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Disaster risk assessment in the Danube macro-region

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DISASTER RISK ASSESSMENT IN THE DANUBE MACRO-REGION

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1. INTRODUCTION

Natural hazard is a "natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage"[1]. Experiences of disaster management (DM) authorities in Europe and climate studies show that these natural incidents and threats have become more and more intense and unpredictable in the last three decades. Evidently climatic variability and the occurrence of various extreme meteorological and hydro meteorological events always had their significant imprints on socio-economic activities and the natural systems. However, according to observations, the number and intensity of these extreme events have increased throughout the recent decades. With regard to the changes in the climate, in the past years there have been major disasters which seem to justify that these events point to a direction where the frequency and severity of weather anomalies are changing as well. There are research results and forecasts (climate models[2]) stating that notable trends could be observed especially for droughts, floods, heavy rainfalls and heat waves[3]. It is essential to better understand these natural processes, to find appropriate risk management options and to address the potential changes resulting from socio-economic and environmental development.

In terms of both material and human resource management, these new, intensified climatic challenges represent increasing burden to disaster management. The costs of disaster preparedness, response, recovery and mitigation have been steadily rising. Therefore it is important to explore and utilize tools, techniques such as risk assessment which support the reduction of specific risk factors related to disasters and allow developing management capabilities. Risk assessment contributes to ensuring that policy decisions are prioritized in ways to address the most severe risks with the most appropriate prevention and preparedness measures.

According to European Commission's working paper on risk assessment and risk mapping[4] "risk assessment is the overall process of risk identification, risk analysis, and risk evaluation". The process allows to perform assessments of the likelihood and the potential impact of a wide range of risks relevant for a region or a country. One significant aspect of disaster risk reduction (DRR) deals with managing the risk of natural hazards. The overall risk assessment process (or ideally feedback cycle) as presented by the ISO 31010:2009[5] standard can take different shapes and forms but the general concept always revolves around the three steps mentioned above. Different supporting tools such as risk scenarios, risk maps and risk matrices help to better understand the profile and the nature of a risk type. DRR in general is an effective climate adaptation option as it systematically analyzes and manages the causal factors of disasters, including through reducing exposure to hazards, lessening vulnerability of people and property, wise management of land and the environment, and improving preparedness for adverse events[6]. The case study unveiled below will highlight the use of the aforementioned climate adaptation risk tools in practice and the elaboration of a tailor-made risk assessment methodology for a coherent geographical area in Europe, i.e. the Carpathian Basin.

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[1] UNISDR: UN International Strategy for Disaster Reduction Sec, 15 January 2009

[2] http://www.met.hu/doc/omsz_hirek/2011.08.23/melleklet_2_szakmai.pdf

[3] Climate change and Hungary: mitigating the hazard and preparing for the impacts (the „VAHAVA" report); ed. by T. Faragó, I. Láng, L. Csete; 2010, Budapest

[4] Risk Assessment and Mapping Guidelines for Disaster Management; Commission Staff Working Paper, Brussels, 21.12.2010 SEC(2010) 1626 final

[5] ISO/IEC 31010:2009 – Risk management – Risk assessment techniques. ISO and IEC

[6] UNISDR: UN International Strategy for Disaster Reduction Sec, 15 January 2009

2. SEERISK PROJECT – A CASE STUDY

SEERISK was a transnational EU funded project called "Joint Disaster Management - risk assessment and preparedness in the Danube macro-region" launched in 2012 and concluded in early 2015. The project consortium comprised 20 project partners representing 9 countries, namely Austria, Slovakia, Hungary, Croatia, Serbia, Romania, Bulgaria, Slovenia and Bosnia and Herzegovina. The consortium was coordinated by the National Directorate General for Disaster Management (NDGDM) of Hungary.

Fitting to the global trends the frequency and severity of the extreme climatic events in South-East European (SEE) region has been increasing due to climate change. Even though this phenomenon affects countries, territories and municipalities differently, there are common and region-specific challenges. SEERISK project took into account particular risks and horizontal challenges as well. The countries involved are territorially coherent: the cooperation concentrated on the Middle and Lower Danube Basin, where a wide range of natural risk types occur. There are regions or municipalities where flood is the predominant risk factor (e.g. in Senica, Slovakia), whereas in other project territories, unforeseeable thunderstorms cause serious damages (e.g. in Siófok, Hungary) or frequent draughts induce damage to agriculture (e.g. in Kanjiza, Serbia). In addition to climate related hardships, institutional, societal and organizational gaps hinder the adaptive capacities in the region such as low level of climate awareness, weak preparedness, territorial planning and administrational inefficiencies.

