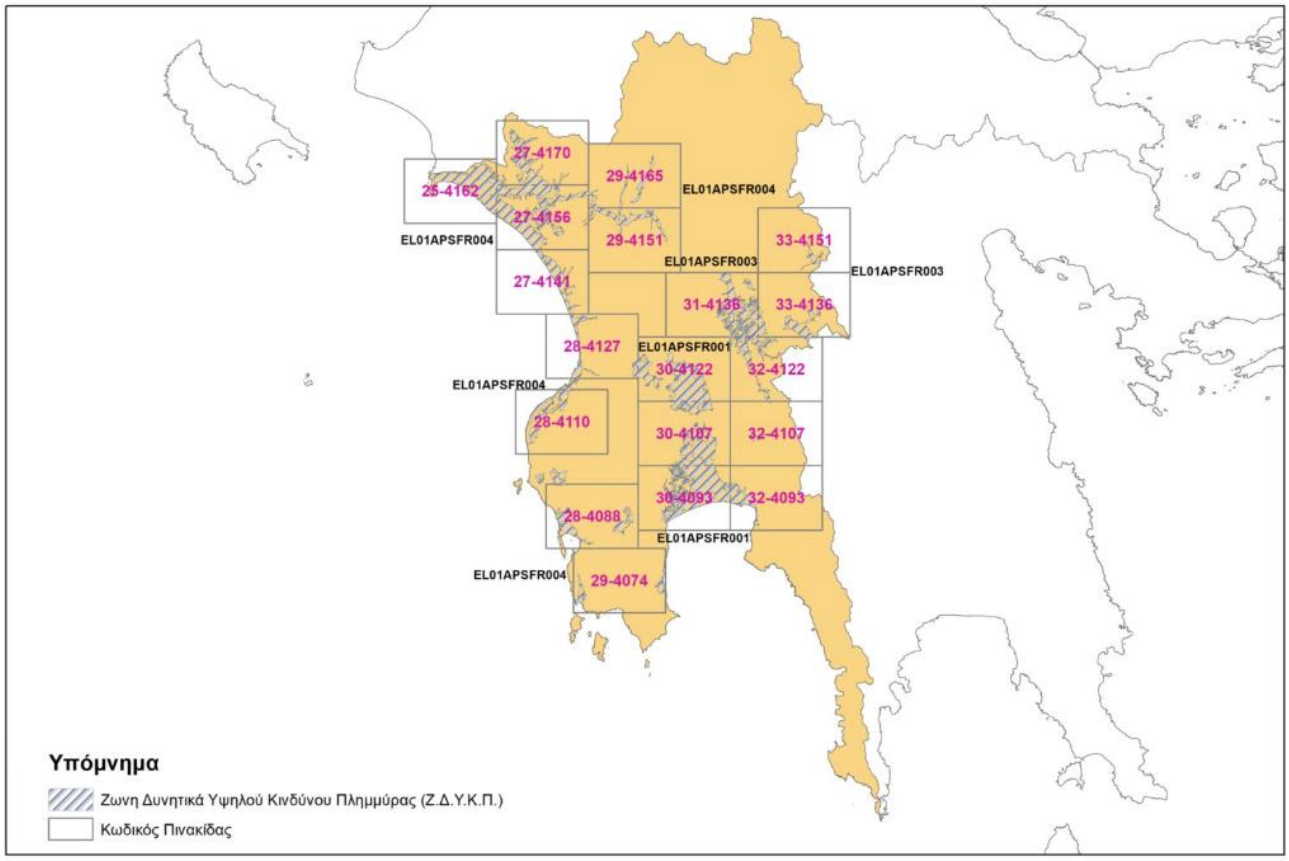

Figure 6-1: Distribution of FHMs and FRMs for river/lake flooding

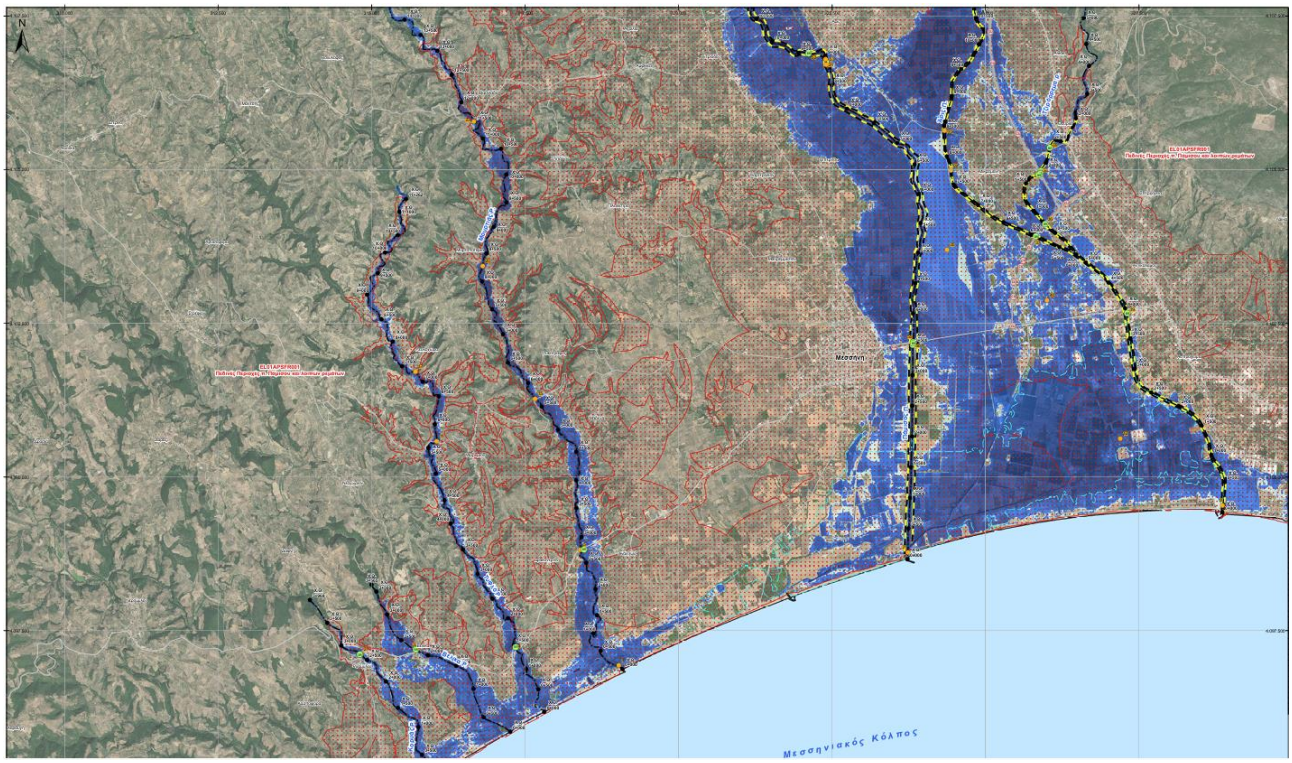

Figure 6-2: Indicative section of a FHM from river/lake flooding in the wider area of Messinia along the Messinian Gulf, EL01APSFR001, with color grading of maximum depth for T=100 years return period

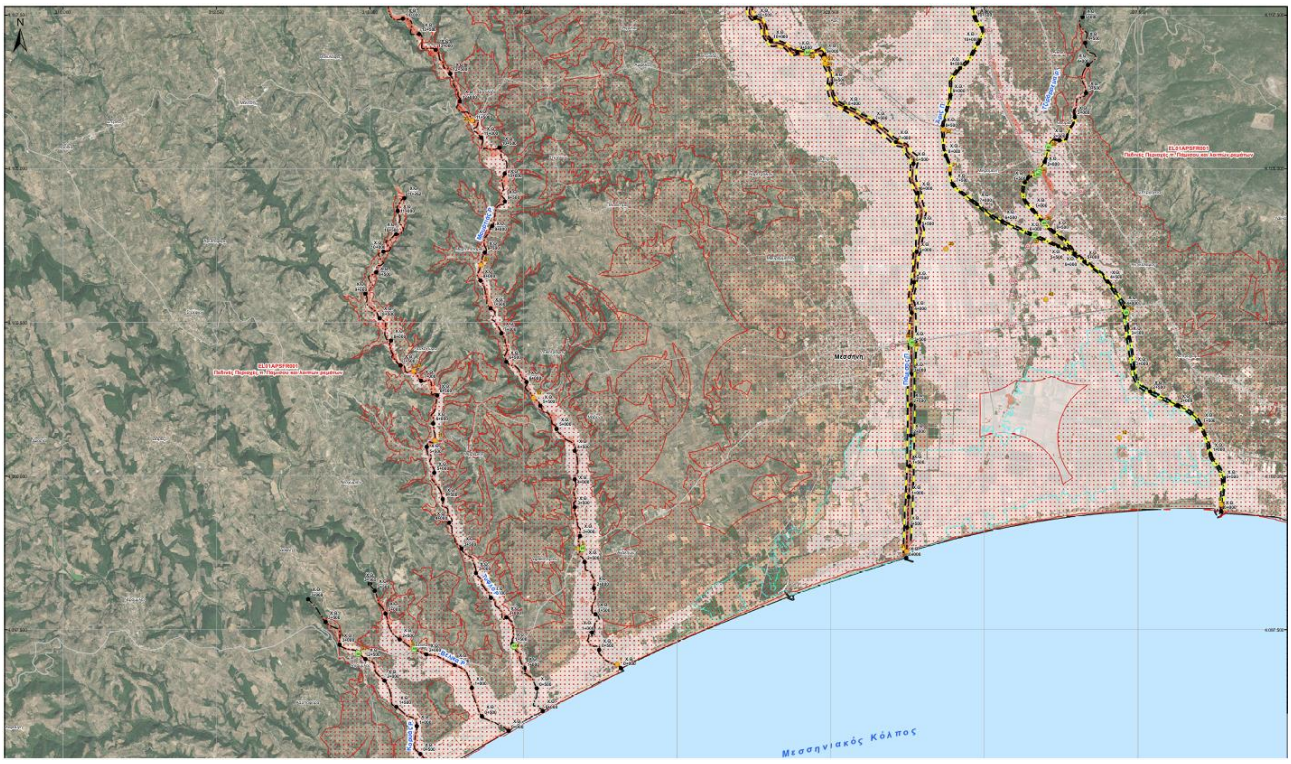

Figure 6-3: Indicative section of a FHM from river/lake flooding in the wider area of Messinia along the Messinian Gulf, EL01APSFR001, with color grading of maximum velocity for T=100 years return period

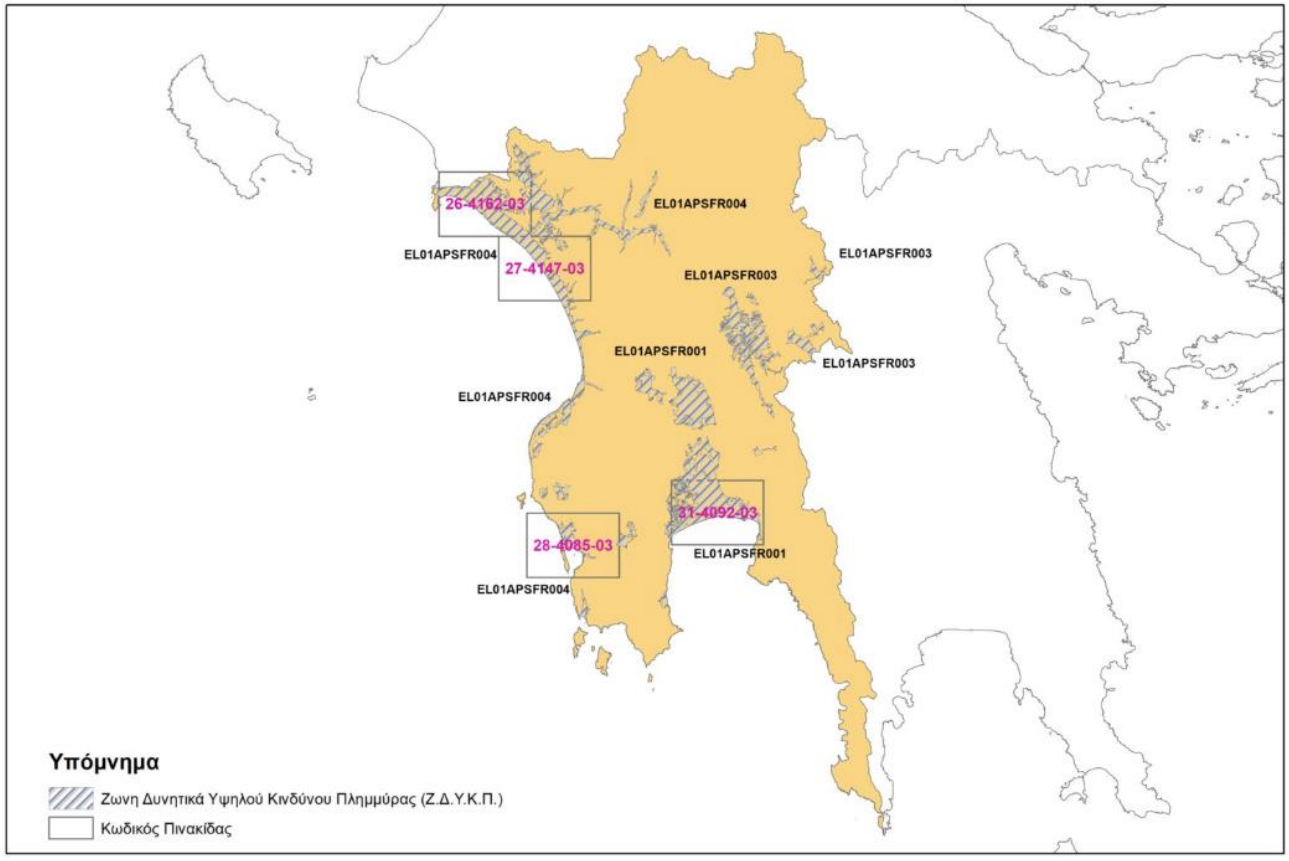

Figure 6-4: Distribution of FHMs and FRMs from sea flooding

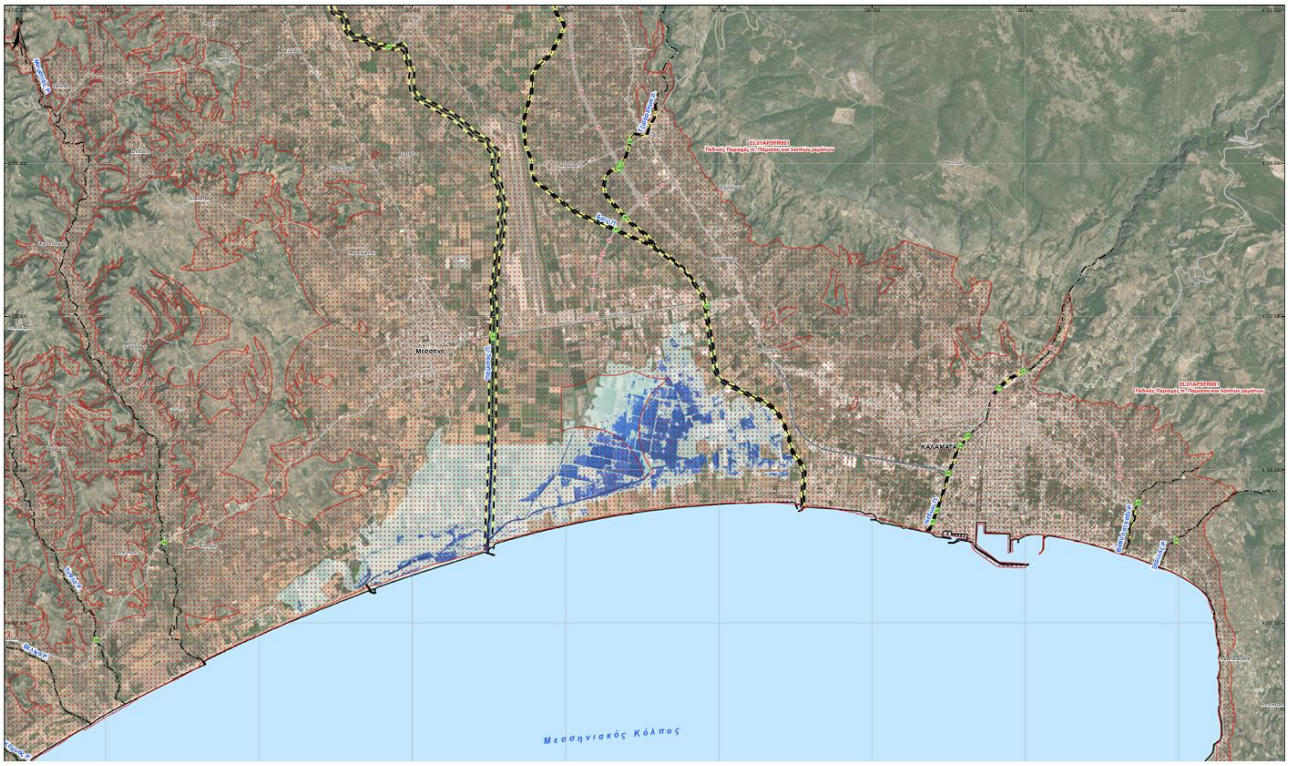

Figure 6-5: Indicative section of a FHM from sea flooding in the wider area of Messinia along the Messinian Gulf, EL01APSFR001, with color grading of maximum depth for T=100 years return period

7 Flood Risk Maps – FRMs

The FRMs due to river/lake flooding are presented at a scale of 1:25,000 for the three return period scenarios (T=50, 100 and 1000 years) while the FRMs due to sea flooding are presented at the same scale but for T=50 and 100 years return period. The FRMs show land uses, economic activities, protected areas and cultural heritage monuments which fall with the inundated area.

