

The Chernobyl Forum: Major Findings and Recommendations

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On behalf of the Forum officers:

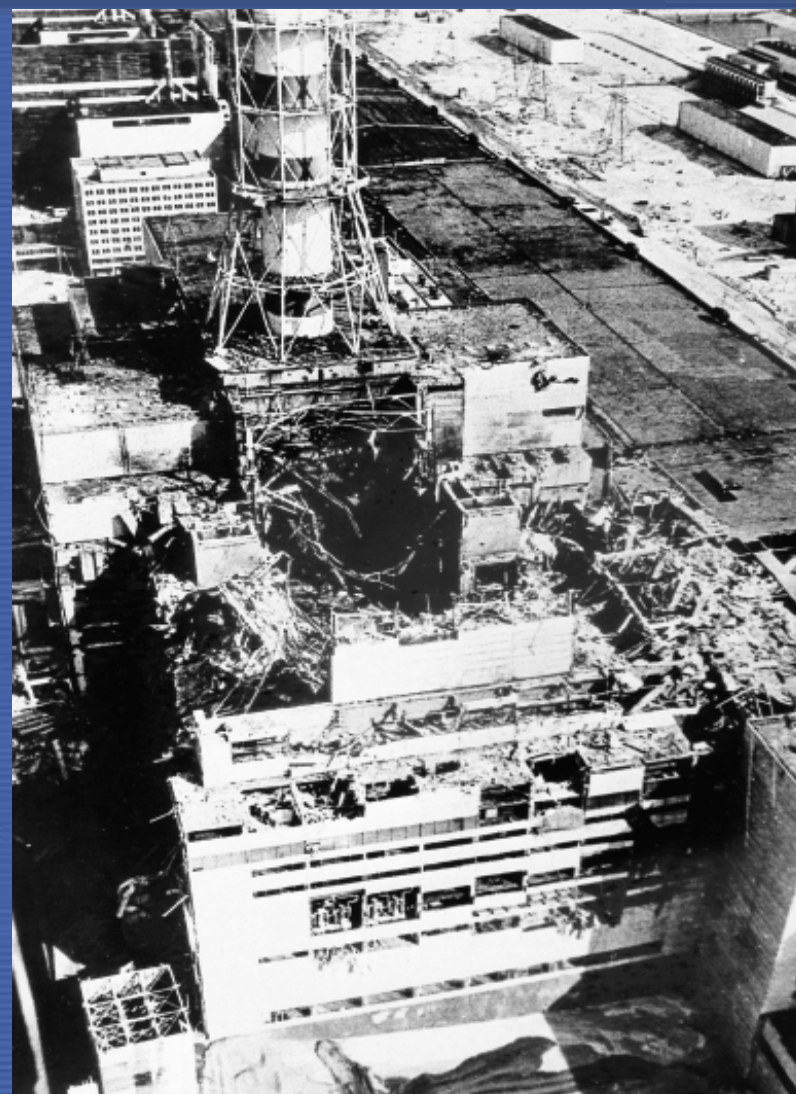
- Dr Burton Bennett, RERF, Japan, Forum Chair
- Expert Group "Environment"
 - Dr Lynn Anspaugh, USA, EGE Chair
- Expert Group "Health"
 - Dr Geoff Howe, USA, EGH Co-chair (Thyroid Studies)
 - Dr Elisabeth Cardis, France, EGH Co-Chair (Solid Cancers/Leukaemia studies)
 - Dr Fred Mettler, USA, EGH Co-chair (Non-cancer outcomes and health care programmes)
- Scientific secretariat:
 - Mikhail Balonov, IAEA
 - Zhanat Carr, WHO
 - Louisa Vinton, UNDP

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 - **Chernobyl Conference in Vienna, September 2005**
 - **60th Session of UN GA, November 2005**

The accident

- On 26 April, 1986, at 01:23 a.m. two explosions destroyed Unit 4 of the Chernobyl NPP located 100 km N from Kiev (2.5 mln) and just 3 km from Pripyat (50 ths.)
- The destroyed reactor got fire that continued for 10 days.



Mitigation of the accident consequences

- Evacuation of 116 ths. residents of the most affected areas
- Construction of the Shelter by November 1986
- Decontamination of settlements
- Countermeasures in agriculture, water supply and forestry



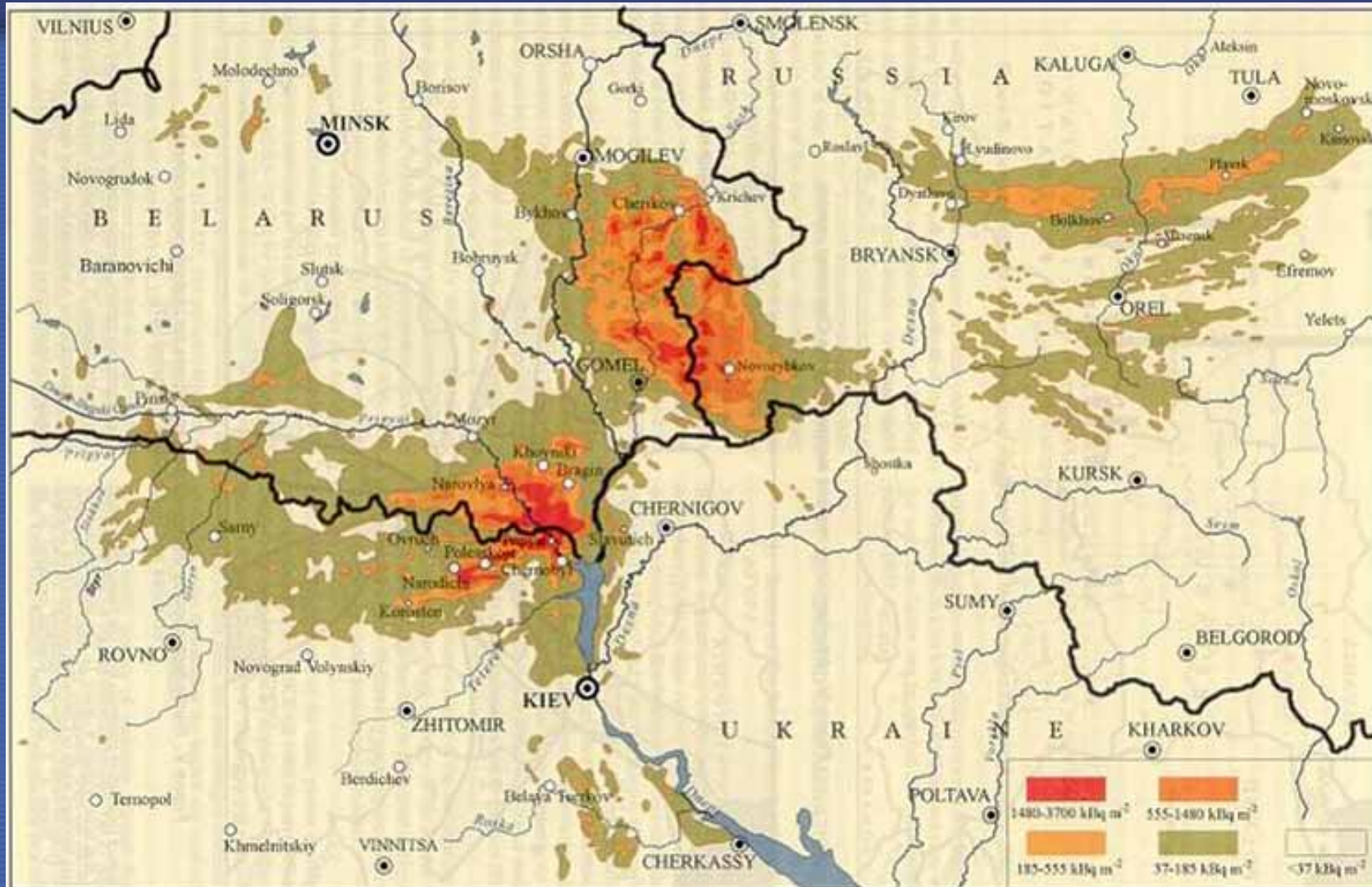
Enormous scale of the accident consequences

