

MIS INTO FLOODS AND POLLUTION IN HYDROGRAFIC AREAS

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ABSTRACT: The project has , the objective to obtain a modular configurable system for monitoring, forecast and assisted decision for the evolution of the level of rivers in hydrographic areas, for reducing the risk due to floods, and for solving the crisis situations. The whole infrastructure is based on radio network communication. The system is to be an operative mean of interpretation for crisis situations. The decision staff (Romanian Water Authority, District Councils, Environment Agencies, Civil Protection, Mairies, Fire Squads and so on) may be informed on line, for optimal decisions with maximum promptness *based on intervention plans*. The project is put into practice and is finalized with a data bank and a pilot system covering such an area between Romania and Hungary.

KEYWORDS: MIS, Data acquisition, radio network transmission, management, open system.

INTRODUCTION

The main technical features of the system are:

- Data acquisition and processing of parameters from meteo and hydro transducers;
- Modeling of specific processes for evaluation of the impact and the risks of floods and water pollution for fundamenting the politics of eliminating or reducing the effects over the ecosystem and the population , both on normal functioning conditions and in situations of emergency ;
- The integration of the preventing politics with those of security and those of action in case of an emergency;
- The presentation of maps for regions, zones, and basins through GIS based programs. The maps are contained in a configuration file, together with the precised location(X,Y) of the control group on screen for each station and associated map;
- The presentation of the acquired data through synoptic schemas and specific programs for optimizing the answers and eliminate or/and reduce the flood effects;;
- Prognoses functions for flood evolution;
- The calculation of hydro/pollution balances on the area surveyed;

- The calculation of the maximum flowrate through the volumetric method ;
- The obtaining of reports as tables or diagrams on selectable areas and time;
- Simulation functions for flooding and water pollution ;

The system will include

- Risk analyzing methods in real time and anticipative, due to plans or technical specifications according to the European legislation;
 - Real time evaluation of the potential flooding or the risk of industrial accidents that may pollute the water.
 - Software that can be a base of study for environmental or industrial risk;
 - The procurement of specific equipment adapted to the potential beneficiaries requests, including training and formation of personnel according to international rules;
- The project is finalized with a data bank and a pilot system covering such an area between Romania and Hungary.

The economic and social objectives:

- The increasing of security in operation in normal and critical conditions in hydrographic areas with a large risk of floods and pollution;
- Larger technologic efficiency (risk survey implies technologic conformity survey)
- An equidistant way of monitoring for hydrographic areas;
- The use of information technologies in taking decisions;
- The adopting and the use of environment quality standards at CE level;
- Application in transfrontier zones;
- The project is harmonized with the European and Romanian strategies;
- It helps to the reconversion of labor force in fields as: environment protection, civil protection, industrial security.

The system is an application, the software providing the necessary functions for data acquisition, the meteo and hydro parameters on the Cris Basin- Oradea

The monitoring of meteo and hydro parameters

The program has a main screen that presents synoptic schemas with the marking of the measuring points connected to the information system and an attached LED for signaling the distress situations.

The Menu has the following options:

- **Work-station configuration** one can configure the work-station as the **main station** so it can communicate with the local stations and allows local interrogation or as an **auxiliary station** so it can read the files from the main station, but can't do the local interrogation.
- **Configuration/Communications** The configuration/interrogation panel has:
 - § 49 "**buttons**" corresponding to the 49 stations - meaning the following:
 - § pressed(ON) and coloured in green - operational stations that can be interogated;
 - § pressed and coloured in yellow - the stations didn't answer the last interrogations, but one still tries
 - § the linking with them, un-pressed (OFF) and coloured in red - those stations are unoperational and they are not to be interogated;
 - § The passage from operational to unoperational station is done automatically,if that station didn't respond to three successive calls (2 interrogations at each call) from the dispatcher.

- **The sub-panels for establishing the physical addresses of the stations** - 4, corresponding to the four basins. They become visible by pushing the buttons that define the basins (Barcau, Crisul Alb, Crisul Negru, Crisul Repede) .
 - Ø **The hourly sincronizing button** - pressing it has the effect a transmission of a command of "hourly sincronizing" to all the stations.
 - Ø **Hour display** - shows the time at the dispatcher.
 - Ø **Dialog box for choosing the number of the station** - the number of the station is the number displayed over the corresponding button (this number refers to the actions of the adjacent buttons "Local interrogation", "Parameters calling", "Parameters setting").
 - Ø **"Local interrogation " button.**
 - when actuating this button a command of asynchron interrogation is sent to the station with the pre-established number from the box " Dialog box for choosing the number of the station".
 - the sending of the message is signalled by the display of a text message on screen; if the station answers in 15 sec. the values from the transducers are displayed in the same text message; if the station does not answer ,another command is sent to the station, also signalled on the screen; if the station answers , the values are registered in the application files. Further more the action of the operating personnel is registered in the "Operator report"
 - Ø **Calling for parameters button** - its action is resembling to the " Local interrogation " button, but it is sent a command of " Calling for parameters" to the selected station; if the station answers the parameters are displayed on the corresponding station display.
 - Ø **Setting parameters button** – the parameters established in the numeric boxes corresponding to the selected stations and initiates a specific dialogue for modifying the established parameters; if the dialogue concludes without errors, a signal of "Parameters validation" is automatically sent, and the station will have the parameters changed.
 - Ø **Configuration report** The program displays on the screen and at the printer the configuration report for:

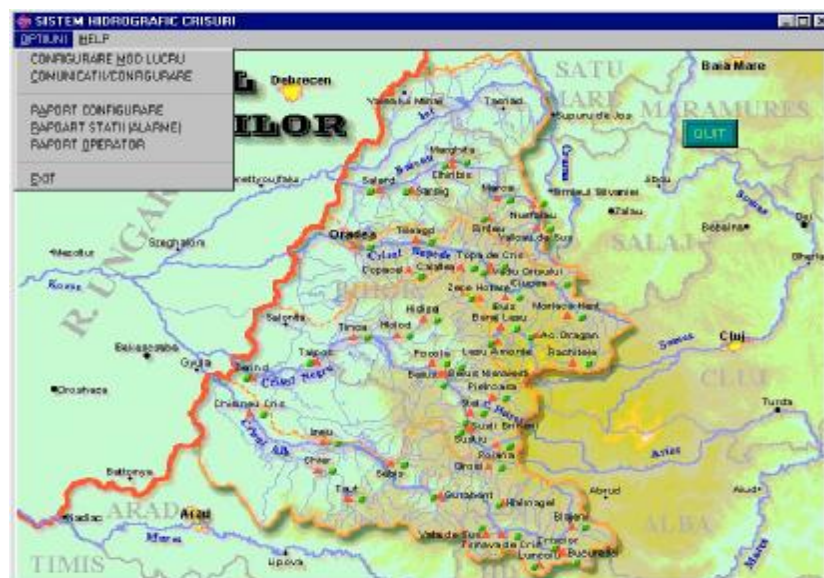


Fig. 1 - Monitoring of meteo and hydro parameters

§ **Station situation report** The program displays on the screen and at the printer the most recent report of messages received from the stations

§ **Operator's report** The program displays on the screen and at the printer the report of the operator's actions .

Using the mouse we obtain on the screen the most recent current values.

A menu can be opened with the following options:

1.Hydrographic data In a pop-out type screen are displayed the geographic and hydrographic data

2.Current values for parameters In a pop-out type screen are displayed the most recent values of the parameters.

3. Parameter report - Last 24 hours On the screen are displayed the graphics with the values of the parameters and the list of values for the last 24 hours.The button ZOOM near each graphic permits the enhancing of the graphic. In the new screen the graphic can be printed.This one and other printing options , like page offset, color or black printing, can be reset.

4. Parameter report - Last month On the screen are displayed the graphics with the values of the parameters and the list of values for the last month.The button ZOOM near each graphic permits the enhancing of the graphic. In the new screen the graphic can be printed.This one and other printing options , like page offset, color or black printing, can be reset.

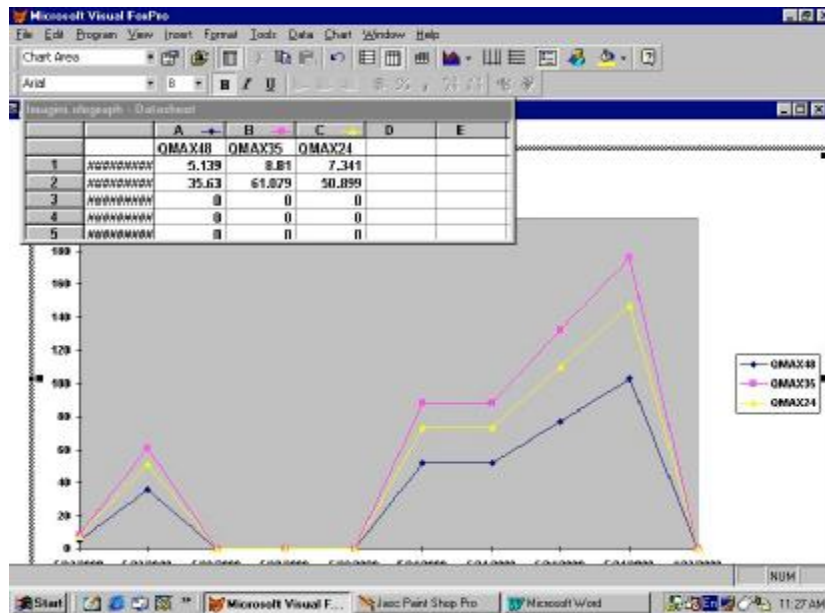


Fig. 2 - Hydrographic data

5. Parameter report - Requested period. On the screen are displayed the graphics with the values of the parameters and the list of values for a requested period of maximum a month..The button ZOOM near each graphic permits the enhancing of the graphic. In the new screen the graphic can be printed.This one and other printing options, like page offset, color or black printing, can be reset.

6.Interrogate station. It is active only on MAIN work mode.It opens a box that displays the values resulting from an interrogation or a warning message for impossibility of communication.