More specifically, the FRMs depict the following elements that are inundated: affected population, health and social infrastructure, water supply infrastructure, energy infrastructure, civil protection infrastructure, rural areas, livestock units, tourist attraction spots, industries both inside and outside industrial concentrations, road network, railway network, airports, Wastewater Treatment Plants, urban waste disposal and management areas, protected areas, monuments, archaeological sites, recreational areas and settlements.

The FRMs are accompanied by the following maps:

- **Soil Erosion Map**, in scale 1:300,000, and the soil erosion classes with appropriate chromatic grading in 5 levels.
- **Flood Maximum Potential Impact Map** (for river/lake flooding and for average sea level rise), at a scale of 1:300,000 and 1**:**100,000, and the vulnerability classes with appropriate chromatic grading in 5 levels.
- **Flood Intensity Degree of Influence Map** (3 for river/lake flooding and for average sea level rise)**,** at a scale of 1:300,000 and 1:100,000, and the influence level classes with appropriate chromatic grading in 5 levels.
- **Flood Impact Assessment Map** (3 for river/lake flooding and for average sea level rise), at a scale of 1:300,000 and 1:100,000, and the impact level with appropriate chromatic grading in 5 levels.

The Flood Risk Assessment in WD EL01 shows that the greatest flood risk occurs for **T=50 years**:

- in the wider area of the city of Kalamata, Messini, Neochori, Zevgolatio and the industrial area of Meligalas due to the high concentration of activities (EL01APSFR001)
- in the wider area of the Public Power Corporation's lignite mines as well as in the Karytena area. It is noted that the flood risk is confined to a small area, as there is neither significant infrastructure nor notable economic activity in the vicinity (EL01APSFR003)
- in the region of Pyrgos, Epitalion and Alfeiousa as well as along the coast from Pyrgos to Zaharo due to significant concentration of activities. Risk is also observed in areas where flood characteristics are pronounced. Finally, the archaeological site of Ancient Olympia is also at risk in the event of a flood with a T=50 years return period (EL01APSFR004)

The greatest flood risk for **T=100 years** occurs:

- in the wider area of the city of Kalamata, Messini, Neochori, Zevgolatio and the industrial area of Meligalas due to the high concentration of activities. Accordingly, the flood risk from sea level rise ranges from very low to low (EL01APSFR001)
- in the wider area of the Public Power Corporation's lignite mines as well as in the Karytena area. It is noted that the flood risk is confined to a small area, as there is neither significant infrastructure nor notable economic activity in the vicinity (EL01APSFR003)
- in the region of Pyrgos, Epitalion and Alfeiousa as well as along the coast from Pyrgos to Zaharo due to significant concentration of activities. Risk is also observed in areas where flood characteristics are pronounced. Finally, the archaeological site of Ancient Olympia is also at risk in the event of a flood with a T=100 years return period (EL01APSFR004)

Finally, the greatest flood risk for **T=1000 years** occurs:

- in the wider area of the city of Kalamata, Messini, Neochori, Zevgolatio and the industrial area of Meligalas due to the high concentration of activities (EL01APSFR001)
- in the wider area of the Public Power Corporation's lignite mines as well as in the Karytena area. It is noted that the flood risk is confined to a small area, as there is neither significant infrastructure nor notable economic activity in the vicinity (EL01APSFR003)
- in the region of Pyrgos, Epitalion and Alfeiousa as well as along the coast from Pyrgos to Zaharo due to significant concentration of activities. Risk is also observed in areas where flood characteristics are pronounced. Finally, the archaeological site of Ancient Olympia is also at risk in the event of a flood with a T=1000 years return period (EL01APSFR004)

The areas presenting high, medium and low flood risk for all return periods and all the flood sources considered are presented in detail within the Flood Risk Management Plan of the Western Peloponnese Water District (EL01). The following figures show the percentage of the flood risk classes' distribution within the Western Peloponnese WD both from river/lake flooding and from sea level rise, respectively.

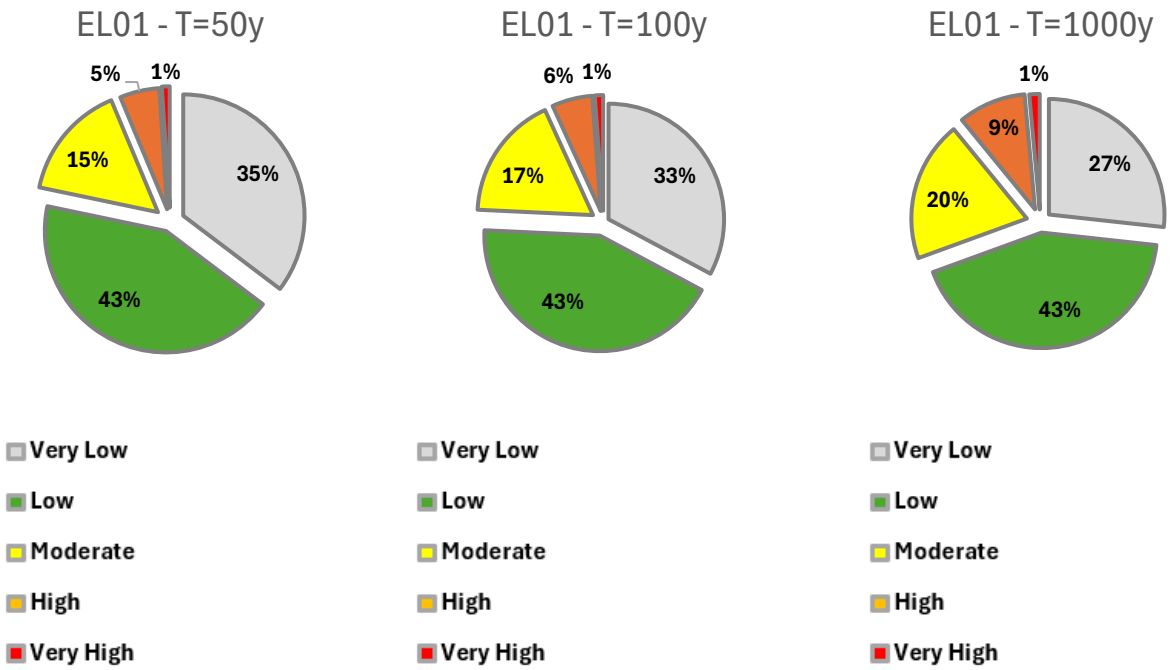

Figure 7-1: Percentage of flood risk classes from river/lake flooding in the WD EL01 for T50, T100 and T1000, respectively

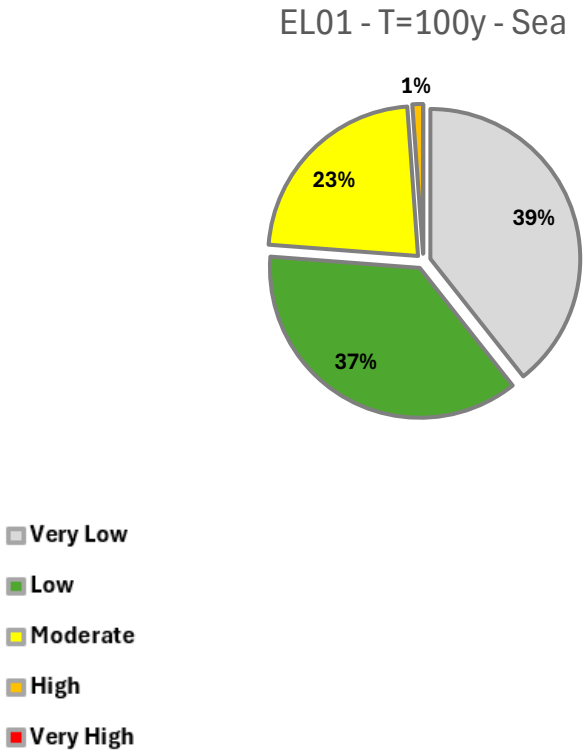

Figure 7-2: Percentage of flood risk classes from sea level rise flooding in the WD EL01 for T100

The table below summarizes, for each APSFR, the potentially affected economic activities and the important infrastructure located within the flooded areas by a T=1000-year return period event.

Table 7-1: Amount of infrastructure and economic activities located within the flooded area of a T=1000-year event for each APSFR in the Western Peloponnese WD

Infrastructure – Economic Activity	EL01APSFR001 T = 1000 years	EL01APSFR003 T = 1000 years	EL01APSFR004 T = 1000 years
Airports	2	-	1
Clinics	3	-	-
Monuments of National Importance	103	5	26
Monuments of International Importance	-	-	14
School Units	47	-	17
Fire Services	3	-	-
Health Centers	5	-	2
Boreholes	4	2	2
Industries	5	-	-
IED Industries	2	-	-
SEVESO industries	-	1	-
Other Industries	51	-	22
Livestock Farms	137	10	172
Police departments	1	-	-
Sports facilities	12	-	2
Nursing homes	1	-	-
Wastewater Treatment Plants	1	-	5
Water Treatment Plants	-	-	1
Habitats	-	-	3
PPC substations	-	-	1

Below, an indicative section of a Flood Risk Map (FRM) within the APSFR EL01APSFR001.

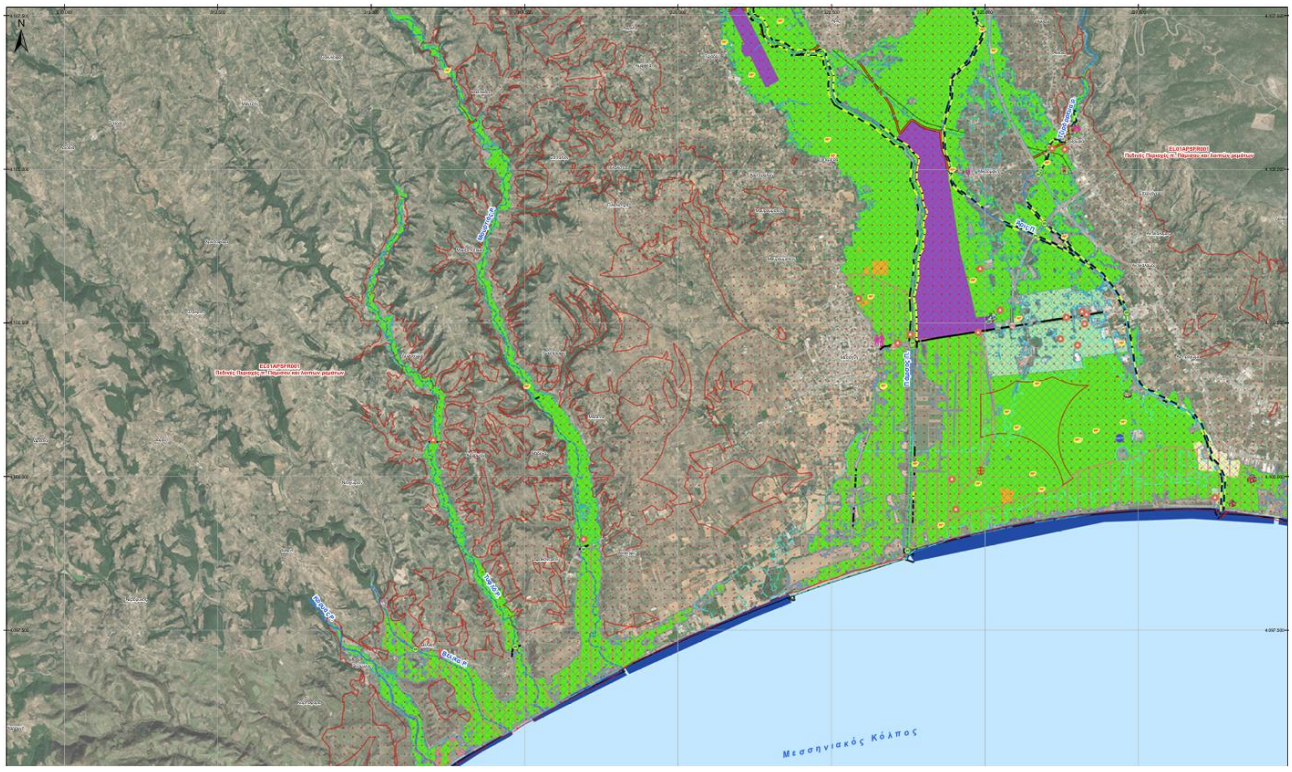

Figure 7-3: Indicative section of a FRM in the wider area of Messinia along the Messinian Gulf, EL01APSFR001, illustrating the affected land uses for a flood event with T=100 years return period

8 Consideration of climate change in the 1st revision of the FRMPs

The European Union recognizes that changes in the intensity and frequency of extreme rainfall events, combined with land use change, are expected to increase flood risk across Europe. The present 1st revision of the FRMPs examines how climate change may affect the frequency of flood events. More specifically, it is examined whether a current flood event with a 50-, 100- or 1000-year return period will experience a decrease or increase in its return period due to climate change.

According to the methodology, climate projection data from 675 rain gauge stations across the country are used to estimate the influence of climate change on the frequency of flood events in terms of rainfall intensity. These data come from the SWICCA (Service for Water Indicators in Climate Change Adaptation, 2015-2018) program and are based on 9 combinations of Global Circulation Models (GCMs), Regional Climate Models (RCMs) and Representative Concentration Pathway (RCP) scenarios.

In the current first revision of the FRMPs, the determination of the new frequency of occurrence of the design floods—at each point along the rainfall–runoff curve based on climate projections—is carried out for **two future climate periods:**

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

For the **EL01 Water District,** the impact of climate change is quite pronounced throughout the Water District**.** More specifically:

- A greater impact is observed in RB Pamisos – Nedon – Neda (EL0132), where the return periods show a significant decrease - especially during the future period 2071-2100 (2080s) and particularly for the T=1000-year return period.