- ARS in 134 emergency workers; 28 of them died in 1986, 19 more died in 1987-2004
- More than 600 ths recovery operation workers exposed
- About 14×10^{18} Bq radioactivity released; the most radiologically important radionuclides were ^{131}I and ^{137}Cs
- Thyroid cancer in children, more than 4000 cases in 1992-2002; 9 of them died
- More than 200,000 sq. km of Europe contaminated with ^{137}Cs , mostly in FSU
- 340 ths people evacuated or resettled
- More than 5 mln. people live in contaminated areas
- Economic costs of hundreds billions USD

Deposition of ^{137}Cs in Europe



^{137}Cs spots in Belarus, Russia and Ukraine



International assessments

- Post-accident review meeting – IAEA, August 1986
- International Chernobyl Project – IAEA, 1990
- UNSCEAR reports – 1988, 1993 and 2000
- IPHECA – WHO, 1991-1995
- EC + FSU joint research projects – 1992-1999
- International Conference “One Decade after Chernobyl: Summing up the Consequences” - IAEA, WHO and EC, 1996
- The Human Consequences of the Chernobyl Nuclear Accident – A Strategy for Recovery – UNDP, 2002
- **The Chernobyl Forum – 2003-2005**

The Chernobyl Forum: political context

- Initiated by the IAEA DG Mr ElBaradei
- Contribution to the implementation of the UN “Strategy for Recovery”
- 8 UN organisations + 3 Governments (Belarus, Russia and Ukraine) involved
- An attempt to agree on fact interpretation and recommendations for future actions by 20th anniversary.
- The results considered by 60th UN General Assembly, Nov 2005.



Major tasks of the Chernobyl Forum

- To generate authoritative consensual statements on the health effects attributable to radiation exposure and the environmental consequences induced by the radioactive materials released due to the accident;
- To provide advice on remediation and special health care programmes; and
- To consider the necessity for continued research, aimed at resolving the disputed issues.

Forum operation

- **Chaired by Dr B.Bennett, RERF**
- **Annual managerial meetings of senior officials from 8 UN organizations and the 3 affected States + observers**
- **Regular expert meetings on the environmental consequences organised by the IAEA (EGE) and those on human health (EGH) organised by the WHO – in total 11 meetings**
- **More than 80 experts from 12 countries and 6 international organisations, such as UNSCEAR, IUR, IARC, etc.**
- **Forum reports on environment and health and the Digest report approved by consensus in April 2005**
- **UNDP complemented the Digest report with the social and economic issues based on UN, 2002**

Chernobyl Forum's products

<http://www.iaea.org/NewsCenter/Focus/Chernobyl/index.shtml>

WORKING MATERIAL
(Limited Distribution)

Environmental Consequences of the Chernobyl Accident and Their Remediation: Twenty Years of Experience

*Report of the UN Chernobyl Forum
Expert Group "Environment" (EGE)*

World Health Organization

Health Effects of the Chernobyl Accident and Special Health Care Programmes

Human Consequences of the Chernobyl Nuclear Accident

A Strategy for Recovery

Chernobyl's Legacy: Health, Environmental and Socio-economic Impacts

and

Recommendations to the Governments of Belarus, the Russian Federation and Ukraine

The Chernobyl Forum



Belarus



the Russian Federation



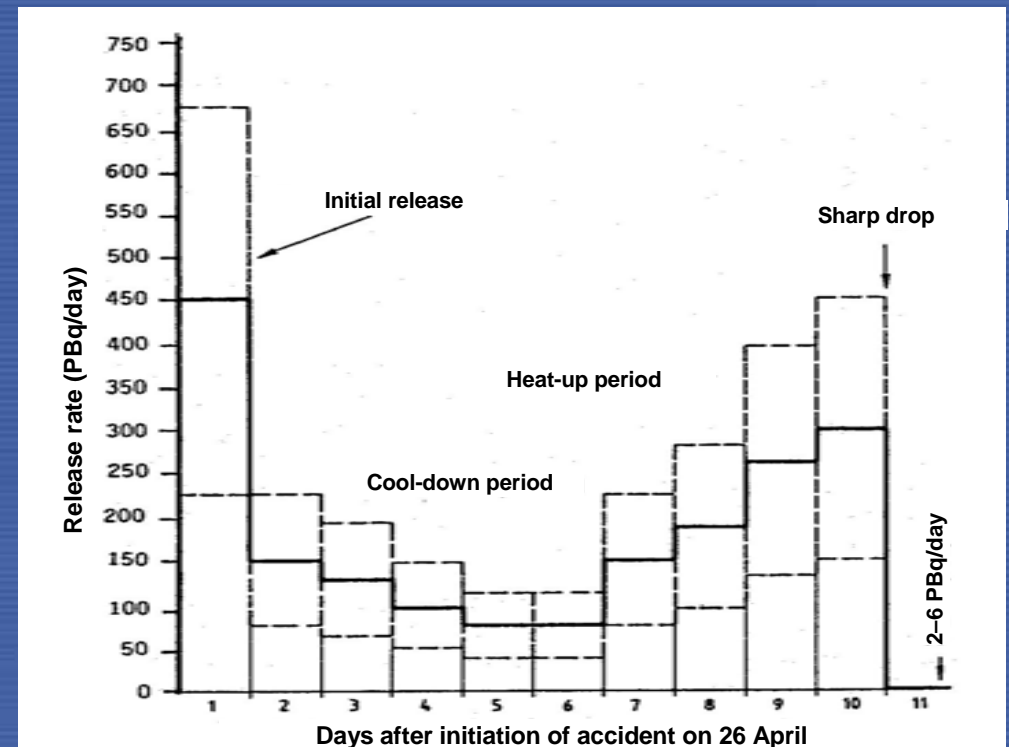
Ukraine



The Chernobyl Forum

Main conclusions of the Chernobyl Forum -1

- The accident at the Chernobyl NPP in 1986 was the most severe in the history of the world nuclear industry.
- Due to the vast release of radionuclides it also became the first magnitude radiological accident.



