

Interreg - IPA CBC



Greece - Republic of North Macedonia

FLOOD SHIELD

Joint flood risk governance and management in the Axios / Vardar cross border area

FLOODSHIELD



The Project FLOOD SHIELD is co-funded by the European Union and national funds of the participating countries.

Introduction



22.250
km²

catchment area of the
river Vardar/Axios

89%

of the catchment area within
the Republic of North
Macedonia (11% in Greece)

≈ 73 km

the length of the Axios
River downstream the
borders



The FLOOD SHIELD Project focuses on the transboundary Axios/Vardar River area that has the potential to provide a wide range of benefits, i.e. environmental, social, economic, and strategic, but also damages such as significant flood risks to the regions it flows through. Floods are considered to be the most frequent and damaging of all types of natural disasters. Taking this for granted, enhanced climate variability and climate change are expected to increase the frequency and intensity of floods. The situation gets further complicated considering the transboundary nature of water flows, making cross border cooperation on flood risk management crucial or even indispensable. Unfortunately, numerous challenges hamper effective cooperation in general and in particular on transboundary floods management, thereby increasing vulnerability to floods at the cross-border areas, including the one of Greece & the Republic of North Macedonia, constituting the Axios/Vardar River Basin. FLOODSHIELD Project was developed under the aim of minimising the appearance of cross-border flood risks and disasters through the strengthening of the cross-border cooperation.

Until today, the cooperation between the 2 countries for the water management plans' development and a joint flood risk management plan both regarding the Axios transboundary area, besides significant efforts from both sides, have been left behind. In addition, there was no structured co-operation between local civil protection authorities for flooding incidents management. The project is estimated to be the springboard for cross border cooperation in tackling the various natural and anthropogenic risks and disasters that may occur.

In this context, awareness raising & information campaigns addressed to the target groups of the project, namely the area's citizens and in particular to vulnerable groups of population, training seminars addressed to the staff members of the relevant authorities, their services and other interested parties and actors including volunteer groups, the purchase of technical equipment and other activities have been foreseen under the aim of enhancing the flood risk management process.

Objectives

The project's main objective is the minimization of the cross-border flood risks and disasters at the Axios / Vardar river basin by strengthening the cross border cooperation in organizational, technological and social levels.

In addition to the main objective, the project aims to the achievement of the following sub objectives:

1. Strengthening the flood risk governance at the cross-border area in order to better assess, plan, monitor, prevent and react against floods
2. Improving the technical capacity for effective cross border flood risk assessment, monitoring, preparedness, and response
3. Promoting the role of citizens and voluntary groups in the civil protection activities, in case of flood disasters, to protect themselves and get actively involved in prevention and reaction activities.

Outputs

The implementation of the project's activities and the achievement of their expected results will contribute achieving the project's specific objectives by enhancing flood risk governance as follows:

- a) The establishment of a Joint Flood Risk Management Group will facilitate dialogue and exchange of technical knowledge and data necessary for effective flood risk management.
- b) Ensuring material-technical infrastructure will result in strengthening management centers and consequently improving their functioning and cooperation at cross-border level.
- c) Developing a cross-border strategy clarifies the steps to be implemented at cross-border level, thus serving as a "manual of instructions" in adopting best practices.
- d) Finally, targeted training contributes to informing all stakeholders and thus assisting in the better response of society as a whole to the management of relevant risks.



To achieve these objectives, several actions were implemented, the most important of which were:



1. the establishment of a Joint flood risk management group that will improve and pool together the capacity of authorities, services and volunteer groups;



2. the establishment and enhancement of Communication and operation cross border centers;



3. the definition of the procedures needed to overcome the barriers in the cross border cooperation;



4. the elaboration of a cross border flood reaction strategy and;



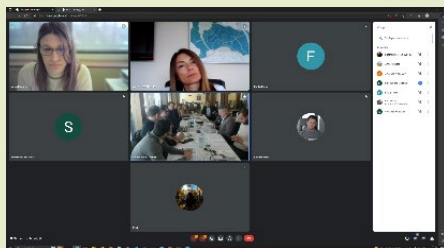
5. the training of the staff of the authorities; services; volunteer groups participating in the interventions during floods and atypical trainings addressed to vulnerable groups of population.

FLOODSHIELD PROJECT THROUGH THESE ACTIONS MADE A SIGNIFICANT CONTRIBUTION TOWARDS IMPROVING JOINT FLOOD RISK GOVERNANCE AND MANAGEMENT.

Strengthening Flood Risk Governance at the cross-border area

Assessment of legal & institutional bottlenecks in cross border cooperation

The Greek Civil Protection System, following EU directives is evolving continuously from Law 2344/1995 to Law 4662/2020 and the establishment of the National Crisis and Hazard Management Mechanism. Plans like "DARDANOS" deal with the reduction of risk and the management of floods. The Republic of North Macedonia faces various incidents, necessitating organized prevention and crisis response systems. The country aligns with UN resolutions, EU directives, and international standards for civil protection. Flood risk management involves their identification, determining their probability of occurrence, assessing potential impacts, and risk reduction measures including risk mapping, vulnerability analysis, estimation of potential losses, and flood prevention-mitigation strategies. A report was jointly developed highlighting all legal and institutional aspects related to flood risk management at national and cross-border levels, aiming to identify all relevant barriers that need to be taken into consideration and addressed and when possible confronted within the framework of the project and particularly ways to enhance preparedness, responsiveness, transnational management and cooperation.



