

**COMMENTS OF DR. ZBIGNIEW JAWOROWSKI
REPRESENTATIVE OF REPUBLIC OF POLAND IN UNSCEAR
"CHERNOBYL'S LEGACY: HEALTH, ENVIRONMENTAL AND SOCIO-
ECONOMIC IMPACTS"
THE CHERNOBYL FORUM**

1. GENERAL COMMENTS:

The apparent aim of the document is to dispel irrational psychosis of fear among the population in the three countries most affected by the Chernobyl accident, and among the public elsewhere. Except for 31 early fatalities, psychosis is the most grave and wide impact of this accident, both at the regional and global scale. It caused the greatest medical, economic and societal harm. The document rightly (although not explicitly) stresses that in the contaminated areas the vast majority of about 5 million inhabitants receives now irradiation from the Chernobyl fallout corresponding to a lifetime dose less than 70 mSv, which is lower than the average global natural lifetime radiation dose of 170 mSv, and many times lower than the natural doses in many regions of the world, and that therefore most of the excessive restrictions imposed during the past twenty years should be removed. The statements about lack of increase of solid cancers, leukaemia, the number of stillbirths, adverse pregnancy outcomes and delivery complications, refuting the false information on disastrous medical effects of Chernobyl accident, disseminated en masse over the past twenty years, are also valuable. There is no need to list here many other statements which are right and most helpful. We shall limit our comments to these parts of the text that need correction and to items that are lacking.

In spite of so many right statements this document may result in continuation of the mass anxiety and radiophobia. Some of information in this document is in apparent contradiction to the earlier statements of UNSCEAR. Therefore one has to object against a statement that this document is the result of "consensus view"¹ of eight organisations, including UNSCEAR.

The document incorrectly presents the real causes of the accident, and of its worst psychological, societal and economic effects. It is clear that these effects were not due to ionising radiation, but rather due to excessive remedial measures, and a massive, global scale radiophobic propaganda. This is recognized in "Chernobyl's legacy..." report, in which the authorities of the former USSR, and of post-soviet countries are slightly and politely criticized for implementation of these measures and for their undue continuation during so many years. However, the report does not explain that these measures were based on recommendations published in documents of international organizations, that these recommendations were based on the LNT (linear non-threshold) assumption, and were utterly exaggerated. At example ICRP Publication No. 40 (1984) recommended for relocation in major radiation accidents a first year dose of 50 mSv. This would correspond to a long-term (or lifetime) dose of about 150 mSv. This policy was followed, and even "improved," by the Soviet authorities. In reality, perhaps the most important lesson of Chernobyl is that these recommendations and the assumption lead to disastrous effects, by not taking into account that the recommendations themselves involve non-radiological risks, incredibly high costs, and other forms of harm, all of which need to be balanced against the radiological benefits. This balancing should occur at

¹ The last paragraph of the Summary states: "This report is a consensus view of the eight organisations of the UN family and of three affected countries."

the level of formulation of the recommendations, and not be deferred to a time of emergency and to persons involved in its remediation. The Chernobyl accident exposed a failure of the ALARA principle.

The reservations of Polish delegation pertain mostly to statements on radiation induced health effects and evacuation measures. In this respect UNSCEAR, as the most authoritative international body in the matter of effects of ionizing radiation, should clearly present its stand. The text of the document does not agree with the opinion of the Committee expressed on these subjects during the fifty-third session. Especially strong protests were expressed by a majority of members against presenting such values as projected 4000 radiation induced late cancer fatalities, and 50 deaths allegedly caused by acute irradiation. Thus, the "Chernobyl's Legacy ..." report in its present form cannot be regarded as expressing "a consensus view" of UNSCEAR, as stated in the Summary, even though some members might be of different opinion.

In light of the arguments presented above, Polish delegation would certainly vote against presenting the Chernobyl Forum conclusions as agreed with UNSCEAR. The Chernobyl case is too serious, and position of UNSCEAR should be discussed and voted during UNSCEAR's regular sessions. Also, UNSCEAR has no mandate to produce documents on matters other than sources and effects of ionising radiation (we had this discussed many times during sessions). Thus we are not able to consent on the Chernobyl Forum documents which deal with matters other than radiation.

Members (Representatives) of national delegations are entitled to publish their personal opinions, also on UNSCEAR texts, but they cannot represent UNSCEAR as a Committee - only themselves, personally.

