D.T2.2.2. Partner-specific pilot action documentation - CROATIA (Istarski vodovod) - Draft

Lead Institution	PP5 – Water utility of Istria (IVB)
Reviewer/s	LP – National Research Council of Italy (CNR)
Lead Author/s	Dragan Kranjčić
Date last release	31.08.2021.

This project is supported by the Interreg ADRION Programme, funded under the European Regional Development Fund and IPA II fund.

Contributors – name and surname	Institution
Melita Čohilj	PP5 - IVB
Boris Mofardin	PP5 - IVB
Tomislav Jelenković	PP5 - IVB

Content

1. Introduction 6
2. Specific activities performed on the pilot site 7
2.1. Computer equipment acquisition 7
2.2. Hydraulic modelling software 8
2.3. Hydraulic model of IVB WSS 10
2.4. IVB WSP 18

List of figures

Figure 1: MUHA IVB Laptops no 1 and 2 7
Figure 2:MUHA IVB Laptop no 3 and PC.....8
Figure 3: Innovyze Infoworks WS Pro software 10
Figure 4: IVB WSS model network 11
Figure 5: Comparison of simulated and metered flow on flowmeter 551UZV 12
Figure 6: Comparison of simulated and metered flow on flowmeter 146UZV 12
Figure 7: Comparison of simulated and metered flow on flowmeter 60UZV 13
Figure 8: Comparison of simulated and metered flow on flowmeter 551UZV 13
Figure 9: Source Sv.Ivan outage simulation start 15.7. 22:15..... 14
Figure 10: Source Sv.Ivan outage simulation 16.7. 04:30..... 14
Figure 11: Source Sv.Ivan outage simulation 16.7. 11:45..... 15
Figure 12: Source Sv.Ivan outage simulation 16.7. 17:30..... 15
Figure 13: Source Sv.Ivan outage simulation 16.7. 19:30..... 16
Figure 14: Source Sv.Ivan outage simulation 17.7. 08:30..... 16
Figure 15: Source Sv.Ivan outage simulation 17.7. 09:45..... 17
Figure 16: Source Sv.Ivan outage simulation 17.7. 15:30..... 17

List of tables

No table of figures entries found.

1. Introduction

Partner-specific pilot action documentation is an "on-going" report to demonstrate the actual status of implementation of the pilot activities. This report will provide the technical information of the specific activities performed on the pilots (models specifically developed, measurements instruments and so on). Therefore, each pilot has to deliver a report on the actual status implementation of the pilot activities specifically referring to the specific activities and planned costs.

Water utility of Istria covers around 2/3 of the area of Istria Region in Croatia with around 70000 installed customer water meters. It has almost 2400 km of pipelines, 95 reservoirs and 42 pumping stations, supplying water intended for human consumption to 98.000 permanent inhabitants, as well as one 200.000 of tourists in summer for approximately 12 Mm3/Y.

The Pilot Action focus on the development of a mathematical (hydraulic) model of the water supply system which will be used for simulating the various hazardous scenarios, their impact on the water distribution as well the simulation of the optimal measures to be taken, all based on the proposals for harmonizing Civil Protection Mechanisms to Water Safety Plans defined in WP1.

2. Specific activities performed on the pilot site

The PA specific activities involve four major steps:

1. Computer equipment acquisition
2. Hydraulic modelling software
3. Development of hydraulic model of IVB WSS
4. Development of Water safety plan

2.1. Computer equipment acquisition

The activity involved the acquisition of computer equipment for the IVB employees who will be involved in the MUHA project. The procurement for the equipment finished in September 2020. Within the planned budget a laptop for the project leader was bought, as well two laptops and one PC for the employees who will work on the hydraulic model.

