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D.T.2.3.4. Report on the performed TTX in Slovenia

Lead Institution	University of Ljubljana
Reviewer/s	Primož Banovec
Lead Author/s	Anja Torkar, Brigita Vavpetič
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Contributors - name and surname	Institution
Primož Banovec	University of Ljubljana
Barbara Čenčur Curk	University of Ljubljana
Brigita Vavpetič	Municipality of Kamnik
Katja Kunstelj	Municipality of Kamnik
Ajda Cilenšek	University of Ljubljana
Anja Torkar	University of Ljubljana
Matjaž Srša	Municipality of Kamnik



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1. Introduction

The municipality of Kamnik is located in the area of Osrednjeslovenska in Slovenia and it ranks 10th depending on the size of the municipality. According to the latest data, there are just under 30,000 inhabitants living in 102 settlements. Kamnik is considered a city with a rich history and cultural heritage. Cultural events and numerous events enrich the old town in all seasons and attract visitors from all over Slovenia.

For the municipality of Kamnik torrential floods are typical. In the last decade major flood events have been recorded in September 2007, September 2010, 2012, November 2014, April 2016 and May 2018.

In the context of MUHA project activities, a tabletop exercise (TTX) was planned in the pilot area of Municipality of Kamnik. The TTX name was “Floods Kamnik 2022 (Poplave Kamnik 2022)” aiming to regulate the organization, management and implementation of protection and rescue activities and other issues that are important for the implementation of the tabletop exercise

The methodological instructions for the implementation of the exercise "POPLAVE KAMNIK 2022" regulate the organization, management and implementation of protection and rescue activities and other issues that are important for the implementation of the theoretical exercise.

The TTX is organized by the Municipality of Kamnik and took place at the Civil Protection Headquarters in Kamnik.

The TTX allows the participation of all the different bodies and administrations at the different territorial levels, from the manager to the regional and national level, involved in the management of a scenario of a flood event in the Municipality of Kamnik.



2. Scenario

Description of the event - Assumptions

Incident date: 6th May 2022

Incident time: 10.00 (CEST)

A precipitation event which was predicted with a red alert of the national Hydrographic agency (ARSO - Agencija Republike Slovenije za okolje) occurred in the night between the May 5th and May 6th.

- The preparedness (pre-activation) is issued as an orange flood alert on May 4th 2022 at 10.00 AM.
- Red alert is issued one day before the flood event (May 5th) 2022, at 10:00 AM.

POVRATNE DOBE ZA EKSTREMNE PADAVINE

Postaja: KAMNIŠKA BISTRICA
Obdobje: 1977 - 2012

Višina padavin (mm)

trajanje padavin	POVRATNA DOBA						
	2 leti	5 let	10 let	25 let	50 let	100 let	250 let
5 min	8	11	13	15	17	19	21 mm
10 min	12	16	19	22	24	27	30 mm
15 min	15	21	24	28	31	35	39 mm
20 min	18	24	29	34	38	42	48 mm
30 min	21	30	35	42	48	53	60 mm
45 min	24	35	42	50	57	63	72 mm
60 min	28	38	45	54	60	67	75 mm
90 min	34	44	51	60	66	72	81 mm
120 min	38	48	55	63	70	76	84 mm
180 min	45	57	64	74	81	87	97 mm
240 min	52	66	75	86	94	103	114 mm
300 min	59	75	85	97	107	116	128 mm
360 min	66	82	92	105	115	124	137 mm
540 min	80	101	116	133	147	160	177 mm
720 min	91	117	134	156	172	188	209 mm
900 min	101	130	149	174	192	210	234 mm
1080 min	108	139	159	185	204	224	249 mm
1440 min	119	153	177	206	227	249	277 mm

Figure 1. Precipitation scenario for the flood return period in the Kamnik area - Source - ARSO (24 hour - 1440 minutes precipitation event with 249 mm precipitation in 24 hours)

The scenario defines the precipitation intensity of 249 mm in 24 hours, which is 100-year return period for the meteorological station Kamnik (Figure 1).