The 2.5 year long project implemented the main outputs and products of the project at 6 pilot municipalities or regions from Romania (Arad), Serbia (Kanjiza), Bosnia and Herzegovina (Sarajevo), Slovakia (Senica), Hungary (Siófok) and Bulgaria (Velingrad).

The project applied climate change related disaster risk assessment, social awareness survey, GIS based disaster risk mapping, emergency preparedness and gap analysis: a comparison between risk assessment and risk perception of local communities.

2.1. Common but differentiated challenges

Countries from the Danube macro-region have been often affected by a range of natural hazards that have caused a significant number of negative effects resulted in human casualties, infrastructure damage and environmental impacts. Many hydro-meteorological hazard events, such as storms or flash floods are direct consequences of climate extremes (extreme weather events), while others like floods or wildfires are becoming even more frequent or extreme due to climate change. Various simulations show a decrease in summer precipitation of about -20% to -35% [7] for SEERISK project countries in the Danube macro-region. Climate change, in combination with socioeconomic changes is expected to modify the spatial distribution of risks too in SEERISK countries. Furthermore, climate-related extremes and hazards are not restricted within national boundaries. For this reason, collaboration between neighboring countries and harmonization of the existing practices and methods are essential.

Although changes in climate are expected to influence the frequency and intensity, spatial extent, duration and timing of hazardous phenomena, extreme weather and climate events may lead to disaster only if:

1. communities are exposed to those events,
2. the vulnerability of these communities is high, and
3. their adaptation potential/capacity is low.

[7] Guideline on climate change adaptation and risk assessment in the Danube Macro-region, NDGDM, 2014, Budapest

2.2. Common risk assessment approach

Communities in the SEERISK project scope (municipalities and regions) aimed to reduce natural disaster risks for a better resilience so that recovery costs and injuries caused by damages from natural disasters could be reduced. At the same time a more efficient institutional and legal framework was meant to improve the disaster preparedness and planning capacities of the local and national disaster management capabilities. The overall objective of the SEERISK was to assist disaster risk management practitioners and decision makers in taking appropriate risk assessment and climate change adaptation measures and actions in the SEE region.

The specific objectives were to:

1. Carry out the process of risk assessment by developing a common risk assessment methodology;
2. Explain how the common risk assessment methodology can be put into practice at the six case study areas;
3. Reveal gaps between the challenges imposed by the natural hazards related to climate change and the level of overall preparedness of the local communities;
4. Suggest possible adaptation solutions to the challenges imposed by the changing climatic conditions;
5. Raise people's awareness of climate change and enhancing overall local-level disaster management preparedness.

The common methodology developed by the SEERISK consortium is solution-oriented: it considers drawbacks, such as lack of significant data sets and it offers alternative way-outs. It has a step-wise approach regarding the risk assessment procedure, the development of risk matrices and scenarios and a theoretical approach to risk mapping.

SEERISK's local level common risk assessment guideline consists of the following steps:

1. Defining the context (aims, end users, risk criteria, etc.) of the assessment and identifying the risks locally (type of hazard, scale, extent, susceptible groups, risk metrics) ;
2. Analyzing the identified risks: hazard analysis and impact analysis. Preparation of risk matrices to compare and rank risks;
3. Evaluating risks: decisions to be made on the need for treating a risk, priorities for treatment, activities to be taken, paths to follow;
4. Constructing municipality level risk maps for the pilot areas.