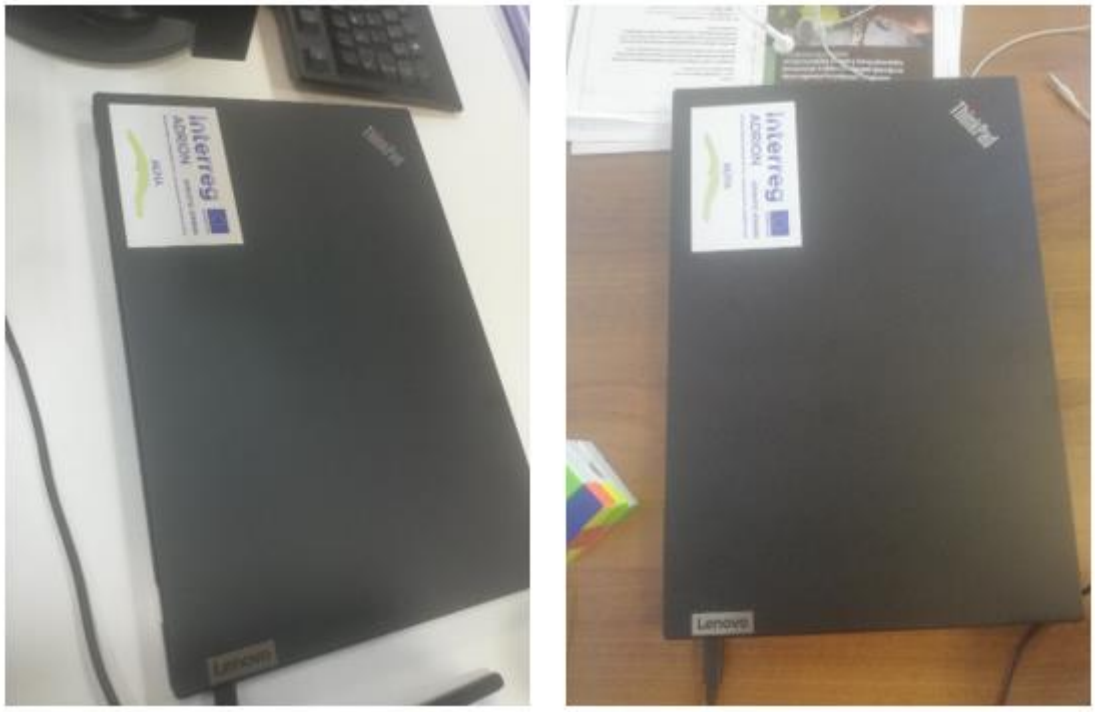

Figure 1: MUHA IVB Laptops no 1 and 2

Figure 2:MUHA IVB Laptop no 3 and PC

2.2. Hydraulic modelling software

Before stepping to the procurement for the development of the WSS hydraulic model it was necessary to define the software platform of the model.

In June 2020. the PA team defined the hydraulic modelling software requirements, the number of licences needed and the required employee education as follows:

- the possibility of performing hydraulic analysis of water supply systems
- The hydraulic modelling solution must enable the design, simulation, optimization and analysis of system performance as a standalone solution without the need for any other CAD or GIS platforms.
- The solution for hydraulic modelling must allow the user complete control of the configuration, calculation, evaluation, visualization, and comparison of an unlimited number of different simulations or scenarios in a single project. The user must be able to create and compare multiple design, analytical and operational scenarios of the solution to make reliable decisions in the management of the water supply system.
- The software must contain tools for checking the consistency of input data when entering them to create a hydraulic model.

- The software must include a tool for calculation and advanced analysis of the impact of water hammer and simulation of scenarios of selected system protection measures. If the Program does not have such a possibility, the Supplier must offer an adequate Program tool that has full compatibility with the Program.
- The software must enable simultaneous work of several users on the same base / model, defining user levels, monitoring the history of model changes and a system for warning of inconsistencies within the model.
- The software must be able to synchronize with the Client's GIS database of networks, hydrants and facilities, SCADA database of flow, pressure and water column height in reservoirs and the database of consumption reading systems by water meters.
- The program must be able to export data in EPANET (* .inp) format, AutoCAD (* .dxf) format, SHAPE format and all results in a spreadsheet database compatible with MS EXCEL.
- Permanent network (floating) license of the Hydraulic System Modelling Software - unlimited number of pipes - 2 licenses
- Permanent Network License for Hydraulic surge analysis software - 1 license
- Employees training (40 hours / prs) 3 pcs
- Annual license maintenance

The public procurement started in July 2020. and finished in September 2020. The contract was signed in September and the winning bid was for the Innovyze Infoworks WS Pro software.

After the successful installation of three permanent floating licences, in the September 2020., an 40 hours software education was held for the 3 employees who will work with the acquired software. The education covered the software basics of network topology definition, demands, calibration, SCADA connectivity, Hydraulic scenarios, etc.