Establishment of the Joint Flood Risk Management Group (JFRM Group)

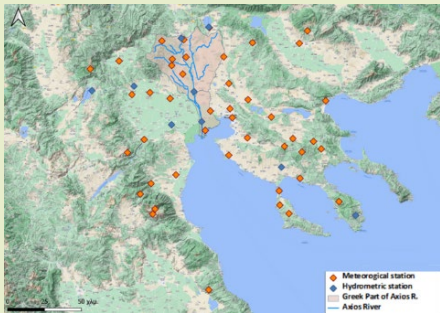
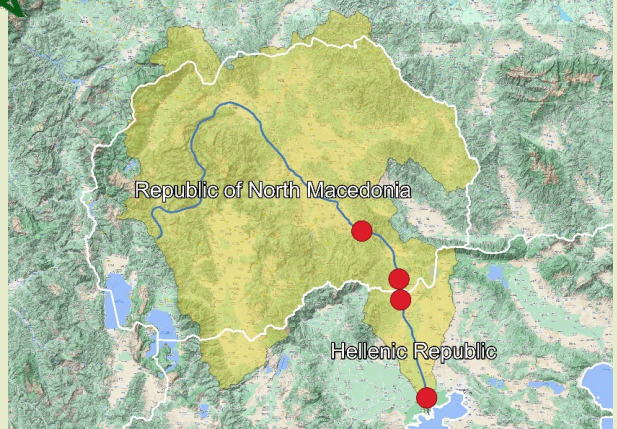
The JFRM group, established under "WP3 Strengthening Flood Risk Governance at the Cross-Border area", unites all Project Partners designated representatives and additional experts in relevant fields. The group was officially established with the official nomination of its members prior to the first meeting, while its role and responsibilities have been further elaborated and approved with a document defining its scope and responsibilities. The JFRM Group had 4 official meetings during the project's lifetime and an MoU drafted on this regard aims at sealing its operation for the years to come. Within this framework the JFRM Group aims to strengthening Flood risk governance at the cross-border area in order to better assess, plan, prevent and react against floods, through the strengthening of the cross-border cooperation, in organizational, technological and social levels. Joint research efforts and data exchange along with more instant communication are the basis of the activities foreseen by the Group.

Establishment of Communication and operation cross-border centres

Axios/Vardar River monitoring stations

Flood warning systems that protect local communities are now commonplace for stakeholders around the world. An alert for a potential flood usually involves difficult decisions to be made and significant effort to prepare local services to deal with a difficult situation. False alarms usually cost an unnecessary amount of money.

A flood warning system needs meteorological data before the event and hydrological data during the event. In advanced systems, both can be combined to optimize the simulation of river flow under flood conditions, thus eliminating false alarms.



A thorough analysis of the wide area of the Axios River showed that both hydrological and meteorological stations form a robust monitoring network. The problem that arose was that not all the hydrological stations had a 24/7 function. Measurement of water flow and discharge must be continuous. Therefore, the project financed the employment of such monitoring stations on the main Axios river, which continuously transmit data to the created for the project IMCBC Platform. Data from both countries are also received by the FLOODSHIELD Early Warning System which gets recalibrated through this procedure. Its results are also integrated at the platform contributing thus to a holistic approach and predictions' accuracy and thus Civil Protection's readiness.



Cross-border Flood Reaction Strategy

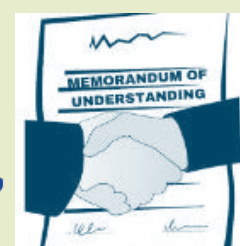


The cross-border flood response strategy provides extensive information on flood-related policies and institutions at various governance levels, for Greece and Republic of North Macedonia, considering also, the directions and the guidelines of the United Nations Organization and European Union. It outlines the present situation, detailing the responsibilities of relevant actors, the role of local institutions in communication and information's dissemination during floods, and the availability of means and equipment. Additionally, it delves into flood evacuation plans and safe routes.

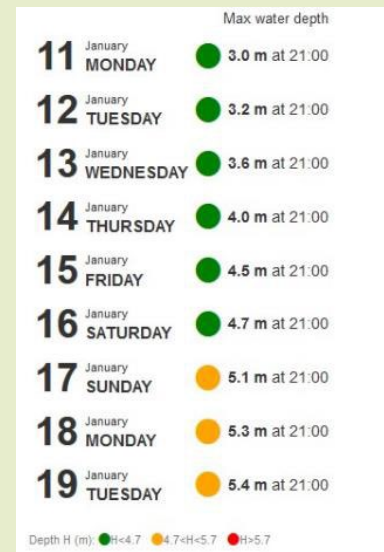
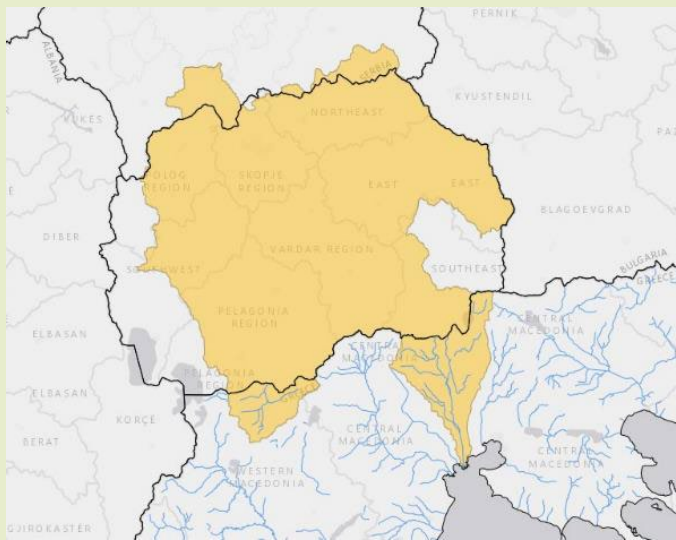
A significant portion is dedicated to describing the FLOOD SHIELD Project and the relevant supportive actions that constitute fundamental pillars, if not the basis, of the strategy, and specifically", encompassing information actions, the establishment of the Joint Flood Risk Management Group, awareness-raising activities, volunteering promotion, monitoring stations study and installation, development of a Data Platform and an Early Warning System (EWS), and vulnerability analysis.

