MONITOR II

SOUTH EAST EUROPE
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Requirement analysis: data

Data needed for CSA

Data needed for the "Continuous Situation Awareness" system can be split into two groups. Data needed to construct the system and data needed for its operation.

First group includes hazard scenarios (or even better risk scenarios) in form of flood maps (including vulnerability studies in case of risk scenarios). This data will allow the system to assess the severity of the flood event and issue appropriate warnings. In effect the system could predict the need for intervention forces and where (and possibly when) they will be most needed. If including vulnerability studies the damage can be anticipated as well as the need for temporary lodgings for the evacuated population, shelter for evacuated farm animals etc.

For the operation of the "Continuous Situation Awareness" system data input is needed. In order for the system to represent actual events on the field with as little delay as possible and also for it to be user friendly, we have to concentrate on the most important data, thus avoid losing time and usability with unnecessary information.

The basic data inputs for the operation of the system are weather forecasts and up to date measurements from automatic meteorological and gauging stations. The second would show the current and the first the possible future state of affairs. That would allow good assessments of the situation at hand and fairly accurate assessments of the future situations. The latter of course being crucial for good preparedness and intervention planning.

It is essential, that these data sources are as steady as possible to ensure steady operation of the CSA system. And since no measurement system is 100% steady, the CSA has to be able to cope with possible (temporary) data deficiencies as a result of measuring system failures or communication difficulties or other similar problems.

In addition to above mentioned data, the CSA system should also use feedback from the field. Meaning that the intervention participants would be able to report on the status of the situation at hand, and share their needs and the needs of the endangered and the affected population. Also the distress calls from the people living in the hazardous areas, received by the information centres, should be somehow forwarded to and included in the CSA.

Data for CSA construction

The Hazard scenarios are results from a set of computer calculations on a mathematical hydrologic - hydraulic model. For the construction of the model, following data is needed:

- Topographic data
- Watercourse geometry and morphology
- Infiltration – runoff data

Additional data for model calibration, such as data of past floods (discharge, water levels) and the according precipitation data is also needed.
The results of calculations based on different inputs (different rainfall distribution in time, space and intensity) would be best presented in form of flood maps, showing the flooded area for different scenarios.
In case of Risk scenarios additional vulnerability studies are needed. For each hazard scenario, additional data regarding land use of the flooded area, endangered population, businesses, affected infrastructure such as roads, railways, bridges etc. is needed.

In Slovenia there were hardly any risk scenario or hazard scenario studies made, so there is room for improvement.

Data for CSA operation

This involves following data:

- Weather forecasts, on which the appropriate hazard or risk scenario of the anticipated flood event is chosen
- Hydrological and meteorological measurements, which would be used to examine whether the chosen scenario is still the proper one, or if another scenario better describes the current situation
- Feedback on the intervention

Weather forecasts and reports

Raw meteorological data (precipitation, wind velocity, air moisture, radar and satellite images etc.) tells a lot about the current weather situation and perhaps even more importantly, it can be used to predict future weather situations. With improving meteorological models such predictions are becoming more and more accurate, which means that weather forecasts, if included in early flood warning systems, can improve preparedness and can better intervention management during floods.

Weather forecasts differ mostly on the time scale of the predictions. The short range weather forecasts (predicting weather situation for some hours ahead) are ordinarily more accurate, but do not leave much time for flood preparations. Forecasts with longer range (some days ahead) are on the other hand less accurate - can lead to wrong conclusions - but allow enough time to make necessary preparations. Thus we can conclude, that the best way is to implement both into the CSA in order to achieve optimal situation awareness and preparedness.

Weather forecasting in Slovenia is also the duty of the Environmental Agency of the Republic of Slovenia (ARSO) at the Ministry of the Environment and Spatial Planning (MOP). In addition to the common weather forecasts, ARSO also presents results of the ALADIN meteorological model. The seventy two hour forecast can be seen on the webpage of the agency. The forecast is renewed every day. In addition to that ARSO - as well as many other similar European agencies - makes extreme weather warnings that are presented on the www.meteoalarm.eu webpage.