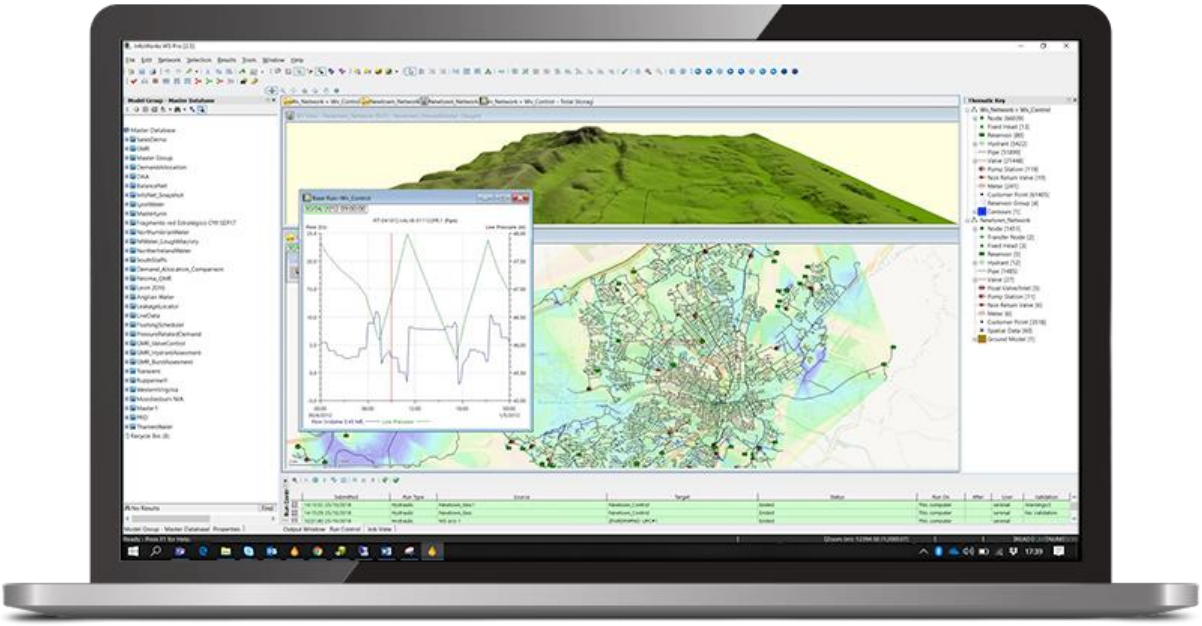

Figure 3: Innovyze Infoworks WS Pro software

2.3. Hydraulic model of IVB WSS

After the acquisition of the specific hydraulic modelling software, it was possible to make the Public procurement of developing the WSS calibrated hydraulic model.

As for the previous activities the IVB PA team defined the project task for the development of the WSS hydraulic model.

The project task defined seven elaborated chapters as follows:

1.Development of hydraulic model of existing WSS

2. Calibration of the developed model

3. Analysis of the current situation of the water supply system according to IWA methodology

4. Conclusion on the current state of functioning of the complete water supply system

5. Proposal for optimization of system operation

6. Analysis of hazard scenarios and operational distribution decisions

7. Analysis of future water consumption

The Public Procurement was announced on the October 2020. and at the end of December 2020. a contract was signed with the winning bidder.

The model development started in January 2021. when IVB gave all the necessary data (topology, consumptions, demand diagrams, SCADA data…) to the contractor.

In the beginning of March 2021 a preliminary topology model was presented and after the examination confirmed by IVB, so that the contractor can move to the next steps.

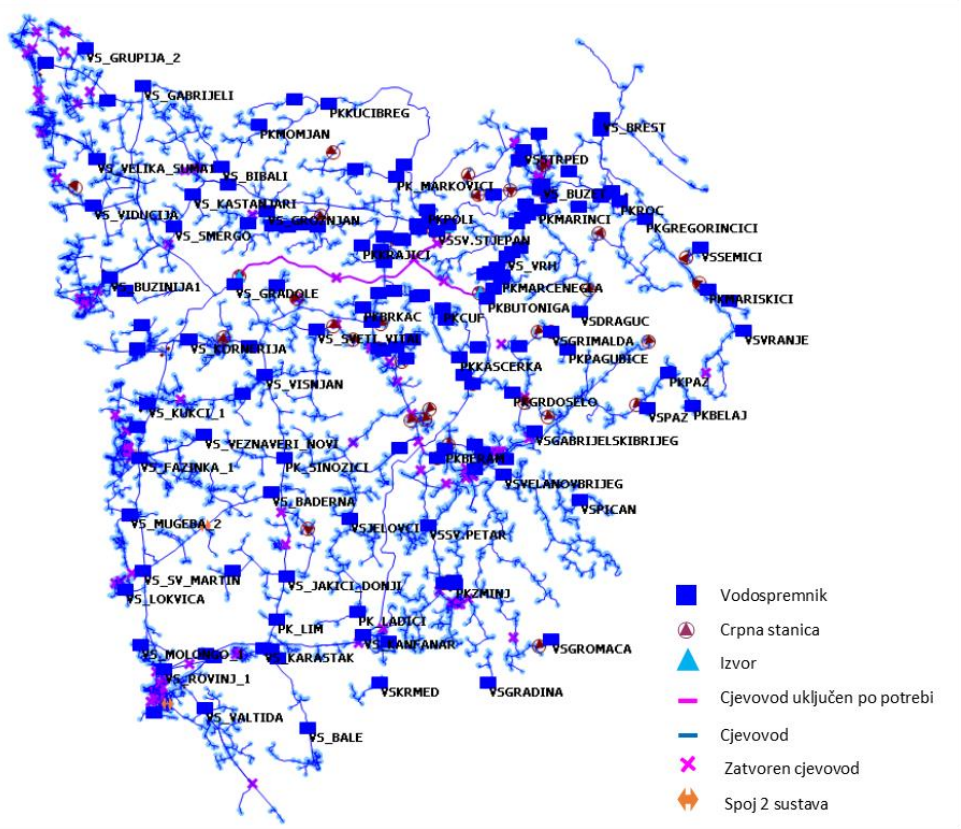

Figure 4: IVB WSS model network

IVB WSS modelled elements:

- 17765 model nodes
- 4 water sources
- 2360 km of pipelines
- 162 reservoirs and pressure breaking chambers
- 55 pumping stations
- 416 pressure reducing valves
- 125 floating valves
- 70088 customer points

The calibration of the WSS was probably the most complex part of the modelling and at the beginning of April 2021. the first iteration was presented. The calibration was mostly based on the water balance in each individual DMA, as there were not many pressure data from the telemetry. The specific consumer demand diagrams were analysed and corrected for each individual DMA, resulting a successful calibrated model.