- A moderate impact is observed in RB Alfeiou (EL0129) during the future period 2041-2070 (2050s) due to climate change, though it is milder that the one in the RB Pamisos – Nedon – Neda (EL0132)

- For the future period 2041–2070 (2050s), the average return period of a current T=50-year flood event decreases to approximately 32 years due to climate change in the Western Peloponnese Water District (EL01).

- For the future period 2041–2070 (2050s), the average return period of a current T=100-year flood event decreases to approximately 65 years due to climate change in the Western Peloponnese Water District (EL01).

- For the future period 2041–2070 (2050s), the average return period of a current T=1000-year flood event decreases to approximately 885 years due to climate change in the Western Peloponnese Water District (EL01).

- For the future period 2071-2100 (2080s), the average return period of a current T=50-year flood event decreases to approximately 30 years due to climate change in the Western Peloponnese Water District (EL01).

- For the future period 2071-2100 (2080s), the average return period of a current T=100-year flood event decreases to approximately 58 years due to climate change in the Western Peloponnese Water District (EL01).

- For the future period 2071-2100 (2080s), the average return period of a current T=1000-year flood event decreases to approximately 693 years due to climate change in the Western Peloponnese Water District (EL01).

9 Differences compared to the 1st FRMPs WD EL01

Compared to the 1st implementation cycle of the Directive 2007/60/EC, the main differences in the 1st revision of the FRMPs are as follows:

- New rain gauges are added from stations that were not included in the 1st implementation cycle of the FRMPs, such as the ones from the National Observatory of Athens (NoA). Most of the stations' time series that have been also used in the 1st implementation cycle are extended with the latest barometric data (up to 2022).

- The equation of the ombrian curve is modified, both in terms of its parameters and the method of its derivation. As a result, both the hyetograph and the flood hydrograph used are modified as well.

- In the 1st revision of the PFRA, the amount and boundaries of the APSFRs are changed compared to the 1st implementation cycle of the PFRA. Consequently, new basins, sub-basins and watercourses are added that fall within the revised APSFRs. Therefore, new areas are included in the fluvial flood routing analysis, while the areas examined for flood risk due to sea level rise are expanded.

- The Digital Terrain Model used in the present 1st revision of the FRMPs is the most updated from the LSO project of 2014-2015 provided by the Public Legal Entity Hellenic Cadastre with a resolution of 2m x 2m. In the 1st implementation cycle of the FRMPs, the DTM used was from the earlier LSO project of 2007-2009 with a resolution of 5m x 5m. Therefore, the DTM forming the basis of the flood routing models differs from the one used in the 1st implementation cycle.

- The calculation of the curve number CN requires both the land use data and the soil types (A, B, C, D), as defined by the underlying hydrogeological formations. The land use data used in the current implementation cycle are the most up-to-date CORINE 2018 data, whereas older versions were used in the 1st implementation cycle. As for the soil type data, some modifications are made in the current implementation cycle compared to the 1st implementation cycle, as analyzed in Deliverable 02 titled: “Analysis of regional characteristics and flooding mechanisms".

- In the current implementation cycle of the FRMPs, the burnt areas are taken into account resulting in changes to the CN values in specific basins and sub-basins, as described in detail in Chapter 7 of Deliverable 02, titled: “Analysis of regional characteristics and flooding mechanisms".

- In the current implementation cycle of the FRMPs, both data from level–volume curves and data for newly operational reservoirs, which were either not yet constructed or not in operation during the 1st implementation cycle, are taken into account.

- Given that in the current implementation cycle the most updated Corine 2018 land use data are used, the Manning coefficient for the entire Water District is modified/updated.

- Additional topographical surveys (culverts and bridges) are conducted along the rivers during the current implementation cycle, compared to the 1st implementation cycle. Furthermore, supplementary studies on existing structures are collected, providing information on their geometry and location.

- In most cases, the hydraulic analysis is performed using the 2D model in HecRas. In a few specific cases of small streams running through gullied terrain, the 1D model of HecRas is used.

- The hydraulic analysis of endorheic basins is performed based on net outflow, meaning that infiltrated rainwater is subtracted.

- Data for assessing the health and safety impact (ΕκΑc) are obtained from specialized and, in some cases, newly developed databases. More specifically:
  - ✓ The 2011 census of the de facto population is taken into account with regard to urban agglomerations, in comparison to the 2001 census data which had been used in the 1st implementation cycle of the Spatial and Urban Planning Framework. It is noted that the 2021 census data are not yet available at the settlement level.
  - ✓ The base data for public hospitals are updated and enriched using the following websites: https://www.dypede.gr/ (6th Regional Health Administration of Peloponnese, Ionian Islands, Epirus and Western Greece) and https://www.eumedline.eu/
  - ✓ Health Centers (HCs) and Regional Clinics (RCs) are updated and enriched using the following website: https://www.dypede.gr/ (6th Regional Health Administration of the Peloponnese, Ionian Islands, Epirus and Western Greece)
  - ✓ The clinics are updated and enriched using the following websites: https://www.moh.gov.gr/ and https://www.eumedline.eu/
  - ✓ Data on social welfare facilities and Nursing Homes, are obtained from the official websites of the Municipalities (for the social welfare facilities) and the following website: https://www.ecclesia.gr/.
  - ✓ Data for Water Treatment Plants (WTPs) are obtained from the official websites of Municipalities and DEYA.
  - ✓ The most updated data for primary and secondary education, both public and private, are obtained from the following website https://data.gov.gr/datasets/minedu_schools/
  - ✓ Data for Higher Education are obtained from satellite imagery (Google Earth) and from the official websites of Universities such as the University of Patras, University of Peloponnese, Hellenic Open University, etc.)
  - ✓ Information for civil protection structures such as the infrastructures of the Hellenic Police and the Fire Department are obtained from their official websites: https://www.astynomia.gr/ and https://www.fireservice.gr/el
  - ✓ PPC's power substations are located using satellite imagery (Google Earth) as well as using data from the website https://www.admie.gr/systima/perigrafi/hartis-grammon

- ✓ Data on public utility infrastructure such as water boreholes, springs, etc. are obtained from the systematic inventory of water boreholes of all uses throughout the country and the databases of National Register of Water Intake Points (http://lmt.ypeka.gr/public_view.html) of the Ministry of Environment Energy. Data for other infrastructure (bridges, culverts, flood control structures etc.) are obtained from the database that was updated in the context of Deliverable 02 titled: "Analysis of regional characteristics and flooding mechanisms".

- Data for assessing the economic impacts (ΕκΟ^{c}) are obtained from specialized and, in some cases, newly developed databases. More specifically:
  - ✓ Data and locations of mining sites, quarries, etc. are obtained from the website: http://www.latomet.gr/
  - ✓ The most recent land use data (crops, greenhouses, etc.) are obtained from OPEKEPE (2021)
  - ✓ Livestock units, in terms of their spatial location, are obtained from the spatial data of OPEKEPE (2021)
  - ✓ The developed and developing tourist areas are identified according to Government Gazette 3155/B/12-12-2013 and Government Gazette 1138/B/11-6-2009
  - ✓ Information for industries and industrial parks are obtained from the website of "ETVA BUSINESS & INDUSTRIAL PARKS ", https://www.etvavipe.gr
  - ✓ The locations of the SEVESO and IED industries are determined from the list of SEVESO industrial units available on the geospatial data website (http://geodata.gov.gr) and the register of installations subject to Directive 2010/75/EE (IED Directive) as of 31/12/2013, posted on the website of the Ministry of Environment and Rural Development.
  - ✓ The remaining industrial units are identified by the 2nd revision of the River Basin Management Plan (RBMP)
  - ✓ Regarding transport infrastructure, the country's road network is sourced from the digital archives of the Ministry of Infrastructure and Transport/ General Secretariat of Infrastructure/ Road Infrastructure Directorate, Traffic Management & Road Infrastructure Registry Department. The railway network is obtained from the database of the Hellenic Railways and Transport Authority. For airports, the list of airports in Greece available on the geospatial data website 'GEODATA.gov.gr' is taken into account, and digitization is also performed based on the most recent satellite images from Google Earth.

- Data for assessing the environmental impacts (ΕκΠε^{c}) are obtained from specialized and, in some cases, newly developed databases. More specifically:

- ✓ Location and information of WWTPs are obtained from the 2nd revision of the RBMP and from the database of the General Directorate for Water regarding Wastewater Treatment Plants, under the Ministry of Environment and Energy

  (http://astikalimata.ypeka.gr/Services/Pages/Browse.aspx)

- ✓ Locations and data of uncontrolled and sanitary landfills (XADA and XYTA) are obtained from the 2nd Revision of the River Basin Management Plans (RBMPs)

- ✓ Data on habitats and biotopes obtained from their mapping as part of the designation process for areas falling under the Natura 2000 network.

- Data for assessing the cultural heritage impacts (ΕκΠοᶜ) are obtained from:
  - ✓ Data from the Archaeological Cadastre (https://www.arxaiologikoktimatologio.gov.gr/) for cultural heritage monuments of national and regional importance, for monuments of historical and cultural importance and museums.
- In the present implementation cycle, the soil erosion maps use the most updated data from the European Soil Data Centre (ESDAC) of the Joint Research Centre (http://esdac.jrc.ec.europa.eu/) for the quantification of the rainfall erosivity factor R, soil erodibility factor K, the topographic coefficient LS, cover-management factor C and the support practice factor P.
- The effect of climate change on the frequency of extreme events, particularly in terms of rainfall intensity, is taken into account.

10 Program of measures of the 1st revision of FRMPs for the Western Peloponnese WD EL01

10.1 Objectives of the 1st revision of FRMPs for the Western Peloponnese WD EL01

The **general objectives** from the 1st implementation cycle of the FRMPs for the Western Peloponnese WD EL01 are determined as follows:

- Mitigating exposure to flooding (Objective S1)
- Reducing the probability of flooding (Objective S2)
- Improving flood preparedness (Objective S3)
- Enhancing post-flood recovery mechanisms (Objective S4)

The above-mentioned general objectives correspond to the four action pillars of the Flood Risk Management Plans (Prevention, Protection, Preparedness, Rehabilitation) and are of a strategic nature. In this 1st revision of the **Flood Risk Management Plans**, the above-mentioned general objectives are further detailed into specific objectives. These are defined in order to identify, differentiate and clarify the individual goals that collectively contribute to the effective achievement of each general objective.

To achieve **General Objective S1 -mitigate exposure** of human health, environment, cultural heritage and economic activities **to flooding**- the following specific objectives are defined:

- S1.1: implementation of actions to gather, supplement, organize and improve available information
- S1.2: implementation of actions to update and organize the meteorological and hydrometric network in order to improve the level of knowledge for flood prevention
- S1.3: adoption of appropriate conditions and restrictions to be imposed in accordance with the FRMPs.

To achieve **General Objective S2 -reduce the probability of flooding** and thereby increase the protection level of human health, the environment, cultural heritage, and economic activities- the following specific objectives are defined:

- S2.1: implementation of environmental actions and measures for the retention, formation and management of the flood zone in the mountainous areas of the watersheds, as well as water retention measures in lowlands to reduce flood risk.
- S2.2: implementation of actions and measures for the utilization of retention ponds, modernization, restoration and construction of drainage networks, stormwater management and flood protection works, to reduce the flood risk through alternative means.

- S2.3: implementation of actions and measures to strengthen flood risk management practices at the protection stage, through the promotion of strategic planning for flood protection and stormwater management projects, while also promoting nature-based retention solutions or controlled flooding, in order to improve runoff management through appropriate legislative and administrative measures.

To achieve **General Objective S3 -improve flood preparedness** and mitigate the impacts of flooding on human health, the environment, cultural heritage and economic activities- the following specific objectives are defined:

- S3.1: implementation of actions and measures to develop early warning systems for floods, as well as to organize and authorize the replacement or maintenance of embankments, in order to enhance flood preparedness.
- S3.2: implementation of non-structural interventions, actions, and measures for the education, information, and awareness-raising of the public and stakeholders, as well as initiatives for the pre-identification of alert thresholds and the marking/warning of areas that are hazardous during flooding, in order to improve the level of flood preparedness.
- S3.3: implementation of actions and measures for the development of plans and operational protocols to organize and strengthen flood risk management practices at the preparedness stage, through appropriate non-structural interventions and legislative/administrative measures.

To achieve **General Objective S4 -enhance post-flood recovery mechanisms** of affected areas (people, environment, cultural heritage and economic activities)- the following specific objectives are defined:

- S4.1: improvement of the damage assessment and compensation mechanism following a flood event through the implementation of economic and legislative/ administrative actions and measures aimed at regulating the procedures and responsibilities for damage recording.
- S4.2: improvement of rehabilitation efforts through environmental actions and measures aimed at establishing post-flood recovery mechanisms.
- S4.3: improvement of the rehabilitation mechanisms following a flood event through the implementation of economic and legislative/ administrative actions and measures aimed at supporting flood-affected populations.

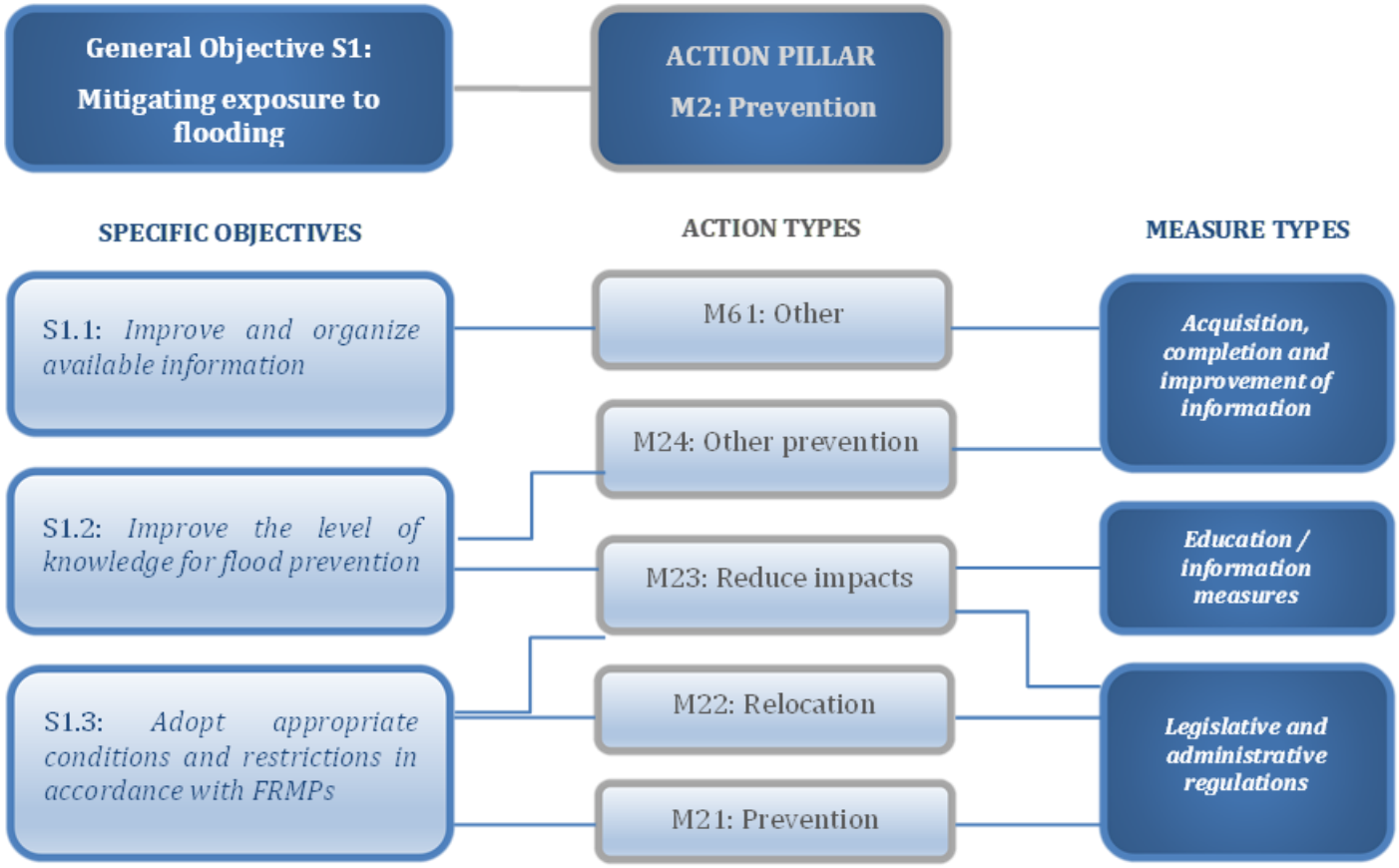

Figure 10-1: Correlation diagram of General Objective S1 - Specific Objectives with Action and Measure Types of the action pillar M2 Prevention[1] of the 1st revision of FRMPs

