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THEORY AND PRACTICE OF FLOOD PREVENTION – A CASE STUDY OF THE CITY OF KRALJEVO

ABSTRACT: Increasingly frequent floods, caused by altered climatic conditions, result significant material damage and loss of human life. The floods of May 2014 were the largest recorded in Serbia, affecting the territory of the city of Kraljevo, particularly the settlement of Grdica and the industrial zone of Šeovac. The damages from the floods impacted residential buildings, infrastructure, agriculture, business entities, and public facilities. Similar flood events, in terms of precipitation volumes and river water levels, also affected the Kraljevo area in 2023. Due to the frequent natural disasters impacting various parts of the territory, along with the extensive network of watercourses and intense climate changes, the city of Kraljevo has adopted an integrated approach to disaster risk reduction. The flood risk reduction system is governed by several legal regulations, primarily the Water Law and the Law on Disaster Risk Reduction and Emergency Management. In compliance with these legal obligations, the city has adopted necessary planning documents, established institutional mechanisms, and properly equipped civil protection units. Additionally, continuous investments have been made in constructing new and reconstructing the existing infrastructure. A significant advancement

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in the city's risk reduction system is the establishment of a civil protection system and inter-municipal cooperation among cities and municipalities in the West Morava River basin. It is important to measure the impact of investments in flood prevention to assess the justification and effectiveness of the resources used. The activities and measures implemented to reduce flood risk from 2014 to 2023 have shown positive results. This paper presents a comparative analysis of the effects of preventive activities and investments in the disaster risk reduction and emergency management system in the Kraljevo area during the specified period. The concluding considerations indicate that preventive investments in the flood risk reduction system and the construction of resilient and necessary protective infrastructure, lead to reduced damages and losses from floods.

Keywords: *Kraljevo, Grdica, Šeovac, floods, Emergency Management Headquarters, prevention, risk reduction system, flood defense operational plan, disaster risk assessment, entities of special significance.*

1. Introduction

Flood defense management, as well as the implementation of measures to reduce the harmful effects of floods from first- and second-order watercourses, are regulated by a set of legal and sub-legal acts. The complexity of the procedures before, during, and after flood events requires continuous investments, both in the construction of flood protection structures and in the development of institutional capacities at the state and local government levels.

Special attention in prevention should be directed towards the significance of the broader community, as well as the behavior of the population living near river courses. Additionally, the role of individuals before, during, and after floods is crucial. The consequences of floods, including the damages and losses caused by flood events, will largely depend on all these factors.

The increased frequency of floods in the past decade has also been caused by climate change. During this period, floods have become frequent, occurring at least once a year with varying degrees of severity, causing damage and losses in different sectors (Warsaw Mechanism).

To illustrate the effects of preventive investments, a case study of the city of Kraljevo, which has been at risk of flooding for years, was used. The vulnerability of Kraljevo in terms of the risk of natural disasters is very pronounced (Assessment of Vulnerability to Natural Disasters and Other

Accidents for the Territory of the City of Kraljevo, 2019, p. 124). The risk level is determined using a probability and consequence matrix according to the formula R=PxC, where R represents the risk level, P the probability, and C the consequences. Floods are identified as one of the unacceptable risks for the city of Kraljevo (Assessment of Vulnerability to Natural Disasters and Other Accidents for the Territory of the City of Kraljevo, 2019, pp. 98 and 108).

To bring flood risk down to an acceptable level and reduce the damage and losses caused by floods, it is essential to implement both structural and non-structural measures (Regulation on the Content and Method of Developing a Disaster Risk Reduction Plan, 2020). By comparing flood events and the state of the disaster risk reduction system in Kraljevo from May 2014 and June 2023, the effectiveness of preventive measures in mitigating flood risk is demonstrated. In similar weather conditions, with heavy rainfall and high river levels, floods have occurred in the same area with varying impacts on the population and economy. The goal is to show how preventive investments can reduce flood consequences through this comparative analysis.

This paper demonstrates the need for an integrated approach to flood risk reduction using the city of Kraljevo as a case study. It emphasizes not only investments in protective infrastructure but also the importance of enhancing public policies. This includes adopting and implementing key documents for the disaster risk reduction system and developing and equipping civil protection units and other crucial entities for safety and rescue.

2. Definition of key terms

To showcase the impact of preventive measures on mitigating the damage caused by floods, it is necessary to define key concepts and examine the state of the flood management and risk reduction system.

