EXPERIENCE WITH THE USE OF RODOS IN EMERGENCY CENTERS AND REASONS FOR THE RE-DESIGN OF RODOS

F. Gering[*], W. Raskob[**]
[*]*Federal Office for Radiation Protection (BfS), Germany*
[**]*Forschungszentrum Karlsruhe (FZK), Karlsruhe, Germany*
e-mail: fgering@bfs.de

One of the major observations following the nuclear accident from Chernobyl was that decision making has to be harmonised. Initiatives emerged to overcome this problem, among others the development of a Decision Support System (DSS) for the application in whole Europe, RODOS (Realtime Online Decision Support System for nuclear emergency management). The RODOS system for off-site nuclear emergency management [European Comission, 2000] is under development with support of the European Commission involving many institutes throughout Europe. Main objective is to develop a decision support system for nuclear emergencies that is generally applicable throughout Europe, covering all distances and all phases of an emergency situation. RODOS has been designed as a comprehensive system incorporating models and databases for assessing, presenting and evaluating accident consequences. Additionally, the system has direct interfaces to plant safety information, radiological and meteorological networks. The RODOS system integrates a whole suite of models, including models for calculating the atmospheric dispersion in the near and far range, a hydrological model chain (run-off of radionuclides from watersheds, transport in river systems, behaviour in lakes and reservoirs), a model for calculating the deposition to soil and plants, a food chain and dose model, and a group of models to evaluate the possible consequences of countermeasures.

The development of RODOS began in 1989 with a small number of partners. Participation and geographical coverage increased during following years, currently the further development of the RODOS system is supported within the EURANOS project, integrating 17 national emergency management organisations with 33 research institutes, brings together best practice, knowledge and technology to enhance the preparedness for Europe's response to any nuclear or radiological emergency (see Fig. 1).

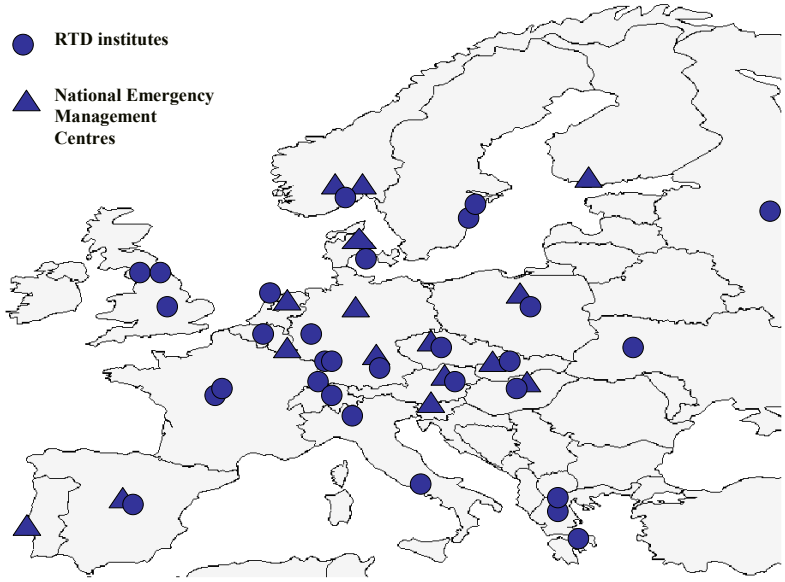

Fig.1 European coverage of the EURANOS project

In the last years the RODOS system has been installed in a number of countries as a decision support tool in national emergency centres, both in the European Union and in Eastern Europe (e.g. in Germany, Finland, Poland, Ukraine).

An explicit goal of the current development of RODOS within the EURANOS project is the improvement of the system to an extent that it could be used by national emergency management organisations in a fully operational emergency mode, as up to now some features of the system require still too much interaction with the system administrator and the response time of the system providing first results is improvable. Furthermore, the general handling of the system has to be tailored to the decreasing resources of national emergency management centres for personal operating IT-tools. To achieve this goal, the RODOS Users Group (RUG) has been established as a discussion and interaction forum for co-ordinating and managing activities related to the demonstration and enhancement of the RODOS system and for providing essential feedback to the developers. The RUG consists of representatives from all emergency centres that are operating the RODOS system or are planning to use it in the future, complemented by some of the key developers of the system to ensure direct feedback from the users to the development teams.