[1] *In the diagram above, the dashed lines alternate with solid lines only for reasons of clear illustration and without any semantic difference.*

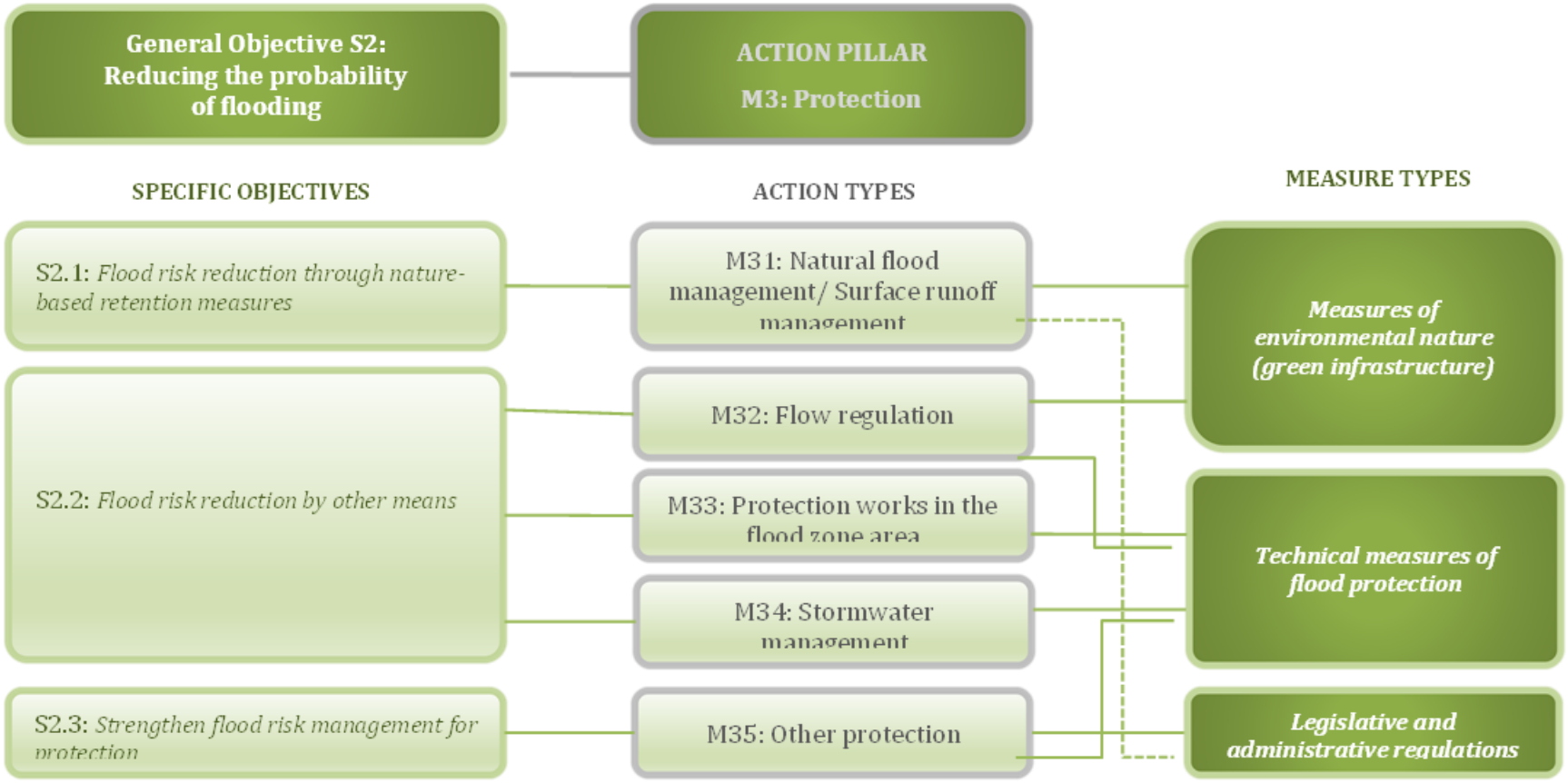

Figure 10-2: Correlation diagram of General Objective S2 - Specific Objectives with Action and Measure Types of the action pillar M3 Protection[2] of the 1st revision of FRMPs

[2] *In the diagram above, the dashed lines alternate with solid lines only for reasons of clear illustration and without any semantic difference.*

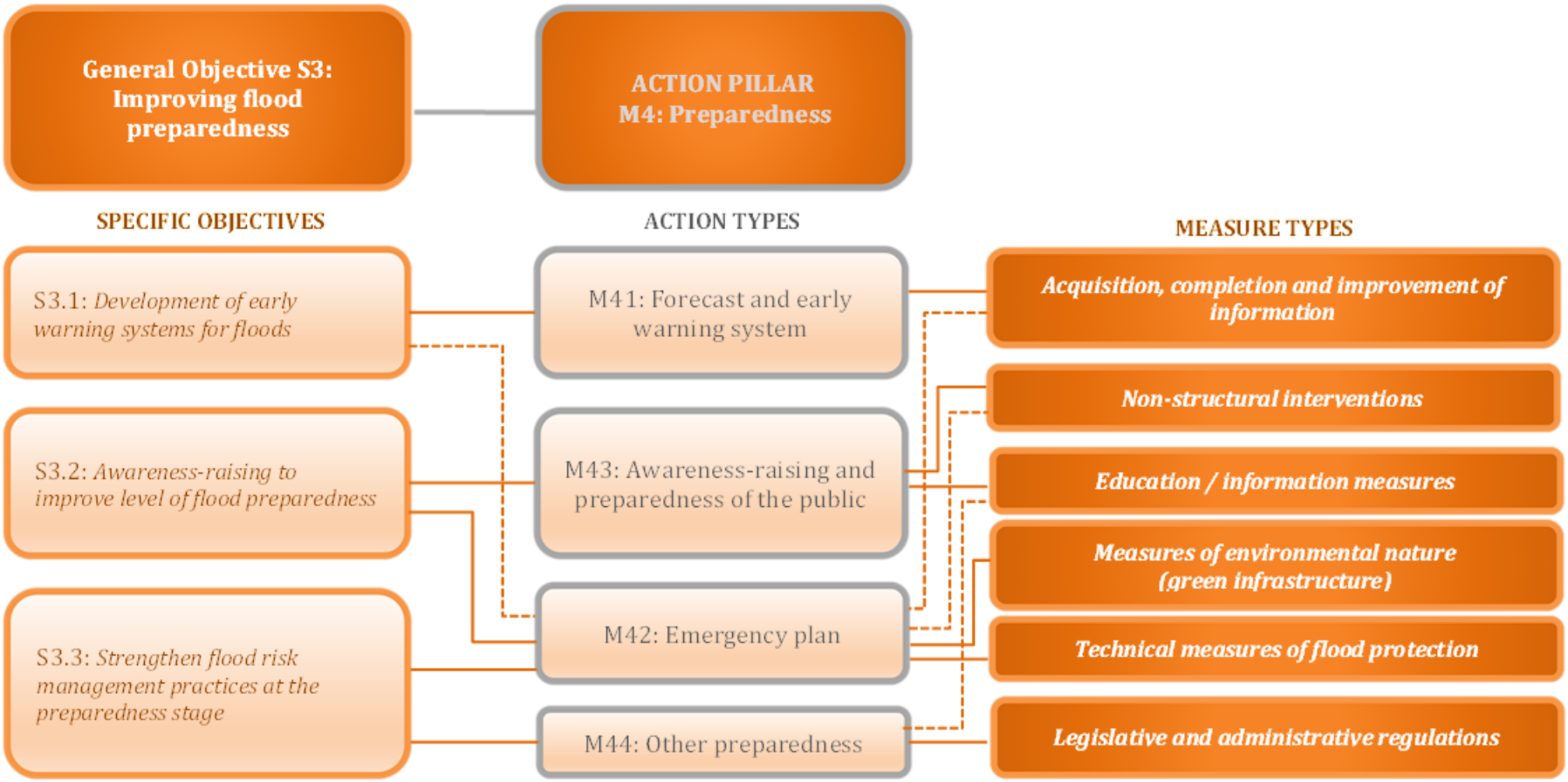

Figure 10-3: Correlation diagram of General Objective S1 - Specific Objectives with Action and Measure Types of the action pillar M2 Preparedness[3] of the 1st revision of FRMPs

[3] *In the diagram above, the dashed lines alternate with solid lines only for reasons of clear illustration and without any semantic difference.*

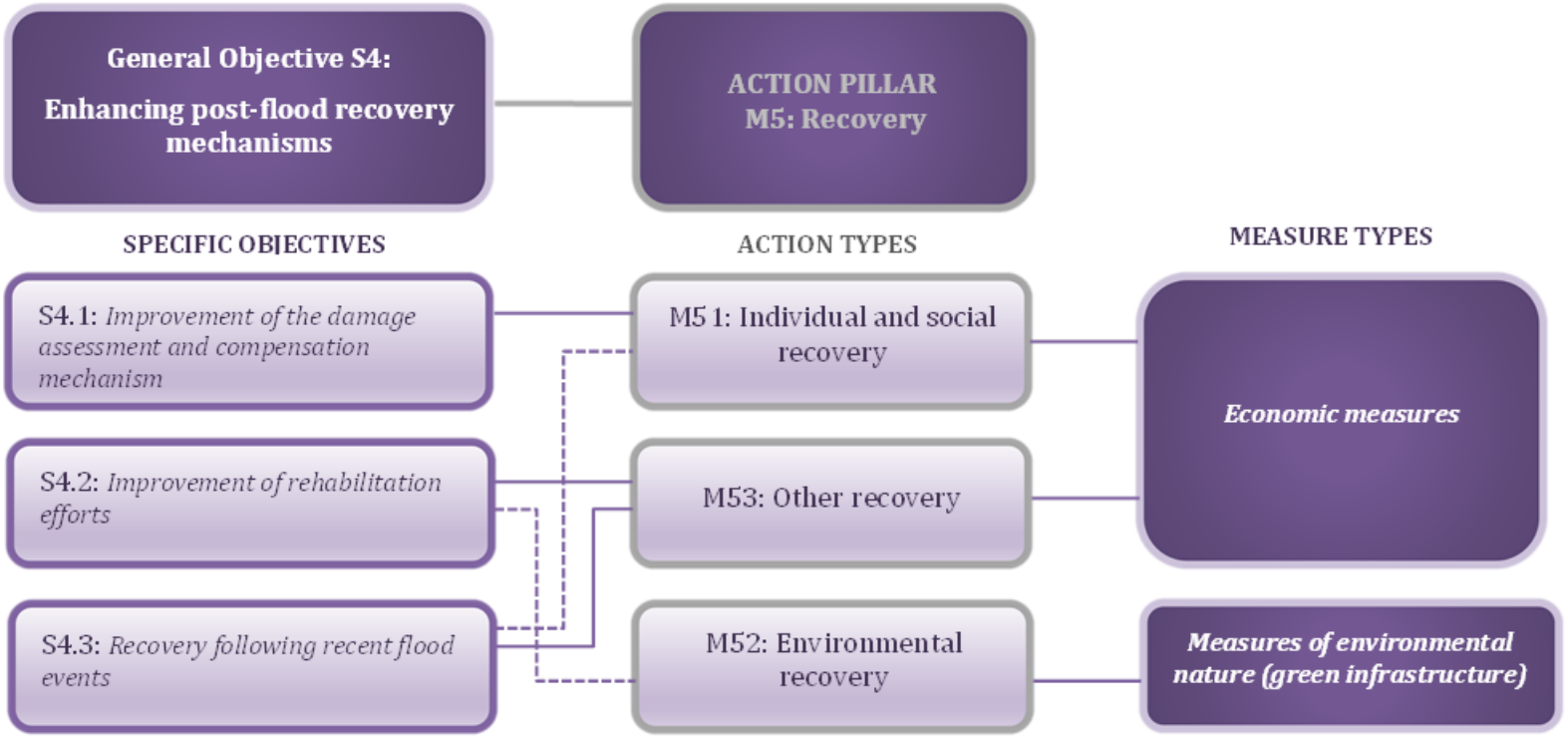

Figure 10-4: Correlation diagram of General Objective S2 - Specific Objectives with Action and Measure Types of the action pillar M5 Rehabilitation[4] of the 1st revision of FRMPs

[4] *In the diagram above, the dashed lines alternate with solid lines only for reasons of clear illustration and without any semantic difference.*

10.2 Preliminary Assessment of a set of measures

In the context of this 1st revision of the FRMPs, a Preliminary Assessment of a set of measures is conducted. Following this assessment, out of a total of 40 measures examined, 32 are selected for further investigation regarding their applicability in WD EL01, while 8 measures are excluded. However, it is noted that after the consultation process, the measure titled: *"Provision of incentives for private flood insurance"* is also excluded, even though it was initially qualified according to the methodology of the Preliminary Assessment.

Thus, out of the 32 measures that are selected for further investigation regarding their applicability in WD EL01 and are put up for consultation, **a total of 31 measures are finally proposed.** Of these, 9 correspond to General Objective S1, 12 to General Objective S2, 8 to General Objective S3 and 2 to General Objective S4. Finally, 28 out of the 31 measures are applied either to the entire Western Peloponnese Water District EL01 or to all the APSFRs. The remaining 3 measures are applied at selected locations within individual APSFRs, based on the available data and calculations.

10.3 FRMP's program of measures for the Western Peloponnese WD EL01

The 31 measures included in this 1st revision of the FRMPs are presented in appropriate measure sheets, with specific color grading according to the General Objective they serve: Blue for S1, Green for S2, Orange for S3 and Purple for S4. Under each measure sheet, a paragraph explains the necessity of implementing the measure and its relevance to the FRMP. For the 3 measures applied to individual APSFRs, the corresponding sheets are also included within each respective APSFR. The 31 measures finally proposed in this FRMP are presented in the table below.