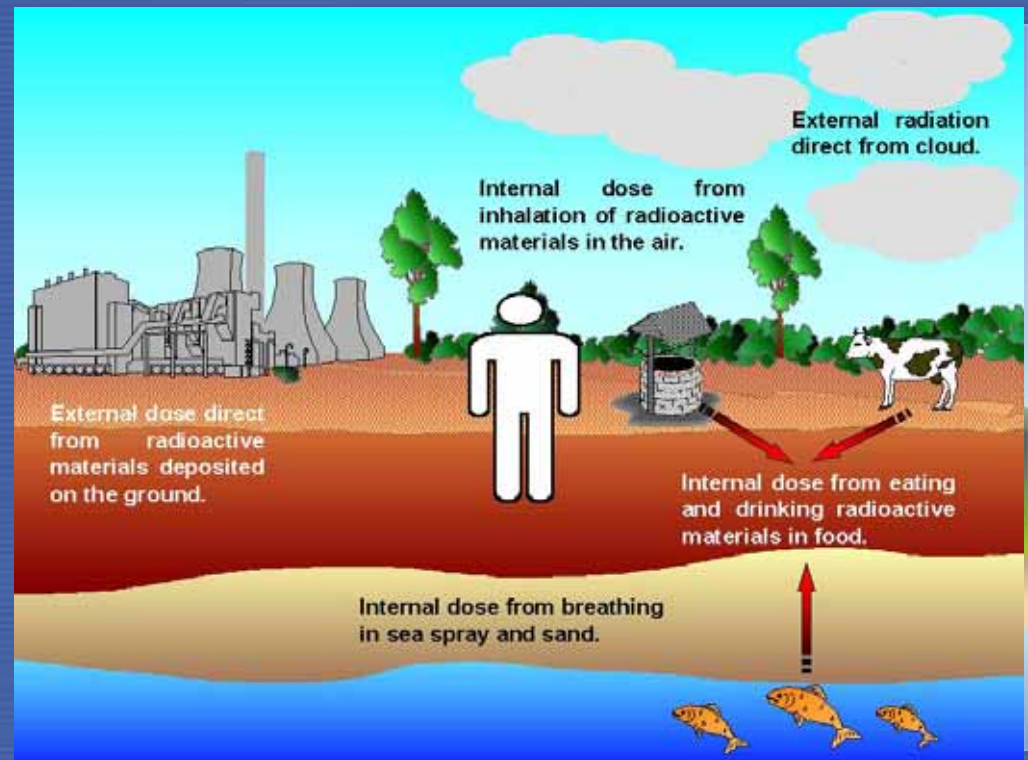
Main conclusions of the Chernobyl Forum - 2

However, in the course of years, the most significant problems have become the severe social and economic depression of the affected Belarusian, Russian and Ukrainian regions and the associated serious psychological problems of the general public and emergency workers.



Main conclusions of the Chernobyl Forum - 3

- The majority of the more than 600 ths. recovery operation workers and 5 mln. residents of the contaminated areas in Belarus, Russia and Ukraine received relatively minor radiation doses which are comparable with the natural background levels.
- This level of exposure did not result in any observable radiation-induced health effects.

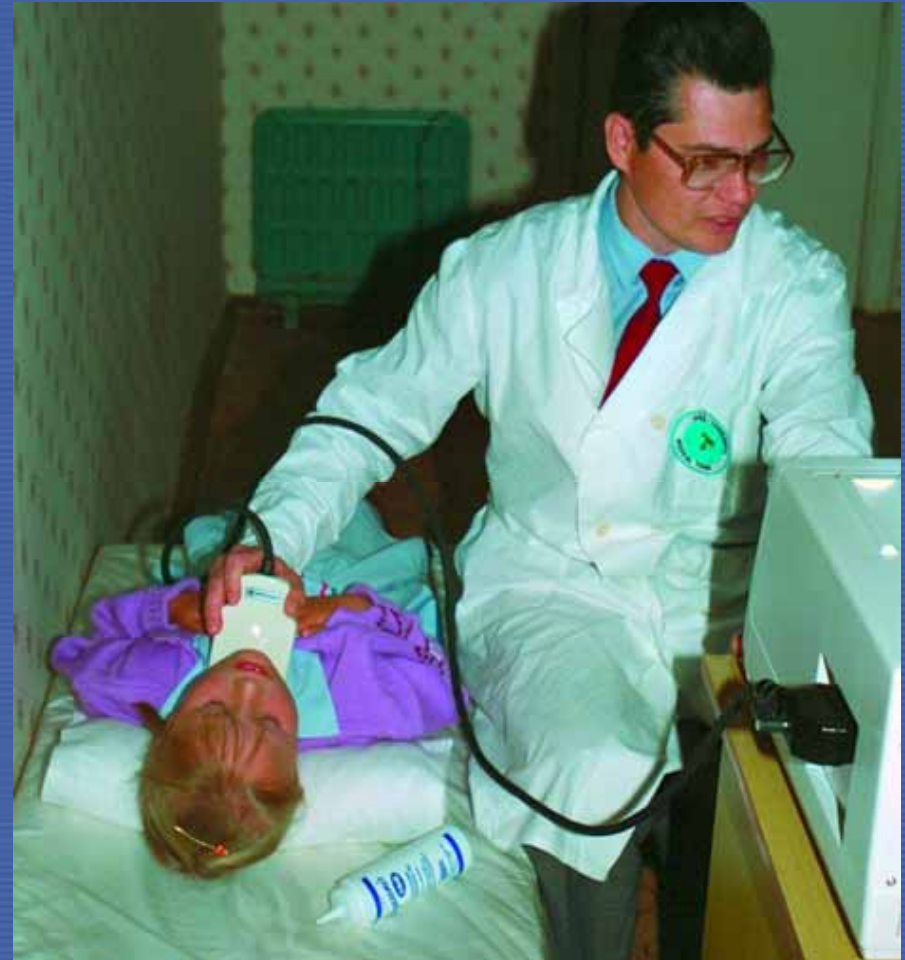


Main conclusions of the Chernobyl Forum – 4

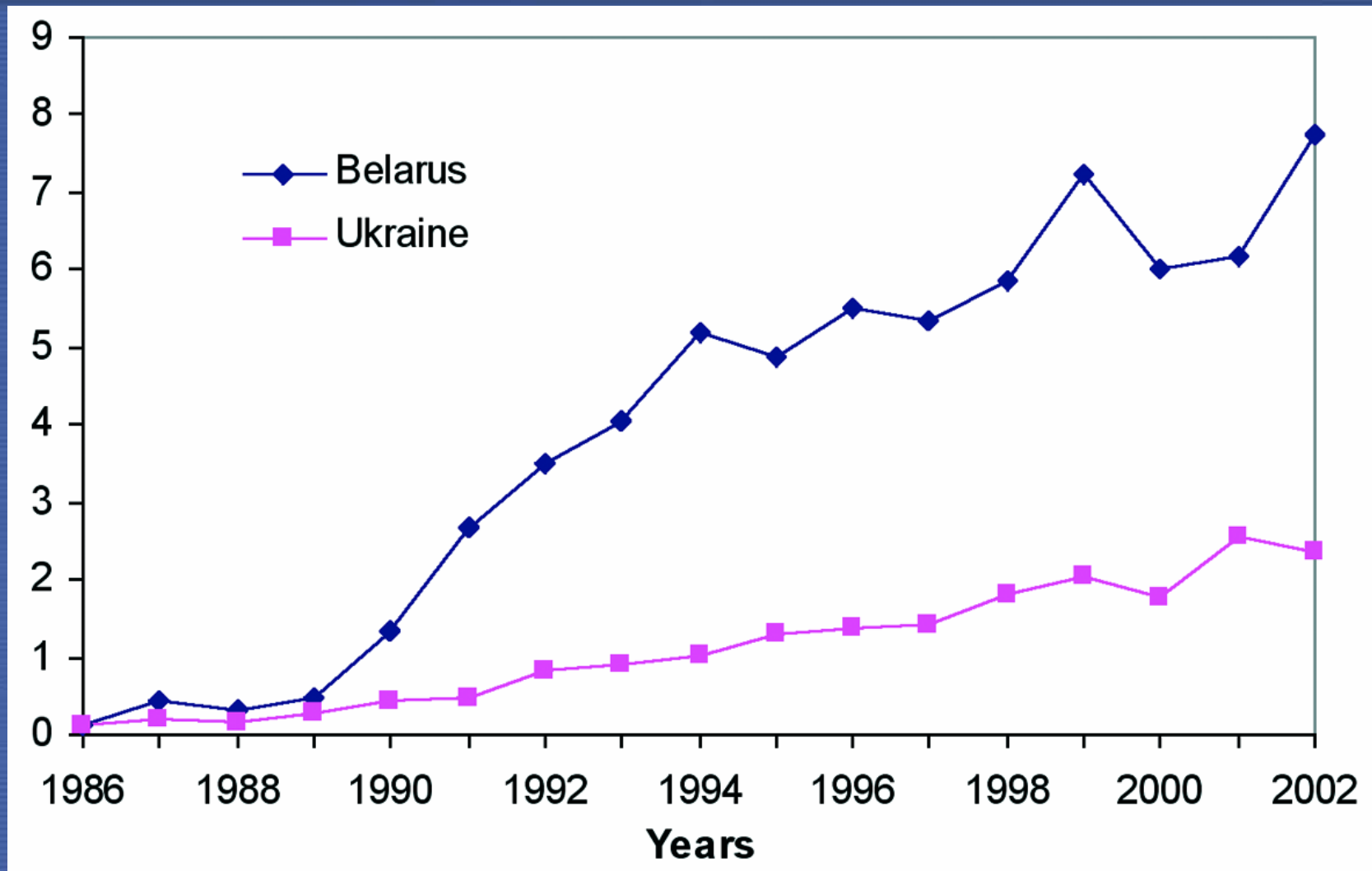
- An exception is a cohort of several hundred emergency workers who received high radiation doses; of whom near 50 died due to radiation sickness and subsequent diseases.
- According to bio-statistical forecast, radiation has caused, or will cause, the premature deaths of around 4000 people from the 600 000 affected by the higher radiation doses due to the Chernobyl accident.