Is there any document concerning by-laws of UNSCEAR to check this interpretation?

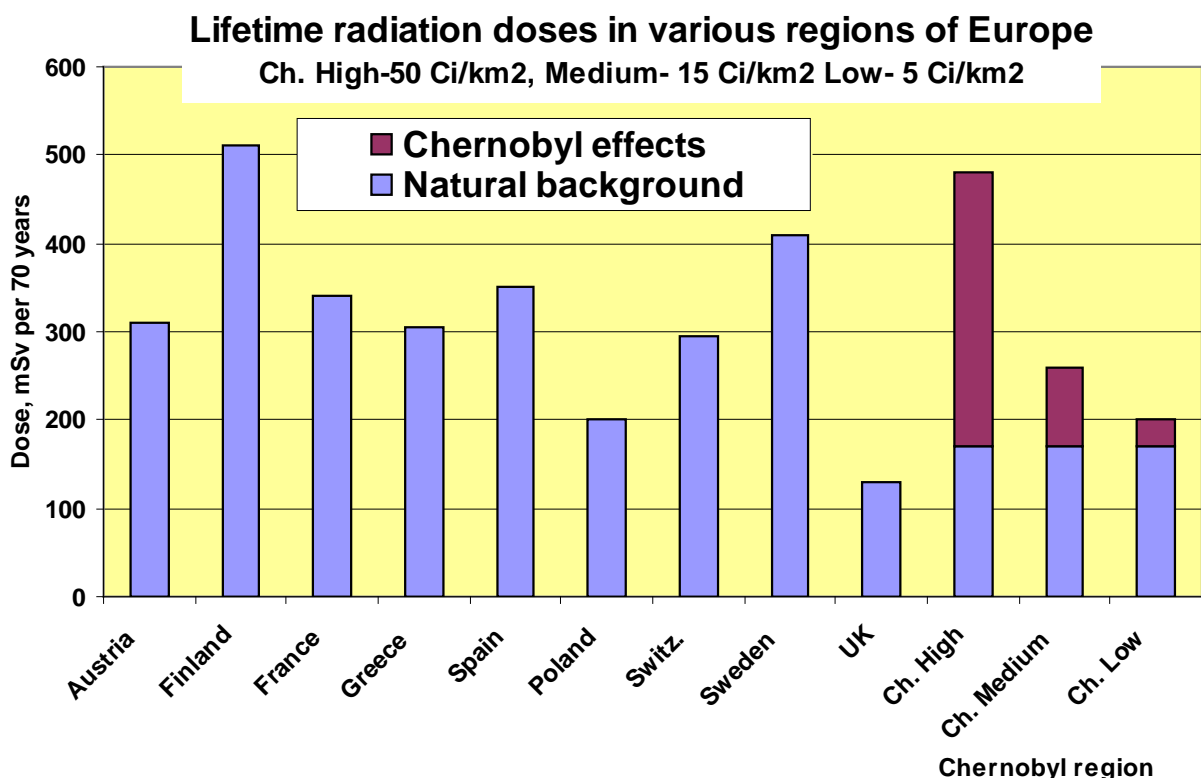
Except for its first report of 1958, UNSCEAR refrained from presenting in its publications numerical projections of late carcinogenic effects of low radiation doses, in recognition of their weak scientific basis. This long standing policy UNSCEAR should apply in the case of Chernobyl Forum documents, if they are to be presented as expressing a consensus. Even in its 1958 report UNSCEAR recognized this weakness, and for projections of leukaemia incidence from nuclear test fallout the Committee presented as equally uncertain two types of estimates: (1) for the non-threshold assumption (400 – 2000 cases per year), and (2) for threshold assumption (zero cases). Later years brought an abundance of information on stimulatory and adaptive responses to low radiation doses, as well as experimental and epidemiological data (reviewed inter alia in UNSCEAR 1994 report), and explanation of the repair mechanisms, which all suggested existence of the phenomenon of radiation hormesis (beneficial effects of low level ionising radiation). These findings should be taken into account in estimation of health consequences of exposure of the public to the Chernobyl fallout. The data collected by UNSCEAR since 2000 (e.g. in A/AC.82/R.650) show that in the three post-soviet countries the incidence of all cancers combined in exposed population was by 2 – 70 per cent lower than in non-exposed population, and in recovery operation workers from Russia and Ukraine by up to 30 per cent lower. This information needs to be included in the "Chernobyl's Legacy ..." document if it is to fulfil its declared task.

