

Call for interest

Feasibility Study of the Flood Hazard Mapping in the Aghstev River Basin (Armenia)

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1 Background

1.1 Floods in Armenia

Armenia does not have abundant flowing surface water, but some 55-70 % of annual discharge occurs in the spring due to melting snow. This can increase water volume in some river basins by ten times and trigger seasonal flooding that severely damages property and infrastructure, particularly in the Araks, Hrazdan, and Aghstev river basins¹.

A 2004 UNDP report noted that the population density in watershed areas exposed to flooding is about 80 inhabitants per sq. km, creating relative vulnerability, that is, five or six deaths per million people exposed².

Among 117 countries, Armenia falls in the middle of the scale of vulnerability and population density in watershed areas. However, this rating fails to capture damage to crops and farmland—Armenia has an average number of people living in watershed areas but the magnitude of lands at risk for flooding is high—estimated at 20-30 %.

According to GFDRR (Global Facility for Disaster Reduction and recovery), the annual average population affected by flooding in Armenia is about 40,000 and the annual average GDP about 100 million USD³.

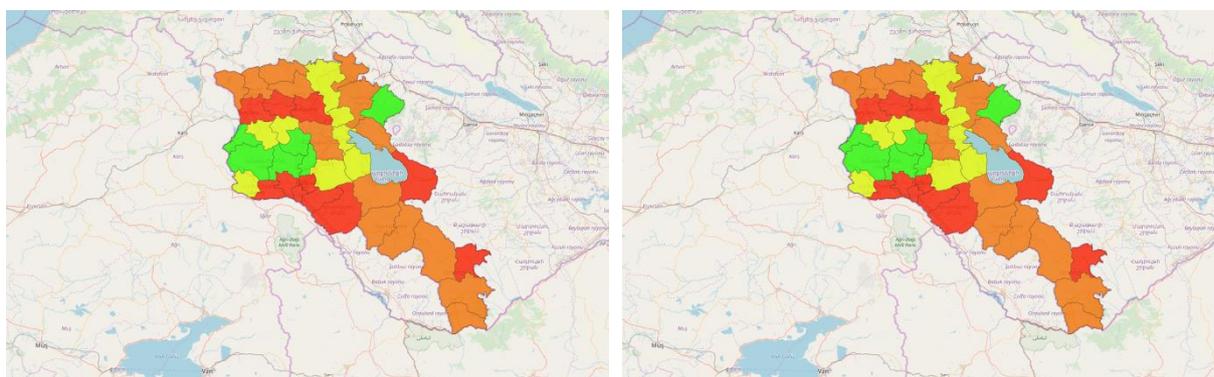
1.2 CEPA Agreement and Obligations under the EU Floods Directive

On 24 November 2017, Armenia signed a Comprehensive and Enhanced Partnership Agreement (CEPA) with the European Union, under which, among other thematic areas and topics, also specific obligations have to be undertaken on water quality and resource management approximation. This includes also Directive 2007/60/EC on the assessment and management of flood risks (EU Floods Directive). The obligations particularly relate to the following:

- Undertaking preliminary flood assessment (Articles 4 and 5).
- Preparation of flood hazard maps and flood risk maps (Article 6).
- Establishment of flood risk management plans (Article 7).

Article 6 of the Floods Directive requires preparing flood hazard and flood risk maps (at the river basin level and at the most appropriate scale) for the areas of potential significant flood risk.

These kinds of maps already exist for Armenia. For example, the Prevention, Preparedness and Response to Natural and Man-made Disasters in the East Partnership Countries have published a flood hazard maps and a flood risk map.



Flood Hazard Map (Left) and Flood Risk Map (Right) of Armenia (PPRD EAST 2 Project)

¹ Drought - Management and Mitigation Assessment for Central Asia and the Caucasus (Wash., DC: World Bank, 2006).

² United Nations Development Programme, Reducing Disaster Risk a Challenge for Development (New York: UN, 2004)

³ Europe and Central Asia – Country Risk Profiles for Floods and Earthquakes – (Wash., DC: World Bank, 2006)

However, these maps are large scale-maps that do not give a lot of details on local scale. They are not compliant with the EU Flood Directive.

