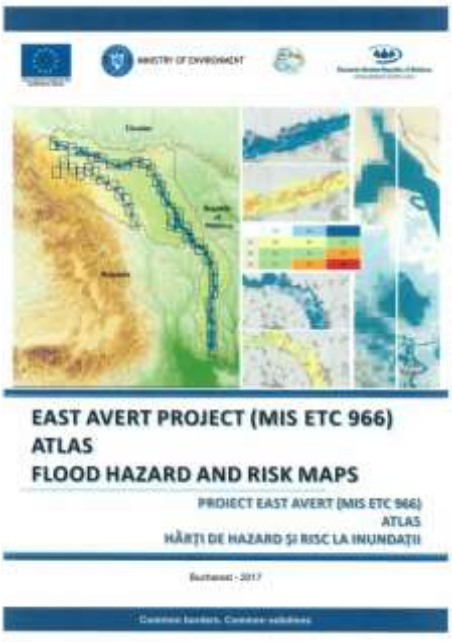
Newsletter 6 - Facts in EAST AVERT Project

Joint Operational Programme Romania-Ukraine-Republic of Moldova 2007-2013

The trilateral project **"The prevention and protection against floods in the upper Siret and Prut River Basins, through the implementation of a modern monitoring system with automatic stations - EAST AVERT",** cod **966,** funded by the **Joint Operational Programme Romania - Ukraine - Republic of Moldova,** European Neighborhood and Partnership Instrument (**ENPI**)

- The European "Directive on the assessment and management of flood risks", endorsed in 18 September 2007, aims to reduce the adverse consequences on human health, the environment, cultural heritage and economic activity associated with floods in the Community. The Floods Directive sets out the requirement for the Member States to develop three kinds of products (Fig. 1):
  - a preliminary flood risk assessment: the aim of this step is to evaluate the level of flood risk in each river basin district or unit of management and to select those areas on which to undertake flood mapping and flood risk management plans;
  - flood mapping comprising of hazard maps and risk maps: the flood hazard maps should cover the geographical areas which could be flooded according to different scenarios; the flood risk maps shall show the potential adverse consequences associated with floods under those scenarios;
  - flood risk management plans: on the basis of the previous maps, the flood risk management plans shall indicate the objectives of the flood risk management in the concerned areas, and the measures that aim to achieve these objectives.

- In frame of large-scale project «**The prevention and protection against floods in upper Prut and Siret river basins through the implementation of modern monitoring system with automatic stations – EAST AVERT**» MIS ETC 966, one of the most visible output was the **Atlas with Hazard and Risk Maps** on Prut and Siret Rivers border region.

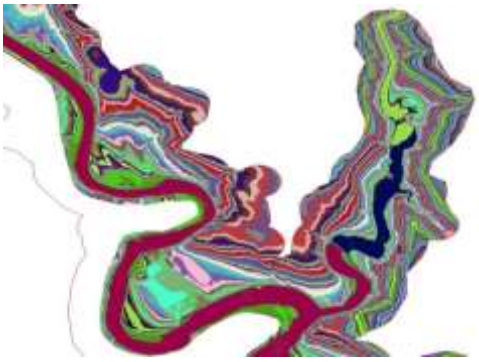


- Elaboration of integrated risk and hazard maps (floodplains) of the transboundary area between Romania – Ukraine - Republic of Moldova for the Prut and Siret Rivers followed the next steps:

Romania-Ukraine-Republic of Moldova
CROSS BORDER COOPERATION

I. ***Develop the Digital Model of the Terrain*** (land), integrated at the border from Romania – Ukraine – Republic of Moldova. Achieving the DTM was realized by:

- topobatiometric measurements - for the elaboration of the cross-sections on the Prut River were performed batimetry works and were collected and integrated already existing data; establishing on the topographic maps and orthophoto plans of the cross-section locations;
- measurements of the cross sections on the tributaries according to the orthophoto plans;
- measurements in the river bed;
- determination of coordinates and quotas of longitudinal profiles of dams located in the Prut & Siret riverbed; the coordinates were determined with GNSS receivers, by LIDAR or using satellite data;
- photogrammetric measurements;

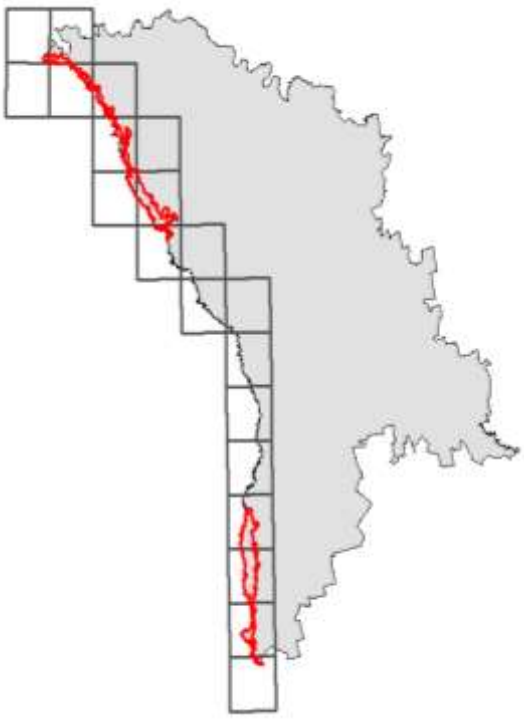


- digital model elaboration of the land for the Prut meadow - on the territory of the Republic of Moldova;
- digital models verification of the Land in order to protect the floods of the territory of the Republic of Moldova;
- developing the land use map adjacent to the Prut River, according to CORINE 2006.

II. Analysis of the historical floods in Siret and Prut River Basins.

- selection of historical significant floods from Siret and Prut river basins;
- selection of the hydrometric stations for which are obtained the necessary information for the description of selected floods.

In Siret and Prut hydrographic basins, in the last years, there have been three major floods that can be considered "historical", in the years 2005, 2008 and 2010. The floods in 2005 mainly affected the lower basin of the Siret river (downstream of Movileni accumulation), being less relevant for transboundary area. Instead, the floods in 2008 and 2010 have many common features in terms of the evolution of the extreme events on the Siret and Prut watercourses.



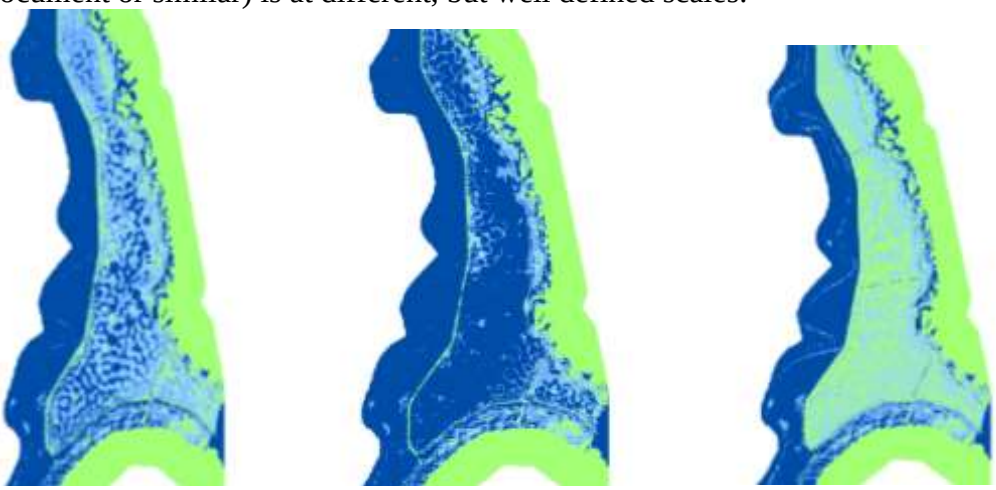
- creating the vectors (digitization) and the raster, for introducing the layers in the modelling programme.