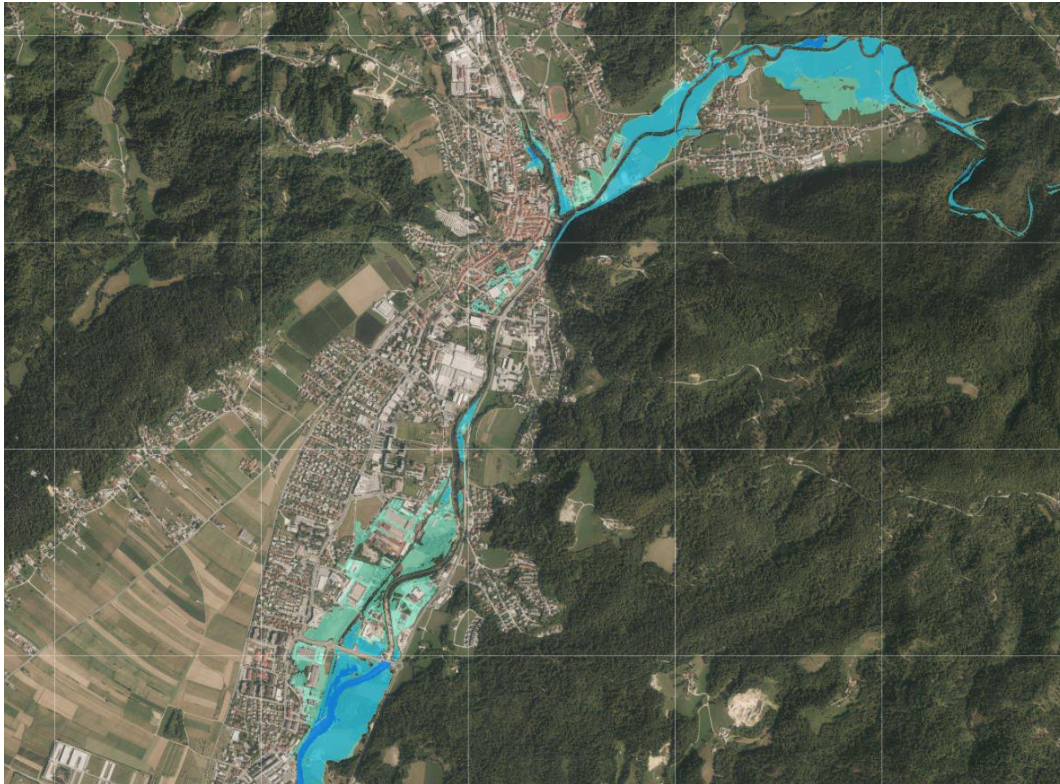


Figure 2. The floods scenario for the flood return period in the Kamnik area (flood hazard map)

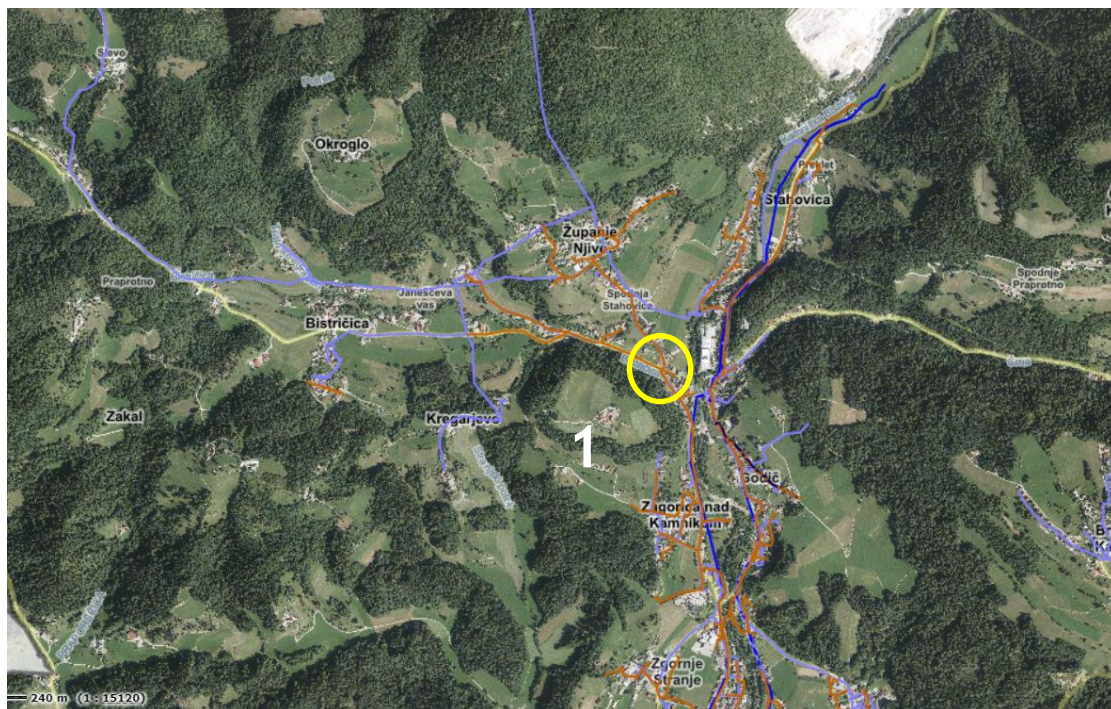


Figure 3. Water supply network with defined critical points for the TTX scenario (emergency scenario location 1 - flooded pumping station)