1.3 Flood Risk Maps and Flood Hazard Maps

Flooding is a temporary covering by water of land normally not covered by water. Flood results from the meeting of:

- A natural process of water production: heavy rain, snow melt, tide... that can be emphasis by human activities.
- The land morphology at large scale (watershed geomorphology) or small scale (river bed geometry).

Flood is a natural process that is a necessary component to the survival and health of many types of ecosystems. The processes and conditions that result in floods are often predictable and usually occur in the same areas, known as floodplains. Unfortunately, people are often drawn to inhabit and develop in floodplains as this is usually flat and fertile land.

Flood hazard mapping is the process of identifying (on a map), areas at risk of flooding. The flood hazard map depicts the magnitude (depth and extension) of flood according to one or several probabilities e.g.: floods with a very low probability or extreme events scenarios; floods with a medium probability (likely return period ≥ 100 y); floods with a high probability, ...

Flood hazard map provides a good foundation for efficient flood-risk management. Flood hazard maps are used when drawing up flood-risk management plans, for preventing flood damages, in land use planning, for providing information on floods, in rescue operations and in determining what the lowest allowable construction elevation should be in order to avoid flood risk. However, flood hazard maps do not inform on the impact of a flood. It “only” delineates parts of the land that can be flooded with a given probability.

Impacts of the floods are addressed by the Flood risk evaluation. It refers potential situation of loss or harm to persons, material belongings or services as a result of the covering of normally dry areas by floods, which are assigned a specific severity (intensity and magnitude) and frequency or probability of occurrence. The European Flood Directive defines it as the “combination of the probability of a flood’s occurrence and the potential negative effects on human health, the environment, cultural heritage and economic activity associated with floods.” (Article 2.2).

Flood risk maps indicate potential adverse consequences associated with floods under several probabilities, expressed in terms of:

- the indicative number of inhabitants potentially affected;
- type of economic activity of the area potentially affected;
- installation which might cause accidental pollution in case of flooding; ...

The Flood risk map is the overlay of the flood hazard map with human activities maps.

2 Scope and objectives of the feasibility study

The objective of the proposed feasibility study (FS) is to develop a methodology of flood hazard mapping.

This methodology has to be adapted to Armenian context (data availability, hydrological process...) and must produce hazard maps that are compliant with the EU Floods Directive.

The methodology will be setting up on a pilot catchment but should be replicable on other catchments.

The FS will also contribute to identify lacks in existing information and other obstacles that need to be addressed before the replication of the flood hazard mapping in other catchments.

At the end of the FS, the flood hazard map will be used at local scale to produce a flood risk map in order:

- (i) to illustrate how to use this decision support tool and;
- (ii) to identify the next steps to achieve in order to produce a flood risk map for the catchment.

This will be synthesis in the form of terms of reference for a subsequent study for the production of a flood risk map of the pilot basin and a road map for development of flood risk management plan in the pilot basin according to EU Floods Directive.

The proposed FS will directly contribute to implementation of Armenia's obligations under CEPA. Particularly, preparation of flood hazard maps for the areas described in the Directive and with the content set forth in the Directive.

Within the FS it is envisaged to develop flood hazard mapping, which is direct obligation of Armenia under the CEPA, but also assessment of flood hazards maps will help to develop flood risk maps, which show the potential adverse consequences on the flood scenarios identified within hazard assessment.

Also, the outcomes of the FS can be used in future for establishment of flood risk management plans under Article 7 of the EU Floods Directive, which is again, clear obligation of Armenian under the CEPA.

3 Project location

Aghstev River basin is a transboundary basin shared between Armenia and Azerbaijan. The total area of the river basin is 2,415 km². Within the territory of Armenia, the length of Aghstev River is 85 km, and the area of watershed is 1,704 km². The population of Aghstev River basin in the Armenian part is 85.000 inhabitants.

Aghstev River originates from the northern slopes of the Pambak mountain range. The river flows south-east up to the Getik River mouth, and then changes its direction to north-east and flows out of the territory of the country to eventually join the Kura river in Azerbaijan. The biggest tributary to the Aghstev River, the Getik River, flows south-vest to join the Aghstev River.



Map of Armenian River Basins – Aghstev River Basin is situated at the North of Lake Sevan (in yellow).

