

**CHALLENGES TO DECISION MAKERS
AFTER URBAN CONTAMINATION:
THE CHERNOBYL EXPERIENCE**



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Abstract

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The real history of the Chernobyl decisions will probably be published in ten or fifty years after the death of the politicians who made those decisions and the soviet scientists who were there creating them. But that is not out of the possibility that real and tragic history will never be published at all.

This is mainly because the most hard and responsible Chernobyl decisions which had to be made in the situation of acute time, skill and information deficit, had been marked by the stamp of time and society where all of us, including the authors, were living.

Never before, and I hope very much, never in the future, has humanity faced the industrial nuclear-radiation accident with the scale like Chernobyl NPP accident. So it's extremely important to summarise and put together not only the scientific but human experience of the scientists which directly formed the large-scale decisions. It is very important to explain to society not only the scientific background of those decisions but also the scientists' personal views, their personal impressions as at the time of decision making as in eight years after the accident.

1. THE RESPONSIBLE AUTHORITIES AT THE EARLY STAGE OF THE CHERNOBYL ACCIDENT

The leaders of the former Soviet Union took the main roles in the management and in the work of the main Chernobyl State-Government Commission. The administrative authorities of Ukraine and Belarus had been informed about the decisions of the Main Commission and carried out the executive functions. Certainly, the Republic and Regional Accidental Commissions existed as well, but the role, scale and influence of their decisions were much more smaller because of the doctrine of absolute centralisation of the power which was at that time.

Necessary scientific competence of scientists for the Main Commission had been provided via the Scientific Institutes of the Soviet Union Academy of Science, Health Ministry of Soviet Union, Ministry of Middle Machinery Making, Defence Ministry and, but in less measure, by the Scientific Institutes of Ukraine and Belarus Academy of Science and by the Institutes of the Republic ministers.

2. MAIN GROUPS OF POSTACCIDENTAL DECISIONS

All the important Chernobyl decisions may be divided into two large groups:

First, the decisions dealt directly with the Fourth Accidental Unit, with decontamination and putting into operation the First, Second and Third Units of the Chernobyl NPP and with the working of special contingents in 5-, 10- and 30 kilometre

zones around the plant. It is possible to make some independent, very important presentations on the first group of decisions.

The second group of decisions includes the urgent, early-stage and long-term countermeasures for the protection of the population who found themselves on the contaminated territories. Very symbolically this second group of decisions can be divided into two subgroups. There are the countermeasures for protection of rural population and ones of urban inhabitants.

In accordance with the main topic of our workshop the main attention will focus on the urban decisions which had been made after the Chernobyl accident and on the main experience which was obtained.

3. INTERVENTION LEVELS

A long time before the Chernobyl accident a set of documents where the intervention levels (A and B) at the case of hard nuclear accident had been created in the former Soviet Union. Those levels determined the radiation situation when the evacuation and iodine prophylaxis had to be made [1-3]. Besides, the official instruction of Soviet Union Health Ministry on the accidental situation existed.

In 70-th years the large investigation on the development the optimal dosages, strategy and tactics of using KI for mass pharmacology protection of thyroid gland exposure in the case of large-scale radioiodine contamination had been completed [4]. However, the Chernobyl experience has shown that practical realisation, all even very good, detail and scientific-substantiation recommendations and intervention levels were rather difficult.

4. MAIN PROBLEMS OF USING THE INTERVENTION LEVELS AND OFFICIAL INSTRUCTIONS

Consider the main difficulties which arose during the decision making in urban radioactive contamination with the examples of some important events:

- Evacuation of Pripjat-town
- Iodine prophylactics
- Temporary relocation
- First May Demonstration in Kiev

4.1. Evacuation of Pripjat

According to the accidental criterion the evacuation may be done if the exposure exceeds 0.25 Sv. Evacuation must be done obviously if the exposure exceeds 0.75 Sv. Already on 26 April the Governmental Commission accepted the decision on the evacuation of Pripjat-town, although the real exposure hadn't exceeded even 10 percentiles of level A. So it seems, that decision was accepted in opposition of the formal recommendations.