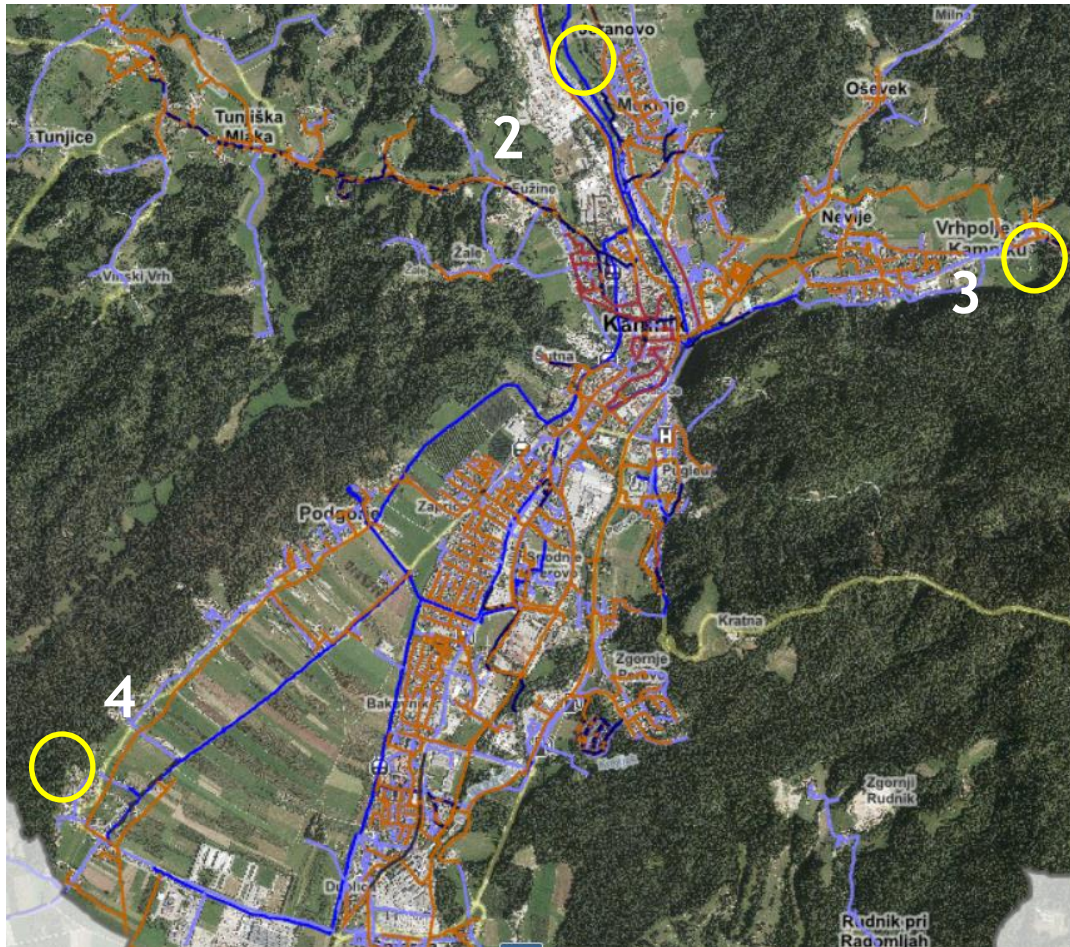


Figure 4. Water supply network with defined critical points for the TTX scenario (emergency scenario locations 2 - river bank erosion, 3 - impact on the WSS on the bridge, 4 - landslide)

1st phase of the scenario - forecasting and pre-activation

Forecasting and pre-activation is based upon the orange flood scenario issues by the national Hydrological institute (ARSO - Environment protection agency of the Republic of Slovenia)



Event no. 1: Flooded pumping station location Bistričica

Event start: 9.00 (6.5.2022): A water main supplying with water the area of Bistričica valley supplying approximately 120 inhabitants is flooded, causing pumped supply interruption (Figure 3 and Figure 5). The event is informed and observed by the SCADA system of the Water Utility, also calls are received from the inhabitants about the failure of water supply.