Snowmelt takes place in the spring and the first part of summer when temperature increases, and in periods with heavy rain (also increasing snowmelt), high flow will be reached.

In the summer and autumn high flows is due to heavy rainfall. In the winter when the precipitation is low and most of it will be stored as snow, there will be long periods with low flow in the rivers.

According to the Global Facility for Disaster Reduction and Recovery, Aghstev River basin is classified at high hazard level of floods, which means that potentially damaging and life-threatening river floods are expected to occur at least once in the next 10 years. The floods cause significant damage to the economy of basin. For example, in 2006, due to spring flash flood in Aghstev River, near the village of Haghartsin, the landslide closed the valley, changed the flow direction, destroyed some parts of the interstate highway M4 and caused extensive damage to residential community areas.

Thus, the proposed feasibility study (FS) on Flood Hazard Mapping in Aghstev River basin is of utmost importance for Armenia.

4 Project Partner

The FS will be carried out in collaboration with the **Service of the Hydrometeorology and Active Influence on Atmospheric Phenomena**.

The Director of the organization is Mr Armen Dpiryan.

The Service has the following coordinates:

Ministry of Emergency Situations of the Republic of Armenia

“Service of the Hydrometeorology and Active Influence on Atmospheric Phenomena” State Non-Commercial Organization

Address: 109/8 A. Mikoyan Str., 4th Block of Davitashen, 0054, Yerevan, Armenia

Phone: +(374-12) 31-79-62

E-mail: armstate@meteo.am

The Service of the Hydrometeorology and Active Influence on Atmospheric Phenomena – afterwards “Armenian Station Hydrometeorological Monitoring Service (**ASHMS**)” – is a State Non Commercial Organisation of the Ministry of Emergency Situations of the Republic of Armenia.

It was founded in 1930 and it is the only state authorised body which realises the Hydrometeorological activity and is responsible for the provision of the reliable and high quality meteorological, hydrological, agrometeorological and climatological information to the government of RA, population and all sectors of the economy.

Its main functions are:

- Provision of hydrometeorological services aimed at obtaining information on hydrometeorological phenomena and satisfying needs of public, state, governmental bodies and different physical and legal entities.
- Implementation of state activities to increase public and economic safety from dangerous hydrometeorological events, mitigation their impact within the territory of the RA.
- Provision of forecasts and observation data to the areas of national economy greatly dependent on whether events, to ensure their timely awareness and readiness.
- Implementation of activities according to international standards of hydrometeorological observations.
- Observations on air, surface waters, soil, crops, pastures , ozone layer, ultraviolet radiation, actinometrical and upper air stations, their data inventory and storage compilation of official forecasts and alerts.
- Implementation of state hydrometeorological programs within the RA.
- Study of water regime and routine of rivers, lakes, reservoirs, performing their state inventory, registry and state cadastre.
- Preparation operative information on hydrometeorological phenomena and potential dangers for population, national economy, environment, dissemination of real time and predicted parameters of those events.
- Establishment of basis for state information resources, foundation and operation of state hydrometeorological archive.
- Participation of elaboration of international and regional hydrometeorological programs of development of unified global systems of comprehensive information exchange.
- Settlement and calibration of special measure and control instrumentations and measuring devices.
- Study of Global Climate Change in the territory of the RA, assessment and forecast of vulnerability of different areas of economy as well as submission of suggestions to interested organizations.
- Participation of development of laws and legislative norms regulating or relating to hydrometeorological activities.
- Special meteorological services for aviation to enhance safety, efficiency and regularity of flights.
- Implementation of researches and applied scientific studies on hydrometeorology, development and improvement of methods of measurements and forecasts.

5 Feasibility Study implementation

5.1 FS activities

Step 1: Inception phase

- Identification of the needed information / existing information.

- Identification and meetings with the different identified organisations and collecting existing information.

Step 2: Data acquisition

- Field reconnaissance in the catchment
- Collection and compilation of hydrological and meteorological data.
- Collection of data on historical floods occurred in Aghstev River basin.
- Topographic data acquisition.
- Satellite images acquisition.

Step 3: Data processing

- Delineation of the Aghstev catchment.
- Modelling of the river network organisation in the catchment.
- Characterisation of the Aghstev's hydrological regime.
- Evaluation of the typical flood events.
- Characterisation of land use and geomorphology in the catchment.