Table 10-1: Linking measures to the spatial level of implementation

Measure Code	Measure Name	General Objective	ALL APSFR / Water District EL01	Specific APSFR	Authorities responsible for the implementation of measures
EL_01_61_01	*Development of a Monitoring System for the Flood Risk Management Plan's Program of Measures*	**S1. Mitigating exposure to flooding**	✓		*Decentralized Administration of Peloponnese, Western Greece and the Ionian Sea – Peloponnese Water Directorate*
EL_01_21_01	*Alignment of the urban development plans with the provisions of the FRMPs*		✓		*Ministry of Urban Planning and Environment (General Secretariat for Spatial Planning and Urban Environment - GSSP)*
EL_01_21_02	*Building and structural regulations within the 100-year flood zone*		✓		*Ministry of Urban Planning and Environment (General Secretariat for Spatial Planning and Urban Environment - GSSP)*
EL_01_21_03	*Adaptation of the urban development plans in flood prone areas (retention basins)*		✓		*Ministry of Urban Planning and Environment (General Secretariat for Spatial Planning and Urban Environment - GSSP)*
EL_01_21_04	*Actions to prevent and protect rural development within the APSFRs*		✓		*Ministry of Agriculture and Rural Development*
EL_01_23_01	*Flood protection measures for the boreholes of the water service providers*		✓		*(1) Service Providers Water supply* *(2) DECENTRALIZED ADMINISTRATION OF PELOPONNESE, WESTERN GREECE AND IONIAN (Peloponnese Water Directorate)*
EL_01_24_01	*Restructuring and modernization of the meteorological and hydrometric data collection network*		✓		*Ministry of Water Resources (General Directorate of Water)*
EL_01_24_02	*Collection and digitization of data regarding stream delineation and flood control structures.*		✓		*Ministry of Technical and Economic Affairs (Technical Chamber of Greece) and Ministry of Economic Affairs and Energy*
EL_01_24_03	*Creation of a national Flood Event database and development of related interactive online platform*		✓		*Ministry of Water Resources (General Directorate of Water)*

Measure Code	Measure Name	General Objective	ALL APSFR / Water District EL01	Specific APSFR	Authorities responsible for the implementation of measures
EL_01_31_01	*Implementation of water control measures in upland regions*	**S2. Reducing the probability of flooding**	✓		*Ministry of Forestry (Forest Directorates), Forestry Offices*
EL_01_31_02	*Nature-based water retention structures in the lowlands*		✓		*MINISTRY OF ENVIRONMENT (Directorate of Flood Control and Land Improvement Projects D19), REGION OF PELOPONNESE (Directorates of Technical Works / Sub-Directorates of Technical Works PE), MUNICIPALITIES*
EL_01_31_03	*Implementation of natural water retention measures / SUDs practices for projects and activities of subcategory A1 and A2 of Law 4014/2011, as in force.*		✓		*Implementing body of each project*
EL_01_32_01	*Multipurpose reservoirs with a flood protection component*			**EL01APSFR003 EL01APSFR004**	*The project owner*
EL_01_32_02	*Utilization of existing reservoirs for flood retention*			**EL01APSFR001 EL01APSFR004**	*Reservoir Management Authorities*
EL_01_33_01	*Modernization and rehabilitation of drainage networks*			**EL01APSFR001 EL01APSFR004**	*Ministry of Environment and Water (Directorate of Flood Control and Land Improvement Projects D19), PELOPONNESE REGION (Directorate of Technical Works / Sub-Directorates of Technical Works PE), OEB*
EL_01_33_02	*Flood protection measures*		✓		*MINISTRY OF ENVIRONMENT (Directorate of Flood Control and Land Improvement Projects D19), REGION OF PELOPONNESE (Directorate of Technical Works / Sub-Directorates of Technical Works PE), MUNICIPALITIES*
EL_01_34_01	*Modernization, replacement and maintenance of existing stormwater drainage networks*		✓		*PELOPONNESE REGION (Directorate of Technical Works / Sub-Directorates of Technical Works of the Region), MUNICIPALITIES, DEYA, Road network maintenance bodies*

Measure Code	Measure Name	General Objective	ALL APSFR / Water District EL01	Specific APSFR	Authorities responsible for the implementation of measures
EL_01_35_02	*Integrated Design of flood protection measures (Master Plan) and construction of the proposed measures*		✓		*ACTION [A] YKKPP (Technical Chamber of Greece),1 ACTION [B] & [C]: To be determined by the Masterplan*
EL_01_35_03	*Evaluation and maintenance of existing water control measures in upland regions*		✓		*Ministry of Forestry (Forest Directorates), Forestry Offices*
EL_01_35_04	*Land use management*		✓		*PELOPONNESE REGION*
EL_01_35_05	*Maintenance and rehabilitation of existing flood protection structures*		✓		*PELOPONNESE REGION (Directorate of Technical Works / Sub-Directorates of Technical Works of the Regional Government)*
EL_01_41_01	*Development and operation of an early warning system for floods*	**S3. Improving flood preparedness**	✓		*• Development agency: Ministry of Education, Culture and Sports • Operating body: YKKPP (General Secretariat of Civil Protection) or PELOPONNESE REGION (Autonomous Civil Protection Directorate)*
EL_01_42_01	*Updating of Emergency Plans, and standardization of emergency flood response procedures / Development of a Local Action Plan Memorandum*		✓		*REGION OF PELOPONNESE AND REGION OF WESTERN GREECE (Autonomous Civil Protection Directorate), MUNICIPALITIES (Civil Protection Offices), DECENTRALIZED ADMINISTRATION OF PELOPONNESE, WESTERN GREECE AND IONIAN (Civil Protection Directorate)*
EL_01_42_03	*Identification of borrow pit locations for embankment restoration/maintenance in case of emergency*		✓		*PELOPONNESE REGION (Directorate of Technical Works / Sub-Directorates of Technical Works of the Regional Directorate, Independent Directorate of Civil Protection)*
EL_01_42_05	*Plan for controlled flooding of lowland areas to protect settlements and critical infrastructure*		✓		*YPYME (Directorate of Flood Control and Land Improvement Projects D19), REGION OF PELOPONNESE AND REGION OF WESTERN GREECE*

[1]According to art. 225 of Law 4782/2021 (Government Gazette 36/A'/9.3.2021) and the Ministry of Justice No. 1086/2024 (Government Gazette 3955/B'/5.7.2024).

Measure Code	Measure Name	General Objective	ALL APSFR / Water District EL01	Specific APSFR	Authorities responsible for the implementation of measures
					(Directorate of Technical Works / Sub-Directorates of Technical Works of the Region), YKKPP (General Secretariat of Civil Protection)
EL_01_43_01	*Awareness-raising actions for the public, local authorities and communities against flood risk*		✓		*YKKPP, Ministry of Education, Ministry of Education, DECENTRALIZED ADMINISTRATION OF PELOPONNESE, WESTERN GREECE AND IONIAN REGIONS (Civil Protection Directorate), PELOPONNESE REGION AND WESTERN GREECE REGION (Autonomous Civil Protection Directorate), MUNICIPALITIES in collaboration with the administration of school units*
EL_01_43_02	*Warning system to avoid crossing Irish crossings during flood events*		✓		*The competent road network body*
EL_01_44_01	*Formulation of a regulatory framework for restoring the conveyance capacity of streambeds and for the maintenance and management of riparian vegetation*		✓		*Ministry of National Economy and Tourism in collaboration with co-responsible bodies*
EL_01_42_04	*Establishment of alert thresholds for critical watercourses of WD EL01 based on the provisions of laws 4662/2020 and 5075/2023*		✓		*PELOPONNESE REGION (Directorate of Technical Works / Sub-Directorates of Technical Works of the Regional Directorate, Independent Directorate of Civil Protection)*
EL_01_51_01	*Restoration of infrastructure following recent flooding events*	**S4. Enhancing post-flood recovery mechanisms**	✓		*Competent bodies, depending on the type of infrastructure, for recording, preparing studies and remediation/compensation, in accordance with applicable legislation*
EL_01_52_01	*Identification of locations for (temporary or permanent) sediment deposition sites (sediment storage areas)*		✓		*PELOPONNESE REGION (Directorate of Technical Works / Sub-Directorates of Technical Works of the Regional Directorate, Independent Directorate of Civil Protection)*

Below, an **indicative measure sheet is provided**. Each measure sheet is color-coded according to the General Objective it addresses. It should be noted that there are differences between the measure sheets of the 1st revision and those of the initial FRMPs; some old fields are modified and new fields are added to facilitate understanding, implementation and monitoring of each measure.

MEASURE NAME	Includes the name of the measure
METER CODE	The Measures are coded as follows: EL_XX (WD code)_XX (Measure Type according to WISE) _XX (Measure serial number)
CORRELATION WITH 1ST CYCLE MEASUREMENT	Continuing from the 1st FRMP or New Measure
PILLAR OF ACTION	Prevention, Protection, Preparedness, Recovery
GENERAL OBJECTIVE	The General Objective of the FRM the measure addresses (S1, S2, S3, S4)
TYPE OF FRM MEASURE	The code of the FRM type of measure and its description are given.
TYPE OF NATURAL WATER RETENTION MEASURE	The code of the type of Natural Water Retention measure and its description are given.
SPECIFIC OBJECTIVE	The Specific Objective of the FRM the measure addresses (S1.1, S1.2, S1.3, S2.1, S2.2, S2.3, S3.1, S3.2, S3.3, S4.1, S4.2, S4.3, S4.3)
TYPE OF MEASURE	Legislative/Administrative regulations Economic measures Education/information measures Non-structural interventions Acquisition, completion and improvement of information Environmental measures (green) infrastructure) Technical Flood Protection Measures
MEASURE DESCRIPTION	Includes a detailed description of the measure
AUTHORITIES RESPONSIBLE FOR IMPLEMENTATION	Reference to the Competent Authority responsible for the implementation, application and coordination of the proposed measure at national, regional, local level as well as to the other authorities involved in its implementation
IMPLEMENTATION AREA	Water District, APSFR, River Basin, Water System etc.
IMPLEMENTATION MONITORING INDICATORS	Varies depending on the measure
TARGET PRICE	Varies depending on the measure

AREA OF IMPACT OF THE MEASURE	Water District, APSFR, River Basin, Water System etc.
IMPACT MONITORING INDICATORS	Varies depending on the measure
TARGET PRICE	Varies depending on the measure
CLIMATE CHANGE RESILIENCE[1]	How the measure performs under climate change. The performance is assessed as Critical, High, Medium, Low.
LINKAGE WITH CLIMATE CHANGE GOALS AND MEASURES	Relevance of the Measure with the objectives and actions of the National Strategy for Adaptation to Climate Change (ESPKA 2016), the PESPKA AMTH (2023), the Climate Law and the EU Specifications.
RELATIONSHIP WITH RBMP GOALS AND MEASURES	Commentary on the synergy of the measure with the objectives and measures of the RBMP
IMPLEMENTATION STAGE	• Mature • No competition is being held • To be implemented • In a tender or contract award procedure • Implemented
IMPLEMENTATION DURATION	Short term: 0-2 years Medium term: 2-6 years, Long term: > 6 years
PROPOSED IMPLEMENTATION TIMETABLE (MILESTONES)	• Project Maturation • No tender procedure is being conducted • Pending implementation • In tendering or contract award process • Implementation
PRIORITY RANKING	Priority ranking of the measure based on the results of its cost-effectiveness assessment
ESTIMATED COST	cost estimate of the measure
INDICATIVE FINANCIAL PROGRAM	Potential sources of funding for the measure

[1]Climate resilience is defined as "The ability of interconnected social, economic and ecological systems to cope with a hazardous event or trend or disturbance, through their response or reorganization in ways that maintain their main function, identity and structure" [INTERIM FRAMEWORK FOR THE ASSESSMENT OF THE CLIMATE RESILIENCE OF INFRASTRUCTURE PROJECTS SUBMITTED FOR CO-FUNDING IN THE NSRF PROGRAMMES 2021 – 2027, National Coordinating Authority, General Secretariat for Public Investments & NSRF, Ministry of Development & Investments, December 2022.

Indicative Documentation of the Necessity of a Measure:

The necessity of adopting and implementing the measure is supported by current developments in flood risk management, as well as by flood risk and climate change assessments conducted within the framework of this FRMP.

10.4 Specialization of measures for the Western Peloponnese WD EL01

During the 1st revision implementation cycle of the FRMP for the Western Peloponnese Water District, a significant specialization of the Program of Measures is carried out, providing more detailed proposals for projects and measures at the Water District level or per APSFR. This specialization takes into account not only the requirements of Directive 2007/60 and the General and Specific Objectives of the 1st revision for flood risk reduction, but also other flood prevention plans and studies implemented in the relevant areas.

All 31 measures of the program are briefly mentioned below, some of which are specialized for individual APSFRs and are accompanied by brief descriptions. A detailed description of all 31 measures of the Program of Measures for WD EL01, along with all relevant information, can be found in the corresponding chapter of the FRMP.

EL _01_61_01: Development of a Monitoring System for the Flood Risk Management Plan's Program of Measures
The measure is a continuation of EL_01_61_01 from the 1st FRMP and concerns the development of a database and an interactive platform for collecting and monitoring the required information from all stakeholders involved in the implementation of the Programme of Measures. It also includes the provision of advisory services by specialized personnel. The measure is implemented by the Decentralized Administration of Peloponnese, Western Greece, and the Ionian Sea, specifically by the Peloponnese Water Directorate.

EL _01_21_01: Alignment of the Urban Development Plans with the provisions of the FRMPs
The measure is introduced for the first time in the 1st revision of the FRMP for EL01 and applies to the entire Western Peloponnese Water District. It concerns the issuance of a Directive specifying the data that should be drawn from the FRMPs during the Analysis Stage/Diagnosis Unit of the studies for urban planning (Local Urban Plans/ Special Urban Plans). This is intended to support the development of well-documented proposals for disaster risk reduction, in accordance with the qualitative guidelines for urban planning set out in the new Urban Planning Standards (Ministry of Environment and Natural Resources/DNEP/32892/1414/2024, D'200).

EL _01_21_02: Building and structural regulations within the 100-year flood zone
The measure is a continuation of EL_01_61_01 from the 1st Flood Risk Management Plan (FRMP) and concerns the formulation of special provisions within the Building and Construction Regulation aimed

EL _01_21_02: Building and structural regulations within the 100-year flood zone
at reducing the vulnerability of structural works, installations, and constructions located within the 100-year flood zone, due to their exposure to flood risk. The goal is to reduce disaster risk. The measure applies to settlements located within the flood zone corresponding to a flood with a return period of T = 100 years. Indicatively, certain settlements and cities located within the Areas of Potential Significant Flood Risk (APSFR) of the Western Peloponnese Water District are mentioned: • Oichalia, Messini, Kalamata (EL01APSFR001) • Megalopolis (EL01APSFR003) • Pyrgos, Ancient Olympia, Zacharo (EL01APSFR004)

EL_01_21_03: Adaptation of the urban development plans in flood prone areas (retention basins)
The measure is introduced for the first time in the 1st revision of the FRMP for EL01 and applies to the flood-controlled areas that will be defined by the Master Plans (measure EL_01_35_02), which will also specify the necessary flood flow retainment measures for each APSFR, as well as those arising from the implementation of measure EL_01_42_05. The measure concerns the appropriate adaptation of urban plans (Local Urban Plans / Special Urban Plans) within the flood-prone areas, in order to propose adequate land uses and restrictions.

EL _01_21_04: Actions to prevent and protect Rural Development within the APSFRs
The measure is introduced for the first time in the 1st revision of the River Basin Management Plan (RBMP) for EL01 and applies to cultivated areas within the Areas of Potential Significant Flood Risk (APSFR). According to the results of the Flood Hazard Maps (FHMs), as well as recent experience with flood events, extensive agricultural holdings within the 100-year flood inundation zone (T=100) are located in APSFR EL01APSFR001, EL01APSFR003, and EL01APSFR004 in the Western Peloponnese Water District. The measure aims to protect cultivated land and support rural development. It promotes the development of an action plan, which may include: a) Identification of crops and areas that are systematically affected by flooding; b) Assessment of drainage network deficiencies that contribute to flooding; c) Identification of alternative crops that are flood-resistant and provide equivalent agricultural income; d) Proposals for financial and other incentives to support crop changes; e) Identification of livestock units for potential relocation and related incentives; f) Proposals for alternative agricultural practices where crop restructuring or relocation is not feasible; g) Economic impact analysis of the proposed actions.