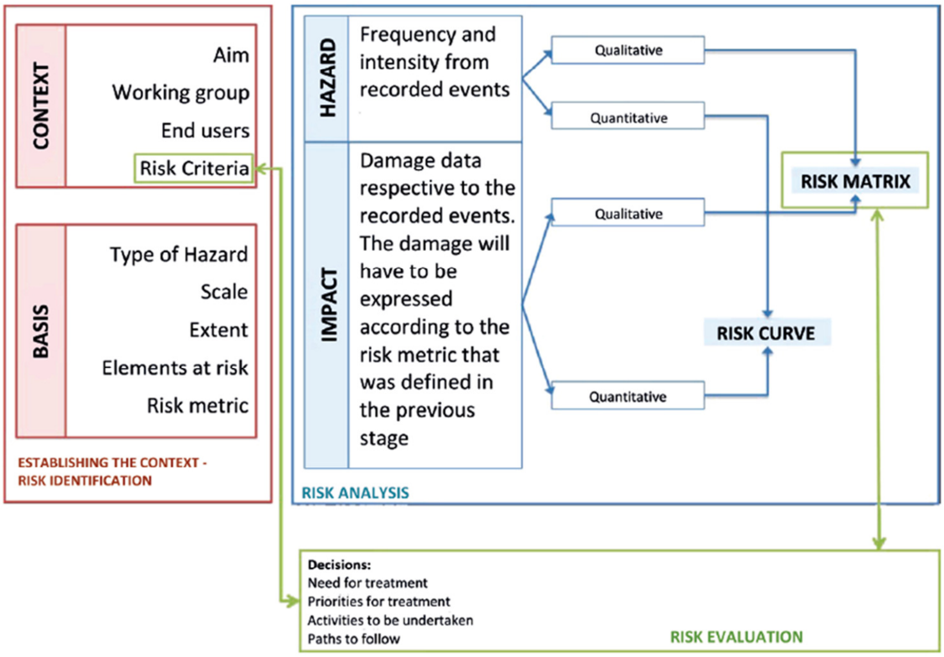

Figure 1. Risk Assessment Process of SEERISK (SEERISK 2014)

One of the most spectacular visual outputs of the implementation of the risk assessment was the construction of pilot municipality risk maps by NDGDM's GIS Team. These static offline as well as dynamic online risk maps provide information for decision makers on which regions or districts are exposed to the highest risks in an urban environment. The risk maps are the result of combining hazard (frequency of the incident) and impact (consequence of the incident) maps. The below figure portrays one example of a municipality level offline SEERISK risk map:

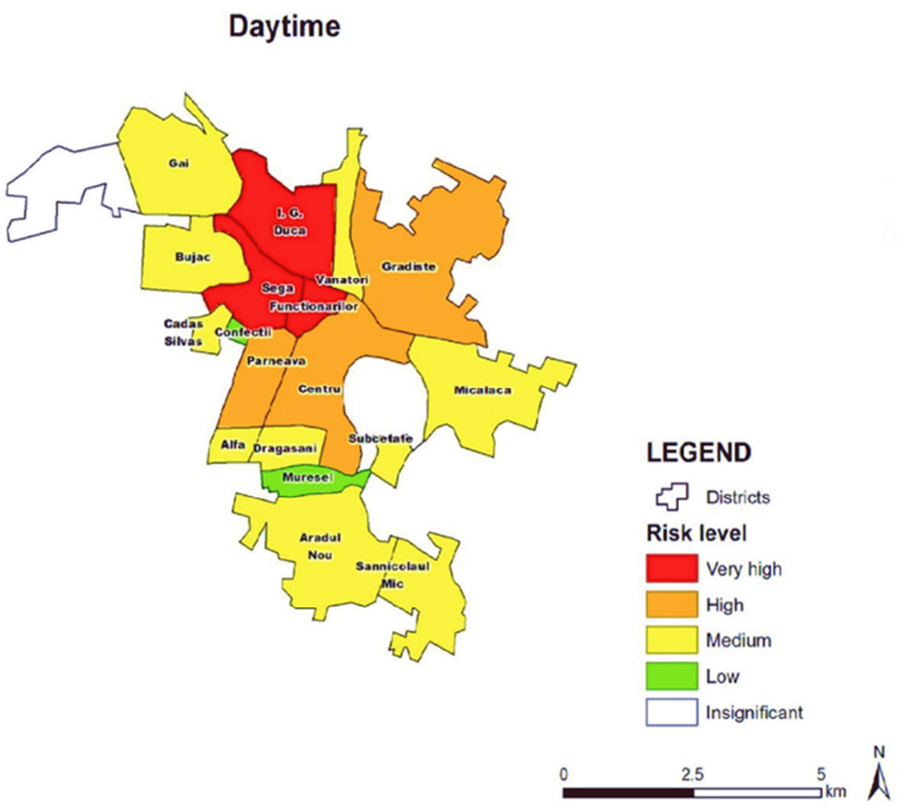

Figure 2. Daytime heat wave risk map of Arad, Romania (SEERISK 2014)

The social aspect of the project conducted a social climate change and risk awareness questionnaire survey in the pilot areas, semi-structured interviews with local decision makers, a local planning document analysis and a gap analysis.