Essentially, strengthening the flood monitoring and management network and training relevant authorities at all stages of management, starting from infrastructure projects and their maintenance (roads, open spaces, green areas, flood prevention, drainage, etc.) up to the planning and management of both water and related crises, are essential needs at the local level. However, comparable importance may also be given to informing and raising awareness among the general public, as knowledge can substantially assist in the prevention and mitigation of disasters and/or in alleviating their effects. Lastly, the role of volunteers in all stages of flood management is highlighted.

Finally, a common strategy is proposed, including measures such as a Memorandum of Cooperation, an open communication line, data exchange, and determination of next steps, mainly the continuation of monitoring and data exchange programs. This comprehensive overview aims to contribute to effective flood risk management and collaboration among relevant entities.

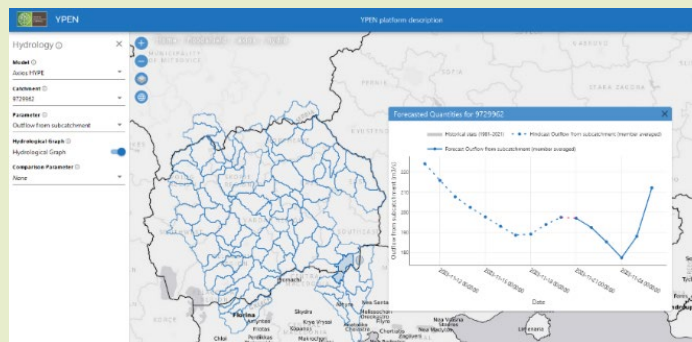


Joint Flood Risk Monitoring and Response System



As part of the FLOODSHIELD project, EMVIS designed and developed the Early Flood Prediction Information System (EFPIS) for the Watershed of the Axios/Vardar River. The EFPIS provides organized and visual forecasts continuously and unattended, including river flow predictions, flow characteristics (velocity and depth), and flood inundation (flood extent), every day with a five-day forecasting horizon. This is achieved by connecting a chain of prediction models, from weather forecasting throughout the river watershed to predicting runoff at 88 points across the watershed, up to depth, velocity, and flood inundation forecasts in the Greek section of the Axios River. The system incorporates telemetry station data to improve predictions, triggering alarms and notifications regarding the exceedance of predefined alarm thresholds. The seamless integration of models and the provision of prediction services are facilitated through an online, interactive, and operational platform. The system has been installed and is operational in the G-cloud of the Ministry of Environment and Energy, for the needs of the competent services, while also being linked to the project.

The system is also interconnected with the stations of the FLOOD SHIELD project, receiving data for further calibration of the model in order to enhance flood response management and governance.



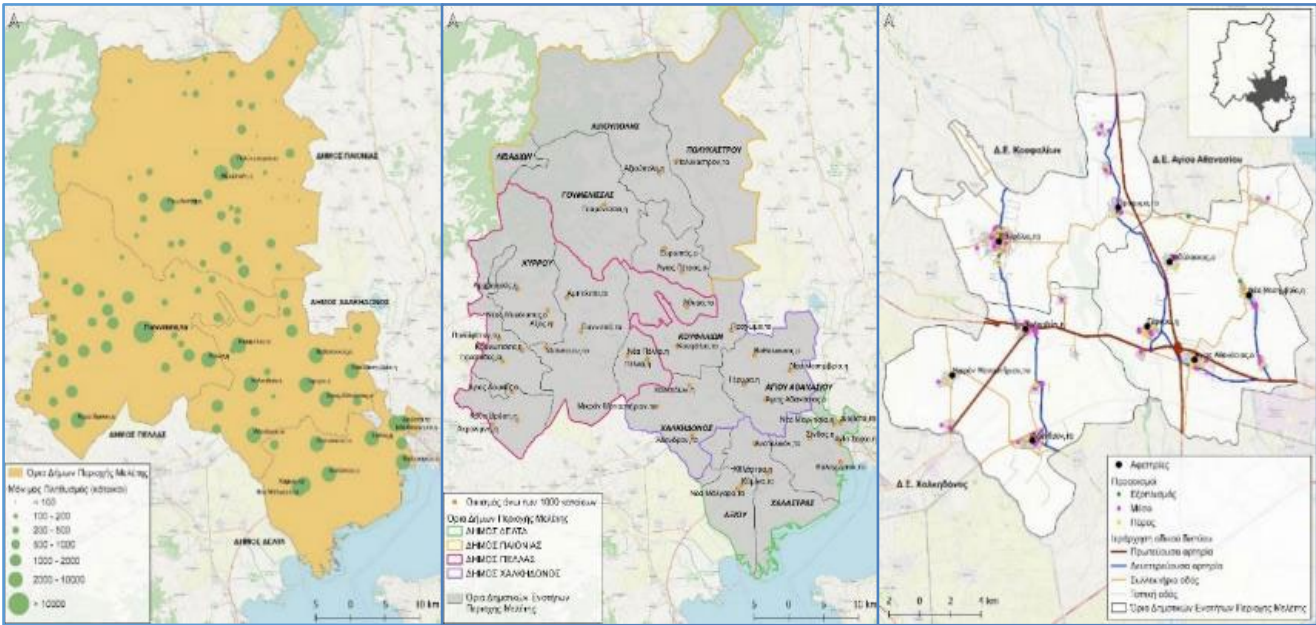
Accessibility modeling of available resources, means and equipment