EL _01_23_01: Flood protection measures for the boreholes of the water service providers

The measure is a continuation of EL_01_23_03 from the 1st Flood Risk Management Plan (FRMP) and includes:

(1) The adoption of flood protection measures by the Water Service Providers. More specifically, Water Service Providers shall adopt appropriate flood protection measures for wells located within the 100-year flood zone (T = 100). Such measures may include, for example, the elevation of electromechanical systems, piping, and well housing, the construction of protective perimeter embankments of suitable height and materials, and other relevant interventions.

(2) The incorporation of flood protection requirements in water use permits. The Water Directorates shall incorporate a requirement for the adoption of flood protection measures in water use permits, in accordance with Joint Ministerial Decision 146896/27.10.2014 (Government Gazette B' 2878 and B' 3142), "Categories of permits for the use and execution of water development projects. Procedure and conditions for issuing permits, their content and duration of validity, and other relevant provisions," as amended and currently in force.

The adoption of appropriate flood protection measures will mitigate the risks associated with hydraulic wells, including damage to above-ground electromechanical equipment and the potential inflow of floodwaters into the underground aquifer.

This measure is mandatory for all existing boreholes located within the 100-year flood zone. According to the data from the current FRMP, immediate implementation is required for a total of nine boreholes. Additionally, three boreholes are located outside the APSFR but within the T = 100 flood zone: one in the Municipality of Megalopolis, one in the Municipality of Tripoli, and one in the Municipality of Gortynia.

EL _01_24_01: Restructuring and modernization of the meteorological and hydrometric data collection network

The measure is a continuation of EL_01_24_04 from the 1st FRMP, applies to the entire Water District, and concerns the upgrade and modernization of the existing analog network of hydrometeorological stations operated by the Ministry of Environment and Natural Resources. The implementation of the measure includes, indicatively, the following actions:

a) Replacement of analog hydrometeorological stations with digital telemetric stations across the country, along with the expansion of the network where necessary

b) Development of a digital platform for the recording and transmission of hydrometric and meteorological data.

The measure will be implemented in cooperation with the Water Directorates of the respective Decentralized Administrations.

In the Western Peloponnese Water District (EL01), there are currently 26 rain gauges operated by the Ministry of Environment and Natural Resources, which will be verified and evaluated as part of this measure.

EL _01_24_02: Collection and digitization of data regarding stream delineation and flood control structures

The measure is a continuation of EL_01_24_04 from the 1st FRMP. It applies across the entire Water District, with priority given to catchment areas affecting the APSFRs. The measure concerns the creation and maintenance of a database through the collection and digitization of information at the APSFR level, specifically regarding:

- Data on existing and new stream delineation projects and as well as other relevant information for the implementation of such projects
- Already delineated watercourses
- Technical data of flood control projects that influence water flow, including site inspection of existing projects implemented under the FRMPs or other studies, along with additional technical information from studies and archives of other competent authorities.

EL _01_24_03: Creation of a national Flood Events database and development of related interactive online platform

The measure is a continuation of EL_01_24_07 from the 1st FRMP and is applicable to the entire Water District. It concerns the design and development of a National Flood Event database, along with an associated interactive online platform, through the establishment of an appropriate spatial data system.

The registry will include, at a minimum, records of flood events and related data collected from competent authorities and involved organizations, in accordance with the General Plan for Emergency Response and Immediate/Short-Term Management of Flood Consequences, "DARDANOS", as applicable at the time and based on guidelines to be issued by the competent service of the Ministry of Infrastructure and Transport.

The objective is to ensure the availability and uniform use of structured data to support damage and impact assessments related to extreme flood events. This will facilitate better coordination among stakeholders and enhance the development and implementation of flood risk management plans.

EL _01_31_01: Implementation of water control measures in upland regions

The measure is an amendment to EL_01_31_08 from the 1st FRMP and concerns natural water retention projects in upland areas. It includes the construction of:

a) Bioengineering, geotechnical, and hydraulic works (e.g., low dams and flow-parallel structures) aimed at reducing erosion, limiting sediment production, and enhancing water retention in mountain regions;
b) Open-type dam structures and sediment retention basins in mountainous watersheds with intense torrential flow
c) Dry retention basins for flood retainment in mountain catchments with milder torrential flow.

EL _01_31_01: Implementation of water control measures in upland regions

The measure primarily applies to mountainous catchments characterized by high erodibility that discharge into the APSFRs EL01APSFR001, EL01APSFR003, and EL01APSFR004—areas identified as high flood risk according to the FRMs. Indicatively, these include:

- The mountain basins of the Kalamata and Messini streams (EL01APSFR001)
- The Xerilas river basin, from Xerorema to its confluence with the Alfeios (EL01APSFR003)
- The mountain basins of the Alfeios river and the upper reaches of streams from the area of Krestena to Filiatra (EL01APSFR004).

EL _01_31_02: Nature-based water retention structures in the lowlands

The measure is introduced for the first time in the 1st revision of the FRMP for EL01 and concerns natural water retention projects at the boundaries of lowland riverbeds. Priority is given to areas within the 100-year flood zones of the APSFRs or upstream locations that present high flood risk, particularly where highly vulnerable uses are found.

The measure includes the implementation of:

- Floodplain restoration and management projects (N03)
- Restoration of watercourse beds to their natural state (N05)
- Meander reformation (N04)
- Construction of dry (offline dry detention basins) and active (online ponds) retention basins and lakes (N01)
- Wetland restoration and management through riparian vegetation (N02)
- Restoration and reconnection of seasonal streams (N06)
- Natural bank stabilization (N10).

It also includes the removal of unauthorized transverse structures within riverbeds, as well as the removal of abandoned or damaged structures located within the flood zones.

The measure applies to APSFRs EL01APSFR001, EL01APSFR003, and EL01APSFR004 of the Water District EL01, specifically in lowland areas within the 100-year flood extent as defined in the FHMs of this revision. It may also apply to upstream locations, provided that studies demonstrate effective flood flow interception and risk reduction.

Indicative areas where the implementation of Natural Water Retention Measures (NWRM) is proposed include:

- Riparian areas of the Nedontas and Pamisos Rivers (EL01APSFR001)
- Elisson River and upper reaches of the Alfeios River (EL01APSFR003)

EL _01_31_02: Nature-based water retention structures in the lowlands

- Neda, Ladon, Elisson, and Alfeios Rivers (EL01APSFR004)

The final locations for implementation will be determined through the Master Plans developed under Measure EL_01_35_02.

EL _01_31_03: Implementation of natural water retention measures Natural Water Retention Measures (NWRM) / SUDs practices for projects and activities of subcategory A1 and A2 of Law 4014/2011, as in force.

The measure was introduced for the first time in the 1st Revision of the FRMP EL01 and is applied to the APSFRs of the Western Peloponnese Water District.

The measure concerns the planning of projects and activities of subcategory A1 and A2 according to Law 4014/2011, as in force, where the implementation of Natural Water Retention measures (NWRM) / SUDs practices should be considered as a priority, when flood control projects are required, to limit surface runoff and contain flood runoff.

EL _01_32_01: Multipurpose reservoirs with a flood protection component

The measure is an amendment to EL_01_32_09 from the 1st FRMP and concerns the obligation to construct new dams with a flood protection component, which requires additional storage volume and an appropriate reservoir operation program. The measure applies to the new significant regional reservoirs / dams / pumped storage projects provided by the 2nd Revision of the RB Management Plan of the Western Peloponnese Water District and falling under the APSFR EL01APSFR003 and EL01APSFR004, specifically:

- Megalopolis pumped storage reservoir and the Kombona Megalopolis dam (EL01APSFR 003)
- 3 pumped storage reservoirs upstream of the existing Ladonas reservoir and a dam on the Vlachaiko stream in Ilia (EL01APSFR004)

EL _01_32_02: Utilization of existing reservoir projects to intercept flood flows

The measure constitutes an amendment to EL_01_32_10 from the 1st FRMP and includes actions to optimize the management of existing reservoirs so that, on the one hand, they cover in the best possible way the needs of the uses they serve, and on the other hand, they offer the maximum possible flood protection downstream.

In this case, for the EL01 reservoir, the measure applies to the Pamisos – Ari reservoir upstream of the EL01APSFR001, as well as to Ladonas, Floka and Filiatrino reservoirs in APSFR EL01APSFR004.

EL _01_33_01: Modernization and rehabilitation of drainage networks

The measure is an amendment to EL_01_33_11 from the 1st FRMP and includes actions for the evaluation, adequacy assessment, cleaning, maintenance, replacement, and modernization of drainage networks.

The measure is proposed for priority implementation in the Regional Units of Messinia and Ilia, corresponding to the APSFRs EL01APSFR001 and EL01APSFR004, respectively. The following drainage networks are cited as indicative examples and not as an exhaustive list:

Messinia Region
- Low and high Zone of Pamisos Messinia, Upper & Lower Messinia (EL01APSFR001)
- Irrigation network of Filiatrino dam, Messinia region (EL01APSFR004)

Ilia Region (EL01APSFR004)
- Pinios - Alfeios dam network
- Pyrgos A drainage network
- Pyrgos B drainage network
- Epitalion drainage network
- Pelopiou drainage network
- Diaselon – Pappadou drainage network

EL _01_33_02: Flood Protection Measures

The measure is an amendment to EL_01_33_12 from the 1st FRMP. It includes the construction of new flood control projects and/or the completion or reinforcement of existing flood protection works that are currently under study or have already been studied and are planned for implementation in lowland riverbeds. Priority is given to areas located within the 100-year flood zones of the APSFRs, particularly in locations identified as high flood risk and characterized by highly vulnerable land uses. The types of interventions include riverbed arrangements, terraces, embankments, culverts, artificial channels, and the removal of sediment deposits.

The measure is proposed for application to watercourses located within APSFR EL01APSFR001, EL01APSFR003, and EL01APSFR004, with priority given to those within the T=100-year flood inundation zones classified as high or very high risk.

Accordingly, and by way of example (not limitation), the following watercourses are identified:

- Nedon, Aris, Girorrema, Xerilas, Megalo Potami, Chouchlotos, Pamisos, Tzamis and Botokos rivers (EL01APSFR001)
- Xerilas, Elisson rivers and parts of the upper course of Alfeios river (EL01APSFR003)
- Tholou, Kalo Nero, Neda, Methoni, Ladon, Xerilas, Kladeos, Elisson and Alfeios rivers (EL01APSFR004)

EL _01_33_02: Flood Protection Measures

In addition, indicatively and not exhaustively, a relevant list of projects is provided in APSFR EL01APSFR001, EL01APSFR003 and EL01APSFR004 which:

(A) is already in development or has secured construction financing

1. Flood control works and debris cleaning of streams in Messinia (EL01APSFR001)
2. Flood protection of the Xerila River in Veligosti, Municipality Megalopolis (EL01APSFR003)
3. Construction of flood protection works on the Patras - Pyrgos motorway (EL01APSFR004)

(B) are found in other stages of maturation

1. Flood protection works in Kalamata from the Nedon River (EL01APSFR001)
2. Flood protection study for the Ari-Messini dam - environmental assessment studies of the discharges and the coastal zone until the entrance of Messini(EL01APSFR001)
3. Delineation of streams within the Megalopolis Basin (Xerilas River, Elisson River and parts of the upper course of the Alfeios River), water resources management projects (EL01APSFR003)
4. Flood control works and delineation of Alfeios River Ilia region (EL01APSFR004)
5. Delineation of Maurozoumena river for approximately ~2km (EL01APSFR004)

It is noted that this measure is being implemented due to the inadequate implementation of Measure EL_01_31_02 of this FRMP, which concerns natural water retention projects in the lowlands. The required flood protection projects will be identified within the framework of the Master Plan implementation (see Measure EL_01_35_02), following an assessment of the impact on flood risk reduction of the upstream hydrological measures (Measure EL_01_31_01), the construction and utilization of regional reservoirs (Measures EL_01_32_01 and EL_01_32_02), and in conjunction with the implementation a study for the designation of flood-controlled areas (Measure EL_01_42_05).

EL_01_34_01: Modernization, replacement and maintenance of existing stormwater drainage networks

The measure is an amendment to EL_01_34_13 from the 1st FRMP. It includes projects for the replacement, reinforcement, and completion of stormwater drainage systems. Priority is given to areas with significant residential development and needs, located within the APSFRs.

Specifically, for the Western Peloponnese Water District, the measure is proposed for implementation in selected urban centers within APSFR EL01APSFR001, EL01APSFR003 and EL01APSFR004. Indicatively, and not restrictively, the following urban centers are proposed:

- Messini and Kalamata (EL01APSFR001)
- Megalopolis (EL01APSFR003)

EL_01_34_01: Modernization, replacement and maintenance of existing stormwater drainage networks

- Zacharo and Pyrgos (EL01APSFR004)

EL_01_35_02: Integrated Design of flood protection measures (Master Plan) and construction of the proposed measures

The measure is a continuation of EL_01_35_15 from the 1st FRMP. Specifically, for the implementation of the Master Plan for flood protection projects in the Western Peloponnese Water District, it is proposed to develop:

- 1 Master Plan covering both the upstream catchment areas of APSFR EL01APSFR001 and the APSFR EL01APSFR001 area itself, within the administrative boundaries of the Peloponnese Region
- 1 Master Plan covering the area of APSFR EL01APSFR003 and its upstream catchment areas within the Peloponnese Region.
- 2 Master Plans for APSFR EL01APSFR004, each covering distinct areas:
  - ✓ part of APSFR EL01APSFR004 belonging to the Region of Western Greece
  - ✓ part of APSFR EL01APSFR004 belonging to the Peloponnese Region

The aforementioned Masterplan will exclude watercourses that are on list (A) and (B) of measure EL_01_33_02 for the APSFR EL01APSFR001, EL01APSFR003 and EL01APSFR004.

EL_01_35_03: Evaluation and maintenance of existing water control measures in upland regions

The measure is a continuation of EL_01_35_16 from the 1st FRMP. It involves the assessment of existing mountain hydrological works in stream and tributary catchment areas, as well as their maintenance, in order to mitigate impacts in areas included within the 100-year flood zones (T=100). Indicatively, and not restrictively, the following mountainous catchments—discharging into T=100 flood zones as defined in the FRMs—are identified as priorities for maintenance interventions:

(1) mountain basins of the Kalamata and Messini streams flowing in APSFR EL01APSFR001. More specifically, within Nedon basin 135 stone retaining dams, 558 dry stone dams as well as supportive vegetative engineering works have been constructed and require evaluation and maintenance.

(2) upper parts of Alfeios, Xerilas and Elisson rivers flowing in APSFR EL01APSFR003

(3) upper parts of Alfeios, Neda, Filiatrino etc rivers flowing in APSFR EL01APSFR004

EL_01_35_04: Land use management

The measure is a continuation of EL_01_35_17 from the 1st FRMP. It concerns the preparation and implementation of pasture management plans, in accordance with the provisions of Law 4351/2015 (A' 164) and Joint Ministerial Decision 1058/71977/2017 (Government Gazette B 2331/07-07-2017). In areas located upstream of the APSFRs that have not been excluded from grazing use, the provisions of the FRMP and the RBMP should be taken into account. Additionally, hydrological criteria should be applied in determining grazing intensity.

The measure is applied across the Water District, with priority given to catchments that discharge into the APSFRs. Immediate implementation of the measure is particularly important for controlling grazing pressure and preventing deforestation in the mountainous river catchments. Specific watercourses whose catchments are proposed for the application of the measure are indicated:

- Pamisos, Nedon, Aris, Velika, Vathy Lagadi, Koryas, Mourtias, Xerilas and Tyflo rivers in APSFR EL01APSFR001
- upper reaches of the Alfeios, Xerilas and Elisson river flowing in APSFR EL01APSFR003
- Alfeios, Giannouzagas, Glatsitiko, Zacharaiiko, Tholou, Kalo Nero, Mavri Limni, Methoni, Neda, Selas, Filiatrino rivers flowing in APSFR EL01APSFR004

EL_01_35_05: Maintenance and rehabilitation of existing flood protection structures

The measure is introduced for the first time in the 1st revision of the FRMPs for EL01. It is applied at the Water District level and concerns all existing flood protection infrastructures located within watercourses affecting their regime. Priority is given to maintenance and restoration projects within the APSFRs or upstream of those that affect flood flows.