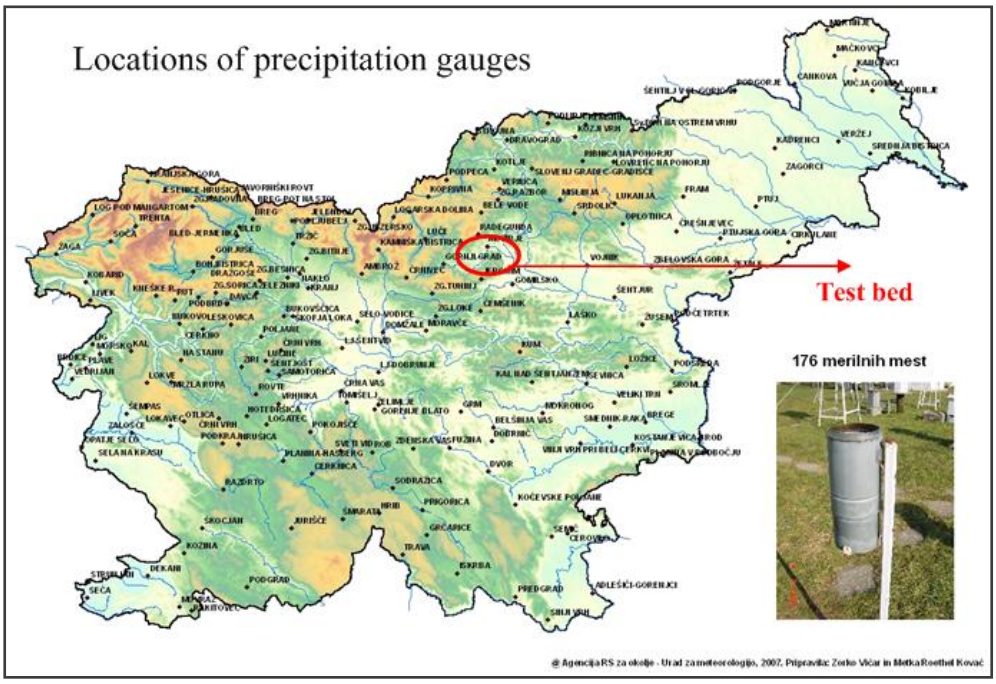
Since the purpose of Meteoalarm weather warning system is to warn the inhabitants of Europe of all the dangers that changing weather brings (storms, high precipitation, frost, extreme temperatures, wildfire risks etc.) and since floods have become very costly natural events in past times, ARSO decided to make a similar warning system called Hidroalarm, specialised in flood risks. Although the system is not yet completed, it proved very useful and accurate before and during the last floods in Slovenia in Sept. 2010.