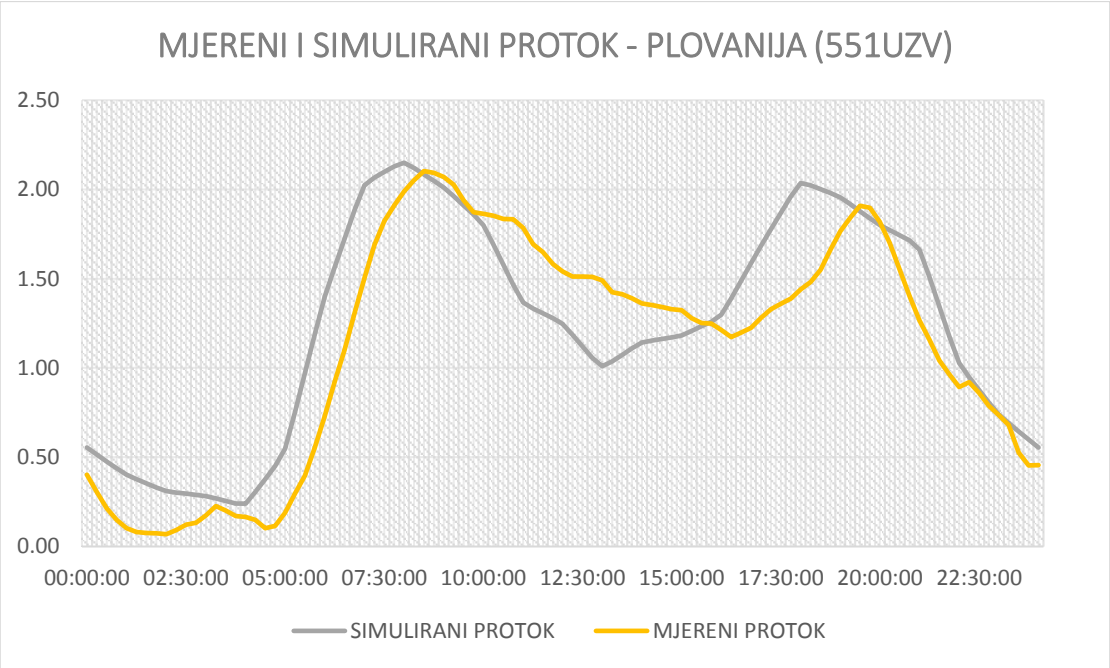

Figure 5: Comparison of simulated and metered flow on flowmeter 551UZV

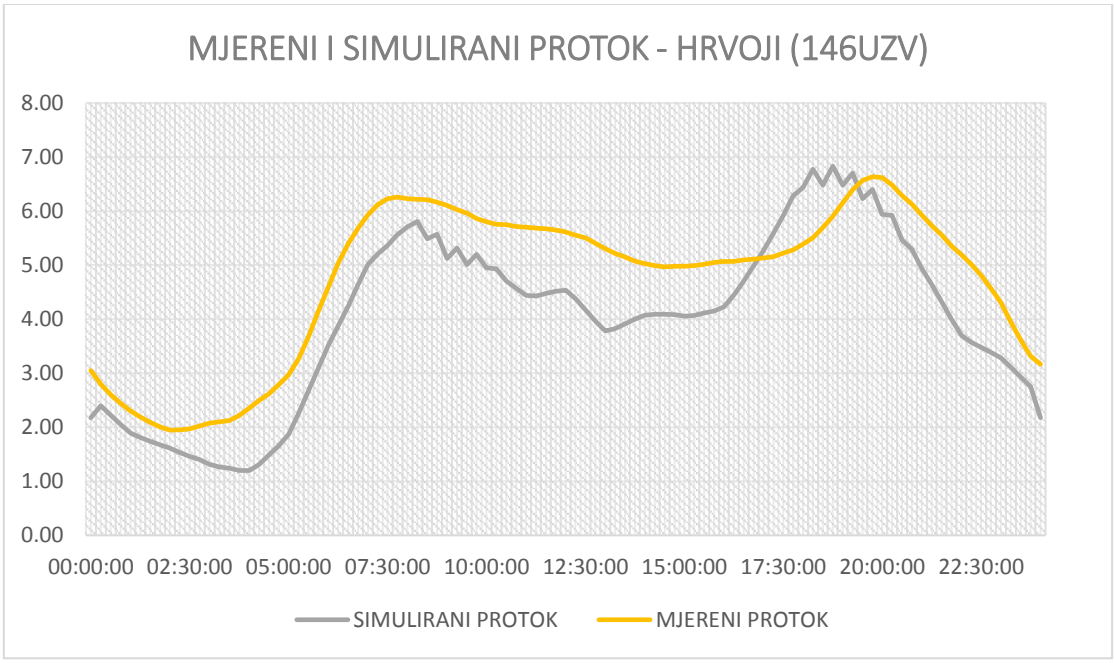

Figure 6: Comparison of simulated and metered flow on flowmeter 146UZV

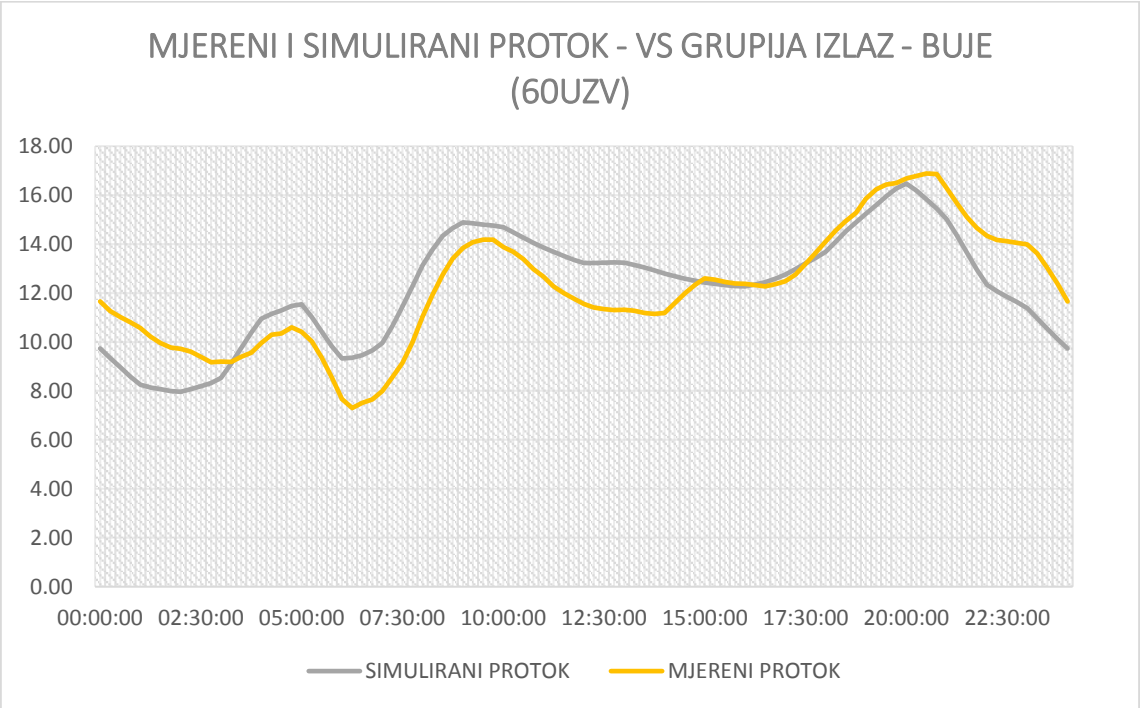