The final decision on the evacuation of Pripjat had been accepted at noon on 26 April 1986 taking into account the recommendations of the physicists. Mainly the arguments were:

- very clear understanding that the radioactive release from the 4th Unit was continuing and no possibility for stopping the release existed in the nearest time;
- comparison of the meteorological situation with the speed of the worsening of radiation gave one evidence that there was the high possibility of the sharp worsening of the radiation situation in any nearest hour and day;

- Pripjat-town located very close (about 3 km) to the 4th accidental Unit where the gamma-exposure rate was enormously high (“red wood”, building place of 5th Unit and other).

Here it is very important to stress that such, in principle, very logical reasons for the decision on the evacuation were never maintained before neither in Soviet nor in international documents.

The authors believe that the recommendations for using the levels A and B for the decision on the evacuation have to be accompanied by the very strict commentaries and explanations on their application. Such types of commentaries should include:

- the time-interval during which these levels should be reached (for instance 1-4, 10 or 100 days);
- the part (percentile) of population which has to be exposed above the intervention level;
- the most critical points (moments) of scenario of accident according to when the levels A and B may be exceeded;
- main requirements to the radioecological and dosimetric information (there structure and volume) which can more reliably provide the prediction of an accidental situation.

Naturally, the additional terms have to be formalised in the framework of some software for decision making support. Such a system has to be a powerful tool in the hands of experts analysing the accidental scenario.

A prototype of such a system is now being developed by some European Institutes financed by the CEC.

But in April of 1986 no such things existed and the actual decision on the evacuation had been taken based on the expert estimations.

4.2. Iodine prophylactics

In accordance with the accepted intervention levels the actions on the protection of the population in the case of a radioiodine attack may be introduced when the thyroid exposure exceeds 0.25-0.3 Gy (level A) and, must be absolutely introduced if exposure 2.5 Gy (level B) is reached or exceeded.

Whole series of additional limitations on the feeding and behaviour may be introduced besides the iodine prophylactics. But it has to be stressed that scientists recommended to the Central Governmental Commission to introduce this action on 30 April. The Commission discussed this proposition for 20 days, but officially the decision on the iodine prophylactics had never been accepted. A common position on the necessity of introducing the iodine prophylactics in the Governmental Commission of Soviet Union Health Ministry was absent.

But putting aside the problem of opinions and positions we'll go back to the so-called scientific and technological aspects of decision making.

Two important, from our point of view, moments have to be noted concerning both the mass iodine prophylactics and the levels of starting the interventions:

Application just dose intervention levels for thyroid gland needs, at least, three additional explanation terms:

- whether these levels deal with the exposure of some age-weighted population or with some percentile of people from one age-subgroup;
- probably these levels may be considered as more conservative or as maximum possible thyroid exposure under most conservative assumptions. In that case we have to agree that all real doses will be much less than these conservative predictions;

- the very definite rules and proceedings for the control of decreasing of real doses at the case of introducing the restriction actions have to be created.

If the decision on the iodine prophylactics is made, the effectiveness of this countermeasure is very dependent on the providing level of its realisation. It includes:

- the creation of system of mobilisation reserve of KI in the scale of stage, areas, oblast, rayon;
- system of fast notification of population and organizations providing the distribution of KI;
- system of control of number of involved people and quality of prophylactics.

Here we can stress that direct calculations of the amount of consumed KI at Ukraine during May of 1986 gave the estimation 5 mln/person. But even now it's not clear whether each person from this 5 mln accepted one dosage of KI, or 0.5 mln inhabitants consumed 10 dosages of KI.

4.3. Temporary removal of children and pregnant women

There were no dose or other criterion for intervention levels for such kinds of countermeasure before the Chernobyl accident. A lot of serious debates concerning the introduction of this countermeasure for Kiev took place.