Figure 5. Photo of the pumping station.

Anticipated measures to be coordinated during the TTX:

- Activation of the **Water Utility** for the rapid rehabilitation of the pumping station (pumping flood water from the shaft, cleaning of the pumping station, purchase/provision of the spare parts (new pump) and reconnection of the system.
- Contacted Electricity Company (**Elektro Ljubljana**) regarding the electricity supply and eventually fuses replacement.
- Temporary provision of the water for the water uses (diversification for different users) - by the **Voluntary Fire Forces of the Kamnik**.
- Coordination by the Civil protection headquarters of the Kamnik Municipality.



Event no. 2: Erosion around the water supply main where the pipes are positioned directly next to the Kamniška Bistrica River.

Event start: 9.05. Due to flood induced bank erosion the main pipe is exposed and in risk to the breach (Figure 4 and Figure 6). Emergency scenario includes road block (police) and engagement of heavy mechanization - Concessionaire for heavy construction machinery and Slovenian Water Agency (responsible for the river maintenance works).



Figure 6. Example of the erosion exposed pipe

Anticipated measures to be coordinated during the TTX:

- Activation of the **Water Utility** for the exposed pipe control and measures in the cases pipe breaches.
- Announcement for water uses to prepare spare water.
- Coordination with the concessionaire for the provision of emergency erosion protection measures
- Coordination by the Civil protection headquarters of the Kamnik Municipality.



Event no. 3: Damages to water supply suspended on the bridge over Nevljica River at Vrhpolje

Event start: 10.06. The water supply is suspended for the upper part of the Kamnik Municipality due to the damage on the pipe suspended on the bridge over the Nevljica River (Figure 4 and Figure 7).



Figure 7. Bridge in Vrhpolje for on the location where TTX is performed

On the figure above the linear infrastructure hanged on the bridge, exposed to flooding events could be seen clearly. Resulting is the failure of water supply and measures related to the re-establishment of the water supply, notifications and temporary water supply.

Anticipated measures to be coordinated during the TTX:

- Activation of the **Water Utility** for the ruptured pipe control and measures in the cases pipe breaches
- Announcement for water users in the Tuhinj valley to prepare spare water
- Coordination of the water delivery for the users in the Tuhinj valley
- Coordination with the concessionaire for the maintenance of road infrastructure regarding the repairs on the bridge.
- Coordination by the Civil Protection Headquarters of the Kamnik Municipality.



Event no. 4: Landslide next to the drinking water reservoir Podgorje

Event start: 10.06. - Water supply relative to the zone around the Podgorje drinking water reservoir is ceased due to the comprehensive pipe break in the road infrastructure (Figure 4 and Figure 8). Temporary (surface) piping is anticipated as a measure.



Figure 8. Landslide on the access road to the water reservoir¹

Anticipated measures to be coordinated during the TTX:

- Activation of the **Water Utility** for the ruptured pipe control and measures in the cases pipe breaches - isolation of the target area with closure valves, identification of the impacted population and activities. Assessment of temporary connections using temporary surface piping system.
- Announcement for water users in Podgorje regarding the water supply service limitations (expected for some days)
- Coordination of the water delivery for the users in Podgorje
- Coordination with the concessionaire for the maintenance of road infrastructure regarding the repairs on road
- Coordination with the Police regarding the closure of the roads.
- Coordination with the expert regarding the nature of the landslide and landslide stabilization measures.
- Coordination by the Civil Protection Headquarters of the Kamnik Municipality.

Identification of roles per participant for every stage of an accident is defined upon the contingency management plan for the floods and water supply for Kamnik municipality.

¹ Photo for purpose of the TTX taken from another location



3. Hazardous events in history (regarding your hazard)

As mentioned in previous chapter the scenario is defined by a precipitation intensity of 249 mm in 24 hours, which corresponds to a 100-year return period for the Kamnik meteorological station. A similar event occurred in November 1990 with high intensity and caused several damages in different damage categories (Figure 9, Figure 10).

