



BY0000237

Information-Analytic Support of the Programs of Eliminating the Consequences of the Chernobyl Accident: Gained Experience and its Future Application

R. V. Arutyunyan, L. A. Bolshov, I. I. Linge, I. L. Abalkina, A. V. Simonov,
and O. A. Pavlovsky

*IBRAE — Nuclear Safety Institute of the Russian Academy of Sciences
52, Bolshaya Tulkaya, 113191, Moscow, Russia*

On the initial stage of eliminating the consequences of the Chernobyl accident, the role of system-analytic and information support in the decision-making process for protection of the population and rehabilitation of territories was, to a certain extent, underestimated. Starting from 1991, activity in system-analytic support was the part of the USSR (later on, Russian) state programs.

This activity covered three directions:

Development of the Central bank of the generalized data on the consequences of the radiation catastrophes [1, 2]; development, implementation, and maintenance of the control informational systems for the Federal bodies; computer-system integration of the.

To our regret, the financial support of the Federal program is permanently shortened during recent years; the perspectives of a new program for 1996 - 2000 are still unclear. A new concept of radiation, medical, and social protection and rehabilitation of the population of the RF is under consideration, but is not yet adopted.

The formed banks of data and models, developed methods of processing, analysis of information, and their integration by modern computer tools make it possible now to perform system analysis and predict the situation on the contaminated territories at the satisfactory level of reliability and accuracy. In order to make a prognosis of the situation evolution, it is important to account for the previous steps in eliminating the consequences of the Chernobyl NPP accident. At the initial stage, a number of mistakes were made: certain protection measures (evacuation, preventing the thyroid exposure, etc.) were implemented too

late; interruption levels were changed hastily; hundreds thousand persons were involved into emergency actions in the region of the Chernobyl NPP, unprepared for the work in the radioactive contaminated territories and objects; wrong informational policy was conducted with respect to the local population and administration. In subsequent periods, the territory, where counter-accident measures were undertaken, was only expanded.

By the end of 1988, there was an unsuccessful attempt to move to the rehabilitation phase on the base of the definition of the additional life doze as 350 mSv [8]. The attempt caused strong negative reaction of the public. As a result, instead of the expected localization of the problem, a substantial increase in its scale was obtained.

Mistakes, made rather by politicians than by experts in radiological protection, and stereotypes, immanent to the previously existing system, affected the strategy of the activity aimed at the elimination of the consequences of the Chernobyl accident. At the same time, the situation concerning the participants of the elimination of the accident consequences (the liquidators) grew more aggravated. Regardless of the exposed doze, the certificate of "the participant of works aimed at the elimination of the consequences of the Chernobyl NPP accident" was delivered to any person who at least one day stood in the region of the Chernobyl NPP or in the resettlement zone. Owing to the existing problems concerning data reliability, inevitable cases of morbidity, disability, and mortality in the whole cohort of liquidators were interpreted as a common and regular manifestation of the harmful effect of radiation.

As a result, the "Law about the social protection of citizens subjected to the effect of radiation owing to the Chernobyl NPP catastrophe" was adopted in 1991. The law took into action several very simple principles for dividing the territory into zones (according to soil contamination by ^{137}Cs) and implementation privileges for the liquidators. Inhabitancy to simplicity and old-fashioned measurement units caused the reception of the contamination level in 1 Ci/km^2 as a bound for the zone separation. It is important that, arbitrary reception of merely simple figures for making decision on such a complicated problem resulted in the multiple increase in the total square of the territories where counter-accident measures were undertaken. The final decision was made even without an exact estimate of the zone sizes. By the summer of 1991, the maximum number of residents of the territories subjected to radioactive contamination was estimated as 1.5 Million. Later on, as a result of the improved estimate of the radiation situation, additional settlements with total number of residents exceeding 2.8 Million persons were included into contaminated zone. It is possible to assume that, if more rational approaches to the strategy of the protective and rehabilitation measures were adopted, they would be restricted by the territory with the total population within 500 000 persons; measures of social protection and medical rehabilitation would be applied to 30 - 50 thousand persons who participated in the works with maximum exposure dozes.

Nevertheless, by the beginning of 1992 there existed (though doubtful) regulating base — the “Law..” and the Federal program that was developed on the base of the “Law...”. Realization of the program made it possible to reduce the population exposure doses and the grating of the agriculture production. In addition to the population resettling, an opposite migration flow appeared. According to certain demographic parameters (for example, the birth-rate), the resettlement zone and the zone with the right for resettlement were even more successful than uncontaminated territories. The results of the sociological inquiries confirmed the compensating effect of the program. These circumstances created rather good perspective for completing work on many territories.