1.1. Excessive evacuation measures.

The draft of report shows symptoms suggesting that in order to obtain approval of Russian government, the reasons of the accident have not been mentioned at all. Further on, probably

in order to avoid possible displeasure of the three governments, several statements indicating criticism towards the excessive evacuation measures and unjustified inclusion of 7 million people into the ranks of "Chernobyl victims" have been deleted. These statements should be kept if the document aims in presenting objective truth about Chernobyl accident and its consequences. In the interest of this truth – and in this case it is the same as the practical interest of humanity – some statements should be included in the report to make it clear that the tragedy of so many people was not due to radiation, but rather due to exaggerated fear of radiation, fed up by various organisations promoting LNT hypothesis.

The report is not presenting the dose levels on which the prescribed relocation of 850 000 people, and implemented relocation of about 400 000 was based. At first, relocation was performed in areas where the lifetime (70 years) dose from Chernobyl fallout might be higher than 350 mSv (5 mSv/year). Later this limit was changed to 150 mSv (i.e. 2.1 mSv/year), and then to 70 mSv (1 mSv/year) (Ilyin, L.A. Chernobyl : Myth and Reality, Moscow, Megapolis, 1995; Filyushkin, I.V. Health Physics Vol. 71, pp. 4-8, 1996). A dose of 1 mSv causes in each human body about 0.2 damage of DNA per year, or 14 damages per 70 years. The normal rate of spontaneous, natural damages of DNA of the same type as those induced by ionising radiation is about 70 million in each cell per year (lower estimate). This shows absurdity of relocating hundreds of thousands of people to protect them from a trifle number of DNA damages added to a virtual tsunami of their spontaneous rate, against which evolution provided us with extremely efficient defence mechanisms.



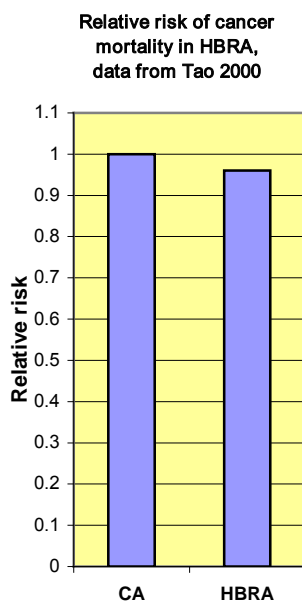
In the present version of the report in the chapter on "**How have the governments responded to the challenges of Chernobyl?**" in the third paragraph the statement "*as...knowledge on the nature of the risks has grown more sophisticated, the basis on which the zones are defined has been called into question*" has been deleted. And yet the report stresses in several points that the "*level of radiation is similar to natural background levels in some other European countries.*" A look at Fig. 1 showing lifetime doses in several European countries and in Chernobyl regions of low, medium and high contamination level shows clearly that the

decisions of evacuation of hundreds of thousands of inhabitants from those regions were utterly wrong! If they should be treated as right, then the government of Finland should evacuate the whole Finnish population, and governments of Sweden or France should evacuate very large areas in their countries. So a statement, which at least suggests that the basis on which the zones were defined is questionable, should be maintained. Please note, that it does not even say that the governments of the three countries were wrong at the time. The statement is very mild, and refers to *"knowledge which has grown more sophisticated"* since the accident, so the reader can understand that the decisions of that time in the past are not criticised, but simply that they would not be taken today.

In accordance with IAEA Basic Safety Standards, Annex V, 1996 permanent resettlement should be considered if the lifetime dose is projected to exceed 1000 mSv. In our opinion this action level is too low. In some regions of the world such doses people receive from natural background radiation in few years time without evidence of any harm. However, even if this current IAEA action level had been applied in the Soviet Union, the unspeakable tragedies of hundreds of thousands of people, economic and societal ruin of millions of inhabitants, and country scale losses of the order of tens or hundreds billion US dollars would not have occurred. Thus, UNSCEAR should question unjustified criteria for evacuation, criticise the historically taken decisions, or at least to indicate that they would not be taken nowadays.

