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ROKO-Database of the Environmental Radioactivity Measurements in Slovenia

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ABSTRACT

ROKO is the acronym of the Environmental Radioactivity in Slovenian language "**R**adioaktivnost v **OKO**lju". Computer database ROKO contains data of all measurements of the radioactivity in the environment in Slovenia. Data about radioactivity in the environment have been collected in Slovenia more or less regularly since 1961 on. Most results are gathered in the form of paper reports. Slovenian Nuclear Safety Administration (SNSA) has initiated the project of transfer of all those data into the electronic form and making it available for easy research. The database is designed so, that it contains all records, relevant for any kind of analyses and for the transfer to the international data systems. By the end of the summer 2005 a major part of data from previous years have already been transferred into the database and the user interface software is under development. It will allow the users to examine individual data records, to plot time history graphs or geographical contour plots.

1 INTRODUCTION

Starting with the year 1961 the monitoring of radioactivity at the territory of Slovenia was going on more or less continuously. The state authorities have financed a regular programme of monitoring, which was intensified after the Chernobyl accident. At regular intervals ranging from few weeks to few months samples of soil, water, food, feedingstuffs and air are collected at several tens of locations throughout the country and the dose, dose rate, isotope activity, isotope concentration or some other parameters, related to radioactive contamination, are measured. The operators of nuclear facilities and some other polluters are performing their regular operational monitoring around their facilities. In addition special studies were performed occasionally like measurements of radon concentrations in dwellings or Cs-137 content in mushrooms. All these activities or projects typically resulted in written reports or published papers. Vast majority of them is in public domain. In the last decade most of such studies are summarised in the Annual Report on the Radiation and Nuclear Safety in the Republic of Slovenia, prepared every year at the Slovenian Nuclear Safety Administration [1]. However, although there is plenty of data available, it would be quite a tedious job for

everyone, who would like to make any special study like trend analysis based on measured facts or estimations of population exposures. In order to make the existing data even more available, the project ROKO was initiated at Slovenian Nuclear Safety Administration in late 2004.

This paper reports about the concept of the system, its first development phases, current state of development and expected time of final implementation.

2 CONCEPT OF THE DATABASE

ROKO is the acronym of the Environmental Radioactivity (in Slovenian language **R**adioaktivnost v **OKO**lju). In the design of the database we followed the following principles:

- It should allow conversion of all existing data into the electronic record under the principle one data-one record.
- It should allow easy future addition of data of any measurements or newly discovered historical data.
- It should allow easy selection of data by geographical location, date of measurement, type of measurements, type of monitoring, measured value, sample type, implementing laboratory etc.
- It should take into consideration all requirements regarding Commission Recommendation of 8. June 2000 on the application of Article 36 of the Euratom Treaty concerning the monitoring of the levels of the radioactivity in the environment for the purpose of assessing the exposure of the population as a whole (2000/473/Euratom) [2].
- It must simplify fulfilment of our obligations regarding reporting to international systems of environmental radioactivity data like EASYPROTEO.
- The design must be simple and easy to maintain, used software support system should be robust, reliable and inexpensive.

The public domain software MySQL for database management and PHP for supporting software tools were than selected. The ROKO Database was developed as a relational database containing one record for each measured value. Each record is related to supporting tables of geographical locations, types of measurements, radionuclides, measuring units, implementing laboratories and several others. For each measurement the following data are available in the database:

Measured radionuclide (isotope)	Type of measurement
Measured value	Date of the beginning of sampling
Measured unit	Date of the end of sampling
Measurement error	Date of measurement
Type of error	Implementing laboratory
Type of monitoring	Used instrument
Type of sample	Source of data
Type of sample preparation	Contractual arrangement, under which the measurement was performed.
Geographical co-ordinates of sampling	For surface waters: name of river, lake, reservoir or sea)

3 THE DATA TRANSFER PHASE

After the database was designed, the process of transfer of data from written reports into the electronic form was contracted. The company AMES was awarded the contract and has mounted quite extensive campaign of filling the data into the database. Some 46 annual reports [4-9] had to be retyped, transferring about 220,000 records into the system. Altogether 20 students were recruited for that job. The system of quality control was developed in order to minimise amount of wrongly transferred data. The process lasted for more that six months and was finished only in summer 2005, when SNSA received the database with row data. Currently we have most of data covering the period 1980 to 2004 included in the database. In the next phase we are going to complete the database with the data which were taken in the period since 1961 as part of monitoring of global contamination in living environment.

In parallel the software for transfer of data into the ROKO Database in the future is under development. It will be the request of SNSA for any future monitoring campaign in the country to submit final results in the form, suitable for easy transfer into the ROKO Database. Every contractor will have the possibility to use this software for that purpose.