The measure includes the following actions that should be carried out on an annual basis:

1. Conducting site visits, noting problems after the end of the wet period
2. Identification of critical positions that need maintenance/ replacement and prioritization
3. Setting an annual maintenance program by the competent authorities which will include:
   - ✓ Cleaning from debris materials hindering the free flow
   - ✓ Slope supporting works
   - ✓ Repair of lining works
   - ✓ Embankment repairs
   - ✓ Repairs of the structures (steps, culverts, crossings, etc.)
4. Secure funding
5. Implementation

EL _01_41_01: Development and operation of an early warning system for floods

The measure is a continuation of EL_01_41_18 from the 1st FRMP. The development of an early warning system for the Western Peloponnese Water District is proposed for all APSFRs. Indicatively and not restrictively, the following areas are proposed:

- the upper, middle and lower reaches of the Pamisos River (RB EL0132 Pamisos-Nedon-Neda, APSFR EL01APSFR001)
- the upper reaches of the Alfeios River (RB EL0129 Alfeios, APSFR EL01APSFR003)
- the entire course of the Alfeios River (RB EL0129 Alfeios, APSFR EL01APSFR004)

EL _01_42_01: Updating of Emergency Plans, and standardization of emergency flood response procedures/ Development of a local Action Plan Memorandum

The measure is a continuation of EL_01_42_19 from the 1st FRMP and is applied at the Water District level. The FHMs and FRMs prepared within the framework of this FRMP, contribute to improved knowledge of flood risk and should be taken into account in the Emergency Plans that will be developed. For the Western Peloponnese Water District (EL01), the following municipalities are located within the boundaries of the T=100-year flood zone: Messinia, Kalamata, Tripoli, Oichalia, Megalopolis, Zacharo, Andritsaina-Krestena, Gortynia, Ancient Olympia, Sikyonia, Kalavryta, Pyrgos, Trifylia, and Pylos-Nestor.

In accordance with the provisions of the General Civil Protection Plan "Xenokrates," in 2019, the Directorate of Planning and Emergency Response of the General Civil Protection Agency, in collaboration with all involved authorities, issued the General Plan for Emergency Response and Immediate/Short-Term Management of the Consequences of the Flood Phenomenon. This plan was distributed to all relevant entities by document number 8794/06-12-2019 from the General Civil Protection Agency for implementation of their respective responsibilities ("DARDANOS 1"). In 2023, the Emergency Planning Department of the General Directorate of the Hellenic Republic, considering administrative and organizational changes since the first edition—primarily affecting central administration authorities—issued the 2nd General Plan for Emergency Response and Immediate/Short-Term Management of the Consequences of the Flood Phenomenon, named "DARDANOS 2."

EL _01_42_03: Identification of borrow pit locations for embankment restoration/maintenance in case of emergency

The measure is a continuation of EL_01_53_27 from the 1st FRMP and applies to the APSFR EL01APSFR001, EL01APSFR003, and EL01APSFR004, where, according to the FHMs, overflows of existing embankments and flooding of the adjacent lowland areas occur. In the T=1000-year flood zone, where embankments have been constructed or are planned, the following actions are undertaken:

1. Administrative actions: the administrative actions through which:

EL _01_42_03: Identification of borrow pit locations for embankment restoration/maintenance in case of emergency

a. permission to immediately take the required embankment restoration materials from specific predetermined locations (borrowing chambers), after an extreme flood event,

b. selection criteria for these positions are determined,

c. these positions are delineated,

d. the permitted uses are determined in the selected and delineated locations

2. Other actions required for the finalization and licensing of positions:

a. A study for the identification and delineation of borrow pits for the immediate extraction of materials to restore or construct embankments. The study shall include: identification of suitable locations for borrow pits, determination of the maximum allowable extraction volumes, geotechnical testing of material suitability, provision of typical embankment cross-sections (pre-flood condition) for immediate restoration, methodology for material extraction and environmental restoration measures for the borrow pit area, accessibility analysis and proposal of access roads suitable under T=50, T=100, and T=1000 flood scenarios.

b. Environmental Impact Assessment (EIA) and compliance with the licensing procedure in accordance with applicable legislation. The activity falls under Group 5 “Mining and Related Activities,” as defined by the relevant Joint Ministerial Decision (as amended and in force), specifically subcategory 5: "Borrow pits for aggregates, soil, or other earth materials used exclusively for infrastructure projects."

Indicatively and not exhaustively, the following are mentioned:

- APSFR EL01APSFR001: Flood protection embankments have been constructed along the watercourses including the Pamisos River.
- APSFR EL01APSFR003: Embankments are present along watercourses particularly in the upper reaches of the Alfeios River.
- APSFR EL01APSFR004: Embankments have been constructed in the downstream sections of the Methoni, Sela, and Xeria rivers, all within the designated flood zone

EL _01_42_04: Establishment of alert thresholds for critical watercourses of WD EL01 based on the provisions of laws 4662/2020 and 5075/2023

The measure is introduced for the first time in the 1st revision of the FRMPs for EL01. It includes the following actions, with the objective of defining alert thresholds corresponding to the four levels of mobilization established by the applicable legislation:

- Hydraulic assessment of watercourses and determination of their discharge capacity (i.e., the maximum flow they can safely convey, including the required freeboard according to technical specifications).

EL _01_42_04: Establishment of alert thresholds for critical watercourses of WD EL01 based on the provisions of laws 4662/2020 and 5075/2023

- Identification of critical points along watercourses suitable for monitoring and recording river flow (e.g., at bridges, access points, or straight channel segments ideal for hydrometric measurements).
- Mapping of critical locations in relation to the development of the flood wave and the proximity of vulnerable receptors — primarily residential settlements and transport infrastructure.
- Establishment of flow and water level thresholds at the above locations for each of the four (4) preparedness levels defined by the legal framework.
- Determination of absolute elevations (levels) and associated flows at selected key locations, corresponding to all four alert levels.

Implementation of this measure is considered essential in critical watercourses, specifically those categorized as high and very high risk. Therefore, the following locations are identified indicatively and not exhaustively:

- in APSFR EL01APSFR001, the following critical watercourses are identified: Vathy Lagadi, Aris, Tzirorrema, Nedon, Xerilas, Megalo Potami, Khouchlotos, Pamisos, Tzamis, Botokos rivers
- in APSFR EL01APSFR003, the application of this specific measure to Alfeios river is proposed
- in APSFR EL01APSFR004 the following critical watercourses are identified: Tholou, Kalo Nero, Neda, Methoni, Ladon, Xerilas, Kladeos, Elisson and Alfeios rivers

EL_01_42_05: Plan for controlled flooding of lowland areas to protect settlements and critical infrastructure

The measure is introduced for the first time in the 1st Revision of the FRMPs for EL01. It concerns the planning of controlled flooding in low- or very low-risk low-lying areas, which will be selected as a priority within or upstream of the T100 flood zones, with the aim of protecting areas within the T100 zones or reducing flood risk in regions identified as high-risk in the Flood Risk Management Plans (FRMPs).

The implementation of this measure will be pursued within the framework of the Master Plan for flood control projects (Measure EL_01_35_02). Upon completion, a special study will establish the institutional framework for these controlled flood areas, including the definition of permitted land uses and prohibitions within their boundaries, in accordance with Measure EL_01_21_03.

This measure is to be examined in detail during the preparation of the Master Plans in line with Measure EL_01_35_02. Indicatively and not restrictively, the following watercourses are proposed for investigation, as they are subject to extensive flooding even under T50-year flood events, according to the Flood Hazard Maps (FHMs):

EL_01_42_05: Plan for controlled flooding of lowland areas to protect settlements and critical infrastructure

- APSFR EL01APSFR001: Pamisos, Aris rivers
- APSFR EL01APSFR003: Alfeios river
- APSFR EL01APSFR004: Alfeios river

EL_01_43_01: Awareness-raising actions for the public, local authorities and communities against flood risk

The measure is a continuation of EL_01_43_21 from the 1st FRMP and is implemented at the Water District level. It includes the implementation of information and awareness-raising actions targeting both citizens and institutions regarding flood risks in their area, as well as precautionary measures to be taken in case of potential flood events. Such actions may include television, radio, and internet campaigns, public events, educational workshops, presentations in schools, etc. These activities will be carried out by the Ministry of Climate Crisis and Civil Protection, the Ministry of Education, the Ministry of National Economy, the Civil Protection Directorates of the relevant Decentralized Administrations, the Autonomous Civil Protection Directorates of the relevant Regions, and the Municipalities, in cooperation with school administration authorities.

EL _01_43_02: Warning system to avoid crossing Irish crossings during flood events

The measure is a continuation of EL_01_43_22 from the 1st FRMP and is applied at the APSFR level, with priority given to areas where a significant number of Irish crossings present a very high risk to residents under high-flow conditions. The objective of the measure is to enhance the preparedness of both citizens and responsible authorities, with the aim of reducing accidents involving vehicle crossings over rivers and streams via Irish crossings during flood events.

To achieve this, the measure involves the installation of systems consisting, at a minimum, of warning signage and water depth indicators at Irish crossings within the Water District. These systems will provide clear and timely information to discourage vehicle crossings under hazardous conditions.

The total number of Irish crossings identified per APSFR within the Western Peloponnese Water District is as follows:

- APSFR EL01APSFR001 a total of 11 Irish crossings
- APSFR EL01APSFR003 a total of 6 Irish crossings
- APSFR EL01APSFR004 a total of 8 Irish crossings

EL_01_44_01: Formulation of a regulatory framework for restoring the conveyance capacity of streambeds and for the maintenance and management of riparian vegetation

The measure is a continuation of EL_01_44_23 from the 1st FRMP and is implemented at the level of the Water District. It involves the development of regulations for the periodic cleaning of

EL_01_44_01: Formulation of a regulatory framework for restoring the conveyance capacity of streambeds and for the maintenance and management of riparian vegetation

watercourses, as well as the maintenance and management of riparian vegetation. These regulations are to be formulated considering the specific characteristics of the watercourses, including geomorphological and hydraulic conditions, type of watercourse, ecological and environmental attributes and the protection status of the area in which the watercourse is located.

EL_01_51_01: Restoration of infrastructure following recent flooding events

The measure is introduced for the first time in the 1st revision of the FRMPs for EL01 and concerns the restoration of areas affected by severe flooding.

Regarding the required interventions in flood defense embankments, they should be implemented following a thorough evaluation and in coordination with Measure EL_01_35_02 (Master Plan), within which the following aspects are examined:

(a) The impact on flood risk reduction in the lowlands, considering the effectiveness of mountain hydrology projects (Measure EL_01_31_01), the utilization of existing regional reservoirs (Measure EL_01_32_02), and the construction of new regional reservoirs (Measure EL_01_32_01) with flood protection components.

(b) The need to implement natural water retention measures in the lowlands (Measure EL_01_31_02), and controlled flooding in low-vulnerability floodplain areas (Measure EL_01_42_05)

(c) The necessity for other flood protection works (Measure EL_01_33_02), which will also define the required restoration interventions for existing embankments.

EL_01_52_01: Identification of locations for (temporary or permanent) sediment deposition sites (sediment storage areas)

The measure is introduced for the first time in the 1st revision of the FRMP for EL01 and concerns the establishment of the procedure through which the optimal management for transported (sediment and debris) materials will be selected following each flood event. The measure applies to all APSFRs within the Western Peloponnese Water District, where:

- In APSFR EL01APSFR001, one study will be carried out for the identification of a deposition site for transported materials, which will spatially concern the areas of the Peloponnese Region, within which APSFR EL01APSFR001 is included.
- In APSFR EL01APSFR003, one study will be carried out for the identification of a deposition site for transported materials, which will spatially concern the areas of the Peloponnese Region, within which APSFR EL01APSFR003 is included.
- In APSFR EL01APSFR004 of Water District EL01, two studies will be carried out for the identification of deposition sites for transported materials:

EL_01_52_01: Identification of locations for (temporary or permanent) sediment deposition sites (sediment storage areas)

- ✓ One study for the part of APSFR EL01APSFR004 belonging to the Peloponnese Region
- ✓ One study for the part of APSFR EL01APSFR004 belonging to the Region of Western Greece

11 Prioritization of measures of the 1st revision of the FRMPs WD EL01

Prioritization of the measures is carried out through the assessment of their economic effectiveness. The purpose of prioritization is to highlight the measures that achieve the greatest reduction in flood damage (benefit) at the lowest cost.

The methodology applied in the current cycle of FRMP's is a modification of the methodology applied in the 1st cycle of implementation of the Floods Directive. The adopted steps are as follows:

- Classification of the proposed measures into two categories: measures that contribute indirectly to damage prevention (Category 1) and measures that contribute directly to damage prevention/management (Category 2)
- Assessment of the expected benefit of each measure of the two categories
- Evaluation of the nature/aspect of each measure (prevention, protection, preparedness, recovery)
- Correlation with other policies (climate change, RBMP)
- Multi-criteria analysis of the overall benefit index of the measure
- Estimate of the total cost of each measure (investment cost, operating cost)
- Calculation of cost-effectiveness index of a measure and prioritization of measures

Particular emphasis is placed on flood risk protection, which is why the proposed measures primarily focus on this aspect. The total initial investment cost of the program of measures is estimated at ~365 million €. Measures under the flood protection aspect represent the largest share of the total cost, ~355 million €. The remaining €10 million concerns the remaining three aspects (prevention, preparedness and recovery.)

Table 11-1: Number of measures per action pillar and total cost on the Western Peloponnese Water District

Measure pillar	Number of proposed measures for EL01	Total initial investment cost of measures €
Prevention	9	~1,320,000
Protection	12	355,120,000
Preparedness	8	8,680,000
Recovery	2	550,000
Total	**31**	**~365,670,000**

The following tables present:

- the Benefit Index (D11)
- the total annualized investment cost (D16) and

The measures in the above-mentioned tables are presented with the score in descending order after applying the prioritization methodology. The measures in these tables are divided by category (Category 1 Measures and Category 2 Measures) according to the same methodology.

More specifically, the Benefit Index (D11) - Table 11-2 ranges between 0 (smallest benefit from the implementation of the measure) to 100 (greatest benefit from the implementation of the measure). In the Western Peloponnese Water District, the measures with the greatest benefit (>90) of Category 1 are:

- Development of a Monitoring System for the Flood Risk Management Plan's Program of Measures (EL_01_61_01)
- Actions to prevent and protect Rural Development within the APSFR (EL_01_21_04)
- Flood protection measures for the boreholes of the water service providers (EL_01_23_01)
- Restructuring and modernization of the meteorological and hydrometric data collection network (EL_01_24_01)
- Integrated Design of flood protection measures (Master Plan) and construction of the proposed measures (EL_01_35_02)

while the measure with the greatest benefit (>90) of Category 2 is Flood Protection measures (EL_01_33_02).

With regard to the total annualized investment cost (D16) - Table 11-3, the measures with an index >1,000,000 and therefore the most costly in terms of their implementation are, by category:

Category 1 Measures:

Maintenance and rehabilitation of existing flood protection structures (EL_01_35_05)

Category 2 Measures:

Flood Protection measures (EL_01_33_02) and Modernization, replacement and maintenance of existing stormwater drainage networks (EL_01_34_01).