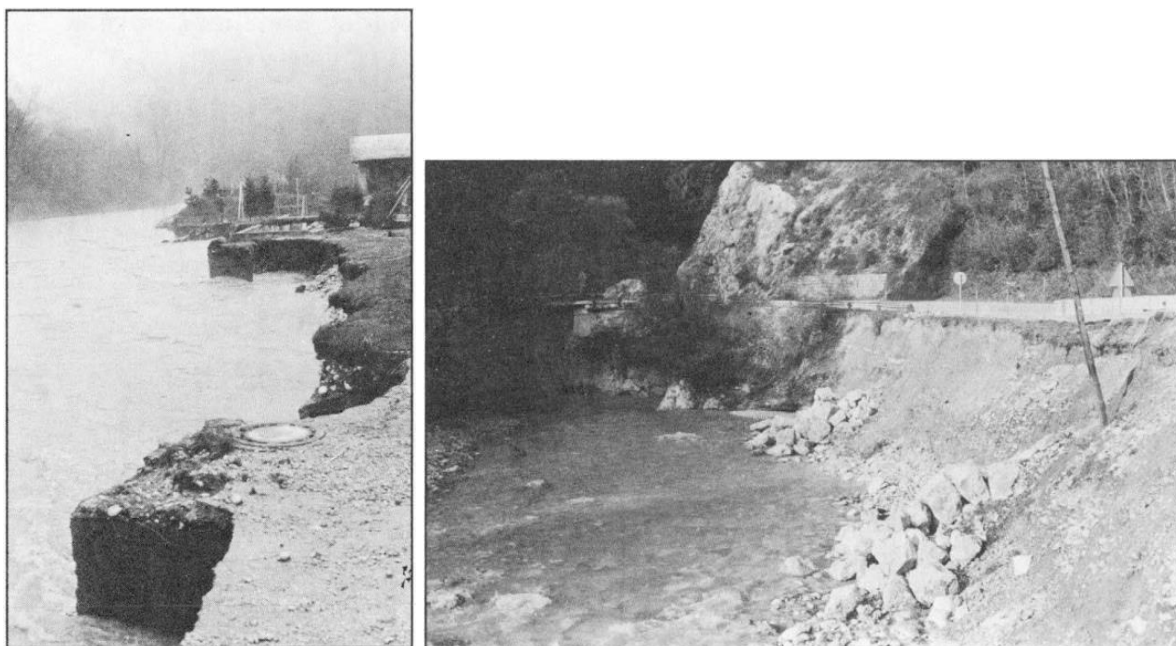
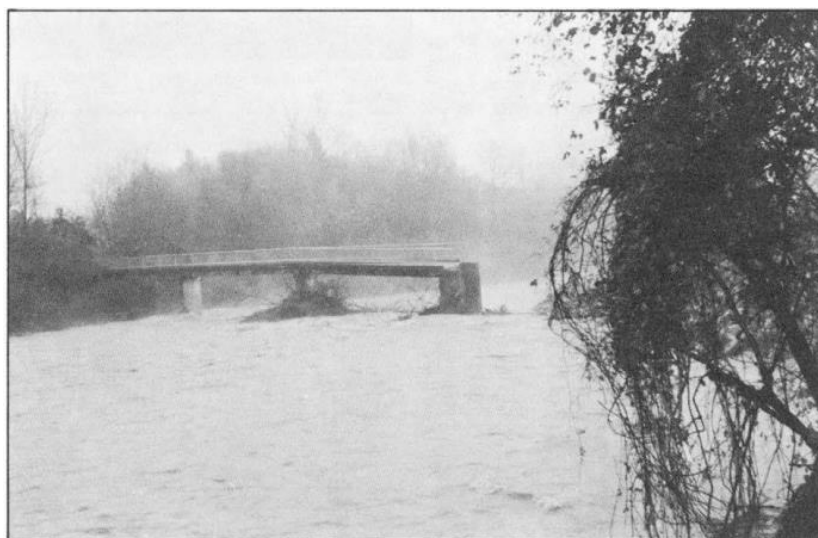


Figure 9. Bank erosion of Kamniška Bistrica River on the infrastructure after the 1990 flood event²



² Bat. M. Lipovšek I (1990) Učinki poplave 1990 ob Kamniški Bistrici v občinah Domžale in Bežigrad (Ujma)



Figure 10. Partially demolished bridge Homec-Radomlje over the Kamniška Bistrica River after the 1990 food event

4. Participants

The TTX took place with the involvement of the following participants:

- Municipal Civil Protection Headquarters Kamnik (Civil Protection Commander and Civil Protection deputy commander)
- Municipality of Kamnik (Lawyer and Public relations)
- University of Ljubljana, Faculty of Civil and Geodetic Engineering (flood experts)
- University of Ljubljana, Faculty of Natural Sciences and Engineering (groundwater experts)
- Water Science Institute (flood experts)
- Water Utility Company - Komunalno podjetje Kamnik d.o.o. (KPK d.o.o., water supply)

5. Timetable

The timeline of the actions that was carried out during the TTX is divided into 3 phases; orange alarm (Table 1), red alarm (Table 2) and flood events in four locations (Table 3, Table 4, Table 5 and Table 6). In the tables the list of actions and responsible bodies for activating are reported.