1.2. Total number of fatalities due to Chernobyl

Another major point of concern is *"the total number of people that could have died or could die in the future from cancer induced by the Chernobyl originated whole body exposure over the lifetime"*, estimated as 4000 in the section entitled, *"How many people died as a result of the accident and how many more are likely to die in the future?"* The report stresses that the claims of hundreds of thousands of victims are exaggerated.



the lifetime", estimated as 4000 in the section entitled, *"How many people died as a result of the accident and how many more are likely to die in the future?"* The report stresses that the claims of hundreds of thousands of victims are exaggerated. In several places it is stated that there has been no increase of solid cancers, nor any other radiation induced diseases among the general population with the exception of thyroid cancers, but nevertheless it is said that *"according to bio-statistical projection" ...this number "is estimated to be around 4000."* Let us clarify this statement. Is it based on *"projection"* of the observed trends? Apparently no, because as indicated above, there is no increase of mortality among the general population. The basis for this *"projection"* is the LNT hypothesis, which has been shown to be invalid for low doses, such as natural doses to the population of Finland, Sweden, China etc. Fig. 2 dealing with China High Background Radiation Area shows that the 80 000 inhabitants of that area, who receive lifetime radiation doses higher by about 300 mSv than the people in control area

(CA), enjoy slightly better health and certainly do not justify any predictions that additional two or three hundred mSv over the lifetime will induce additional premature deaths (data from [Tao 2000]).

The 4000 projected deaths were apparently calculated for about 600 000 persons, with an average annual radiation dose of about 1.9 mSv, and a cancer risk factor of 5% per Sv. Several UN organisations, including UNSCEAR, and the former chairman of ICRP advised against making such calculations, based on LNT and collective dose. Just publishing this number will be harmful and petrify the Chernobyl fears. No efforts (as proposed in the *"Chernobyl's legacy..."*) to explain to the public all intricacies of the easy-chair-elucubrations

of radiation risk assessments, and comparing them with other risks or spontaneous level of cancer deaths, etc. will help. The past twenty years proved that this is impossible, and a kind of day-dreaming. Making such calculations was defined by one of the founders of radiological protection Dr. Lauriston S. Taylor as the "deeply immoral uses of our scientific heritage" (Some non-scientific influences on radiation protection standards and practice. Health Physics, 32:851-874, 1980). This statement fits some parts of the Chernobyl Forum documents.

Also incorrect is presenting a number of 50 "current" fatalities as all caused by acute irradiation. It appears that from among 134 heavily irradiated persons, 28 died soon after the accident due to acute radiation disease, and 106 persons remained alive. From among these 106 persons 22 died during the next 19 years, which gives the mortality rate of 1.09% per year, i.e. slightly higher than mortality rate in Poland in 2000 of 0.98%, but much lower than the average mortality rate in 2000 in Belarus (1.4%), Russia (1.38%) and Ukraine (1.65%) (Statistical Yearbook of the republic of Poland, 2001, Warsaw, Central Statistical Office, p. 734). In Table 9, p. 24, UNSCEAR draft report on "Health Effects due to Radiation from the Chernobyl Accident" (A/AC.82/R.650) it is clear that among 17 Chernobyl survivors of the acute radiation syndrome who died until 2001, only 4 or 5 persons died because of neoplastic diseases. Thus in 2001 this group mortality structure was 24% or 29% of cancer deaths among all mortality causes, i.e. not much different from the values of 23.0% for Poland in 1999, or 25.2% in Austria, and 26.1% in Germany, both in 1990 (Zatoński, W. et al. Atlas of Cancer Mortality in Central Europe, IARC Scientific Publications No. 134, Lyon, 1996, p. 175; Zatoński W. et al., Cancer in Poland in 1999, Report of The Maria Skłodowska-Curie Memorial Cancer Center and Institute of Oncology, Warsaw, 2002). Presenting these fatalities as caused by the Chernobyl radiation is a misuse of science.

Therefore the statements on 4000 + 50 Chernobyl fatalities should not be approved by UNSCEAR .

The authors of the Forum report speak in another place (section on "***Do people living in the affected regions have an accurate sense of the risks they face?***" p. 23) about "*misconceptions and myths about the threat of radiation.*" They stress that these misconceptions promote "*a paralysing fatalism among residents.*" This is very much true. But then, is it not the duty of UNSCEAR, as the most authoritative body in the world in matters of "Effects of Atomic Radiation" to say clearly that the residents have no more reason to be afraid than the people in Finland? And to add that actually the people in Finland, Sweden and France, where the radiation is high, are among those nations that enjoy the longest life expectancies in the world? If UNSCEAR will not say it, who will?