The experiences of the RUG in the last years has led to significant modifications of the work programme of the EURANOS project. In particular the user interaction with the RODOS system was criticised in the light that manpower and resources in emergency management organisation is reduced from year to year and therefore the operation of the decision support system has to be assured also with a very limited amount of trained operators and experts. In particular in the first phase of the emergency, an easy and fast access to results is essential to have enough time initiating emergency actions such as evacuation, sheltering and distribution of iodine tablets. Taking these aspects into account a development process has been initiated by the RUG, which consists of two steps:

In a first step a newly structured user interface was developed using state of the art IT technologies with its implementation in JAVA (object oriented programming language). This new interface facilitates direct error management of the user's input and guides him through a series of easy to understand input frames.

In a second step the existing system was carefully examined and user requirements for further developments were collected. Based on these results a complete re-design of the RODOS system has been initiated, focusing on modern IT-technology and enhancing the system to be used as an information platform for tools related to emergency management and rehabilitation.

The main critics of RODOS users regarding the current RODOS system and based on their long-time experiences with the system were the following:

- The system is not easy and intuitive to use (especially when deployed in emergency situations; e.g. too many parallel windows, no intuitive behaviour, it does not have a Windows-like look and feel, it does not completely shield the user from the underlying Unix operation system, and there are only few consistency checks on input). Considerable training is therefore needed to operate the system.
- The GIS tool lacks important functionalities (e.g., direct import of raster or vector map data in common formats; aggregation of results; easy configuration of layers)

- Data stored in data base cannot be accessed by the user (e.g., for visualization of measurement data; visualization and editing of model parameters, for use in a separate (national) system)
- Maintenance effort is very high (e.g. no administration tool)
- Adaptation to national conditions is very laborious (e.g. use of national weather forecast data; adaptation of model parameters)
- Integration of new models is quite difficult
- Instabilities of the whole system during runs

As a result the RODOS system is in operational use only in very few countries (i.e. it lacks broad acceptance). This reduces the chances that a sustainable maintenance and support for the system can be assured after the end of the EURANOS project and further more questions the whole idea of establishing a common European system.

The main objective of the RODOS users is to have a system that provides support in case of a nuclear or radiological accident anywhere in Europe, supports exercise preparation in addition to emergency management, can be made operational in all European countries (e.g. meets or can easily be adapted to national requirements), and that is easy to operate (at least in certain core functionalities) and reliable in its use. Especially important are:

- User friendly and intuitive graphical user interface with low training requirements and easy, consistent and neatly arranged user input forms
- Graphical representation of results that meets user requirements (e.g. integration of GIS functionalities, multi-lingual, annotated, etc.)
- Easy system administration and low maintenance costs
- Technical support including hot-line, web page (properly managed, supervised and kept actual, with notification on news etc.) for download both updates, patches, new versions etc. and guides and manuals, FAQ section
- Easy way of integrating external simulation modules in a framework with clearly defined interfaces

The RODOS users laid down their requirements for the re-design of the RODOS system in a long “wish list”, in which priorities for the various requirements were provided, general demands were listed and more detailed requests were developed for a list of 16 use cases, which describe typical applications of the system in an emergency centre.

In the meantime the re-design of RODOS has already led to the delivery of three prototypes developed by UCEWP (Ukrainian Center of Environmental and Water Projects, Kiev, Ukraine), several more advanced prototypes are planned for the second half of the year 2007, a final version is planned for the end of 2008. The delivered prototypes were immediately evaluated by the RUG. Following this evaluation, the RUG provided guidance in defining the objectives of the next prototype. This interaction is the only guarantee, that the re-engineering will achieve what the operational community expects and will continue with the next prototypes in the same way.

Web page:
EURANOS web site: http://www.euranos.fzk.de/