As a major practical trial of the theoretical risk assessment guideline and the risk maps, four disaster simulation field-exercises was organized at the end of the project in 2014 at the following pilot areas: Siófok , Arad, Velingrad, Sarajevo-Ilidza. An additional international, comprehensive field and table top urban search and rescue (USAR) exercise was organized in Hajdúszoboszló as well.

In order to better communicate risks and threats to vulnerable population groups a common emergency communication strategy has been developed by SEERISK to provide a scheme that can be used as a template, containing prevention and emergency communication steps in case of a weather-related hazard or disaster event.

The project was implemented with the involvement of all project partner experts covering different types of tasks according to their appropriate professional profiles.

2.2.1. Type of solutions

SEERISK aimed to implement a mixed people and technology based solution. The main focus was on climate change related knowledge transfer, community involvement, international cooperation, institutional capacity building and more importantly public awareness raising. Technology based solution included GIS based risk mapping, disaster simulation field exercises, improving emergency preparedness and emergency communication strategies.

2.2.2. Role of actors in the solution

The project consortium was led by the National Directorate General for Disaster Management (NDGDM), Hungary and all the other consortium member organizations were invited (after a thorough selection procedure using specific criteria) to take part at the cooperation. The collaboration was not public or inclusive as the project was a scientific research cooperation with strict project partner policy framework. NDGDM, being the lead partner, was the most active stakeholder during the implementation, however local level decision makers were also effectively facilitated the project.

The involved municipalities were the pilot areas where SEERISK's outputs and results were tested. They provided local knowledge and assistance during the implementation phase especially in case of the public awareness questionnaire survey, the semi-structured interviews of the decision makers and the local planning development analysis.

SEERISK, being mainly a social science and climate adaptation research project, involved state funded public organizations with national and local scope such as DM authorities, universities, hydro-meteorological and research organizations. NGOs were only indirectly involved in the implementation e.g. civil protection volunteer organizations during the disaster simulation field exercises. Local peoples were contributing to the result by taking into part the public awareness questionnaire survey.

Pilot area municipalities benefited the most from the improved resilience as the types, the geographical distribution and the levels of risks were visually illustrated in the risk maps thus the general level of emergency preparedness have been improved as well as the knowledge on the connection between climate change and the extreme natural disasters.

2.3. Outcomes and lessons learnt from case study

The most significant and transferable element of the project is the common comprehensive disaster risk assessment methodology which helps communities to systematically identify, analyze and evaluate risks from climate change related natural hazards in their regions. Other, particularly useful results are the risk maps that are linked with the risk assessment methodology and help visualize risks over a geographical area.

In order to suitably transfer this solution it is vital to educate disaster management and local level decision makers about the concept of disaster risk assessment and its possible benefits for the communities. A couple of trainings, specific guidelines and lectures would suffice to pass on the basic knowledge regarding the risk assessment methodology. It is important to make it clear that risk assessment does not necessarily require quantitative data input as the technique is able to draw up comprehensive risk profiles by relying on qualitative information as well. Although the more quantitative data have been used during the process the more precise the risk profile will be. GIS based risk mapping would involve slightly more resource and specialized knowledge. An experienced GIS expert, a GIS software and a proper hardware would be needed to construct detailed risk maps. SEERISK consortium has developed a GIS Best Practices guidelines[8] which aims to transfer the specific technical knowledge acquired during the project's lifetime. The document's main aim is to provide a practical complementary material to the Common Risk Assessment Methodology; present a detailed explanation of the work done by NDGDM's SEERISK GIS Team; share the know-how of developing online risk maps.

Local authorities in the SEERISK project consortium were keen taking part in the cooperation as specialized state programs (in this case climate adaptation) are mostly absent in the SEE region. Decision makers realized that climate change are now poses a major threat to local communities and available, mostly EU, financial sources can be mobilized to tackle this problem. Local authorities of municipalities are the biggest employers in many cases, therefore they have the most means and influence to raise public awareness and change public opinion. Most of the bottom-up or external climate adaptation initiatives are approved and endorsed by local authorities and organizations with national scope (mayors, city councils, notaries, DM authorities) although some SEE region municipalities started to implement top-down programs too. So local authorities are the key players in the success or the failure of climate adaption actions, they can either facilitate or hinder implementation.

The process was meant to extensively rely on partner cooperation however the activity of some partners was unbalanced. What is important, especially in the SEE region, is that public, higher education and research institutions, DM authorities, municipalities can be successfully motivated only if the program carries financial benefit or substantial cost reduction for them.

[8] http://www.rsoe.hu/projectfiles/seeriskOther/download/GIS_Best_Practices.pdf

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