The United Nations International Strategy for Disaster Reduction (UNISDR Terminology: Disaster Risk Reduction) defines disaster risk management as a blend of planning documents, institutions, and organizations, along with the skills and capacities needed to minimize the harmful effects and likelihood of disaster events.

The term “high water” is defined as the highest level reached by the river during a flood or a sudden rise in water levels. Ljiljana Gavrilović defines a flood as the overflow of high water from the riverbed (Gavrilović, 1981, p. 7). “While not every high water event necessarily leads to a flood, a flood is always a result of high water” (Gavrilović, 1981, p. 7).

Floods occur as a result of large volumes of water. "Floods are a type of natural disaster caused by the overflow of high water from natural and artificial reservoirs, such as riverbeds and water storage areas. As a category of 'natural risks,' floods, which are atmospheric and hydrological phenomena, can last for hours, days, or even months, and can impact extensive areas that may surpass local or national boundaries" (Milojković & Mlađan, 2010, p. 173). Thus, floods can vary in their territorial impact, affecting parts or entire local government units, regions encompassing multiple cities and municipalities, entire countries, or even extending beyond national borders.

Under the European Union Directive, a flood is defined as the temporary inundation of land that is normally not covered by water, with sources of flooding including rivers, mountain torrents, intermittent streams, and seas (Directive 2007/60/EC, 2007). Similarly, the Water Law (2010) defines floods as the temporary covering of land by water that typically remains dry. The law also distinguishes between floods caused by external sources, such as overflow from watercourses, and those caused by internal sources, such as excess atmospheric and groundwater.

According to the methodological guidelines for creating flood hazard and risk maps in the Republic of Serbia (Regulation on the Methodology for Developing Flood Hazard and Risk Maps, 2017), floods are defined as the temporary inundation of land that is usually not covered by water and can result from either external or internal water sources. The regulation also defines flood-prone areas as regions susceptible to flooding, with protected and unprotected areas determined based on the presence or absence of flood protection infrastructure.

Floods vary based on the duration of the floodwave and other classification criteria, such as whether they are caused by rain, snowmelt, dam breaches, landslides, or flash floods. "A common characteristic of all flash floods is their sudden and rapid onset, relatively short duration, the delivery of enormous amounts of sediment and rocky material, and their significant destructive impact" (Gavrilović, 1981, p. 7).

Flood adaptation measures must be both visible and measurable in terms of their effectiveness and efficiency. It is therefore vital for governments, cities, and municipalities to invest in flood prevention to safeguard people, businesses, the environment, and natural resources. "Floods and flash floods are among the most severe crises and threats to human life and the environment, negatively impacting the economy and the sustainability of natural resources" (Aćimović, 2021, p. 44). In this context, it is necessary

to focus on maintaining and repairing existing flood protection systems and constructing new protective infrastructure.

3. The importance of inter-municipal cooperation of disaster risk reduction

One of the strategies for mitigating disaster risk involves inter-municipal cooperation, which entails the collaboration of local government units. The legal framework for such cooperation is outlined in the Law on Local Self-Government (2007). Recently, these collaborative platforms have gained increasing importance in addressing risks associated with climate change. Joint efforts by cities and municipalities enhance existing resources and foster the acquisition of new knowledge and skills in disaster risk reduction.

Moreover, certain risks, such as floods and forest fires, are of such magnitude and nature that regional communication and collaboration among neighboring municipalities are essential.

Another significant reason for cooperation, from the perspective of local governments, is the rational use of resources, particularly human and material resources. This is crucial, as local government budgets are often insufficient to cover all necessary investments for disaster risk reduction.

4. Analysis of floods from May 214 and June 2023

In this section of the paper, a comparative analysis of flood events and the associated damage caused by floods in May 2014 and June 2023 is presented. Between these two flood events, improvements were made to the disaster risk reduction system and emergency management, along with investments in preventive measures in the city of Kraljevo.

Within the context of domestic legislation and international policies and directives, the disaster risk reduction system should be examined through normative, institutional, material-technical, and functional frameworks.

4.1. Basic Information About the City of Kraljevo

City of Kraljevo is situated in the region encompassing the lower course of the Ibar River and the middle course of the West Morava River. In terms of territorial extent, Kraljevo is the largest local government unit in the Republic of Serbia, following Belgrade. It covers an area of 1,530 km², representing 1.7 percent of Serbia's total land area.