As part of the FLOODSHIELD project, an accessibility modeling of available resources, means and equipment in the neighboring areas was carried out in order to be available for use in case of extreme flooding events. The most vulnerable target groups were also considered. The deliverable essentially captures an indicator of the level of accessibility for the selected areas, accompanied by an explanatory map of the levels of accessibility per geographic area and based on the developed flood risk scenarios. The accessibility model includes all the data combinations of destinations, distances, time and obstacles related to transport aiming to the measurement of the relevant difficulty that a person or a group of individuals when trying to reach an infrastructure, service or resource. In its simplest format refers to the quantitative definition of the opportunities to move within an area. Time, cost and distance parameters are also considered on this regard, compared among different points through the use of GIS.

It is the first time that accessibility modelling is applied to facilitate flood preparedness and management!

Inventory and mapping of available means and equipment by the competent authorities, voluntary groups, individuals and/or companies.

Mapping of the road network and the settlements in the areas identified by the vulnerability analysis as vulnerable.



This accessibility modeling along with its preparatory analysis should be the basis for all local authorities to better assess the capabilities of their respective areas of interest, thus making their relevant plans more accurate and substantial.

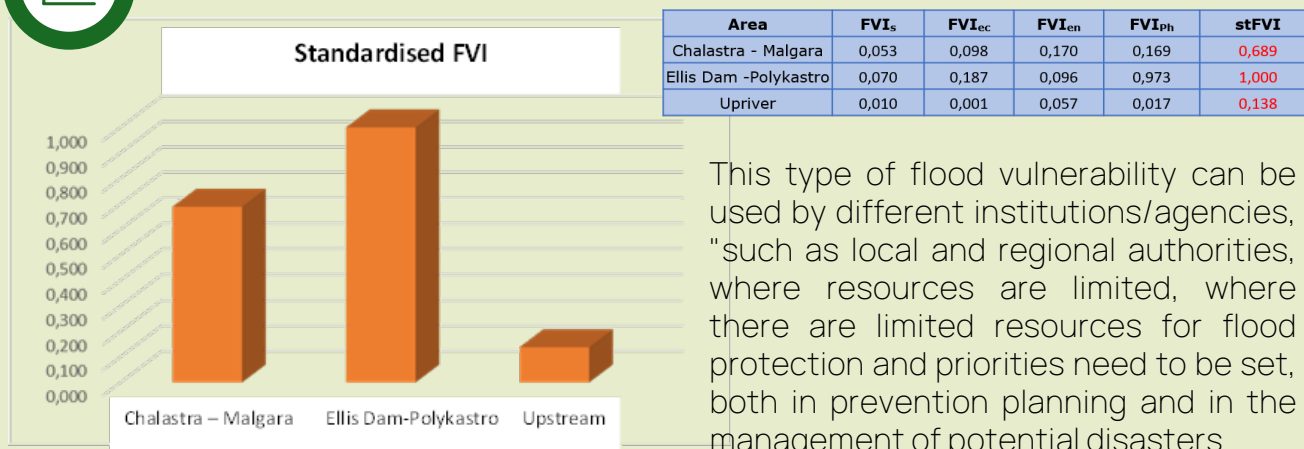
Flood vulnerability analysis



Directive 2007/60/EC requires EU Member States to prepare their own flood risk management plans (FRMP). The relevant Greek plans include the potential flooded areas for a given return period of $T = 50, 100$ or $1,000$ years. The plans also consist of a vulnerability analysis per cell, i.e., the parcels of land that make up the flood risk maps.



A different type of vulnerability analysis has been achieved by estimating the vulnerability of the flooded areas as a whole, rather than in the fragmented manner in the FRMPs. FV index was used to calculate the vulnerability. FVI consists of scores relevant to social, environmental, economic and physical characteristics.



The results of such a vulnerability analysis can be used only for reasons of comparison. In the Greek part of Axios/Vardar River the area extending from the Ellis dam to Polykastro was found to be the most vulnerable in flood. Regarding the Republic of North Macedonia, additional details are required to complete the study. It is expected that in the coming years, and possibly through the continuation of this project in the next programming period, this study will be implemented.

