Presentation 5.1

MDSS IN SLOVENIA – EXPERIENCES AFTER 2 YEARS OF OPERATION

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INTRODUCTION

Road weather information system RWIS have been used to support road maintenance services in Slovenia for many years. The need for this assistance is particularly pronounced in winter time since Slovenia is located in a meteorologically diverse territory between the western Alps, northern Adriatic and Pannonian Plain. There are nearly 120 road weather stations (RWSs) altogether on Slovenian roads, situated mostly on motorways and regional roads.

Beside the RWSs data, short-term weather forecasts of high temporal and spatial resolution from INCA/ALADIN meteorological systems of National weather service ARSO are used. The INCA (Integrated Nowcasting through Comprehensive Analysis) system has been developed primarily for providing improved numerical forecast products in the nowcasting with high time resolution (30 min and 1 hour) and high spatial resolution of 1 km. The INCA analysis and nowcasting data include temperature, humidity, wind, and the amounts and types of precipitation. A widely used physical model for forecasting the road surface temperature (RST) and road condition METRo was incorporated into the road weather information system (RWIS).

Experiences of using METRo model showed that the root mean square (RMS) error for the RST predictions were generally satisfactory but could be too high at some sites, especially for the predictions around noon. Generally, to solve this problem, physical model was improved with further parameterisations of the relevant physical phenomena (anthropogenic influence, traffic influence, shadowing from the near objects, road physical characteristics) and combined with statistical techniques (i.e. regression, neural network) to improve the quality of input or output variables. Results of this development (Eurostars project METRoSTAT) were presented at SIRWEC conference in Andorra in 2014.

In winter 2015/2016 the RWIS was upgraded with additional functionalities and become a Maintenance Decision Support System (MDSS) which supports managers in making appropriate decisions. Route-based forecasts were implemented along the entire Slovenian road domain. Such road forecasts can support winter maintenance decisions with automatically treatments selection (MDSS provides time, type, amount and place of each treatment). The consultant for this module was company Klimator AB from Sweden. System is developed as a modern cloud-ready web application. The poster was presented at SIRWEC conference in Colorado in 2016.

EXPERIENCES AFTER 2 YEARS OF OPERATION

MDSS was fully operational on Slovenian motorways in last two winters. There is a picture about user's interface below to show the basic functionalities of MDSS.

Our experiences showed that route-based weather forecasts optimization is a is a process that never ends. We developed algorithms and methods to extrapolate measurements from RWSs and forecasts with emphasis on continuous validation and verification of the obtained data. Verifications of route-based forecasts were made with occasional additional measurements at predefined locations.