Main conclusions of the Chernobyl Forum - 5

- Another cohort affected by radiation are children and adolescents who in 1986 received substantial radiation doses in the thyroid due to the consumption of milk contaminated with radioiodine.
- In total, about 4000 thyroid cancer cases have been detected in this cohort during 1992–2002; more than 99% of them were successfully treated, but nine persons died (as of 2004).



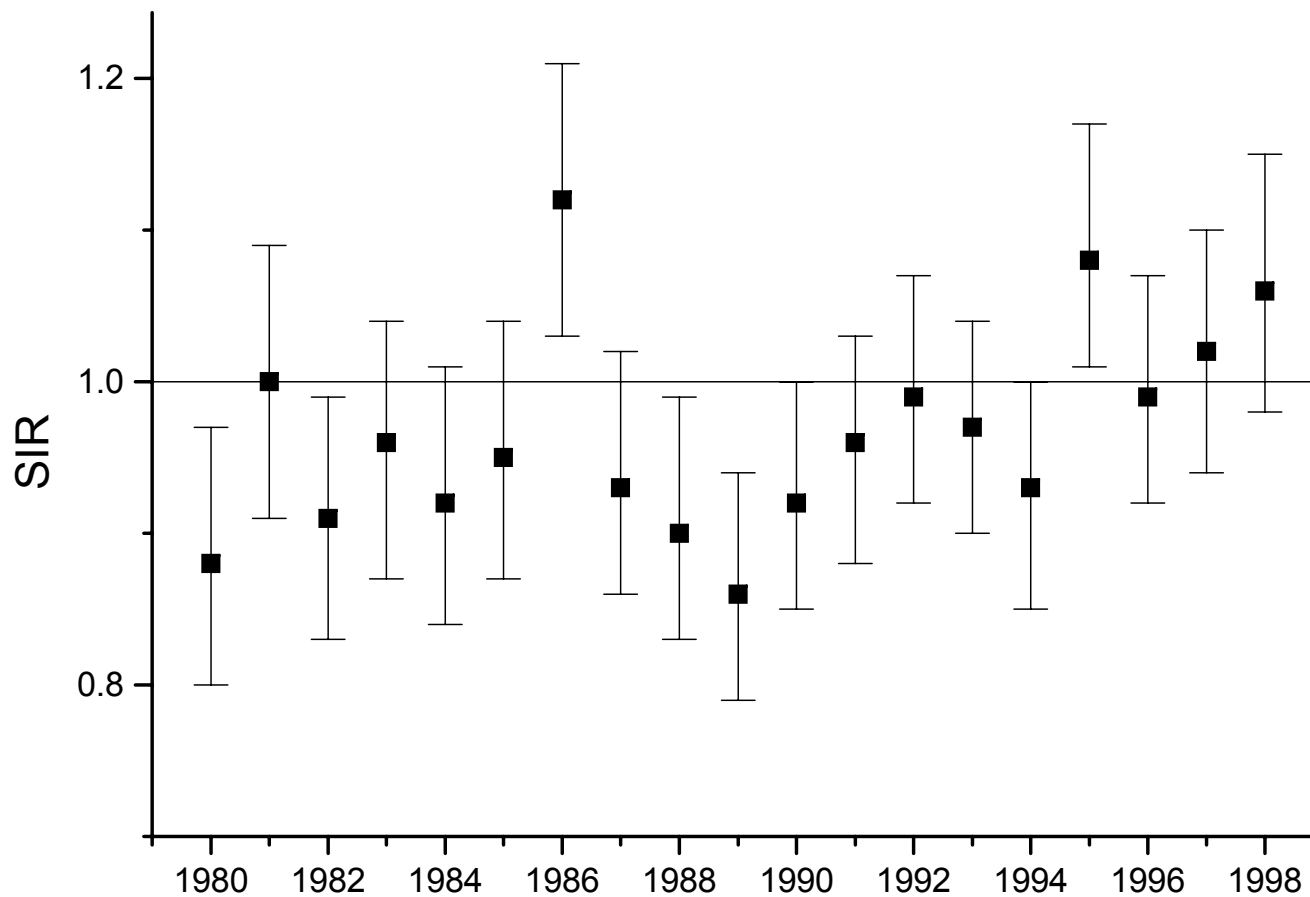
Incidence rate of thyroid cancer per 100,000 children and adolescents as of 1986 (Jacob et al., 2005)