Table 1: TTX - orange alarm (4.5.2022), where weather situation is monitored

TTX - Floods in Municipality of Kamnik - chain disaster/accidents - impact on drinking water supply	
<p>Orange alarm - weather situation is monitored</p> <p>4.5.2022</p>	<p>Preparation for the event - Monitoring the situation on the Slovenian Environment Agency website, daily - information bulletin with the announcement.</p> <p>Orange alarm in central Slovenia (VOLNA) - communication between headquarters, PR</p> <p>Municipality of Kamnik:</p> <ul style="list-style-type: none"> - Briefing the Civil Protection Operational Headquarters on the weather forecast - KPK d.o.o. member of operational part of Civil Protection HQ is familiar with the weather forecast. Preparation of flood bags, filling the bags, checking the supplies and emergency purchase if needed - Are there any active construction sites along watercourses and key roads that need to be secured? Also, are there any renovations of water supply systems that needs to be secured?



	<ul style="list-style-type: none"> - Where is the key construction machinery of contracting companies - Civil Protection orders all available teams to be ready <p>KPK d.o.o.:</p> <ul style="list-style-type: none"> - Director is member of the Civil Protection HQ and gets acquainted with situation, approves communication with the operative person for flood bags - Expected increased turbidity in some parts of the water supply network - Emergency service works constantly and is operational at all times <p>Žurbi EKO d.o.o.:</p> <ul style="list-style-type: none"> - Mobility of construction machinery to Kamnik <p>Inštitut za vodarstvo (Water Science Institute):</p> <ul style="list-style-type: none"> - Expert basis - for decision-making (planning) <p>Hidrotehnik d.o.o.:</p> <ul style="list-style-type: none"> - concessionaire for the middle Sava - river supervisor - start of communication <p>Press release - announced orange alarm:</p> <ul style="list-style-type: none"> - General news - keep an eye on the situation - Residents are warned and urged to clean canals and meteor drains
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Table 2: TTX - red alarm (5.5.2022), where weather situation is monitored and serious situation is almost certain to happen

<p>Red alarm - weather situation is monitored - a serious situation is almost certain to happen</p> <p>5.5.2022</p>	<ul style="list-style-type: none"> - Civil Protection: Standby is ordered - continuation of the monitoring status. - HIGHER LEVELS OF PREPAREDNESS OF THE OPERATIONAL WORK OF THE CIVIL PROTECTION STAFF - Additional quantities of flood bags are filled - The data of the automatic hydrological stations at the measuring points Nevljica and Kamnik are intensively monitored - Monitoring of the radar image of precipitation (direction of development of the event), the radar image of precipitation for Austria is also monitored - The Civil Protection Headquarters is in contact with the electricity company (Domžale supervision) and Telekom (also large generators from Elektro Ljubljana) (Civil Protection has 14 generators in stock 9 KW -11 KW - three-phase), outside sockets at fire stations. - The electrical generator is being checked at the Civil Protection Headquarters - Voluntary fire brigades (PGDs) - generators at PGD locations and in vehicles - The Civil Protection headquarters instructs PGDs on the possibility of transporting water
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	<ul style="list-style-type: none"> - Contact with the Drinking Water Bottling Plant in Črnivec to be on standby - The Logistics team is activated - checks the stocks of material and technical resources (MTS), electrical generators and warehouse is being prepared <p>KPK d.o.o.:</p> <ul style="list-style-type: none"> - Operatives - filling anti-flood bags, delivery to PGDs and critical locations - Check the electrical generators in case of power failure - 11 units for power failure are available - No generators for water pumping stations - only for smaller ones - Contact with Electricity company (Elektro Ljubljana) is established - Predicted telecommunications outage (SCADA) - Preparation and disinfection of additional tank for water transport (to be checked) <p>Administration of the Republic of Slovenia for Civil Protection and Disaster Relief (ReCO LJUBLJANA) - regional headquarters of the Civil Protection Ljubljana, warehouse ROJE - National Logistic Center Ljubljana Roje</p> <p>ŽURBI EKO d.o.o. in JURJEVEC d.o.o. - heavy machinery - confirms that they are on standby (also HIAB for logs)</p> <p>RIVER SUPERVISOR: intervention team - its open construction sites - limited capacity.</p> <p><u>National Institute of Public Health (NIJZ)</u> - there are no activities in the preparation phase, instructions for food supply during floods are available, but there is no one to contact (GAP)</p> <p><u>National Laboratory of Health, Environment and Food (NLZOH)</u> - after 15 PM - results after 48 hours? NLZOH - should it be activated by the Regional Headquarters? Activating an environmental unit? (minimum regional level)</p> <p>Inter-communal exchange 1:1 - checking inventory list (suppliers - ANDOTEHNA)</p> <p>PRESS-RELEASE:</p> <ul style="list-style-type: none"> - Announced red alarm - Operational headquarters is working. Cooperation with contracting companies to perform protection, rescue and assistance tasks. - WHAT SHOULD INDIVIDUALS DO: instructions for flood residents (LINK URSZR) - measures before the flood
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	<ul style="list-style-type: none"> - (http://www.sos112.si/slo/page.php?src=pp7.htm), http://www.sos112.si/slo/page.php?src=pp7_2.htm - Reassure residents - Canals and meteor drains should be cleaned - Warning - in case of rising watercourses, withdrawal from watercourses and warning for driving on flooded roads
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Table 3: Flood events on 6.5.2022 - location 1