The territory of Kraljevo is characterized by a large number of watercourses, including 174 second-order watercourses and five first-order watercourses. Additionally, the dominant hilly-mountainous terrain, which comprises over 70% of the area, contributes to the occurrence of flood events (Operational Flood Defense Plan for Second-Order Watercourses in the Territory of Kraljevo, 2023, p. 9).

The Western Morava, Ibar, and Gruža rivers are the most significant first-order watercourses traversing the Kraljevo area. The territory of Kraljevo includes the central section of the Western Morava River, extending from the village of Obrva to Ugljarevo, covering approximately 35 kilometers with a riverbed width of around 25 meters. Additionally, the thermal waters of Mataruška and Bogutovačka Banja hold substantial tourist and economic importance for the region.

4.2 Observed Area and Climatic Characteristics 2014-2023

Observed Area

The research area focusing on the effects of preventive measures for reducing flood damage encompasses the city of Kraljevo, with particular emphasis on the settlement of Grdica and the Šeovac industrial zone, which is situated within the adjacent local community of Adarani.

The settlement of Grdica is characterized by a densely populated urban environment with residential buildings intended for individual or family housing. The majority of the houses were constructed between 1960 and 2010. Additionally, Grdica is home to numerous business entities, with the most notable being the companies Radiator, Amiga, and Mladi Radnik.

The Grdica area features a well-developed urban water supply and sewage network, as well as a low-voltage electrical supply network. The area is intersected by the Kraljevo-Čačak railway line, and to the south, the settlement is bounded by the Ibarska Magistrala and an access road leading to the center of Kraljevo. To the north of the observed area, the boundary is the West Morava River.

The local road and street network in the area is extensive, complemented by a drainage system for surface waters, with the most significant stream being Čađavac-Moravac. The area of the settlement Grdica features a gentle slope from south to north, running from the Ibarska Magistrala towards the West Morava River. Following the exodus of 1999 from the southern Serbian autonomous province of Kosovo and Metohija, a portion of the displaced Serbian population settled in the part of Grdica near the West Morava River.

The primary rivers within the territory of the city of Kraljevo include the Ibar, Studenica, Lopatnica, West Morava, and Gruža (Decision on the Enumeration of First-Order Waters, Government of the Republic of Serbia, 2014). On these rivers, seven automatic hydrological stations have been established. These stations are part of the official reporting network of the Republic Hydrometeorological Institute of Serbia (Regulation on the Methodology for Creating Flood Hazard and Risk Maps, 2017).

Based on reports from the Republic Hydrometeorological Institute of Serbia, on May 15, 2014, and June 16/17, 2023, approximate rainfall amounts and similar river levels on the West Morava were recorded. However, this assertion cannot be fully documented because the primary gauge for measuring water levels on the West Morava relevant to the floods in the settlement of Grdica (Miločaj measurement station) was dismantled before the June 2023 flood event due to the construction of the Morava Corridor. Nevertheless, for the purposes of this analysis, data from the Kratovska Stena measurement point and precipitation amounts during the observed periods will be utilized. Additionally, river levels of the West Morava's tributaries within the Kraljevo area, as well as upstream in the Čačak area, were identical on May 15, 2014, and during the night between June 16 and 17, 2023.

4.3. Description of the Flood Event from May 2014

The floods of May 2014 were the most significant in the last 120 years. "The floods affected 22% of the total population, and consequently more than two-thirds of municipalities, tragically resulting in over 50 human casualties and considerable material damage" (Aćimović, 2021, p. 47). Due to heavy rainfall, in May 2014, the territory of Kraljevo experienced the overflow of the West Morava, Gruža, and Musina rivers, as well as the occurrence of flash floods. Consequently, on May 15, 2014, at the recommendation of the Emergency Situations Headquarters, the mayor declared a state of emergency for the territory of Kraljevo (Decision on the Declaration of a State of Emergency for the Territory of Kraljevo, Mayor of Kraljevo, 2014).

The May 2014 natural disasters impacted the entire territory of the city of Kraljevo. The most affected areas were the local communities situated within the catchments of first-order rivers and regions prone to flash floods. While certain parts of local communities were threatened by internal water effects, the occurrences of landslides, erosion, and rockfalls on municipal roads affected nearly every local community. Additionally, the threat of an

epidemic intensely endangered seven local communities; however, it was contained through preventive measures, terrain sanitation, and water control.

The entire territory of the city of Kraljevo was considered to be at risk from river flooding, the effects of flash floods, internal waters, as well as landslides, erosion, rockfalls, and the potential occurrence of epidemics.