4 USER INTERFACE

User interface is that part of the whole system, which is really offering added value to the users. The development of the user interface was initiated in spring of 2005 and was subcontracted to the company Zavod za varstvo pri delu. The design requirements were the following:

- The interface should be web based, ie. no special software should be needed at user's computer other that internet browser.
- Public domain software must be used.
- No software changes should be needed after new data are added into the database.
- Basic starting point for search into data should be a map of Slovenia (Figure 1).

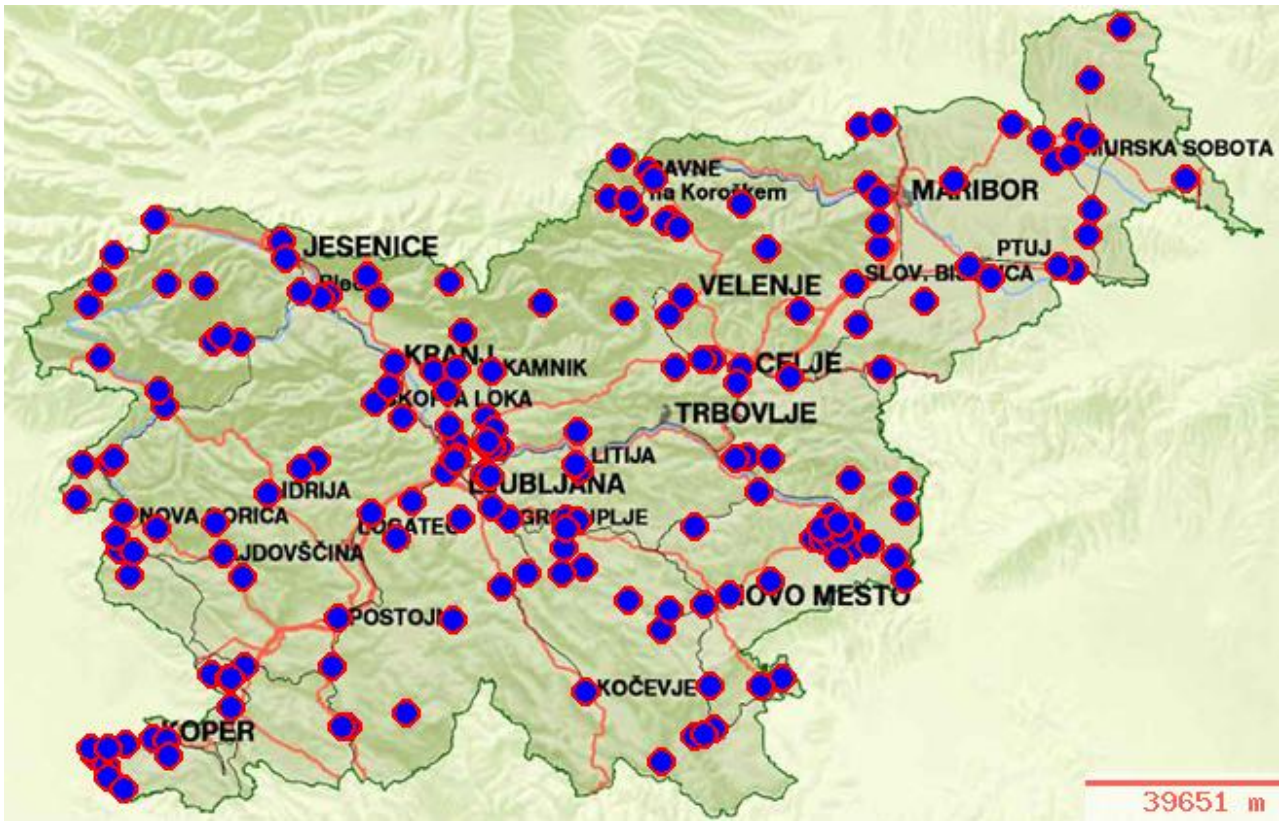

Fig. 1: An example starting point showing locations of measurements

- There should be three basic graphical types of display of results:

a. All available data about individual measurement at selected site and selected time (Figure 2).

Data	
Location	Sava (Ljubljana) (14.5208 E, 46.0956 N)
Isotop	I-125
Quantity	Bq/m3 – Specific activity per volume unit
Measuring date	1994

Podrobnosti o meritvah	
Value	0,59 Bq/m3
Type of monitoring	Monitoring of global contamination in living environment
Quantity	Specific activity per volume unit
Location	Sava (Ljubljana)
Measuring date	26.04.1994
Sample	Water (river)
Isotop	I-125
Source	ZVD_1994_xxx_1.txt
Sample preparation	"Drying and ashing"
Instrument	GAMMA - SOLID STATE DETECTOR
Type of error	Standard deviation
Type of measurement	Discrete single measurement
Performer	IJS-F2 – Jozef Stefan Institutei
Contract	Contract number N-1994

Figure 2: An example of information about individual measurement

b. Time history of selected parameter at a selected site (Figure 3).