<p>Event notification - location 1</p> <p>(Studenca Bistričica pumping station)</p> <p>6.5.2022</p>	<p>IN THE ACTIVATION PHASE:</p> <ul style="list-style-type: none"> - Citizens report directly to the KPK that there is no water - Citizens over 112 report that there is no more water in Bistričica - (limited, through ReCO Ljubljana transfer to the on-call service (PGD Kamnik, which further deploys units according to the location of the event registration) - SCADA - KPK - on facilities equipped with remote control it is detected, the specific pumping station is not on SCADA. - The duty officer conducts an inspection and prepares a report <ul style="list-style-type: none"> - what happened - The pump is flooded and is not working, there is electricity at the pumping station - Duty unit. electro on KPK is activated <p>INTERVENTION:</p> <ul style="list-style-type: none"> - Civil Protection KAMNIK - Waiting for the KPK report if they need help. - Waiting for KPK report and if they need help - theoretical estimate of how much time they will need to solve the matter and notice the Civil protection HQ - Water supply level in water tank (as a reserve in case of pumping station failure) <p>PRESS RELEASE from KPK d.o.o.:</p> <ul style="list-style-type: none"> - Press release is harmonized with the Municipality PR- uniform message - Bistričica area - due to the failure of the pumping station, the supply of water is interrupted - In other areas, due to anticipated problems, there is water saving and preparation of a basic/smaller water supply - <p>Civil Protection Kamnik communicate with Civil Protection Central warehouse - stocks of material and technical resources (MTS): generators, pumps. What is the dedicated equipment at the Central Drinking Water Supply Warehouse - (they have nothing) CECIS is not activated?</p> <p>INTERVENTIVE WATER SUPPLY:</p> <ul style="list-style-type: none"> - In accordance with the plan for the operation of KPK in case of extraordinary events (the plan needs to be upgraded) 10 + 12 m³, additionally with 902 - supply of drinking water with bottled water.
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	<ul style="list-style-type: none"> - Warehouse control and contact with suppliers for emergency supply of pump and controller.
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Table 4: Flood events on 6.5.2022 - location 2

<p>Event notification - location 2</p> <p>(Bank erosion along the KIK)</p> <p>6.5.2022</p>	<p>IN THE ACTIVATION PHASE:</p> <ul style="list-style-type: none"> - No need to call electrical company as we assumed there was no electricity involved - Žurbi EKO d.o.o., Jurjevec d.o.o. take protective measures - Precipitation monitoring, precipitation trend - event development - PLANNING of measures - member of the Civil Protection (construction expert), landslides, method of erosion protection - Representative of the utility company is in the planning team <p>PIPE DAMAGE SCENARIO</p> <ul style="list-style-type: none"> - Action plan - prepared by the KPK d.o.o. <p>POLICE is present and is closing the state roads Concessionaire for the maintenance of state roads.</p> <p>HIDROTEHNIK - watercourse erosion - together with DRSV. Municipal road - KPK concessionaire inspector - directly</p>
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Table 5: Flood events on 6.5.2022 - location 3