1.3. Recommendations to governments

In view of the above discussion Polish delegation presents the following comments to this chapter. Seven million people are now included in the cohort of Chernobyl victims, what testifies that the whole approach to the post-accident situation was wrong. Now time came to say it aloud, and to allow the people to return to their villages, to establish realistic radioactivity limits for milk, meat or mushrooms, at the levels that ensure a true safety, and to break the vicious circle of fear, despair and need.

The Forum Report says in page 21 "*the Soviet government adopted a very cautious policy with regard to the level of radioactive contamination that was considered acceptable...*" But today we know that this "policy" was wrong, and according e.g. to BSS 1996, should not have been adopted. Also in the summary of the International Conference "Decade after Chernobyl" in Vienna on 9-12 April 1996 [Summary 96] the conclusion No. 66 speaks about "*erroneous*

decisions taken by the government at that time." In 1996, at an international conference with the participation of Russian representatives, it was possible to speak about committed errors. Why should we not be able to repeat it today?

The recommendation to the three governments should be: ***"revise your policy and adopt radiation limits according to the knowledge we have today, not according to the fears born in the aftermath of the accident."***

1.4. The effects of low radiation doses

In page 23, section ***"Do people living in the affected regions have an accurate sense of the risks they face?"*** the Forum Report writes that people *"still lack the information"* and speaks about *"misconceptions and myths about threat of radiation"* and *"unresolved controversies surrounding the impact of low dose radiation on health."*

Is it not the right time to withdraw the LNT as the basis for evaluation of the situation in Chernobyl? To tell those people in Chernobyl that the hypothesis used for regulations and administrative aims, does not mean any practical danger? To show them examples of other populations and their health records? UNSCEAR did point to possible benefits of low dose radiation more than a decade ago [UNSCEAR 94]. Now with the vast new information from the experimental and theoretical work, UNSCEAR should address the issue once again. The example of the French Academy of Science and the French Academy of Medicine [Acad. 05] which has officially stated that low level radiation does not involve health risks should be followed. This would be the best service that the international community can give to the people around Chernobyl.

2. DETAILED COMMENTS

2.2 In paragraph 3 of the Summary of the "Chernobyl's legacy..." *"the number of emergency and recovery workers who died due to radiation sickness and subsequent diseases"* is given as 50. It is not correct: see discussion above.

In addition, please, note that the statement *"of various causes"* is NOT equivalent to *"due to radiation sickness and subsequent diseases."* In the [Summary 96] the conclusion No. 14 said that *"...over the last decade additional 14 patients died. Their deaths were not due to ARS, so they cannot be directly ascribed to the effects of radiation."* Today the number of people who died has risen, but it is still people who died due to *various causes*, and consequently their deaths should not be ascribed to radiation. There is no reason to change this position in the present Forum Report. It would be better to write in the Summary just the sentence which is in the text on p. 7. It is more precise.

2.3 Further on in paragraph 3 there is the statement about 4000 premature deaths. It is discussed above. It should be deleted, as not based on any facts, but only on a doubtful LNT hypothesis, which led to disastrous post-Chernobyl effects. Against its aim, by this statement the "Chernobyl's Legacy..." will continue fuelling the radiation hysteria among population of contaminated areas. Instead we propose to state: *"The observations during the twenty years that have passed since the accident do not indicate any significant increases in radiation induced mortality among the general population."*

2.4 Paragraph 6. *"Countermeasures... were on the whole timely and adequate."* [UNSCEAR 2000] report and later the report of [UNDP 02], but also the main body of report as it was

presented in September 2005 in Vienna [Forum 2005], stress rather that the restrictions should be lifted. Thus the [UNDP 2002] report says on p. 19, paragraph 24:

*"As far as possible **people should be allowed to take their own informed decisions** about where they wish to live, even if those decisions may lead to them facing a measure of increased risk. Studies should be undertaken to establish how far the present regime of **restrictions could responsibly be relaxed,...**"*

Indeed, the UNSCEAR 2000 report provides coefficients for evaluation of lifetime doses since 1986 till 2056 (without evacuation). The results are shown in Fig. 1 above. It is evident that the measures were not *"timely and adequate"* but excessive and mostly unnecessary. In the main body of the Forum report presented in September 2005, in page 7, there is the text quoted above. We propose to keep this text in the main body of the report and also to put it into the summary.