Based on the Damage Assessment Report from June 2014, the floods caused significant damage in the observed area. Landslides on the broader territory of the city resulted in damage amounting to 50 million dinars (Report on the Global Damage Assessment from Natural Disasters Affecting the City of Kraljevo. City Council of Kraljevo, 2014, p. 74). A total of 459 residential buildings were damaged (Operational Flood Defense Plan for Second-Order Watercourses in the Territory of Kraljevo, 2023, p. 71), with the damage amounting to 52,788,566.81 dinars (p. 70). In the settlement of Grdica, approximately 300 residential buildings (pp. 32-34, 39-51) and 21 business entities (pp. 60, 170-171) were affected by the floods. A large number of citizens were evacuated, and facilities of the primary school in Grdica were used for housing. As a consequence of the floods, the water supply and sewage systems in Grdica were out of service for 30 days, and the electricity supply was disrupted for 72 hours. The damage was extensive, affecting residential and commercial properties as well as infrastructure. For comparison, the budget of the city of Kraljevo for 2014 was 3,528,551,000 dinars (Decision on the Budget of the City of Kraljevo for 2014, 2013).

4.4 Status of the Disaster Risk Reduction and Emergency Management System in 2014

Regulatory Framework

In the period immediately before or during the flood events of May 2014, and in accordance with the then-applicable regulations (Decision on the Organization and Functioning of Civil Protection in the Territory of the City of Kraljevo, City Assembly of Kraljevo, 2013-III), the city of Kraljevo had developed and adopted the following documents related to disaster risk reduction and emergency management, as well as the protection and rescue system:Decision on the Organization and Functioning of Civil Protection in the Territory of the City of Kraljevo; Operational Plan for Flood Defense for Second-Order Watercourses for 2013; Act on the Formation of the Emergency Situation Headquarters and Technical-Operational Teams within the Headquarters; Decision on the Appointment of Commissioners and Deputy Commissioners for General Purpose Civil Protection Units. Additionally, the

Operational Plan for Flood Defense for Second-Order Watercourses for 2014 was in the process of being adopted by the City Assembly.

Conversely, during this period, the city of Kraljevo lacked a risk assessment for disasters,known at the time as the Assessment of Vulnerability to Natural Disasters and Other Accidents, as well as protection and rescue plans. Additionally, the legislation in effect did not mandate the creation of a Disaster Risk Reduction Plan as part of the essential planning documentation for the area in question.

Institutional Framework – Key Entities in the Flood Defense System

While the Emergency Situations Headquarters of the City of Kraljevo was established by a specific act of the City Assembly (Decision on Amendments to the Decision on the Establishment of the City Emergency Situations Headquarters of Kraljevo, 2013) and consisted of 23 members, the legal entities qualified for protection and rescue in emergency situations were designated by the Decision of the City Council on the Appointment of Qualified Legal Entities for Protection and Rescue in Emergency Situations within the City of Kraljevo (Decision on the Appointment of Qualified Legal Entities for Protection and Rescue in Emergency Situations within the City of Kraljevo, 2014), which identified 13 such entities.

Furthermore, the commissioners and deputy commissioners for general-purpose civil protection had not been appointed by the Emergency Situations Headquarters' resolution, which specified 68 individuals.

Material-Technical Framework

In the time of the May 2014 floods, the city of Kraljevo did not possess equipment for civil protection or flood defense. Investments in flood defense prior to the May 2014 floods, as outlined in the Program for Land Development managed by the Public Enterprise for Land Development "Kraljevo," were coordinated with the relevant water management company (Public Water Management Enterprise Srbijavode) and focused on constructing protective structures along the Ibar River and second-order watercourses under local government jurisdiction.

Functional Framework

Although civil protection commissioners and their deputies were appointed by a specific act of the Emergency Situations Headquarters, there was no training for these individuals, nor was there any equipment provided. Additionally, no civil protection drills or simulations of potential flood events were conducted.

Based on the Report on the Work of the City Emergency Situations Headquarters for 2014 (Report on the Work of the City Emergency Situations Headquarters on the Territory of the City of Kraljevo for 2014, 2015) and the Damage Assessment Report (Report on the Global Assessment of Damage from Natural Disasters Affecting the City of Kraljevo, 2014), it can be concluded that the activities of the emergency protection and rescue system at the time were reactive. They were primarily driven by the flood events and focused on evacuation, relief, rescue, and other measures and actions taken in response to the floods.