Figure 7: Comparison of simulated and metered flow on flowmeter 60UZV

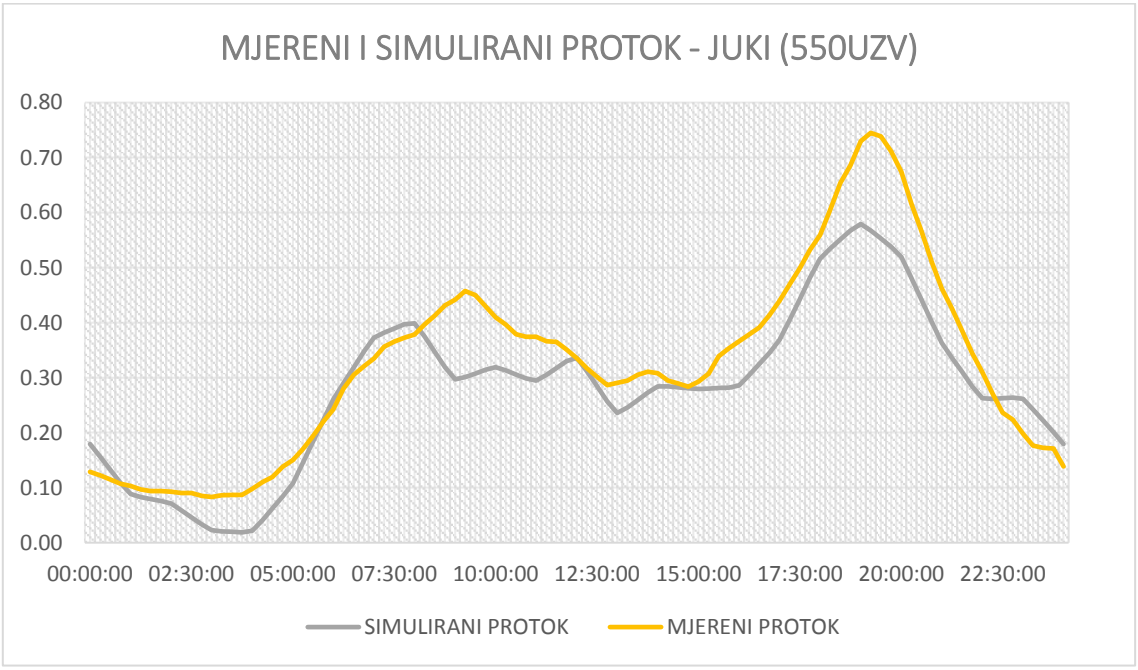

Figure 8: Comparison of simulated and metered flow on flowmeter 551UZV

The developed model of the existing WSS showed/confirmed several bottlenecks in the system and confirmed itself as a necessary development tool.