Incident Management & Cross– Border Collaboration Platform (IMCBC)

ENGAGE® 

The ENGAGE IMS/CAD software suite constitutes an Integrated Management and Control System for Emergency Call Handling and Incident Management & Computer Aided Dispatch (CAD). It incorporates multiple components and services into a unified software environment. ENGAGE is a modular system that offers flexibility to adapt to the security requirements of any environment. All its components are combined into a common software platform based on a multi-tier architecture with numerous connectors and communications tailored to client requirements.

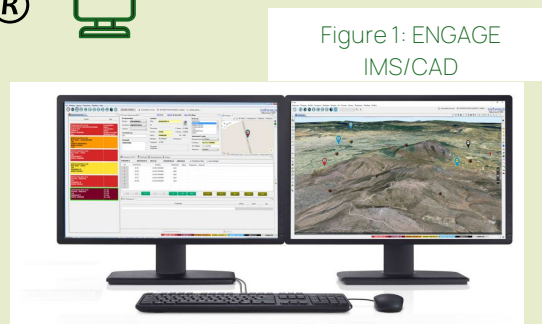


Figure 1: ENGAGE IMS/CAD

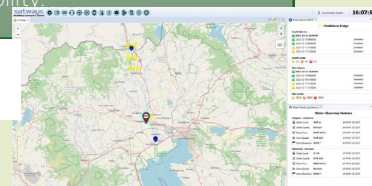
In the context of the FLOOD SHIELD project, the ENGAGE system provides the following key functionalities:

1	Call Taking: Recording emergency calls and related information.
2	Incident Management: Managing incidents based on received notifications and field sensor measurements.
3	Operational Resource Management: Managing operational resources.
4	Resource Tracking: Monitoring resource positions.
5	Alerts and Alarms: Displaying notifications and alarms from third-party systems.
6	Collaboration: User collaboration features.
7	User Management: Managing organizations, groups, users, roles, and permissions.
8	GIS Functions: Viewing and editing Geographic Information System (GIS) data in 2D/3D.
9	Mobile Data Terminal Integration: Interfacing with mobile data terminals.
10	Logging & Audit: Electronic logging of user actions.
11	System Administration: System management functions.
12	Training Sessions: Training environment using virtual scenarios.

Additionally, the solution for smart mobile phones and their integration with the platform allow for the sending and receiving of information to and from mobile devices, extending the system's management and control capabilities to field forces, thereby enhancing system performance and improving personnel collaboration between the management center and the field (see Figure 3). The mobile application offers features related to:

1	High-resolution 2.5D map
2	GPS navigation
3	Visualization of operational information
4	Presentation of the list of active incidents, their details, and assigned resources either on the map or in lists.
5	Collaboration between management levels through information exchange (text, images, videos, etc.)
6	Automatic device tracking. The application broadcasts the location of smartphones to the platform.
7	Status update capability.

Figure 2: Integration with External Systems



Integrated Incident and Resource Management

In usual practice, each organization is equipped with a call center that receives all incoming calls from citizens and creates new incidents based on the received information. However, within the framework of the FLOOD SHIELD project, this process is enhanced with the capability of generating incidents based on notifications received through the early flood warning system as well as sensor measurements installed in the field. Furthermore, through the use of the training environment, it is possible to automatically generate specific incidents, allowing the organization's participation in a training session and access to the list of virtual scenarios that will be generated. Through this perspective, dispatchers have immediate visibility into all incidents, sub-incidents, allocated resources, and any measures that may have been taken (Figure 1). Additionally, the capability to visualize geographic data on a 2D/3D map is provided to support the core workflows of the system, such as incident management, resource management, and tracking their positions, etc. The map is based on a set of geographic backgrounds, which serve as the necessary foundation for supporting and visualizing dynamic geographic data generated by the system and users.

In the bottom right panel of Figure 2, measurements taken by the sensors are displayed. For more information regarding the type and periodicity of the data received from the platform to achieve comprehensive incident and resource management, see details about the 'early warning system' and about the stations.

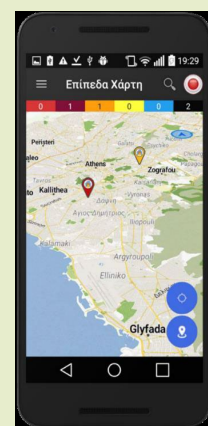


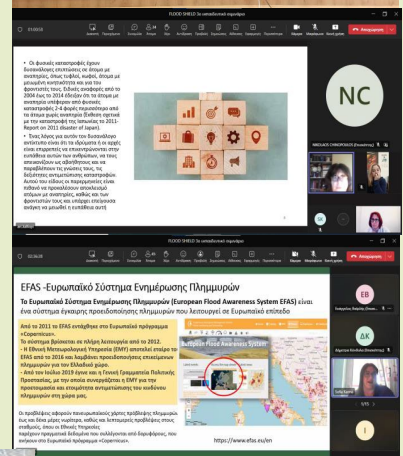
Figure 3: The mobile phone application

Training Programmes



Seminars

e-learning & in situ



A series of Educational Seminars & Workshops on the topic 'Operation and Use of the Common Monitoring and Risk Management System for Floods' was organized. The educational seminars & workshops of FLOOD SHIELD focused on raising awareness and increasing the commitment of all stakeholders involved in flood prevention and management, as well as preparedness for flood events. The target groups of the seminars were mainly municipal employees of relevant specialties, as well as stakeholders involved in flood management and response, such as volunteer groups, intervention teams (Civil Protection), experts, etc. A series of three (3) educational seminars was organized in November 2023.