The software generates hourly, automatically a HYAVERT telegram, for all the stations that are on level alarm, or immediately after receiving "red meteor", for rain and offers the possibility of automated execution launch of a USER application, after a cycle of an hour (established by the user). In an asynchrony mode, one may launch another application existent on the users PC.

Information Management and Processing.

The software has a main panel for different user's options:

ALARM and STATIONS REPORT the user may obtain a report of alarm situations by pressing the **INTERFACE** panel button.

1. **OPERATOR REPORT** the user may obtain a report of a daily or monthly operator's activity, that can be displayed on screen or/and print it.
2. **REPOART GENERATOR** The application offers the user a report generator, where the user may choose the data base associated to one of the stations, can select the fields of the data base that he wants to be included in the report, can choose the the presentation form, the page format, or a sorting (upwards or downwards) after the chosen field. After the establishing of the report data the user has 3 options of finishing:
 - A) Saving the report under the implicit name or the name he wants under the implicit directory, or in another directory and the listing will be made later.
 - B) Saving in the manner described and modifying through specific means.
 - C) Saving and printing

4. PROGNOSYS FOR HYDROGRAPHIC BASINS

The calculation formulas for volumetric prognosis in the hydrographic basins take in account: mathematical models for evolution; mathematical models for flow recovery; affluent flows linked with lake telegrams; lake capacity curve; mathematical models for calculation and statistic analysis; mathematical models for level and flow prognosis;

5. Hydro Balance on rivers The pannel **BILANT HIDROLOGIC** includes the section "OPERATOR DIALOGUE", a section where the user must introduce the specific calculation parameters and the data for which a balance is needed. The software will calculate the hydrologic balance on the last 24 hours between the current refference hour and the refference hour from the earlier day.

After the date specification and the calculation parameters for starting a calculation procedure the software waits for the parameters validation. The user has 2 possibilities:

§ view the report that contains **HYDRO BALANCE ON RIVERS**

§ to print the report that contains **HYDRO BALANCE ON RIVERS**

To launch this application one choose the corresponding option from **INTERFACE** panel, the user having the option to store the data from the current year and the precedent year. The archive will have the name of the year and will be saved in the archives directory.

6. THE CALCULATION OF THE MAXIMAL FLOWRATES The user must choose the station for which is wanted the calculation of maximal flowrates through volumetric methods. The panel **CALCULATION OF THE MAXIMAL FLOWRATES** contains the section "DIALOGUE WITH THE OPERATOR", a section in which the user must put in the specific calculation parameters. There is a field **DATE AND HOUR** where the operator will find the current date and hour. He

can keep them or change them with new values. After choosing the parameters for starting the calculation procedures using one of the 2 calculation methods, the operator must select one of the two initiator attached to the two methods. The identification of the method is made by using the two pictograms attached to the two buttons. After using one of the methods, the user has 4 options:

- a) **VIEW THE REPORT** – situation preview
- a) **PRINT REPORT** – print the situation on the system's printer.
- b) **DIAGRAM** – a diagram is obtained with the data resulting from the application of the method (qmax-datatime) that will be memorised in a temporary data base. During the application (especeally after choosing this option) a Browse command will be made (Browse implicit SQL).

PRINT DIAGRAM – for printing the diagram use the button PRINT DIAGRAM, a Browse command will be made, the user having the option that by double click on the only existing register in the only field of the temporary data base, to reconfigure the implicit form of the diagram. (legend can be modified/renounced, diagram colour/form can be changed, values can be adjusted, environment clour or font changed), etc.

OVR-OIR REPORT At the reference hour (OVR or OIR) a report will be drawn containing: station code; level (at reference hour); flowrate (at reference hour); temperature (at reference hour); last 24 hours rains; The operator will make an entry in the corresponding field (implicit current data). Then he actates the corresponding button in the panel. For preliminary preview VIEW the REPORT button is pressed and for printing PRINT REPORT is used.

8. ALARM REPORT FOR NUMERIC IN-PUTS The application offers the option of generating, viewing, and printing the situation of alarms on numeric in-puts, daily, monthly or at a chosen interval.

CONCLUSIONS

The project has, the objective to obtain a modular configurable system for monitoring, forecast and assisted decision for the evolution of the level of rivers in hydrographic areas, for reducing the risk due to floods, and for solving the crisis situations. The whole infrastructure is based on regional data radio network communication. The project is finalized with a data bank and a pilot system covering such an area between Romania and Hungary. The decision staff (Romanian Water Authority, District Councils, Environment Agencies, Civil Protection, Mairies, Fire Squads and so on) may be informed on line, for optimal decisions with maximum promptness *based on intervention plans*.

The system realise the modeling of specific processes for evaluation of the impact and the risks of floods and water pollution for fundamenting the politics of eliminating or reducing the effects over the ecosystem and the population, both on normal functioning conditions and in situations of emergency; The application software offers the possibility of interfacing with other applications and systems: Integration in an existing information system; transmission to a higher level; data transmission to other regional or national authorities; the integration of other specific equipments (i.e. meteo radar), data base statistics, evolution prognosys.