Namely, the protection and rescue system, in a broader sense, was essentially in its infancy. This is confirmed by the Decision of the City Assembly of Kraljevo from January 2014 (Resolution on the Management of the Facility at Rudno Located on Cadastral Parcel No. 1726/2 KO Rudno, 2014), which transferred the facility at Rudno to the relevant Department in the City Administration for the purpose of conducting civil protection training. This decision was made less than four months before the flood events of May 2014, so the implementation of the planned training had not even begun when the floods occurred.

4.5 Current State of Disaster Risk Reduction and Emergency Management System in 2023

Normative Framework – Observed Documents

Before the flood events of June 2023, the City of Kraljevo adopted documents in the field of disaster risk reduction, including the Decision on the Organization and Functioning of Civil Protection in the City of Kraljevo, the Disaster Risk Assessment, the Operational Flood Defense Plan for Second-Order Watercourses for 2023, the Conclusion on Determining Entities of Special Importance for Protection and Rescue, and a series of acts establishing general-purpose civil protection units and appointing commissioners and deputy commissioners of civil protection.

Institutional Framework – Entities of Significance for the Flood Defense System

If the Emergency Situation Headquarters of the City of Kraljevo consists of 29 members, the entities of special significance for protection and rescue are determined by a special act of the City Council, totaling 19 entities.

The commissioners and deputy commissioners of civil protection are a unique aspect of the disaster risk reduction system in the City of Kraljevo. To date, a total of 112 individuals have been appointed, and nine general-purpose civil protection units have been formed by special acts of the relevant Department for Civil Protection of the City Administration, with a total of 88 members.

Material and Technical Framework

After forming the civil protection units, it was necessary to secure resources for equipping them. The civil protection equipment includes mobile anti-flood systems and civil protection uniforms.

Among significant investments in flood protection that played a crucial role in reducing flood risk in June 2023, the following stand out: the construction of a protective embankment on the left bank of the West Morava River in the settlement of Grdica, and the construction of the Morava Corridor highway, which also includes the regulation of the West Morava River's course.

Functional Framework

The development of the civil protection system in the territory of Kraljevo following 2014 included the integration of local residents, businesses, educational institutions, and various organizations. Particularly noteworthy for this analysis are the civil protection exercises that simulated flood events and the use of human and material resources. One such exercise took place in the Sheovac industrial zone in October 2021, commemorating International Disaster Risk Reduction Day. The exercise involved participants from civil protection units, the firefighting and rescue unit of the Ministry of Interior's Emergency Situations Sector, and employees of the company GIR. The exercise included the deployment of mobile flood protection systems aimed at safeguarding thiscompany. This scenario closely mirrored the events that occurred in June 2023.

Following the floods of May 2014, and at the initiative of the city of Kraljevo, a move was made towards intermunicipal cooperation among cities and municipalities in the West Morava River basin. The goal of this cooperation was to enhance local government activities within the West Morava basin, focusing on developing civil protection systems, joint actions to reduce risk levels, and creating conditions for rapid and efficient recovery after disasters (Makismović, 2017, p. 30).

The intermunicipal cooperation was formalized through the signing of an Agreement on Cooperation by 19 cities and municipalities within the

West Morava basin (Agreement on Cooperation in the Field of Disaster Risk Reduction and Civil Protection Development in Cities and Municipalities in the West Morava Basin). As part of the EU project "FOR YOU," 900 sets of uniforms for civil protection members and 600 meters of mobile flood protection systems were procured. The project also produced a specialized document mapping areas within the West Morava basin suitable for the installation of mobile flood protection systems if needed. One such area is the Šeovac.

3.6 Flood Risk Reduction Measures from 2014 to 2023

Direct investment in the civil protection system in the Kraljevo area has prevented major river overflows and damage in the settlement of Grdica and the industrial zone of Šeovac, as well as in other parts of Kraljevo territory. During the observed period, various measures were implemented to enhance the city's resilience to floods. The following infrastructure projects and other measures were crucial for reducing flood risk in the area between the two flood events:

- A protective embankment was built on the right bank of the West Morava River to protect the settlement of Grdica from flooding.
- A Disaster Risk Assessment, draft Protection and Rescue Plan, and draft Disaster Risk Reduction Plan were developed.
- The Operational Flood Defense Plan was improved in collaboration with FAO.
- An Agreement was signed for cooperation among cities and municipalities in the West Morava River basin to develop the civil protection system, reduce disaster risk, and ensure rapid recovery after disasters.
- Acts were adopted for the appointment of civil protection commissioners and deputy commissioners, as well as for the formation of general-purpose civil protection units.
- Flood protection equipment, including mobile flood defense systems, was procured.
- Uniforms for civil protection purposes were obtained.
- The number of entities of special significance for protection and rescue was increased.
- Private entities (e.g., GIR, Mladi Radnik, AMC, etc.) were actively involved in the disaster risk reduction system.
- Training for civil protection personnel was conducted in collaboration with other institutions and organizations.