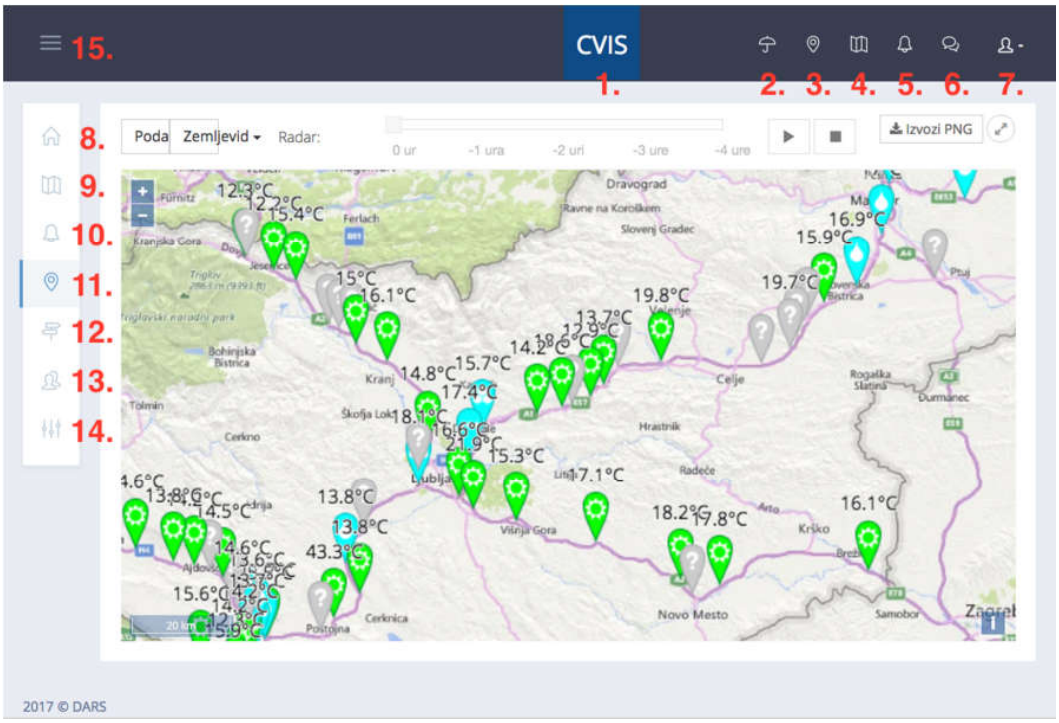

Fig. 1. MDSS user's interface: 1 connection to RWIS, 2 weather forecast in words and pictures, 3 map with RWSs, reports about measurements, 4 road forecast with actions, 5 notices of measures, 6 message notices, 7 Edit your profile, browse conversations, and sign out, 8 The MDSS entry page, 9 road forecast with actions, 10 Overview of current and archive actions and the possibility of creating a new one, 11 map with RWSs, reports

about measurements, 12 Overview of motorway bases, 13 User administration, 14 Control panel administration of applications and files, 15 Extension of the menu / navigation bar.

The implementation of the MDSS into the winter service and the education of users was also a very important task of the implementation process. Training was carried out across all motorway maintenance bases (9 locations). Winter service staff is a demanding user who expect precise and reliable weather information on the road. In order to gain more trust in MDSS from the service staff, we had needed to clearly distinguish real time RWS measurements from real time (route-based) extrapolations/predictions. Based on the feedback, proper use of words in warnings, actions, decisions etc. should be used (for example: phrase "Possibility of ice on the road" instead of "Ice on the road"). Continuous cooperation with road winter maintenance staff is the key to an effective system that is tailored to the needs of the user.

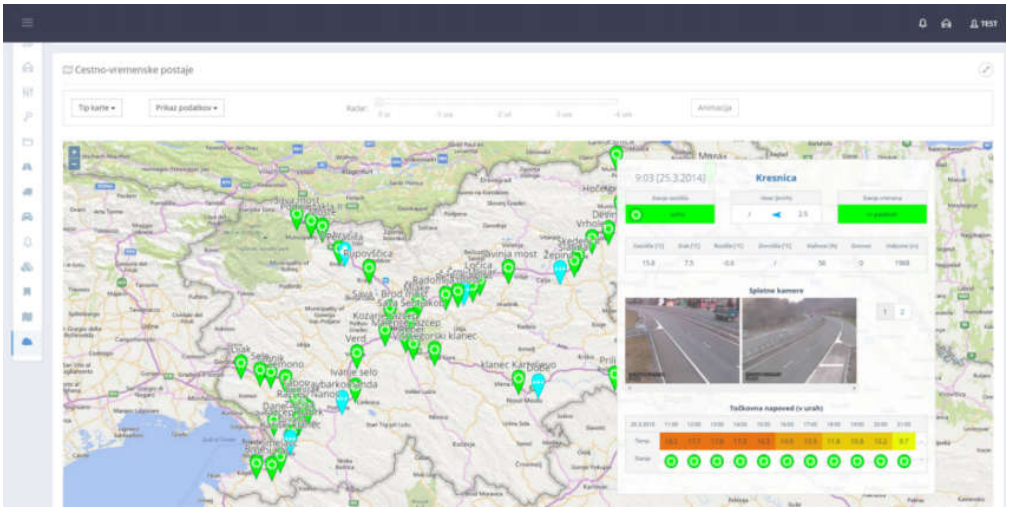

Fig. 2. Recommendation of action in MDSS.

PLANS FOR THE FUTURE

Mobile measurements of 15 new mobile sensors on winter service vehicles will be implemented into RWIS/MDSS before the next winter season. They will enable route-based weather forecast verification on one hand and dynamic route-based weather forecasts, especially on critical sections, on the other hand. Route-based weather forecast will be further optimized with additional thermal maps and machine learning.

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