2.5 Page 3 Highlights

Paragraph 1, first line

The term "disaster" is not appropriate for an accident that caused 31 immediate deaths and probably no additional deaths over the next twenty years. Even the mass media (e.g. International Herald Tribune) acknowledged that it was *"a major industrial accident, but not a disaster."* The term *"disaster"* could have been used originally immediately after the accident, when the expected number of fatalities was counted in hundreds of thousands, which has been clearly shown to be erroneous. The Forum report should not use the terminology which is contrary to its own summary of the effects of this accident. Today the term "disastrous consequences" can be only used in the context of social and economic consequences of wrong decisions taken by authorities, which forced hundreds of thousands of people away from their homes and developed psychosis of fear and depression in 7 million of people qualified as "Chernobyl victims." It is not the radiation doses, but the fear of radiation that has devastated lives of so many people.

2.6 Page 3, Preface

Paragraph 1. This paragraph (especially a citation from IAEA: "foremost nuclear catastrophe in human history") strongly suggests to an uninformed reader that the accident was caused by a **nuclear explosion**. It should be clearly stated that the cause of the accident was not a nuclear explosion, but a dramatic power surge, with a resulting explosion of steam and hydrogen. At this point one should add that the principal cause of the accident was a unique combination of errors in the reactor design, with an inherent unsafe features of the reactor physics, not found in any other types of power reactor. The lack of safety culture and a human error were important but secondary, and in any other type of reactor they would not have resulted in such severe consequences. From the point of view of human losses the Chernobyl accident was a minor event as compared with many other industrial catastrophes. We propose to delete the quotation from IAEA *"foremost nuclear catastrophe"* and to use the space for the above comment.

2.7 Page 4 section on *"How much radiation ..."*

Paragraph 3. ... *"...received high doses..."* and *"as a result 28 of them died within first four months from radiation and thermal burns, and another 19 died over the years up to 2004."* See comments above (p.5).

We propose to rewrite this paragraph so that it does not suggest that those deaths were due to radiation exposure.

2.8 Page 5 first paragraph below box

The contemporary readers, and the future historians, need to know what were the doses avoided by implementing mass evacuation.

2.9 Page 5, last two lines from the bottom . The sentence on natural radiation in India, Iran, Brazil and China: "*Some residents in these areas receive over 25 mSv per year from the radioactive materials in the soil on which they live....*" This is an essential information, which would help to fight radiophobia, the declared aim of this report. It shows that the individual doses of the order of 1 mSv or a few mSv are without importance. In the proposed text this sentence is deleted, which demonstrates the state of mind of the editors. We propose to keep it as it is, and show the reader reality, rather than imaginary and terrifying numbers of radiation fatalities.

2.10 Page 6 section "*How many people died...*"

First paragraph, line 4 – the word "*highly*" should be added before the word "*exaggerated...*"

2.11 page 6, section "*How many people died...*" First paragraph line 7

"Estimated number of fatalities 4000...." This is discussed above. We propose to delete it.

2.12 Page 7. section on "*What diseases have already resulted....*"

Paragraph 2. This paragraph comments the estimate of 4000 fatalities. We propose to remove it together with this estimate.

Paragraph 4, the report says about recovery workers:

... about 5% of fatalities that occurred in 1991–1998 in the cohort under study of 61 000 Russian workers exposed to an average dose of 107 mSv can be caused by radiation-induced diseases. The absolute number of deaths in this cohort attributable to radiation caused by solid cancers, circulatory system diseases and leukaemia was estimated to be about 230 cases.

Summing up together fatalities due to neoplastic diseases, with circulatory ones which are about twice a high as the neoplastic ones, is improper. A two-fold increase in chronic lymphatic leukaemia (deemed not to be caused by radiation) among the Russian emergency workers, suggests that also an increase in number of other deaths registered in this group may have a non-radiation cause. The conclusion that 230 death was caused by an average dose of 107 mSv is unfounded, and highly improbable. Again a LNT fear mongering?

