Federal Medical Biological Agency of Russia

Problems of nuclear legacy regulation in Russia

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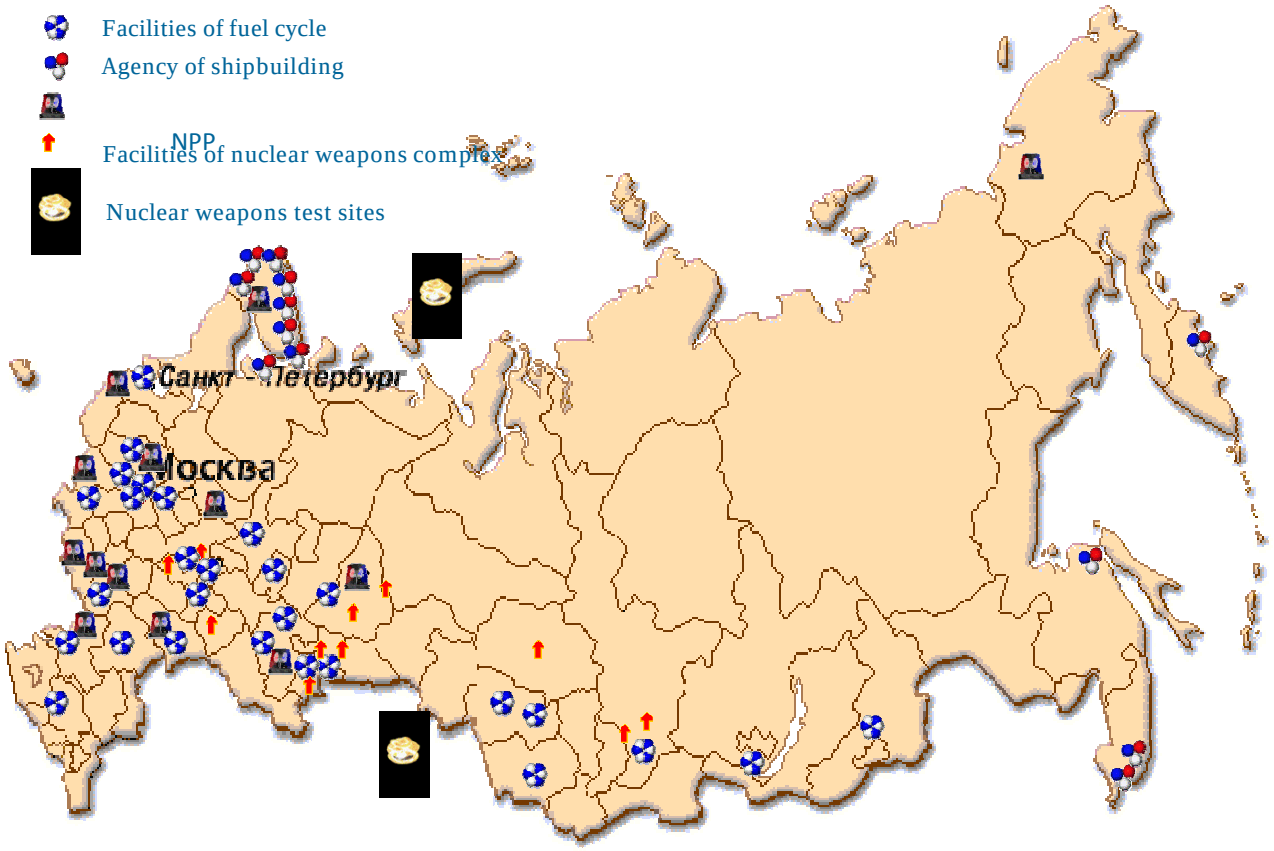
Content

1. Nuclear Legacy: classification, examples, consequences
2. Nuclear Legacy Regulation: problems and trends
3. International Cooperation
4. Conclusions and Recommendations

Federal Laws of Russia

- radiation protection of the public, 1996
- Sanitary-epidemiological prosperity of the public, 1999
- Preservation of the environment, 2001