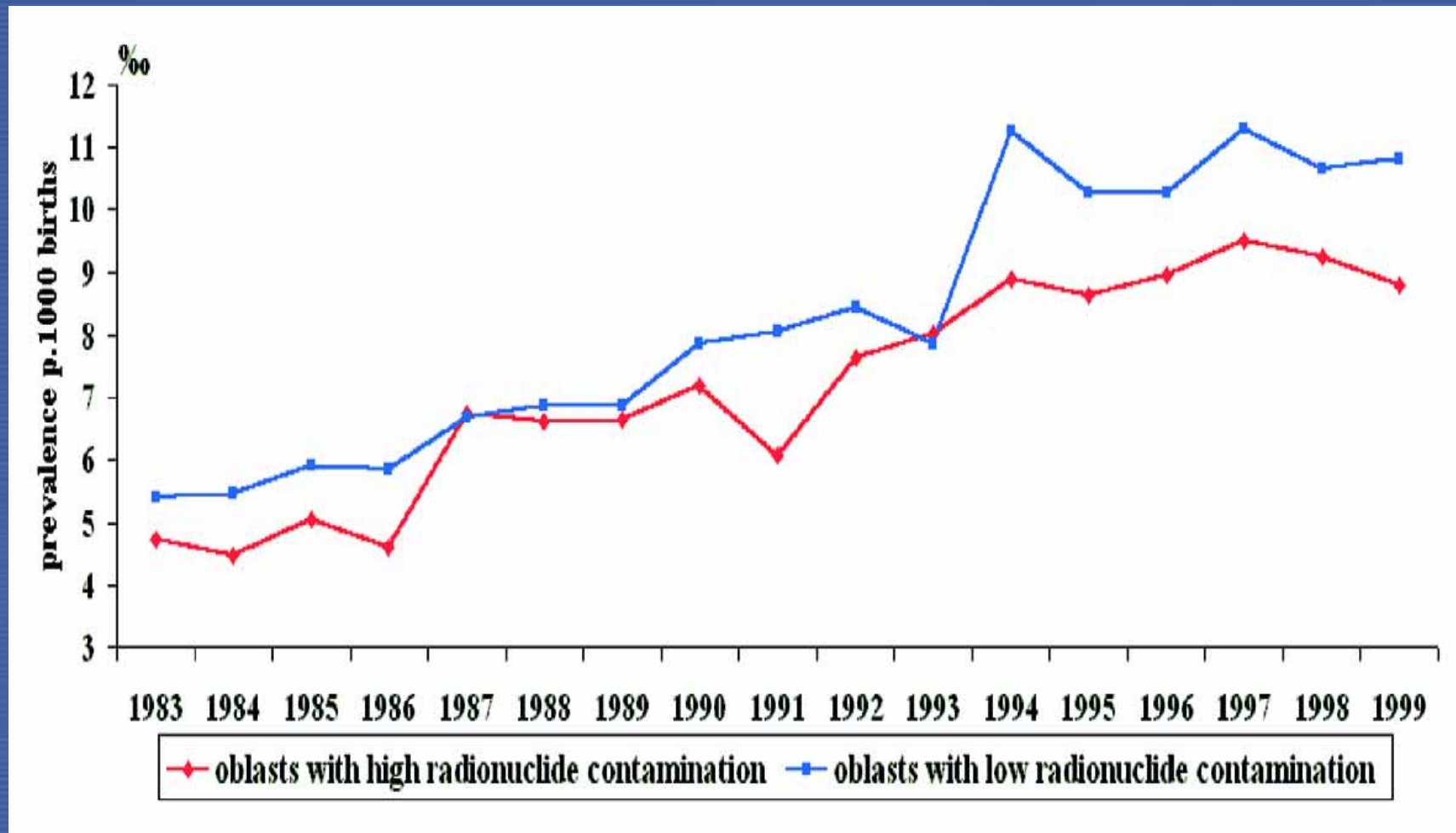
Other diseases resulted from the Chernobyl radiation exposure

- **Russian emergency and recovery operation workers, according to RNMDR (Ivanov et al. 2004):**
 - Doubling of leukemia morbidity in workers with $D > 150$ mGy,
 - Some increase of mortality (~5%) caused by solid cancer and cardiovascular diseases,
 - Increased cataract frequency.
- **Residents of contaminated areas:**
 - No reliable data on increased incidence of any somatic disease except of thyroid cancer in children and adolescents (considered above),
 - According to biostatistical forecast, substantial increase of radiation-induced somatic morbidity in the future is unlikely.

Dynamics of solid cancer incidence among residents of 5 contaminated rayons of the Bryansk oblast standardized to incidence in other rayons (SIR) (Ivanov&Tsyb, 2004)



Prevalence of malformations at birth in 4 oblasts of Belarus with high and low levels of radionuclide contamination (Lazjuk GI et al., 1999)



Main conclusions of the Chernobyl Forum – 6

Psychological consequences:

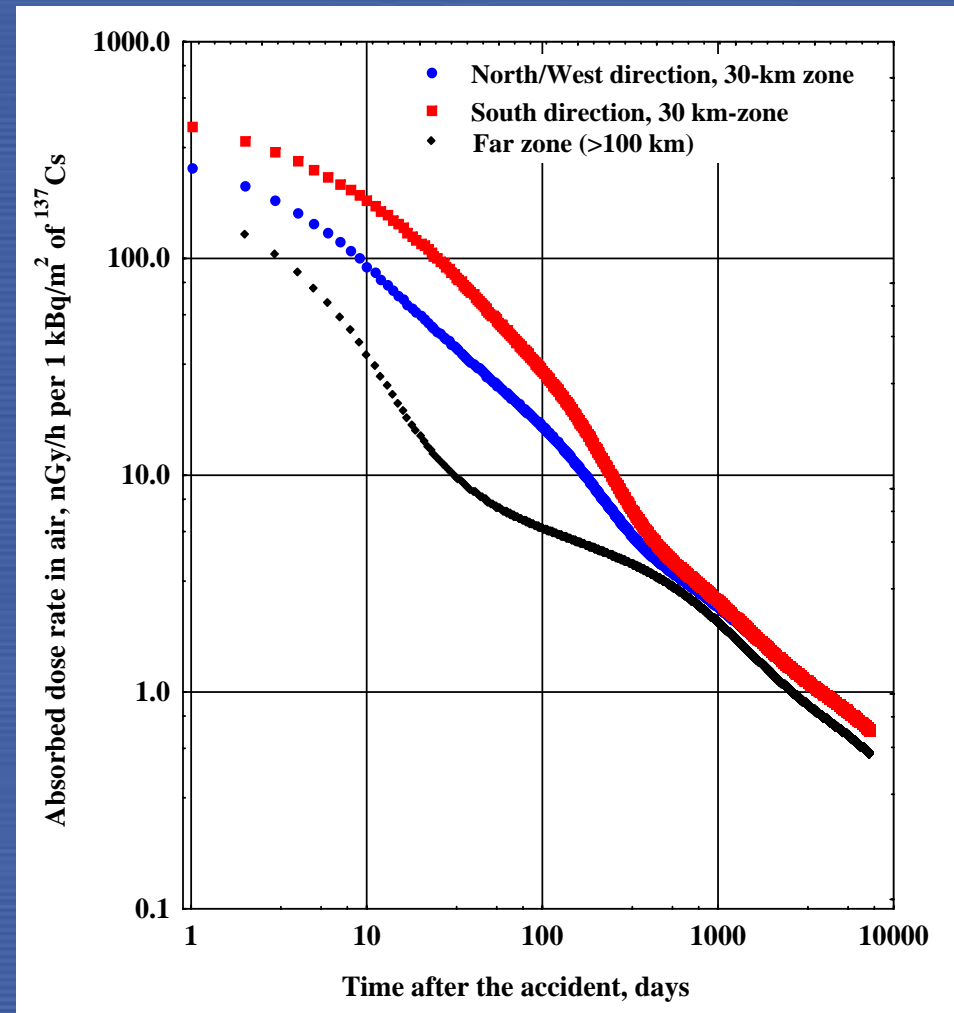
- Many people have been traumatised by the relocation, the breakdown in social contacts, fear and anxiety about what health effects might result.
- Elevated anxiety and unexplained physical symptoms among affected people reported.
- “Chernobyl Victims or Invalids” and not the “Chernobyl Survivors”.
- Renewed efforts at risk communication, based on accurate information about the health and mental health consequences of the disaster, should be undertaken.