2.13 Page 7. section on "*What diseases have already resulted....*" Thyroid cancer in children

UNSCEAR documents clearly show that the registration rate of "Chernobyl" thyroid cancers increased not only in children, as was initially expected, but also in adults. In Belarus the incidence rate (SIR) for adult population ranged in 1995-1999 between 3.21 and 11.8, and in recovery operation workers between 3.10 and 6.65. These values of SIR were much higher

than among those exposed as children or adolescents in 1992-1997, which ranged between 0.25 and 1.75 (A/AC.82/R.639, Tables 8, 13 and 14). The average thyroid dose estimated for evacuated population of Belarus and Ukraine was 470 mGy, and for residents of the contaminated areas who were not evacuated were exceeding 2000 mGy for the most exposed infants, and for adults about 100 mGy. The average dose for the population of the three republics is estimated to be 7 mGy (A/AC.82/R.650). This should be compared with the average thyroid dose of 1,100 mGy (maximum 40,000 mGy) received from iodine-131 by 34,000 Swedish patients. Among these patients, there was no statistically significant increase in thyroid cancers in adults and children, who have not been thought to have cancer before treatment with iodine-131 (Holm et al., 1988; Hall et al., 1996). In fact, an opposite effect was observed; there was a 38% decrease in thyroid cancer incidence as compared with the non-irradiated adult population. In a smaller British study of 7417 patients receiving iodine-131 with radiation doses up to 300 000 mSv, a 17% deficit of cancers was observed (Franklyn, J.A., *The Lancet*, 353 (June 19, ; 2111-2115, 1999). In the contaminated Bryansk oblast in Russian Federation, the number of thyroid cancers registered in the years before the Chernobyl accident (1982 – 1983) for the age groups under 20 years was reported as zero (A/AC.82/R.650). In Polish females, for the years 1983 to 1986 in the age group of 0 to 15 years, the number of thyroid cancers ranged between zero and 10, and was similar in the years after the Chernobyl accident, ranging in 1995 between zero and 7, and in 1996 between zero and 4. This difference between the two countries may be a result in difference of the diagnostic methods and health service organization. The sudden rise in thyroid cancer incidence rate was observed in the Bryansk oblast already in 1987, i.e. one year after the accident (UNSCEAR, 2000). This is not in agreement with the latency of 8-10 years after irradiation observed earlier for these cancers. Most probably the increased number of thyroid cancers in population of the contaminated areas is due to dramatic change in diagnostic services.

The maximum incidence rate of the "Chernobyl" thyroid cancers in children and adolescents of 0.027% was registered in 1995 in the Bryansk oblast, Russia. In Minsk region, Belarus, the normal incidence of occult thyroid cancers is 9.3% (Furmanchuk, A.W. et al. *Histopathology*, 23:319-325, 1993).

The normal level of the occult thyroid cancers for the age group of 0 – 15 years is in Finland 2.4%, and for whole population 35.6% (Fransila, K.O. and H.R. Harach, *Occult papillary carcinoma of the thyroid in children and young adults - A systematic study in Finland*. 1986. 58: p. 715-719). The difference between this maximum and data from Finland is by a factor of about 90 for children, and > 1000 for adults. This shows an enormous potential for the screening effect. The occult thyroid cancers have the same histopathology and invasiveness as the "Chernobyl" cancers.

We propose to state that "about 4000 thyroid cancer cases registered since 1987 among people exposed as children, adolescents and adults, are probably a screening effect."

Paragraph at the bottom: "...we can be reasonably certain that most of thyroid cancer incidence can be attributed to radiation". The increased registration of thyroid cancers in the contaminated areas, among the relocated people and emergency workers is most probably a typical screening effect. The above statement is certainly incorrect.

2.16 page 11 end of paragraph 3 "the radionuclide contamination expected to be of significant interest." What is meant by "significant interest"? Should the reader understand that it is only scientific interest, dealing with migration processes, or should he fear radiological hazards

due to Pu and Am? According to UNSCEAR 2000 report population is not endangered by these nuclides.

2.17 page 13, end of first paragraph *"milk may still be produced with Cs 137 activity concentrations that exceed national action levels of 100 Bq per kilogram."* These levels are more restrictive than the levels recommended by the IAEA or in force in the EU. If we take 500 Bq per litre of milk as in the EU, then the restrictions on milk drinking can be lifted. Regulations are not issues of concern for UNSCEAR, but should not "Chernobyl's Legacy ..." point this out?