5. Conslusion

In the territory of the city of Kraljevo, which covers an area of 1,530 km², there are five primary watercourses and as many as 174 secondary watercourses. For the purpose of identifying the flood-prone area, the city's territory is conditionally divided into the sub-basins of the Ibar, Gruža, and West Morava rivers.

In order to reduce the risk of floods and the losses when floods do occur, the Republic of Serbia and the city of Kraljevo have undertaken a whole series of preventive measures. In addition to investing in the construction of protective embankments, flood protection equipment has been procured, appropriate documents in the field of protection and rescue have been adopted, general-purpose civil protection units have been formed, equipped, and trained, and cooperation with other cities and municipalities in the West Morava basin has been established.

Alongside significant investments in flood risk reduction measures, it is necessary to establish a hydrometeorological station system for early warning of flash floods in the territory of Kraljevo. In this regard, it is also important that in the future, hydrological (HS), meteorological, or rain gauge (MS) stations be installed in appropriate locations.

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TEORIJA I PRAKSA PREVENCIJE OD POPLAVA – STUDIJA SLUČAJA TERITORIJE GRADA KRALJEVA

APSTRAKT: Sve češće poplave, uslovljene izmenjenim klimatskim uslovima, dovode do velikih materijalnih šteta, ali i gubitaka ljudskih života. Poplave iz maja meseca 2014. godine su najveće poplave koje su zabeležene u Srbiji, a zahvatile su i teritoriju grada Kraljeva, a posebno

naseljeno mesto Grdicu i industrijsku zonu Šeovac. Štete od poplava su nastale na stambenim objektima, infrastrukturi, poljoprivredi, privrednim subjektima i objektima javne namene. Slični poplavni događaji, s aspekta količine padavina i nivoa vodostaja plavnih reka, zahvatili su teritoriju Kraljeva i 2023. godine. Iz razloga čestih nepogoda koje pogađaju različite delove teritorije, kao i razgranate mreže vodotokova i intezivnih klimatskih promena, grad Kraljevo je pristupio integralnom pristupu smanjenja rizika od katastrofa. Sistem smanjenja rizika od poplava uređen je nizom zakonskih propisa, a pre svega Zakonom o vodama i Zakonom o smanjenju rizika od katastrofa i upravljanju vanrednim situacijama. U skladu sa zakonskim obavezama, Grad je usvojio neophodna planska akta, osnovao institucionalne mehanizme i izvršio adekvatno opremanje jedinica civilne zaštite. Dodatno, vršeno je kontinuirano ulaganje u izgradnju nove i rekonstrukciju postojeće infrastrukture. Od posebnog značaja za razvoj sistema smanjenja rizika na teritoriji Grada jeste formiranje sistema civilne zaštite i međuopštinska saradnja gradova i opština u slivu reke Zapadne Morave. Efekte ulaganja u prevenciju poplava treba meriti kako bi se utvrdila opravdanost i učinak uloženih resursa. Aktivnosti i mere preduzete na smanjenju rizika od poplava u periodu od 2014. do 2023. godine dale su rezultate. U radu je, kroz uporednu analizu, dat prikaz efekata preventivnih aktivnosti i ulaganja u sistem smanjenja rizika od katastrofa i upravljanja vanrednim situacijama na teritoriji Kraljeva u navedenom periodu. U zaključnim razmatranjima ukazano je da preventivna ulaganja u sistem smanjenja rizika od poplava, kao i u izgradnju otporne i neophodne zaštitne infrastrukture, rezultiraju manjim štetama i gubicima od poplava.

Ključne reči: *Kraljevo, Grdica, Šeovac, poplave, Štab za vanredne situacije, prevencija, sistem smanjenja rizika, operativni plan odbrane od poplava, procena rizika od katastrofa, subjekti od posebnog značaja.*

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