As is well known, before noon on 30 April, because of the meteorology situation the radiation influence of the accident in Kiev was practically absent. But already on 3 May the situation around the decision on possible removal of 0.5mln children became very strong. Dosimetric reasons for such countermeasures were absent.

But some leaders of Ukraine and Kiev and many scientists felt very strong pressure from the public opinion and because of the high registered levels of gamma-exposure rate. From a psychological point this situation was very understandable. It is very easy to understand those rather rich inhabitants of Kiev who did not wait for the official decisions and removed their families and children to other areas of Ukraine and Soviet Union.

As a result of all this the decision of the Ukraine administrative authorities on the mass removal of children for summer health-improving rest for Kiev, Jitomir, Chernigov and other cities had been accepted.

This temporary removal of children and pregnant women which had been taken from 10-12 May of 1986 really averted a significant portion of children from collective thyroid exposure dose and partly from the ingestion doses as well.

The Chernobyl experience has shown that for such a situation a special intervention levels system based on a cost-benefit analysis has to be developed. At this, the advantages from both averted doses and psychological effects must be included in the structure of the "benefit" portion of scales. Some such investigations are now being developed in the framework of one of the Joint Study Projects of the CEC.

This problem falls out of the framework of some common intervention level creations. The matter is that the loss of health inside the Ukraine and Belarus population, as a result of the Chernobyl accident, has to be considered not only as radiation induced illnesses but, follow the WHO-definition, "health is the state of full physical, psychological and social happiness but not only the absence of illnesses".

4.4. May First Demonstration in Kiev at 1986

The first of May was a major holiday in the former Soviet Union. Keeping with tradition a large demonstration took place on that day.

To date sharp debates on the question why the May First demonstration had not been cancelled, why time spent outside especially for children had not been limited in spite of the gamma-exposure rate on 1-2 May which reached peak values (1 and more mR h⁻¹) have been held.

Already in May of 1987 the entire structure and levels of exposure for the inhabitants of Kiev had been estimated. As a result the average external exposure during the 12 month period was about 3.5 mSv and the average internal (without the thyroid exposure) exposure was 1.5 mSv. The portion of cloud exposure in external doses didn't exceed 10%. Exposure obtained during the May First demonstration was not more than 1% of the total annual dose.

Certainly, the cancellation of the May First demonstration could not have provide a significant decrease in total exposure. But on the other hand it seems absolutely unacceptable to have a situation where a hundred thousand people including children walked outside when the gamma-exposure rate from the radioactive depositions was a hundred times higher than the ordinary background.

So a system of operative decisions and intervention levels which takes into account both socio-psychological positive effects following the averted doses and hard diseases from the acquit deformation of a regular style of life (for instance the total panic in a big city) must be developed.

5. CONCLUSIONS

Commentaries on some very important decisions have been left out of this presentation:

These are:

- establish the accidental dose limit for the clean-up workers (liquidators) which were 0.25 Sv in 1986, 0.1 Sv in 1987 and 0.05 Sv later;
- establish the accidental annual dose limit for population on the high contaminated territories: 0.1 Sv for the first year and 0.03 Sv for the second and third years;
- establish the temporal permissible levels for the contamination of water, food and ground;
- establish the values of intervention levels on the dose and ground contamination criterion for permanent relocation (life-time dose, annual dose and others).

All of these decisions were followed not only by long and hard scientific and unscientific debates and discussion but by the human passion as well. Very often since the beginning of the time of "glasnost" the introduction of those decisions was accompanied by the storm of critical publications in mass media.

But to round off the final conclusion on the accident decisions we are absolutely sure that the Chernobyl experience has to be used in two directions.

First, it is necessary to create a powerful computer system of rules and procedures instead of a table of intervention levels.

Second, the decision making system has to include socio-psychological acceptability for both the decisions themselves and their consequences for the population and society which come under the decisions.

Probably this system is only the author's dream, but the progress is important without such dreams.

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