<p>Event notification - location 3</p> <p>(Vrhpolje Bridge)</p> <p>6.5.2022</p>	<p>IN THE ACTIVATION PHASE:</p> <ul style="list-style-type: none"> - Control of critical bridges - HIAB - firefighters - contracted company - Survey of the territorial area - PGD - situation under the bridge - communication - every 2 to 3 hours. Key bridges (locations): Nevljica (Šmartno v Tuhinju), Bistričica (in Bistričica), Nevljica (Mamutov most) <p>INTERVENTION:</p> <ul style="list-style-type: none"> - If the interventions are minor, they can be carried out by firefighters - Major interventions are carried out by contract companies: Jurjevec d.o.o., Žurbi EKO d.o.o. - Inform the state concessionaire - Gorenjska Gradbena Družba GGD <p>IN CASE OF BREAKING THE PIPES ON THE BRIDGE - NEVLJICA IN FRONT OF THE GORGE:</p> <ul style="list-style-type: none"> - Inform the residents
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	<ul style="list-style-type: none"> - Preparation for repair, wait for the water to withdraw - Safety on site is a priority - safety instruction mandatory - Closed for traffic (Tuhinjska dolina) - Estimated time of emergency repair and re-establishment of drinking water supply - Plan - chlorine shock treatment - described in the HACCP plan
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Table 6: Flood events on 6.5.2022 - location 4

<p>Event notification - location 4</p> <p>(Landslide, Studenca)</p> <p>6.5.2022</p>	<p>IN THE ACTIVATION PHASE:</p> <ul style="list-style-type: none"> - Control of critical bridges - HIAB - firefighters - contracted company - Survey of the territorial area - PGD - situation under the bridge - communication - every 2 to 3 hours. Key bridges (locations): Nevljica (Šmartno v Tuhinju), Bistričica (in Bistričica), Nevljica (Mamutov most) <hr/> <p>INTERVENTION:</p> <ul style="list-style-type: none"> - First, the assessment of the situation by KPK d.o.o. - Assessment of Mr. Vrabc (Landslide expert) - type of landslide, landslide safety assessment - Area of landslide is closed by KPK and Police, notifications for residents - Provisional - temporary care for drinking water supply - Precipitation up to 50 mm is not a problem
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6. Lessons learned

Firstly, TTX revealed that the exercise was very well structured and organised. Prepared scenarios in several phases were realistic and clear to all participants. It should be noted that prepared chain events in four different locations due to floods are very unlikely to happen in real life, but nevertheless the plan was to have as many different events as possible in case of floods affect the drinking water supply.

Secondly, although TTX was assessed as successful, we summarized some shortcomings and highlighted and exposed the following conclusions:

- The Civil Protection Headquarters is secure place, therefore the reception areas is mandatory to avoid unauthorized matters.
- Each organisation has to keep record of who is involved in the intervention (records of attendance) and daily informs Civil Protection Headquarters with adequate information.
- Minutes of meetings, official notes of field visits of critical events are needed and expected to be handed over to Civil Protection HQ.



- PR has an important role and needs to inform the public accordingly. The news needs to be correct, short, concise and understandable to avoid any misunderstandings. If the event is of 'big extend' the mayor or the head of intervention is supposed to inform the public every three hours.
- Contract companies for the implementation of protection, rescue and assistance in natural and other disasters in the municipality of Kamnik do not need provision for temporary orders as they already have a contract with the Municipality. Claims for damages are legally covered and insurance policy is arranged. In this part the support and administration team is very important.
- The Planning Team are activated and established at the Civil Protection HQ in Kamnik, especially when event is complex.
- In the intervention all the involved people need to be listed accordingly.

Generally, all participants agreed that one of the most important thing is that roles and responsibilities of each staff or company involved are clear and that all involved people communicate with Civil Protection HQ. An important role is also played by PR, which informs the public about the potential hazards, on the developments of events and communicate how people can help and protect themselves and above all to reassure the public so that there is no panic.

7. Conclusion

The main conclusion is that exercises, in any form, are really welcomed and should be necessary in order to be able to be more efficient in real incidents.

The training and exercises are very important for all participants, as they are more confident in the event of an accident. In each exercise, deficiencies can be identified and therefore corrected after the exercise. In the case of the drinking water supply, a database on the availability of spare parts should be set up.