The most interesting hydraulic model part regarding MUHA project was the Analysis of hazard scenarios. The four MUHA hazards (Flood, Drought, Earthquake and Accidental Pollution) were analysed based on the impact on the WSS component previously defined in DT 2.1.3 document.

In the pictures below it is shown the impact of outage of the Source Sv.Ivan due to flood or earthquake hazard on the associated pumping station Sv.Ivan. A total of 12665 customers points are without water after 20 hours. With the proposed distributional measures in the WSS, around 3000 customer points are without water supply, and water filled cisterns have to be engaged for 48 h.

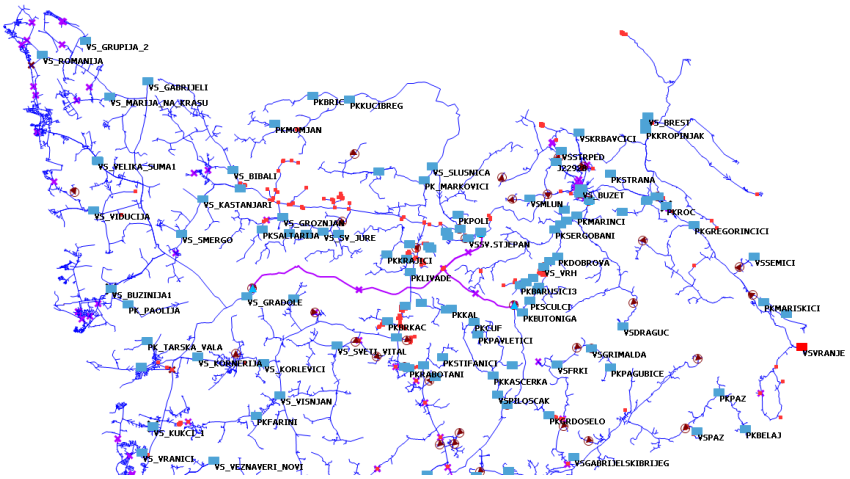

Figure 9: Source Sv.Ivan outage simulation start 15.7. 22:15

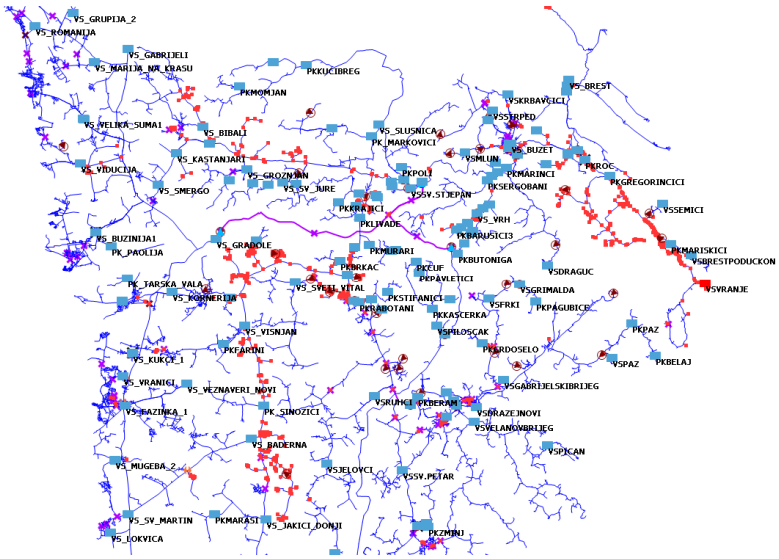

Figure 10: Source Sv.Ivan outage simulation 16.7. 04:30

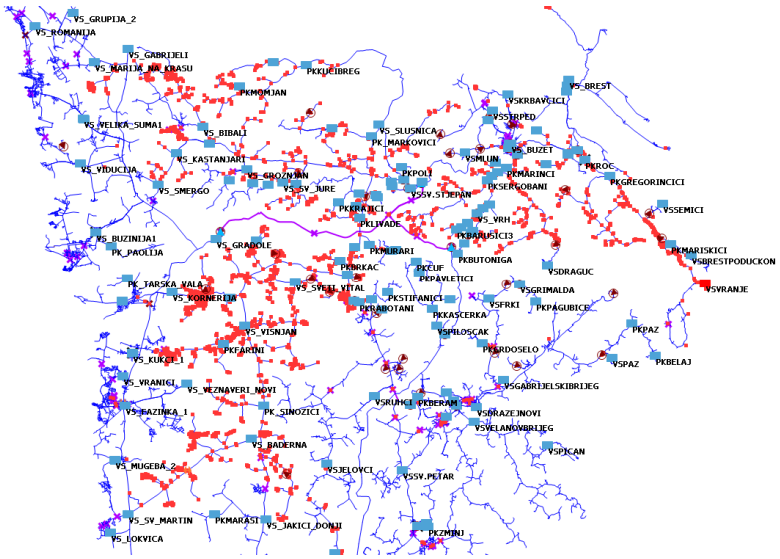

Figure 11: Source Sv.Ivan outage simulation 16.7. 11:45

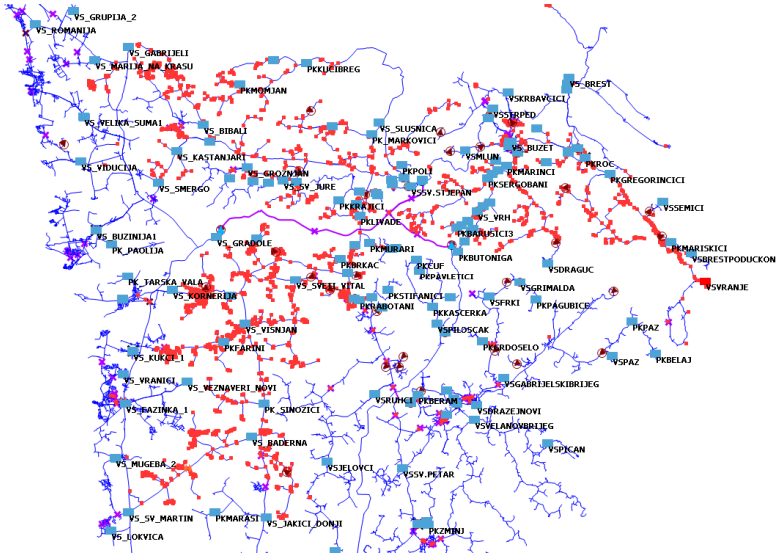

Figure 12: Source Sv.Ivan outage simulation 16.7. 17:30

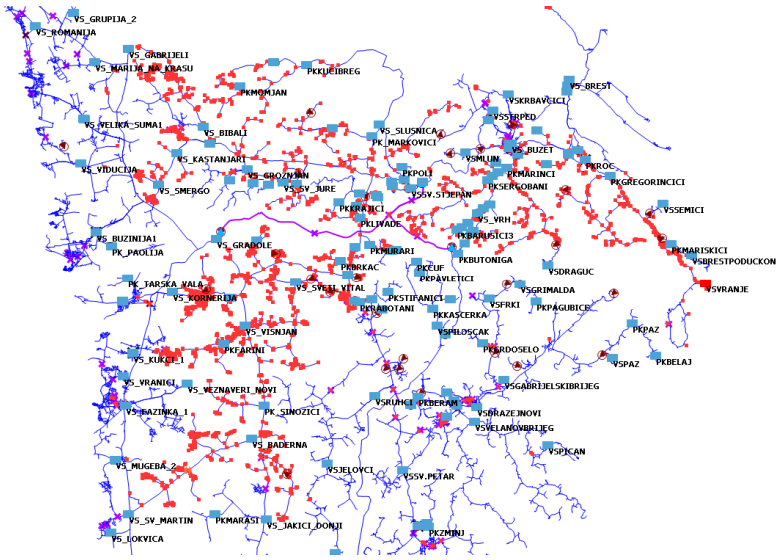

Figure 13: Source Sv.Ivan outage simulation 16.7. 19:30

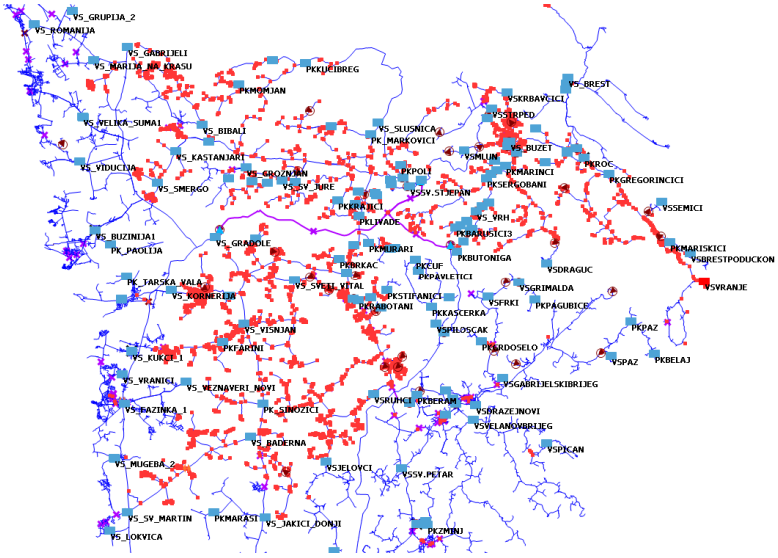

Figure 14: Source Sv.Ivan outage simulation 17.7. 08:30

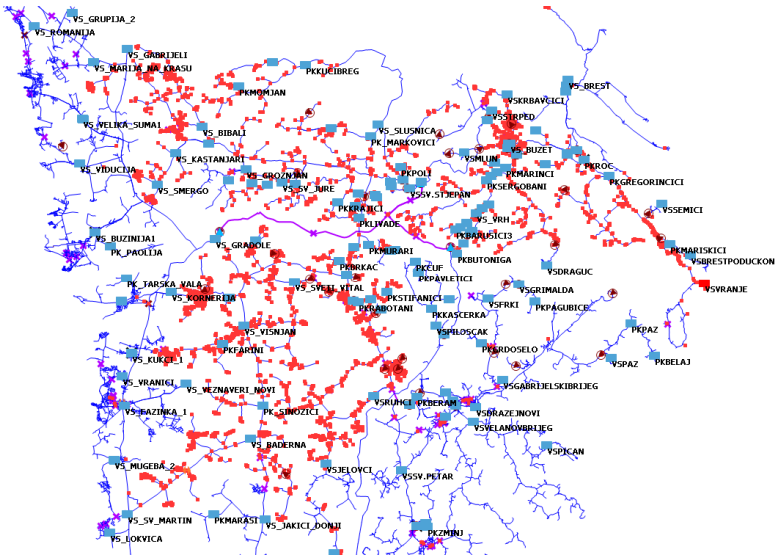

Figure 15: Source Sv.Ivan outage simulation 17.7. 09:45

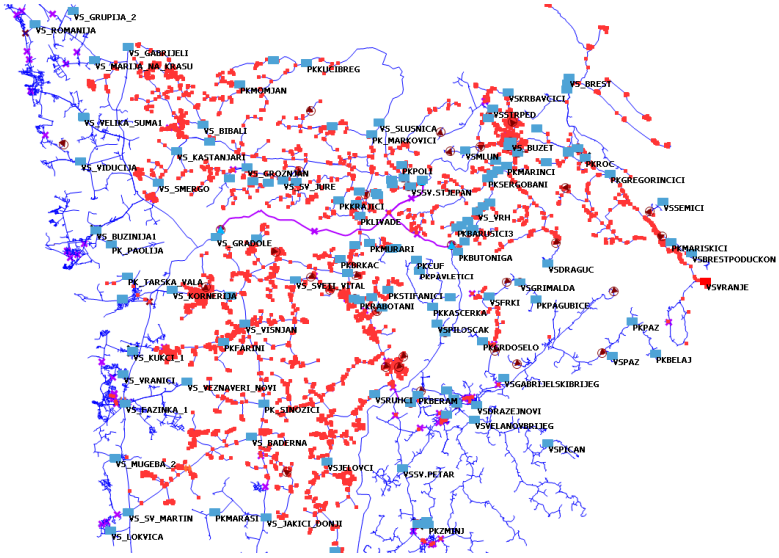

Figure 16: Source Sv.Ivan outage simulation 17.7. 15:30