III. ***Developing Hazard and Risk Maps***.

In 2007/60/EC Directive (Flood Directive), flood risk is defined by the combination of two components, namely, the probability (frequency) of the floods occurrence, and the potentially adverse effects on human health, environment, cultural heritage and economic activity associated with them.

Flood hazard maps include the main features of a flood generated by a flow with a certain probability of exceedance. Knowing that in hazard maps is modelled a future event rather that one which has already occurred, they shall be considered as "scenarios". In fact, these maps provide more accurate information in areas that have been identified as susceptible to flooding.

The ***flood hazard map*** is the document that represents the expansion of potentially flooding areas of major river beds (including depths) for floods the maximum flow of which is characterized by the following probabilities of exceedance: 0.1% (low probability of overtaking), 1 % (average overtaking probability) and 10% (high probability of overrun). The purposes of the hazard map are: decision support, drafting flood management plans, population awareness and other general purposes. However, the maps does not provide the degree of precision needed to design some constructions, especially industrial ones, roads, treatment/ power plants, etc. The ladder displayed/ printed flood hazard maps (in GIS format - ArcMap document or similar) is at different, but well defined scales.



100 years 200 years 1000 years

Hazard areas

Risk maps are created in accordance with technical requirements and include:

- ✓ risk assessment, taking in consideration the probability of 100, 200, and 1000-years risk models (return period scenarios), and the use of the CORINE land cover map.
- ✓ population quantity evaluation entering the hazard area after the scenario 100, 200 and 1000 years.
- ✓ The flood characteristics highlight the magnitude of the phenomenon through water depth, velocity and flood duration. However, in most cases, the hazard map only represents flood-prone areas in the river floodplains and water depth generated by peak discharge with a certain probability of exceeding.

Flood risk maps show not only where floods can occur and their magnitude, but also their potential consequences, in quantitative (monetary) or qualitative (intensity) terms, being a combination of hazard and vulnerability.

The water depth, one of a common element used to define the magnitude or intensity of a flood, will generate different degrees of damage. 3 thresholds were defined for water depth within the project:

Index	Level of magnitude	Depth (m)
H1	Low	< 0.5
H2	Medium	0.5-1.5
H2	High	> 1.5

Accordingly to Floods Directive specifications, the hazard maps should show the flood extent, the water depth, and, where appropriate, the flow velocity or the relevant water flow.
Using the vulnerability classes the flood risk matrix were adapted and, and the degree of intensity is assessed qualitatively, being a combination between hazard and the presence or exposure of the receptors as shown below:

RISK			The magnitude of the hazard (water depth)		
			H1	H2	H3
			Small(<0.5)	Medium (0.5-1.5)	High (>1.5)
Consecințe	C1	Small	R0	R0	R1
	C2	Medium	R1	R1	R2
	C3	Big	R1	R2	R3

where: R0 = flood risk insignificant; R1 = small flood risk; R2 = average flood risk; R3 = flood risk.

During the modelling phase, within the EAST AVERT Project, the following data has been collected and considered as input data for the computation model:

- Topographic maps,
- Hydrological data:
  - Gauging station (discharge, water levels)
  - Precipitation data
  - Recorded flood extent
- Geometrical data:
  - Cross sections
  - Longitudinal profile
  - Digital Terrain Model (DTM)
  - Hydraulic structures (dykes, weirs with operational rules, sills etc.)

- Hydrographical data (watercourse network, gauging station locations, lateral inflows),
- Extent of past floods.

Public disseminated flood risk maps, along with hazard maps, summarize essential flood information along the main watercourses. This can be an important tool for to implement different national or local plans and strategies in areas such as land use planning, urban planning, flood risk management, informing the general public, etc.