Recommendations on health care and research

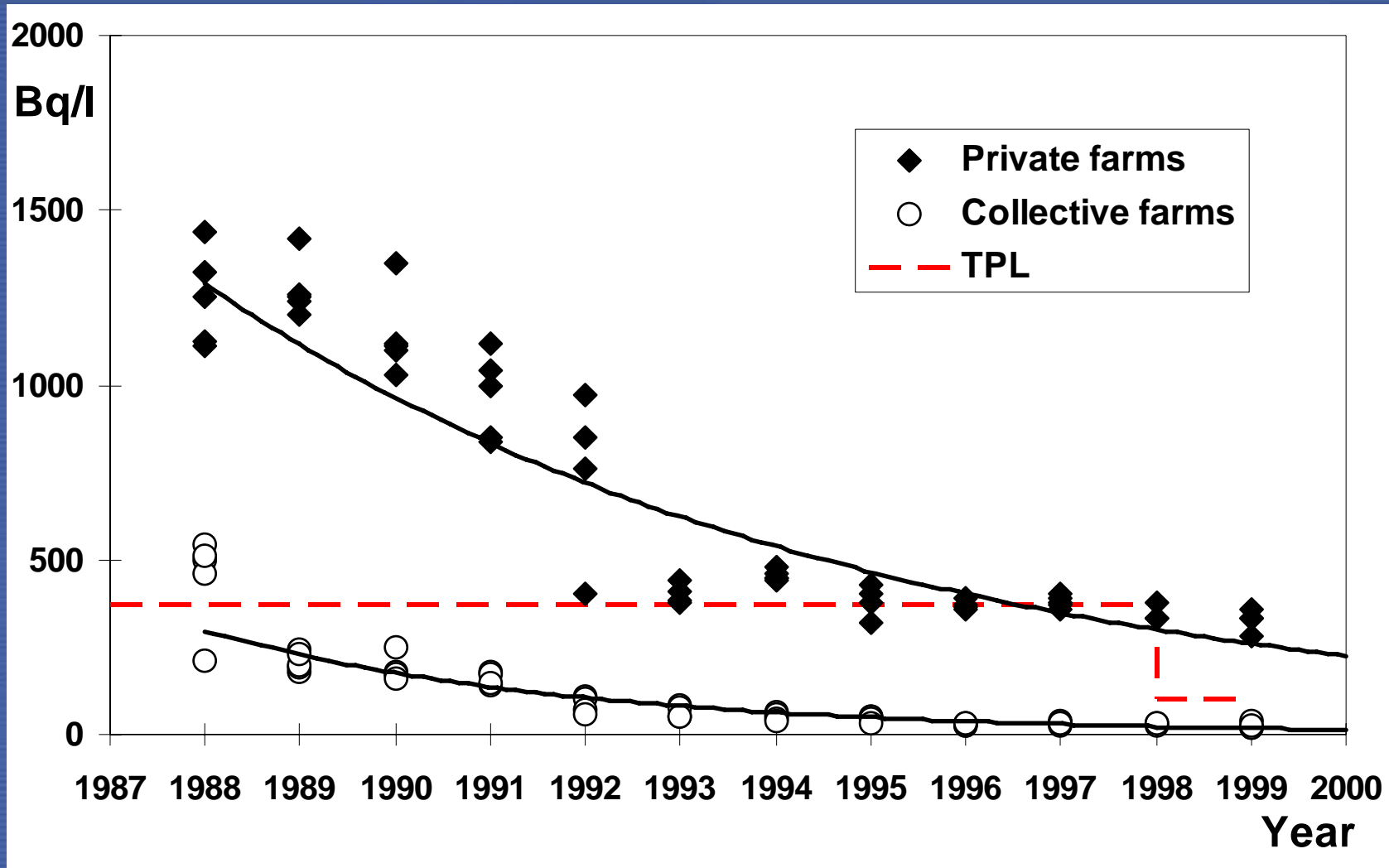
- Medical care and annual examinations of the highly exposed emergency workers, including those recovered from ARS should continue.
- Current follow-up programmes for persons with whole-body doses of less than 1 Gy should be reconsidered relative to necessity and cost-effectiveness.
- Resources might more profitably be directed towards reduction of infant mortality, alcohol and tobacco use, detection cardiovascular disease and improvement of mental health status of the affected population.
- Screening for thyroid cancer of children and adolescents, who resided in 1986 in the areas with radioactive fallout, should continue.
- A number of other generic and targeted recommendations.

Main conclusions of the Chernobyl Forum – 7

- Radiation levels in the environment have reduced by a factor of several hundred since 1986 due to natural processes and countermeasures.
- Therefore, the majority of the land that was previously contaminated with radionuclides is now safe for life and economic activities.

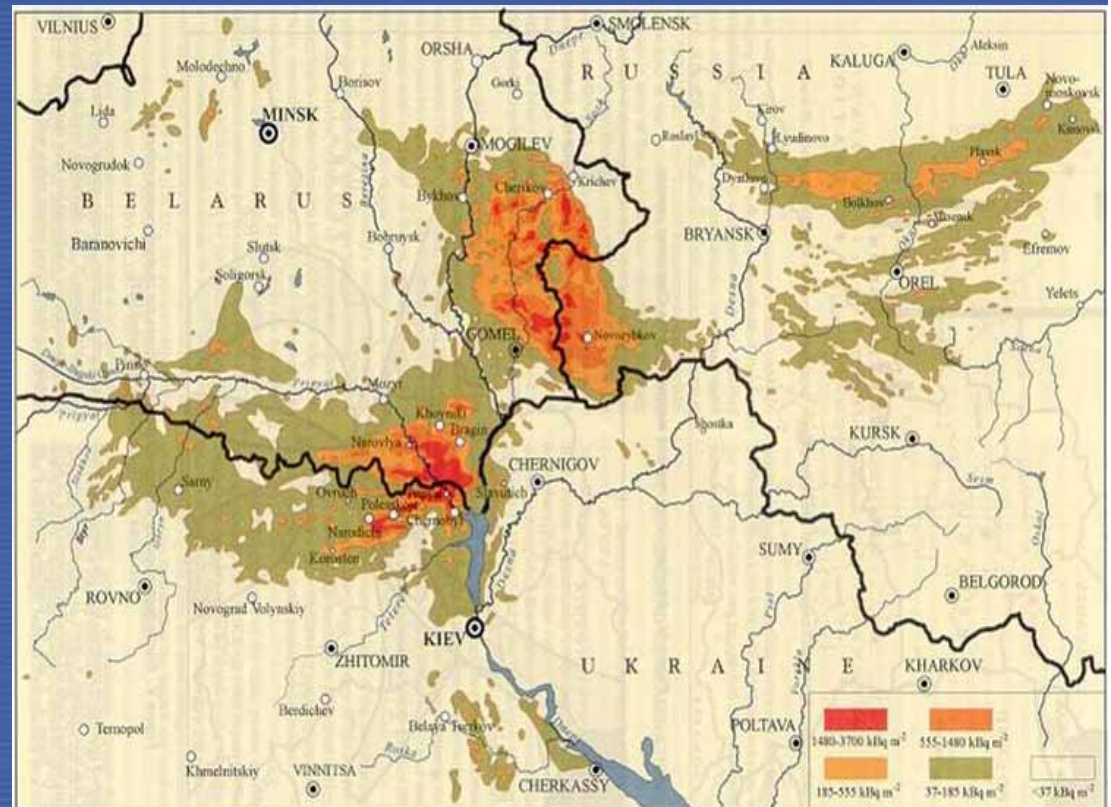


Typical dynamics of Cs-137 activity concentration in milk with a comparison to TPL, Rovno region, Ukraine