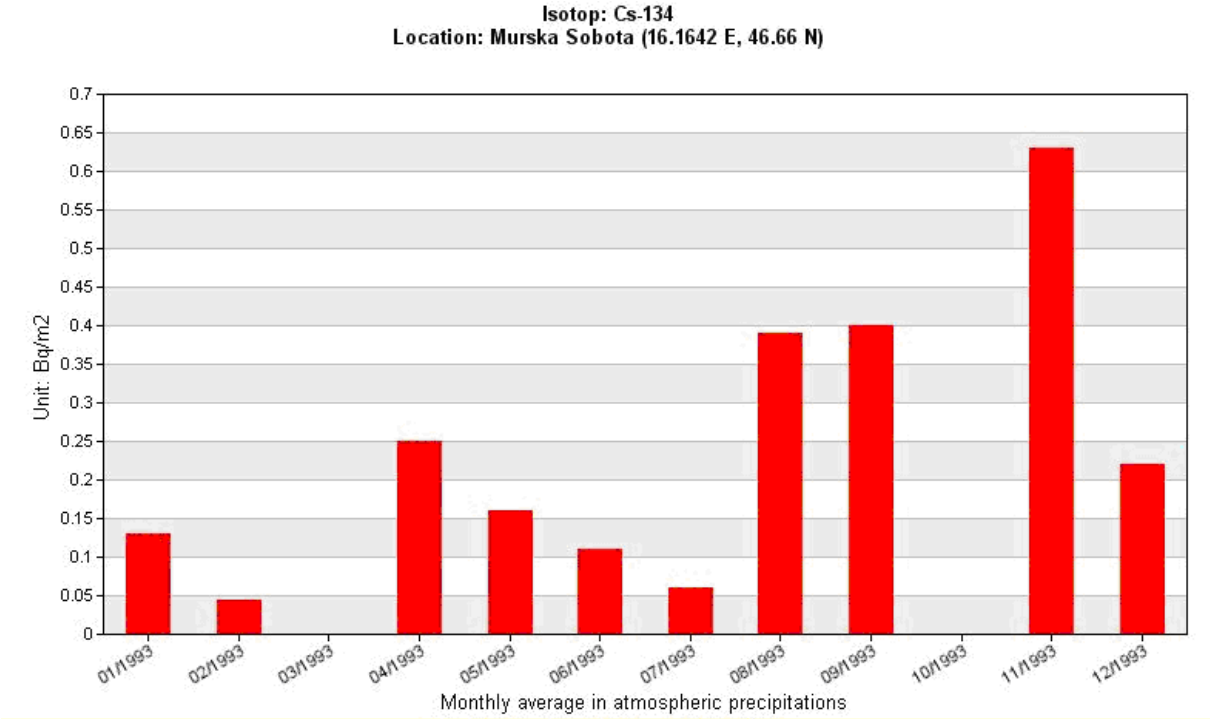

Figure 3: An example of time history of data generated by test version of the software

c. Isolines of parameters (contour plots) of selected parameter at selected time.

- There must be possibility to export data in numerical form for any further processing by the user.

The implementation of the software is not finished by the time of preparation of this paper. Currently the first test version is under testing at SNSA. After finishing the system will be made publicly accessible from the home page of SNSA www.gov.si/snsa. It is expected to achieve that towards the end of 2005. The comments of users will be welcomed and reasonable proposals for improvements will be considered in the future.

We expect some problems with the quality of data, transferred from written to digital form. Although there was a quality control system implemented during the retyping process, errors are still present. Therefore users of ROKO will be warned, that any data retrieved from the system, should be checked against original in paper form before they are used for any relevant purpose.

5 FUTURE DEVELOPMENT AND CONCLUSIONS

The paper reports about the idea and development of modern system for archiving and retrieval of information about radioactive measurements of the environmental samples. After the user interface is finished towards the end of 2005 and data are available for use by anybody interested, we hope to provoke additional interest in the problems of radiological contamination of the environment. In ROKO database was the first time that radioactivity measurements for a long period of time for the whole territory of Slovenia were gathered. The very first experience of users of ROKO database is very positive because the database provides user friendly access which is comprehensive in terms of wide variety od different radioactivity measurements types in the territory of Slovenia. As a long term consequence

better understanding of relevant physical processes could be expected, resulting in optimisation of human activities, that contribute to the environmental radioactivity contamination, and countermeasures, implemented by state authorities and/or commercial organisations.

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