Table-top exercises

So as to enhance our strategy

Sessions

for People with Disabilities, the Elderly and students

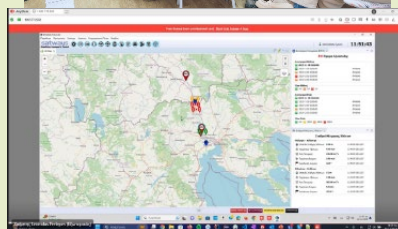


Table-top exercises were organized to assess the interaction between systems and the readiness of services.

The main objective of these informal educational and informative sessions was to present the main axes of disaster preparedness, determine everyone's role in self-protection and the protection of others, provide advice on how each individual can be prepared for a flood incident, and understand the importance of the emergency phone number '112'.

Activities / Information for the Public



Radio spot

Production of a radio spot with a duration of 15 to 30 seconds. The spot focused on promoting volunteerism and raising public awareness.

VR Videos

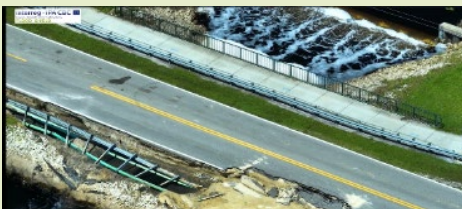
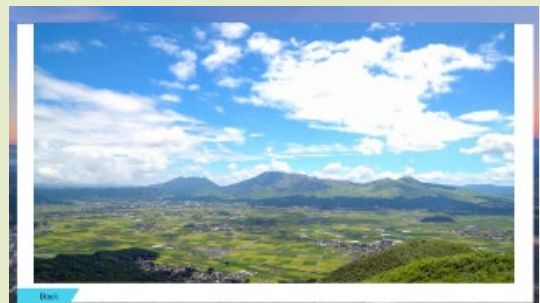


Production of technologically advanced interactive VR videos depicting areas prone to flooding. This video was based on 360-degree visualization and enhanced with additional interactive and educational content.



Production of a 2-minute video aimed at raising public awareness about the dangers of floods and ways to address them.

Video



Awareness raising and information campaigns



Series of events

in the context of the International Day for Disaster Risk Reduction.



The main objective of the events was to discuss the new challenges that central, regional and local authorities, as well as the business world, the academic community, organisations of volunteers and local communities have to face due to the increase in intensity and frequency of extreme weather events and the climate crisis in general, which bring to the fore the need for immediate measures to protect citizens and the environment from floods.

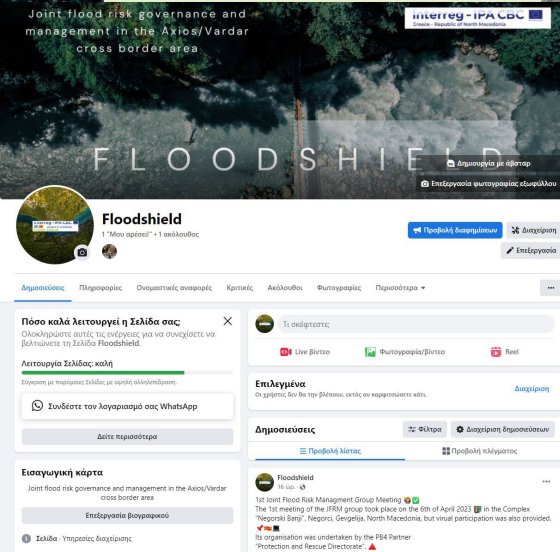
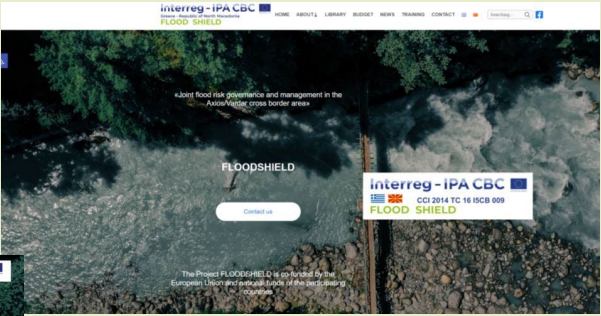
Web tools (site, social networks, quizzes)



Site & social networks

Creation and maintenance of the FLOODSHIELD project Facebook site in English.

Creation and maintenance of the FLOODSHIELD project website in (3) languages (English, Greek, Macedonian).



Production of pages on the project's official website for online information and quizzes. The project's official website hosts, in the form of 'micro site' pages, quizzes, exercises, and information related to flooding phenomena with the aim of informing and raising awareness among the public.