Main conclusions of the Chernobyl Forum – 8

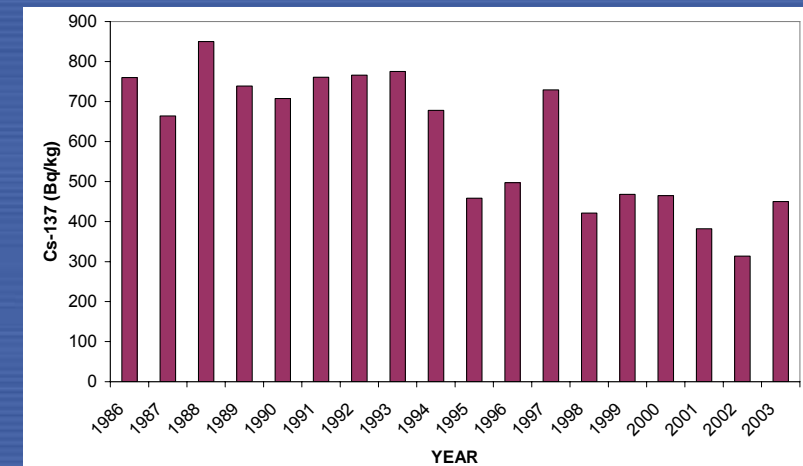
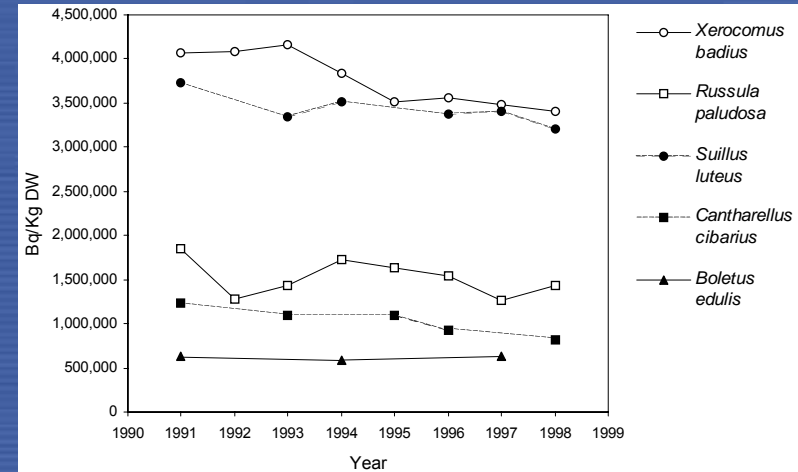
However, in the Chernobyl Exclusion Zone and in some limited areas of Belarus, Russia and Ukraine some restrictions on land-use should be retained for decades to come.



Main conclusions of the Chernobyl Forum – 9

- Particularly high ^{137}Cs activity concentrations have been found in mushrooms, berries, and game;
- These high levels have persisted for two decades, and this can be expected to continue for several decades.

Mushrooms, Ukraine



Moose, Sweden

Main conclusions of the Chernobyl Forum – 10

Radiation-induced effects on plants and animals

- Irradiation caused numerous acute adverse effects on the plants and animals living up to 10-30 kilometres from the release point.
- The following effects caused by radiation-induced cell death have been observed in biota:
 - Increased mortality of coniferous plants, soil invertebrates and mammals; and
 - Reproductive losses in plants and animals.
- A few years were needed for recovery from major radiation-induced adverse effects in populations of plants and animals.
- Due to removal of human activities, the Exclusion Zone has paradoxically become a unique sanctuary for biodiversity.
- There is nothing that can be done to remedy the radiological conditions for plants and animals residing in the Exclusion Zone that would not have an adverse impact on plants and animals.

A white-tailed eagle chick in the CEZ. Before 1986, these rare birds have been hardly found in this area (S. Gaschak, 2004)

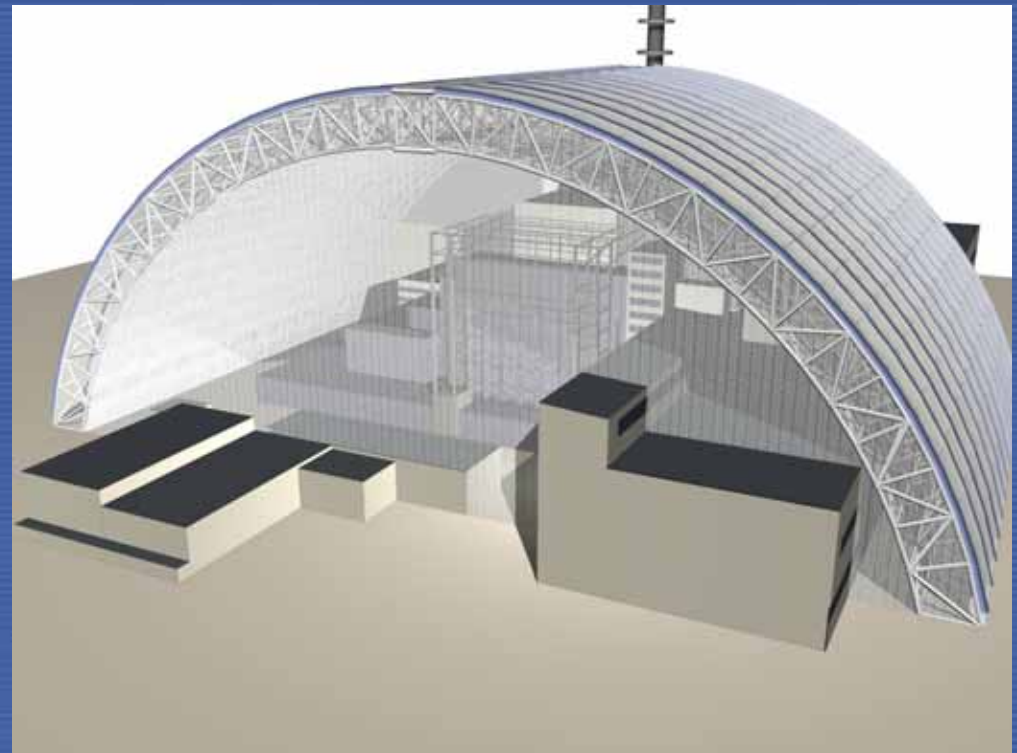


Recommendations on environmental monitoring, remediation and research

- There is no need for major new research programmes on radioactivity; but it is of use to continue limited targeted monitoring of some specific areas.
- To inform the public on persistent high contamination of wild food products (fungi, game, berries, etc.) and on simple cooking procedures aimed at reducing internal exposure.
- The number and frequency of sampling and measurements can be substantially reduced.
- Remediation measures remain efficient mainly in areas with poor (sandy and peaty) soils where there is a high radiocaesium transfer from soil to plants.
- Technologically based remediation measures applied to forests and surface waters will not be practicable on a large scale.

Main conclusions of the Chernobyl Forum – 11

Priority for Ukraine should be the decommissioning of the destroyed Chernobyl Unit 4 and the safe management of radioactive waste in the Chernobyl Exclusion Zone, as well as its gradual remediation.