The analysis results showed the range of impact on the WSS and helped defining an operational protocol which must be coordinated with the Civil protection department and implemented in the WSP.

2.4. IVB WSP

With budget reallocation, IVB managed to ensure funds for make an WSP.

The development of the Water Safety Plan for human consumption will enable harmonization with the legislative framework consisting of Commission Directive (EU) 2015/1787 of 6 October 2015 amending Annex II. and III. Council Directive 98/83 / EC on the quality of water intended for human consumption and the Water for Human Consumption Act (OG 56/13, 64/15, 104/17, 115/18, 16/20) which defines that legal entities that supply more than 1,000 m3 of water per day or supplying more than 5,000 people must establish water safety plans for human consumption by 31 December 2023 at the latest.

It is necessary to harmonize the Water Safety Plan for human consumption with the guidelines, toolbox and other documents adopted through the project Multihazard Framework for Water Related Risks (acronym: Project MUHA) co-financed by the European Union through the Interreg Adrion Program.

WSP will be done in two phases.

PHASE I - Analysis and description of the state of the water supply system ISTARSKI VODOVOD d.o.o. for the purpose of technical and organizational harmonization with legal and normative requirements:

- characteristics of water for human consumption

- flow diagrams

- consumer identification

- characteristics of water supply facilities and network

- description of technological procedures of water treatment

- analysis of current hazard and risk assessments and procedures according to adopted risk assessments (operational plans) - ISO 9001, ISO 14001, ISO 50001, HACCP and within the Service for Occupational Safety, Environmental Protection and Insurance

This phase is almost completed. Šušnić d.o.o. did draft of the document and now IVB check it.

PHASE II - Development of a water safety plan for human consumption – WSP which include:

- hazard identification, risk analysis, risk management, monitoring, corrective actions (risk analysis includes integration of guidelines for dealing with drought, flood, accidental pollution, and earthquakes - Guidelines for modelling and integration of hazards)

- development of support programs - operational plans for risk management and risk assessment

- unification of hazard and risk assessments and procedures according to adopted risk assessments (operational plans)

- harmonization with the standard HRN EN 15975 -1: 2016 - Security of drinking water supply - Guidelines for risk and crisis management (crisis management - method of action, monitoring, responsibilities, communication protocol, planning of alternative supply)

- education of responsible employees for the application of WSP

- Holders of activities: water safety team (according to assigned responsibilities) / consultants

The contract with Šušnić d.o.o. is signed in June. The deadline for drafting the Water Safety Plan for human consumption is 6 (six) months and it will be sent for the initial conformity assessment to the Croatian Institute of Public Health.