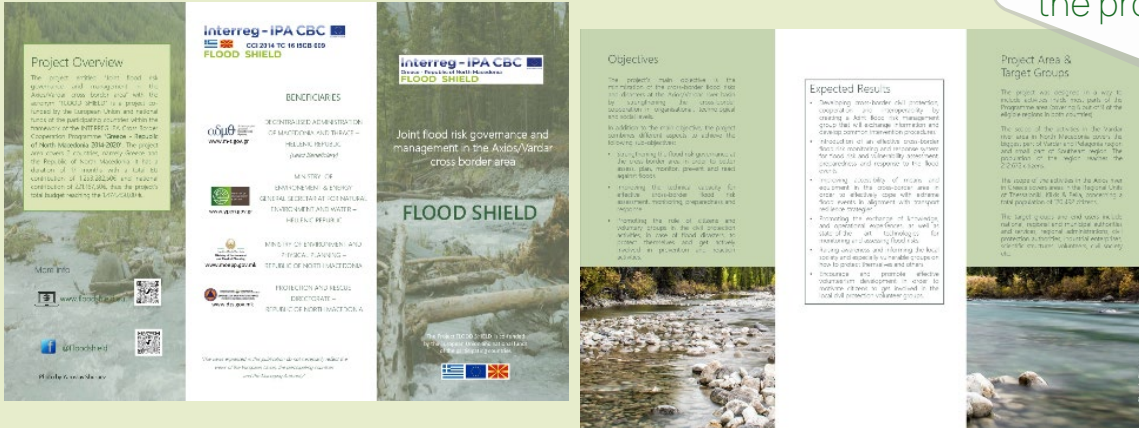
Quizzes





Promotional material

Leaflet of the project



As part of the FLOODSHIELD project, a rich informational material was created, including the production of a leaflet (in 3) languages, (English, Greek & Slavic Macedonian), one banner, two newsletters and lots of posters. The purpose of this material was to inform the public, local entities and relevant stakeholders about the implementation of the project.



Newsletters



Promotional material

Very rich informative material was created within the framework of the project. One of the main documents is the self-protection guidelines produced in three (3) languages providing information on how to get protected and raise awareness against floods. The guidelines have been produced in pocket size format and leaflet under the aim of addressing a wider public.

FLOODS

Be aware of flood risks in your area and the local authorities. Floods can occur in any area, even in areas that are not considered high risk.

The purpose of Flood Shields is to help you to understand the risks of flooding in your area and to take the necessary steps to protect your property and yourself.

Don't panic when you see a flood warning. Floods are a natural part of life and they can be managed. Stay calm and follow the instructions of the local authorities.

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What to do and not to do before, during & after floods

Flood self-protection guidelines

BEFORE A FLOOD (WHEN FLOODING IS FORECAST)

Be alert

- Monitor your surroundings.
- Check the weather forecast.
- Check the local authorities' website for flood warnings.
- Check the local authorities' website for flood warnings.

Protect your property

- Move valuables and irreplaceable items to higher levels.
- Check the structural integrity of your property.
- Check the structural integrity of your property.

Assemble disaster supplies

- Check your water supply.
- Check your water supply.

Be prepared to evacuate

- Identify your evacuation route.
- Identify your evacuation route.

DURING A FLOOD

Be alert

- Monitor your surroundings.
- Check the weather forecast.
- Check the local authorities' website for flood warnings.

Protect your property

- Move valuables and irreplaceable items to higher levels.
- Check the structural integrity of your property.
- Check the structural integrity of your property.

Assemble disaster supplies

- Check your water supply.
- Check your water supply.

Be prepared to evacuate

- Identify your evacuation route.
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AFTER A FLOOD

Be alert

- Monitor your surroundings.
- Check the weather forecast.
- Check the local authorities' website for flood warnings.

Protect your property

- Move valuables and irreplaceable items to higher levels.
- Check the structural integrity of your property.
- Check the structural integrity of your property.

Assemble disaster supplies

- Check your water supply.
- Check your water supply.

Be prepared to evacuate

- Identify your evacuation route.
- Identify your evacuation route.

ΠΑΝΗΜΥΡΕΣ

Ο παρόντος οδηγός προοιχεί να σας ενημερώσει σχετικά με τον κίνδυνο πλημμύρας στην περιοχή σας και να σας βοηθήσει να λάβετε τα κατάλληλα μέτρα προφύλαξης προκειμένου να προστατευτείτε από τον κίνδυνο πλημμύρας.

Η πλημμύρα είναι ένα φαινόμενο που μπορεί να συμβεί σε οποιοδήποτε μέρος της χώρας. Η πλημμύρα μπορεί να προκαλέσει βλάβες στα κτίρια, στα αυτοκίνητα και στα υπάρχοντά σας. Μπορεί επίσης να προκαλέσει τραυματισμούς ή θάνατο.

Το παρόντος οδηγό προοιχεί να σας ενημερώσει σχετικά με τον κίνδυνο πλημμύρας στην περιοχή σας και να σας βοηθήσει να λάβετε τα κατάλληλα μέτρα προφύλαξης προκειμένου να προστατευτείτε από τον κίνδυνο πλημμύρας.

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Πριν από μια ΠΛΗΜΜΥΡΑ

Μην είστε σε κώλυση

- Μην είστε σε κώλυση.

Συμπεριλάβετε τα απαραίτητα

- Συμπεριλάβετε τα απαραίτητα.

Ετοιμάστε ένα σχέδιο

- Ετοιμάστε ένα σχέδιο.

Μετά από μια ΠΛΗΜΜΥΡΑ

Μην είστε σε κώλυση

- Μην είστε σε κώλυση.

Συμπεριλάβετε τα απαραίτητα

- Συμπεριλάβετε τα απαραίτητα.