Step 4: Flood plain modelling

- Definition of a flood plain modelling regarding the available data.
- Development of a hydraulic model of the Aghstev's flood plain.
- Calibration of the model with collected and observed data.
- Exploitation of the model to simulate the extension of the flood plain for various hydrological events.
- Preparation of a draft of flood hazard map.
- Workshop for the presentation to the Service of the Hydrometeorology and Active Influence on Atmospheric Phenomena and other stakeholders.

Step 5: Flood hazard mapping

- Update of the flood modelling approach.
- Production of the final Flood Hazard Map.
- Production of the explicative notice.

Step 6: Flood hazard map exploitation

- Production of a flood risk map for a part of the of Aghstev's catchment facing to important or frequent flood damages.
- Identification of lacks in existing information and other obstacles that need to be addressed before the replication of the flood hazard mapping in other catchments.

- Preparation of terms of reference for the production of a flood risk map and a road map for development of flood risk management plan for Aghstev catchment.
- Production of the final report.

5.2 Deliverables

The following document will be produced during the FS:

Document	Delivery time
Inception Report	1 month after the beginning of the first mission to Armenia
Flood Hazard Map of the Aghstev catchment and explicative note – Provisional version – workshop	7 months after the beginning of the first mission to Armenia
Flood Hazard Map of the Aghstev catchment and explicative note – Final version	1 month after the reception of the comments on the provisional version
Terms of reference for the production of a flood risk map and a road map for development of flood risk management plan for Aghstev catchment	11 months after the beginning of the first mission to Armenia
Final report	12 months after the beginning of the first mission to Armenia

In addition, 2 short progress reports will be produced during the study (one after 4 months and another one 8 months after the beginning of the study).

A workshop will be organized by the Project Partner for the presentation of the provisional version of the flood hazard map 7 months after the start of the contract.

5.3 Short listing criteria

- Interested candidates must provide information indicating that they are qualified to perform the services (descriptions, organization and employee of the firm or company, description of assignments of similar nature completed in the past years and their location, experience in similar conditions or in the targeted country and/or region, general qualifications and the key personnel to be involved in the proposed assignment);
- ***Financial capacity (notably based on the company's turnover and balance sheet total for the last 3 financial years);***
- Qualification and experience of the key experts who would be part of the team for this assignment;
- The Applicant must have established, or must agree to establish, a place of business in the Walloon Region;
- Estimated Budget required to carry out the feasibility study.

5.4 Application procedure

Fill out the Expression of Interest Form and submit it before 31 October 2019, at 12:00 pm (midday Belgian Time), by sending such application file to the following e-mail address : info@sofinex.be

Our management team will carefully analyze your application based on the information you completed.

For any clarification on the application procedure, please address it to SOFINEX by e-mail : info@sofinex.be

5.5 Selection criteria

Applications received by SOFINEX will be reviewed by our management team following the "Short listing criteria". Only shortlisted applicants will be presented to SOFINEX's Board of Directors.

SOFINEX reserves the right to accept or reject any or all of the received Expression of Interest documents with or without giving any reasons whatsoever.

Applicants will be notified accordingly.

Expression of Interest Form

This Expression of Interest Form can be completed electronically by pressing the 'Tab' key or clicking with your mouse on the grey text boxes and check boxes, or in hardcopy.

Your contact details	
Name and type of company	
VAT Number	
Address	
Contact person	
Telephone number	
Email address	
Fax	
Name of partner organization/s (if any)	
Address	
Bank details	

Questions – Organization

1. What is your company's capacity and experience in this business sector "flood hazard management" ? How many years has your organization been involved in this area?

2. Is your company considered an "SME" (as such term is defined in the EU Recommendation 2003/361) or a "large company"? Could you please provide its staff headcounter as well as its turnover and balance sheet total for the last 3 financial years?

3. Do your company intend to use subcontractors for this feasibility study? If so, please list them below (name, contact details and sector of activity).

The undersigned declares that it has no conflict of interest in the proposed application proceedings.

The undersigned declares that the statements made and the information provided in the duly completed application are complete, true and correct in every detail.

Signed :

Date :