2.18 Page 16, section *What were the radiation induced effects on plants and animals?*

Forum report speaks about *"numerous acute adverse effects"* on animals and plants at distances up to 30 km from the release point. However, in paragraph 4 it says *"No adverse radiation induced effect has been reported in plants and animals exposed to a cumulative dose of less than 0,3 Gy during the first month of the accident."* The dose higher than 0.3 Gy could be accumulated only in some special spots of the secluded territory. It would be misleading to suggest that such doses were typical for the distances up to 30 km from the plant. It seems therefore more appropriate to write about animals *"living in some spatially limited spots within the higher exposure areas, i.e. at distances up to 30 km etc."*

2.19 Page 19 Paragraph 2

"Large sums continue to be paid out in the form of social benefits for as many as 7 million recipients in the three countries."

In view of the comparisons of radiation doses in Chernobyl vicinity with other European countries, shown above, and taking into account that the radiation doses obtained by these 7 million people are negligibly small, it should be stressed that the approach used by governments involved must have been wrong, since it resulted in such a mismanagement of the situation, in loss of enormous amounts of money, and in development of feeling of helplessness and dependency on social aid among millions of people.

2.21 Page 20 bottom *"Anxiety over the effects of radiation on health shows no sign of diminishing."*

Again, it is the role of UNSCEAR to stress that the governments of the three countries should change their excessively restrictive regulations and thus give an impulse for hope in the communities around Chernobyl. Also, UNSCEAR is the best international organisation to clarify the health effects of low doses and make sure that they are correctly presented to the populations involved.

2.22 Page 21 paragraph last but one

The sentence proposed to be deleted should be kept in place, and used also in the summary, as remarked above. It says

"...as...knowledge on the nature of the risks has grown more sophisticated, the basis on which the zones are defined has been called into question"

It should be remembered that the decisions about zones were taken under conditions of incomplete knowledge, uncertainty of further developments of the situation, and strong political and emotional stress. Since then it has been postulated by various international bodies that the decisions concerning intervention zones should not be left to administration acting after the accident but rather pre-established in regulations in force.

The experience of Chernobyl has shown that too cautious approach leads to disastrous detrimental effects of enormous scale. Certainly no one will defend today the sequence of decisions which have resulted in mass evacuations and declaring seven million people as victims of Chernobyl. The sentence should therefore remain in the text.

2.23 Page 22 and 23 Several sentences criticising the situation and indirectly the government have been deleted "*corruption played a role*", "*the system created perverse incentives*", "*scarce funds and abuses*" ... "*entitlements distributed unevenly*," These deletions are fully acceptable, the criticism of governments in this way does not serve any useful purpose. The important is to show that radiation is not as bad as believed, because this has influence on the way people think about their future.

2.24 Page 23 section "*Do people living in the affected regions have an accurate sense of the risks they face?*"

This question is discussed in general comments

2.25 Page 29, section on ***Remediation and countermeasures***, paragraph 3 ... "*where radionuclide concentrations in milk still exceed national action levels*"

The governments in question should be advised to change these action levels.

2.26 page 32 paragraph 2 – why is it proposed to cross out "*health recuperation, free meals for children, free medicine*" ?

Zbigniew Jaworowski, MD, PhD, DSc

Representative of Republic of Poland in UNSCEAR

Additional References

Acad. 05	French Academy of Sciences and National Academy of Medicine: Dose-effect relationships and estimation of the carcinogenic effects of low doses of ionising radiation, Paris, March 30, 2005
FORUM 05	The Chernobyl Forum (Belarus, the Russian Federation, Ukraine, FAO, IAEA, UNDP, UNEP, UNSCEAR, UN-OCHA, WHO, WORLD BANK GROUP), -: Chernobyl's Legacy: Health, Environmental and Socio-economic Impacts and Recommendations to the Governments of Belarus, the Russian Federation and Ukraine, Vienna September 2005
Summary 96	The summary of the International Conference "Decade after Chernobyl" in Vienna, 9-12 April 1996.
UNDP 02	Chernobyl Report-Final-2002 , The Human Consequences of the Chernobyl Nuclear Accident, A Strategy for Recovery, A Report Commissioned by UNDP and UNICEF with the support of UN-OCHA and WHO 25 January 2002
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