Ετοιμάστε ένα σχέδιο

- Ετοιμάστε ένα σχέδιο.

Self-protection Guidelines

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Ελλάδα - Δημοκρατία της Βόρειας Μακεδονίας

FLOOD SHIELD

Κακο... να σε ροιγάρει και να σε ροιγάρει πριν από τις βροχές και μετά τις πλημμύρες.

Κακο... να σε ροιγάρει και να σε ροιγάρει πριν από τις βροχές και μετά τις πλημμύρες.

Прирачник за само-заштита при поплави

Κακο... να σε ροιγάρει και να σε ροιγάρει πριν από τις βροχές και μετά τις πλημμύρες.

Κακο... να σε ροιγάρει και να σε ροιγάρει πριν από τις βροχές και μετά τις πλημμύρες.

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Ελλάδα - Δημοκρατία της Βόρειας Μακεδονίας

FLOOD SHIELD

What to DO and not to DO before, during and after floods

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- Check the weather forecast.
- Check the local authorities' website for flood warnings.

Protect your property

- Move valuables and irreplaceable items to higher levels.
- Check the structural integrity of your property.
- Check the structural integrity of your property.

Assemble disaster supplies

- Check your water supply.
- Check your water supply.

Be prepared to evacuate

- Identify your evacuation route.
- Identify your evacuation route.

BEFORE A FLOOD (WHEN FLOODING IS FORECAST)

Be alert

- Monitor your surroundings.
- Check the weather forecast.
- Check the local authorities' website for flood warnings.

Protect your property

- Move valuables and irreplaceable items to higher levels.
- Check the structural integrity of your property.
- Check the structural integrity of your property.

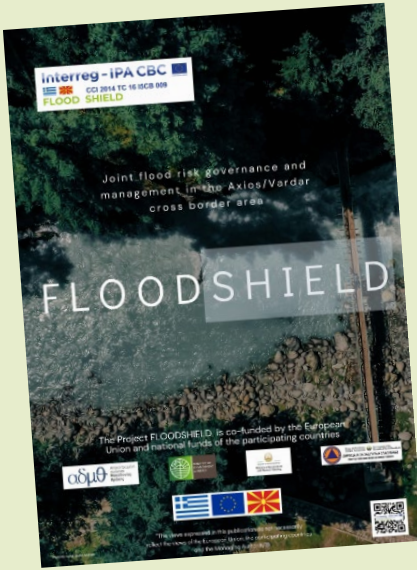
Assemble disaster supplies

- Check your water supply.
- Check your water supply.

Be prepared to evacuate

- Identify your evacuation route.
- Identify your evacuation route.

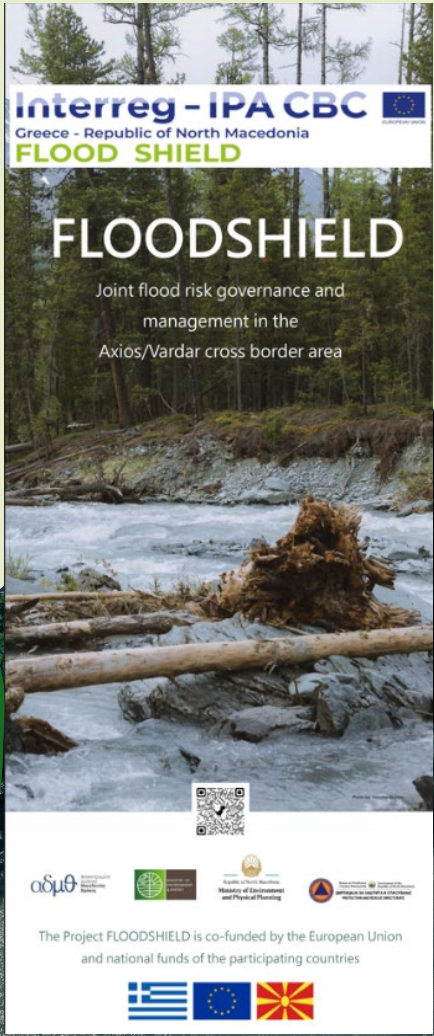
Promotional material



Posters



Banner



Partnership



αδμθ Αποκεντρωμένη
Διοίκηση
Μακεδονίας
Θράκης

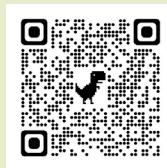
DECENTRALISED ADMINISTRATION
OF MACEDONIA AND THRACE

- Hellenic Republic
(Lead Beneficiary)
www.m-t.gov.gr

MINISTRY OF
ENVIRONMENT & ENERGY
GENERAL SECRETARIAT FOR
NATURAL ENVIRONMENT AND
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www.ypen.gov.gr

MINISTRY OF ENVIRONMENT AND
PHYSICAL PLANNING - Republic of
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www.moep.p.gov.mk

PROTECTION AND RESCUE
DIRECTORATE -
Republic of North Macedonia
www.dzs.gov.mk



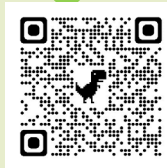
Duration

22/07/2022 - 22/12/2023



Budget

1.474.450.00€





Disclaimer:

"The content of this document is the sole responsibility of the FLOOD SHIELD project consortium and cannot in any way be taken to reflect the views of the European Union, the participating countries, and the Managing Authority."