Table 11-2: Prioritization of measures of the 1st revision of the FRMPs for the WD EL01 based on the overall benefit index (D11)

MEASURE NAME	CODE	PILLAR	TYPE OF MEASURE	D11 (overall benefit index)
CATEGORY 1 MEASURES				
Development of a Monitoring System for the Flood Risk Management Plan's Program of Measures	EL_01_61_01	**Prevention**	Acquisition, completion and improvement of information	**100**
Actions to prevent and protect Rural Development within the APSFRs	EL_01_21_04	**Prevention**	Acquisition, completion and improvement of information	**98**
Flood protection measures for the boreholes of the water service providers	EL_01_23_01	**Prevention**	Legislative / Administrative Regulations and Technical Flood Protection Measures	**98**
Restructuring and modernization of the meteorological and hydrometric data collection network	EL_01_24_01	**Prevention**	Acquisition, completion and improvement of information	**93**
Integrated Design of flood protection measures (Master Plan) and construction of the proposed measures	EL_01_35_02	**Protection**	Technical flood protection measures	**92**
Awareness-raising actions for the public, local authorities and communities against flood risk	EL_01_43_01	**Preparedness**	Education/information measures	**76**
Formulation of a regulatory framework for restoring the conveyance capacity of streambeds and for the maintenance and management of riparian vegetation	EL_01_44_01	**Preparedness**	Legislative/Administrative regulations	**75**
Maintenance and rehabilitation of existing flood protection structures	EL_01_35_05	**Protection**	Technical flood protection measures	**74**
Building and structural regulations within the 100-year flood zone	EL_01_21_02	**Prevention**	Legislative/Administrative regulations	**72**
Implementation of Natural Water Retention measures (NWRM) / SUDs practices for projects and activities of subcategory A1 and A2 of Law 4014/2011, as in force.	EL_01_31_03	**Protection**	Measures of environmental nature (green infrastructure)	**71**

MEASURE NAME	CODE	PILLAR	TYPE OF MEASURE	D11 (overall benefit index)
Alignment of the urban development plans with the provisions of the FRMPs	EL_01_21_01	Prevention	Legislative/Administrative regulations	71
Adaptation of the urban development plans in flood prone areas (retention basins)	EL_01_21_03	Prevention	Legislative/Administrative regulations	71
Updating of Emergency Plans, and standardization of emergency flood response procedures/ Development of a local Action Plan Memorandum	EL_01_42_01	Preparedness	Acquisition, completion and improvement of information	70
Establishment of alert thresholds for critical watercourses of WD EL01 based on the provisions of laws 4662/2020 and 5075/2023	EL_01_42_04	Preparedness	Non-structural interventions	70
Collection and digitization of watercourse demarcation data and flood control project data.	EL_01_24_02	Prevention	Acquisition, completion and improvement of information	50
Creation of a National Flood Events database and development of a related interactive online platform	EL_01_24_03	Prevention	Acquisition, completion and improvement of information	50
Identification of borrow pit locations for embankment restoration/maintenance in case of emergency	EL_01_42_03	Preparedness	Measures of environmental nature (green infrastructure)	48
Identification of locations for (temporary or permanent) sediment deposition sites (sediment storage areas)	EL_01_52_01	Recovery	Measures of environmental nature (green infrastructure)	47
CATEGORY 2 MEASURES				
Flood Protection measures	EL_01_33_02	Protection	Technical flood protection measures	93
Modernization, replacement, maintenance of existing stormwater drainage networks	EL_01_34_01	Protection	Technical flood protection measures	69
Development and operation of an early warning system.	EL_01_41_01	Preparedness	Acquisition, completion and improvement of information	55
Warning system to avoid crossing Irish crossings during flood events	EL_01_43_02	Preparedness	Non-structural interventions	41

MEASURE NAME	CODE	PILLAR	TYPE OF MEASURE	D11 (overall benefit index)
Plan for controlled flooding of lowland areas to protect settlements and critical infrastructure	EL_01_42_05	Preparedness	Technical flood protection measures	26
Utilization of existing reservoirs with a flood protection component	EL_01_32_02	Protection	Technical flood protection measures	25
Nature-based water retention structures in the lowlands	EL_01_31_02	Protection	Measures of environmental nature (green infrastructure)	22
Implementation of water control measures in upland regions	EL_01_31_01	Protection	Measures of environmental nature (green infrastructure)	20
Land use management	EL_01_35_04	Protection	Measures of environmental nature (green infrastructure)	18
Modernization and rehabilitation of drainage networks	EL_01_33_01	Protection	Technical flood protection measures	18
Evaluation and Maintenance of Existing water control measures in upland regions	EL_01_35_03	Protection	Technical flood protection measures	16
Multipurpose reservoirs with a flood protection component	EL_01_32_01	Protection	Legislative / Administrative Regulations and Technical Flood Protection Measures	14

Table 11-3: Prioritization of measures of the 1st revision of the FRMPs for the WD EL01 based on the total annualized investment cost (D16)

MEASURE NAME	CODE	PILLAR	TYPE OF MEASURE	D16 (total annualized investment cost)
CATEGORY 1 MEASURES				
Maintenance and rehabilitation of existing flood protection structures	EL_01_35_05	**Protection**	Technical flood protection measures	**8.714.399**
Integrated Design of flood protection measures (Master Plan) and construction of the proposed measures	EL_01_35_02	**Protection**	Technical flood protection measures	**181.550**
Establishment of alert thresholds for critical watercourses of WD EL01 based on the provisions of laws 4662/2020 and 5075/2023	EL_01_42_04	**Preparedness**	Non-structural interventions	**181.550**
Flood protection measures for the boreholes of the water service providers	EL_01_23_01	**Prevention**	Legislative / Administrative Regulations and Technical Flood Protection Measures	**121.257**
Identification of borrow pit locations for embankment restoration/maintenance in case of emergency	EL_01_42_03	**Preparedness**	Measures of environmental nature (green infrastructure)	**99.852**
Identification of locations for (temporary or permanent) sediment deposition sites (sediment storage areas)	EL_01_52_01	**Recovery**	Measures of environmental nature (green infrastructure)	**99.852**
Restructuring and modernization of the meteorological and hydrometric data collection network	EL_01_24_01	**Prevention**	Acquisition, completion and improvement of information	**55.965**

MEASURE NAME	CODE	PILLAR	TYPE OF MEASURE	D16 (total annualized investment cost)
Actions to prevent and protect Rural Development within the APSFRs	EL_01_21_04	Prevention	Acquisition, completion and improvement of information	46.637
Development of a Monitoring System for the Flood Risk Management Plan's Program of Measures	EL_01_61_01	Prevention	Acquisition, completion and improvement of information	38.634
Collection and digitization of watercourse demarcation data and flood control project data.	EL_01_24_02	Prevention	Acquisition, completion and improvement of information	37.310
Awareness-raising actions for the public, local authorities and communities against flood risk	EL_01_43_01	Preparedness	Education/information measures	14.524
Formulation of a regulatory framework for restoring the conveyance capacity of streambeds and for the maintenance and management of riparian vegetation	EL_01_44_01	Preparedness	Legislative/Administrative regulations	10.893
Updating of Emergency Plans, and standardization of emergency flood response procedures/ Development of a local Action Plan Memorandum	EL_01_42_01	Preparedness	Acquisition, completion and improvement of information	10.893
Creation of a National Flood Events database and development of a related interactive online platform	EL_01_24_03	Prevention	Acquisition, completion and improvement of information	2.665
Building and structural regulations within the 100-year flood zone	EL_01_21_02	Prevention	Legislative/Administrative regulations	0

MEASURE NAME	CODE	PILLAR	TYPE OF MEASURE	D16 (total annualized investment cost)
Implementation of Natural Water Retention measures (NWRM) / SUDs practices for projects and activities of subcategory A1 and A2 of Law 4014/2011, as in force.	EL_01_31_03	**Protection**	Measures of environmental nature (green infrastructure)	**0**
Alignment of the urban development plans with the provisions of the FRMPs	EL_01_21_01	**Prevention**	Legislative/Administrative regulations	**0**
Adaptation of the urban development plans in flood prone areas (retention basins)	EL_01_21_03	**Prevention**	Legislative/Administrative regulations	**0**
CATEGORY 2 MEASURES				
Flood Protection measures	EL_01_33_02	**Protection**	Technical flood protection measures	**5.383.547**
Modernization, replacement, maintenance of existing stormwater drainage networks	EL_01_34_01	**Protection**	Technical flood protection measures	**1.822.767**
Modernization and rehabilitation of drainage networks	EL_01_33_01	**Protection**	Technical flood protection measures	**663.097**
Evaluation and Maintenance of Existing water control measures in upland regions	EL_01_35_03	**Protection**	Technical flood protection measures	**452.254**

MEASURE NAME	CODE	PILLAR	TYPE OF MEASURE	D16 (total annualized investment cost)
Development and operation of an early warning system.	EL_01_41_01	**Preparedness**	Acquisition, completion and improvement of information	**385.656**
Land use management	EL_01_35_04	**Protection**	Measures of environmental nature (green infrastructure)	**42.310**
Warning system to avoid crossing Irish crossings during flood events	EL_01_43_02	**Preparedness**	Non-structural interventions	**31.480**
Utilization of existing reservoirs with a flood protection component	EL_01_32_02	**Protection**	Technical flood protection measures	**24.681**
Multipurpose reservoirs with a flood protection component	EL_01_32_01	**Protection**	Legislative / Administrative Regulations and Technical Flood Protection Measures	**21.155**
Plan for controlled flooding of lowland areas to protect settlements and critical infrastructure	EL_01_42_05	**Preparedness**	Technical flood protection measures	**0**
Nature-based water retention structures in the lowlands	EL_01_31_02	**Protection**	Measures of environmental nature (green infrastructure)	**0**
Implementation of water control measures in upland regions	EL_01_31_01	**Protection**	Measures of environmental nature (green infrastructure)	**0**

12 Public information and consultation

To inform the public and the relevant bodies and institutions, a sufficient number of meetings were organized during which the Draft Flood Risk Management Plans were presented for public consultation.

The consultations took place at both the local/regional and central levels, aiming to encourage the active participation of stakeholders, either by attending the events or by submitting their proposals on the issues under consultation.

During the implementation of the consultation and communication activities, some or all of the actions described in the following paragraphs were carried out in combination.

- In the first 4 months, inspections were conducted in the study area, meetings were held with relevant agencies and services, and an inspection report was submitted for the special areas located outside the APSFRs.
- The Flood Hazard Maps, along with the accompanying Technical and Non-Technical Reports, were subsequently posted on the website of the General Secretariat for Natural Environment and Water of the Ministry of Environment and Energy: https://floods.ypeka.gr/.
- Subsequently, the Flood Risk Maps along with the accompanying Technical and Non-Technical Reports were posted on the website of the Directorate General of the Ministry of Environment and Natural Resources: http://floods.ypeka.gr/ .
- The Flood Risk Management Drafts and the Strategic Environmental Impact Studies (SEIS) were posted on the website of the General Secretariat for Natural Environment and Water of the Ministry of Environment and Energy: https://floods.ypeka.gr/consultation/2round-consultation/ .
- A form for submitting observations and corrections to the Draft Plans was posted on the website of the General Secretariat for Natural Environment and Water of the Ministry of Environment and Energy: https://floods.ypeka.gr/2round-consultation-el01/ .
- The invitation and program for the Consultation day in Kalamata, regarding the 1st Revision of the FRMP for the Western Peloponnese Water District (EL01), have been posted on the website of the General Secretariat for Natural Environment and Water of the Ministry of Environment and Energy.
- The List of Social Partners for the Consultation Day in Kalamata, regarding the 1st Revision of the FRMP for the Western Peloponnese Water District (EL01), has been posted on the website of the General Secretariat for Natural Environment and Water of the Ministry of Environment and Energy.
- Questionnaires were posted to enable participation in the consultation process, allowing institutions and the public to briefly express their views. The questionnaires were digital and accessible through the website of the General Secretariat for Natural Environment and Water of the Ministry of Environment and Energy (https://floods.ypeka.gr/consultation/consultation-events/). The questionnaire is also included in the Deliverable entitled 'Consultation Results Report'.
- On Friday, July 12, 2024, the Consultation Day for the 1st Revision of the FRMP of the Western Peloponnese Water District (EL01) was held in Kalamata, during which the following materials were provided in printed and/or electronic form:

- ✓ Draft Summary of the Flood Risk Management Plan (FRMP) for the Western Peloponnese Water District
- ✓ Questionnaire on the consultation issues of the Western Peloponnese Water District

The Consultation Day in Kalamata was held in a hybrid format, with over 70 people participating in person and more than 200 participating remotely via live or recorded broadcast available at the following link: https://www.youtube.com/watch?v=7Q0rMr7NPLs&t=8070s .

- The consultation on both the Draft Flood Risk Management Plan and the Strategic Environmental Assessment (SEA) of the 1st Revision of the Flood Risk Management Plan for the Western Peloponnese Water District (EL01) lasted more than seven months.

The conclusions of the consultation process are summarized as follows:

1. The need to reassess the methodology for determining APSFRs, incorporating the results of the flood hazard and risk analysis from the Flood Risk Management Plan as well as new data on flood events.
2. The necessity of developing specifications for the construction of mountain hydrological management projects, the cleaning of watercourses, and the implementation of natural retention measures for sediments in the lowlands.
3. The necessity of prioritizing nature-based flood protection projects.
4. The necessity of modernizing, maintaining and cleaning the existing drainage ditch network.
5. The impact of climate change on the return period of flood events and the necessity to align the proposed measures with climate change objectives and measures (PESPKA).
6. Adaptation to the most recent administrative divisions as defined by the Ministerial Decision No. 64436/2023 (Government Gazette Issue 4821/B/01-08-2023).
7. The impact of recent fires on the intensity or even potential occurrence of flooding phenomena.
8. The necessity to enhance the completeness and accuracy of data used in flood risk assessment, including background information, hydrometeorological data, records of historical flood events, technical registries of flood protection projects, and data on human activities.
9. The need to include the competent authorities in the program of measures.
10. The need to modify various fields in the measure sheets of the Program of Measures, or even to remove a measure where necessary.
11. The need to update and supplement Ministerial Decisions, Presidential Decrees, Official Gazette entries, and related legal documents.
12. The further utilization of local knowledge and experience from various agencies and services for the assessment of and response to the impacts of flood events.
13. The contribution of pumped storage projects and hydroelectric projects in general to the flood protection of downstream areas.
14. In areas of controlled flooding, Local and Special Spatial Plans, as well as Delimitation Zones, should be taken into account.

15. The need to further specify certain measures of the Flood Risk Management Plan to enable their implementation at the local level.
16. The need to provide compensatory benefits for residents, livestock breeders, farmers, and professionals who will be negatively affected by the implementation of the measures (e.g., relocation of activities, restructuring of agricultural production toward more flood-resistant crops, etc.).
17. The prioritization of the roles and responsibilities of the involved bodies, considering the applicable legislation, to ensure effective utilization of the results of the Flood Risk Management Plan (FRMP), given that in many cases the bodies involved at each stage of prevention, preparation, and response to flood phenomena are numerous and interdependent.
18. The possibility of financing actions and projects in areas outside the APSFRs.
19. The urgency of promptly initiating and promoting the measures outlined in the Flood Risk Management Plan.
20. The necessity of comprehensive planning for flood protection projects at the catchment level, taking into account the results of the flood hazard and risk analysis from the Flood Risk Management Plan, Directive 2000/60/EC, current Environmental, Spatial, and Urban Planning legislation, as well as all alternative options for managing flood runoff.
21. The difficulties faced by the Public Administration in utilizing the results of the Flood Risk Management Plan, due to insufficient staffing and lack of appropriate expertise within the competent bodies.
22. The issue of non-rational urban planning, which in many cases in Greece follows development rather than precedes it.
23. The complexity of legislation and the division of responsibilities among state bodies, which hinders the easy and rapid resolution of arising issues.
24. The lack of citizen education on dealing with natural disasters, as well as insufficient environmental education and awareness.
25. The importance of synergy between certain Flood Risk Management Plan measures and specific measures of the River Basin Management Plans.