Socio-Economic Impact of the Chernobyl Accident - 12

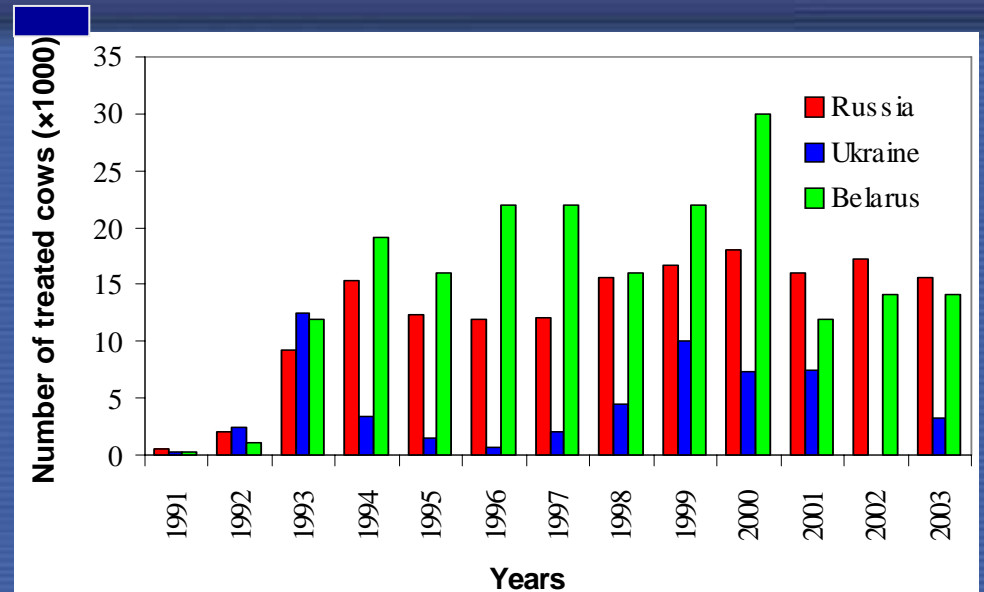
- Enormous damage to economy of the USSR and its successors, Belarus, Russia and Ukraine, due to direct and indirect costs,
- Depression of local economy in the affected regions,
- Destruction of local communities due to resettlement of 340 ths. people,
- Psychological distress of people, development of the “Chernobyl victim” complex,
- Compensating exposure to risk rather than actual injury to health or economy,
- Difficulties in implementation of expensive investment programmes, particularly in market conditions.

Chernobyl-related construction, 1986-2000 (thousands)

	Belarus	Russia	Ukraine	Total
Houses and flats	65	37	29	130
Schools (places)	44	18	49	112
Kindergartens (places)	19	4	11	34
Outpatient health centres (visits/day)	21	8	10	39
Hospitals (beds)	4.2	2.7	4.4	11.2

Main conclusions of the Chernobyl Forum – 13

- Countermeasures implemented by the Governments in coping with the consequences of the Chernobyl accident were on the whole timely and adequate.
- However, recent research shows that the direction of these efforts must be changed. Social and economic restoration of the affected Belarusian, Russian and Ukrainian regions must be a priority.



Main conclusions of the Chernobyl Forum – 14

- Targeted research of some long-term environmental, health and social consequences of the Chernobyl accident should be continued for decades to come.
- Preservation of the tacit knowledge developed in the mitigation of the accident consequences is essential.

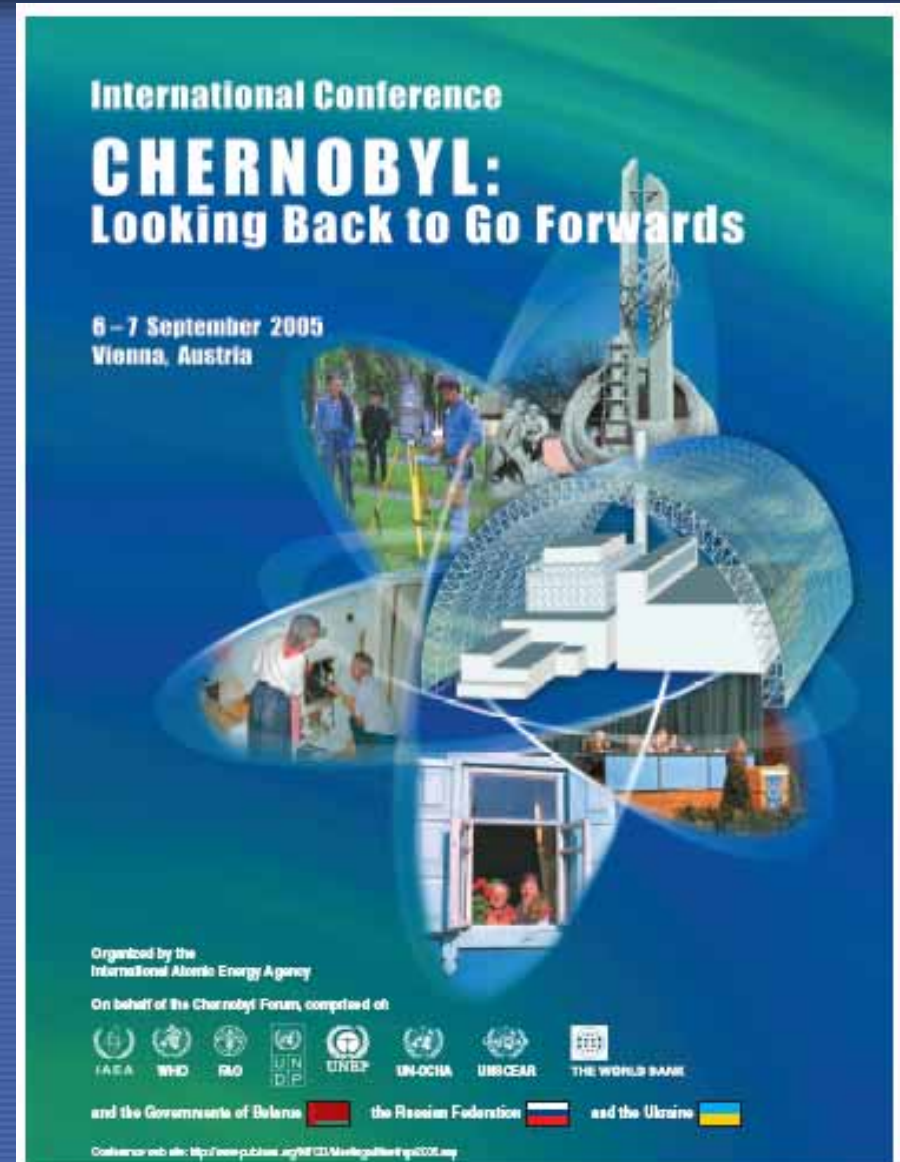


Main conclusions of the Chernobyl Forum – 15

- The Forum report is the most complete on the Chernobyl accident because it covers environmental radiation issues, human health and socio-economic consequences. About 100 recognised experts in the field of Chernobyl-related research from many countries, including experts from Belarus, Russia and Ukraine, have contributed to it.
- This report is a consensus view of the eight organisations of the UN family and of three affected countries.

International Conference “Chernobyl: Looking Back to Go Forwards”

- Held 6-7 September 2005 in Vienna
- About 250 participants from 41 country and 20 organisations:
 - summarized the Forum’s work,
 - informed decision-makers, mass media and the general public, and
 - promoted the proposed actions
- Accompanied by extensive press campaign



60th Session of the UN General Assembly

- Considered on 14 November 2005 the report A/60/443 of the Secretary-General on Chernobyl that includes, *inter alia*, the results of the Chernobyl Forum.
- Accepted Resolution A/60/L.19, in which:
 - Noted consensus reached among members of the Chernobyl Forum regarding assessment of the accident consequences and future actions;
 - Noted the necessity to widely disseminate Forum's findings and recommendations;
 - Requested to organise further studies consistent with the recommendations of the Chernobyl Forum.
- Thus, for the first time the Chernobyl Forum reached highest international consensus in the assessment of the accident consequences and recommendations for future actions.