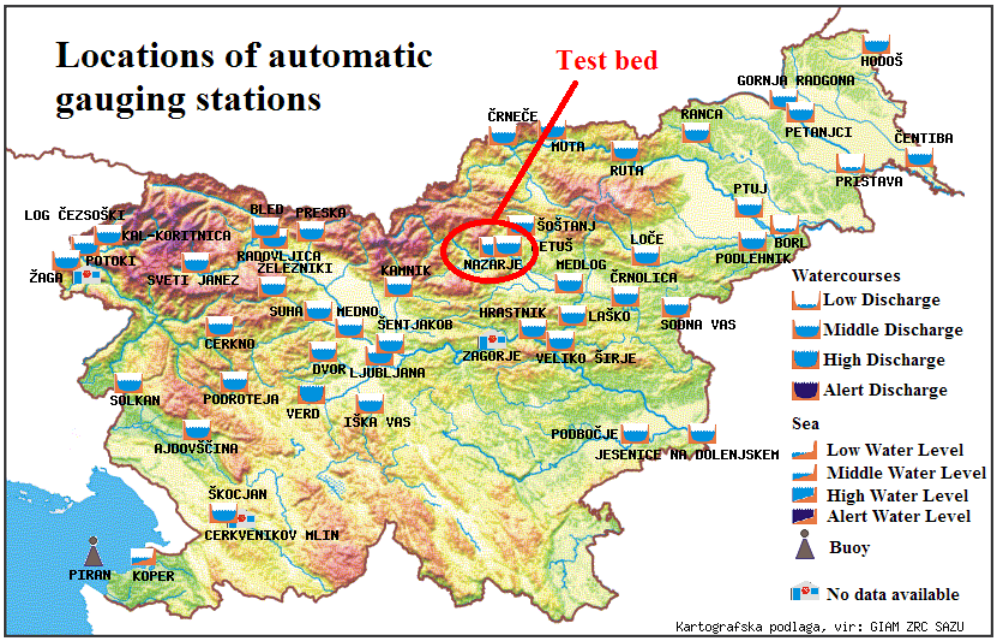
Measurements

In Slovenia most environmental measurements are carried out by the Environmental Agency of the Republic of Slovenia (ARSO) at the Ministry of the Environment and Spatial Planning (MOP). The Agency manages one hundred and seventy six precipitation gauges on which precipitation is measured twice daily (manual readings), thirty six automatic meteorological stations (automatic real time measurements transmission) and thirty seven pluviographs. In addition to that, meteorological radar and satellite images (cloud pictures) are also being used for better precipitation measuring and weather forecasts.

The measurements of the automatic stations are available on the ARSO website (with some delay: 0.5 – 1 hour), as are the measurements of the meteorological radar (the precipitation image of radar measurements in ten minute intervals is shown with some ten minute delay) and the satellite images.

Unfortunately none of the automatic precipitation stations are located in the test bed. But two lie in the vicinity.





ARSO also manages one hundred and eighty two gauging stations of which forty seven are automatic. The measurements of the automatic stations (on thirty minute intervals) are also available on the ARSO website, but sadly with quite a delay (approximately one hour delay). Measurements are presented as water levels, water temperature and water discharge. Although the presented data is raw (not reviewed), which means that its accuracy might be in question (especially the discharge, since the relationship between water level and discharge is not fixed due to hydrometric changes in the watercourse), it is on the other hand very useful, even essential.

Since the Slovenian test bed is often subject to minor and major (and even extreme) floods, it is quite well equipped with gauging stations, for there are two automatic stations operational

within the test bed (Nazarje and Letuš I). That itself means a good basis for the foundation of an early warning system like the CSA will include.

Feedback information

Although feedback information is not necessary for the operation of the SCA warning system, it can be of great help during intervention.

On field intervention participants can, since they have a good overview, give valuable reports on the situation at hand. From their knowledge of the terrain, local demands and from their experience, they can often see one step ahead and can provide the intervention leaders with good situation assessments. In addition to that they are constantly in touch with the affected and the endangered. Thus they are able to report on the actual needs of the people.

Distress calls from the people living along watercourses, reporting high water-levels or flooding of watercourses are currently being received at and collected by the regional centres of information (ReCO). These forward the received information to the civil protection forces (which are included in the intervention). The ReCO are also obliged to make reports on the received distress calls. In crisis situation though, these reports are seldom finished in time, as a result of an overwhelming amount of calls received. Information from such distress calls could be used in the CSA system to help with situation assessment. Although some filtering of the information would seem wise, since many callers report of the same circumstances, some might exaggerate etc.

List of input data

Following data is needed for the "Continuous Situation Awareness" system:

- Data for CSA construction
  - Hazard/Risk scenarios
    - data needed for modelling (topographic data, watercourse geometry and morphology, infiltration – runoff data, data for model calibration)
    - data needed for vulnerability studies (land use, endangered population, infrastructure, businesses ...)
- Data on CSA operation:
  - Weather forecasts
  - Meteorological measurements (mainly precipitation)
  - Hydrological measurements (water levels and discharge)
  - Feedback information

Conclusions

Regarding hazard/risk scenarios there is much to be done, since there are close to none such studies made in Slovenia. For the CSA system to be useful and accepted, hazard and risk scenarios would have to be made. The main problem regarding the subject is that it may take many years for hazard/risk scenarios to be prepared for all the flood zones, since there are no legislative regulations or guidelines made on the subject and since there are currently no real tendencies to make them.

Meteorological and hydrological data needed for the operation of the "Continuous Situation Awareness" system is available to use (it is even presented on the web). The main problem are the delays. They are manageable in case of floods resulting from long term precipitation, but in case of torrential and flash floods every minute of delay means higher damage risks and higher risk of human casualties. That is why it is essential to get real time data with as short a delay as possible. A direct lineage between data collection and SCA input would seem a good solution. To find a way to achieve that, additional research would have to be made.