The performed prognosis for the evolution of the radioecological and social-psychological situation on the contaminated territories [4] led to a conclusion that, for the present stage, radiological approaches to the choice of the strategy for the realization of the state program are inadequate to the existing situation. Such possibilities were lost in 1991. There are two possible variants for the further development of the situation.

The first, “safe” variant assumes realization of the program up to 1998 for all territories, including weakly contaminated, where radiation situation is already completely normalized. In this case, in the time period 1998 - 2000, it is possible to localize rehabilitation and compensating measures on the territories of just four regions (Bryanskaya, Kaluzhskaya, Tuskaya, and Orlovskaya) with total population 300 000 - 400 000 residents. The average doses of additional exposure for the residents of the settlements by the year 2000 will not exceed 1 mSv per year virtually everywhere but several small settlements with total population not exceeding 1000 persons. The specific features of the motivation, psychological precepts, people relations and mood in various zones of contamination, together with objective differences in radiological situation, lead to necessity of the differentiated approach to changes in the zone status in the transient period, and of the forced appeal to the simplest characteristics of the radioactive contamination (like the rate of the external gamma exposure).

The second variant assumes abrupt shortening of the program, which might be stipulated by the new “Concept of the radiation, medical, and social protection and rehabilitation of the population of the Russian Federation, subjected to accidental exposure”. This concept suggests zone separation according to the year doze only (zones of radiation control and voluntary residence); it is much more consistent than the actual Law. According to the new concept, even the most conservative dosimetric estimates show that, the zones of radioactive contamination should include territories with the population up to 100 000 residents. However, the measures aimed at the transition to the new concept cannot be implemented quickly. Without a transient period, very unfavorable social-psychological situation would be developed inevitably. Personal and political potentials of the territories covered by the actual program make it quite probable that, new legislative authorities will be again forced to make a decision about the

necessity to adopt "the general concept of the safe residence on the contaminated territories, acceptable for the wide strata of the population".

There are a lot of Chernobyl lessons. One of the most important is that, the problem of elimination of the consequences of the large-scale radiation catastrophes is such varied that any "straightforward" approach will not give positive results. Making strategic decisions requires both qualitative and quantitative description of all consequences, including radiological, social-economical, psychological, demographic, medical, and, to the same extent, political.

The gained experience in the elimination of the consequences of the radiation catastrophes can be applied in the tasks of prevention and improvement of the preparedness of the related civil, defense services and local authorities for the actions in emergency situations. In particular, during 1993 - 1995, IBRAE prepared and carried out several practical games devoted to the problems of making decisions for the population protection in course of the radiation accidents [6 - 8]. Special systems of the full-scale modeling of the radiological information in course of the radiation accidents are developed for the training goals. These systems generate arbitrary amounts of all kinds of the radiological information.

References

- [1] L. Bolshov, I. Linge, R. Arutyunyan *et al.*, Chernobyl Experience of Emergency Data Management. Proc. of NEA Workshop Emergency Data Management, 12-14 Sept. 1995, Zurich, Switzerland (in press).
- [2] L. Bolshov, I. Linge, R. Arutyunyan *et al.*, The Information System "Chernobyl" of EMERCOM of Russia (this issue).
- [3] R. Arutyunyan, L. Bolshov, V. Demianov, A. Glushko *et al.*, Environmental Decision Support System on Base of Geoinformational Technologies for the Analysis of Nuclear Accident Consequences (this issue).
- [4] I. Linge, R. Arutyunyan, I. Ossipiants, *et al.*, Experience of the Complex Analysis of the Situation on the Territories Contaminated as a Result of the Chernobyl NPP Accident. Proc. Conf. "Radioecological, Medical, and Social-Economical Consequences of the Chernobyl NPP Accident. Rehabilitation of the Territory and Population", Golitsino, 21-25 May 1995.
- [5] L. Il'in, Reality and Myths of Chernobyl, ALARA Ltd, Moscow, 1994, pp. 385-410.
- [6] R. Arutyunyan, I. Linge, O. Pavlovsky, J. Brenot, P. Ginot, H. Maubert, and D. Robeau. Franco-Russian Role-Play on Decision Making in the Event of Radiological Contamination of Large Areas of Land. PORTSMOUTH-94 Proc., Nuclear Technology Publishing, 1994, pp. 329 - 332.
- [7] Command and Headquarter Training, Guideline Materials, 22 - 24 November, 1994, Moscow, NSI-IBRAE.
- [8] Command and Headquarter Training "Polyarnye Zori-95", Practical Game Report, 22 - 24 November, 1994, Moscow, NSI-IBRAE.