Facilities under FMBA



Part 1

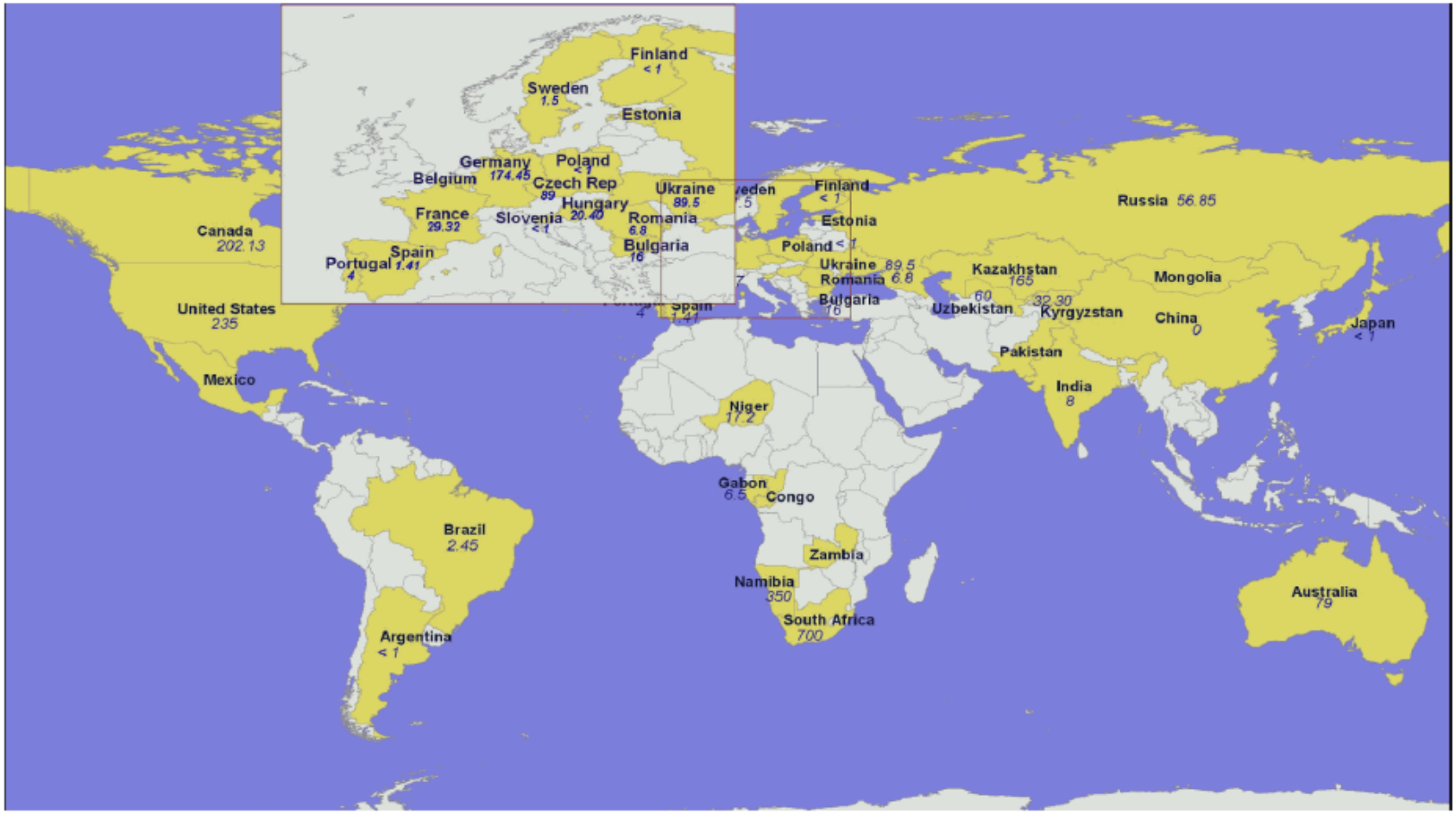
Nuclear Legacy: classification, examples, consequences

- Nuclear Weapons Production and Tests
- Radiological Accidents
- Spent Nuclear Fuel (SNF) and Radioactive Waste (RW) at Sites of Temporary Storage (STS)
- Uranium - TENORM

Classification

- **Man-Made Radiation**
  - Uranium Tailing Dumps
  - Places of Legacy Radionuclide Management Operations
  - Early Nuclear Materials Production
  - Nuclear Weapons Landfills
  - Radiation Accident Areas

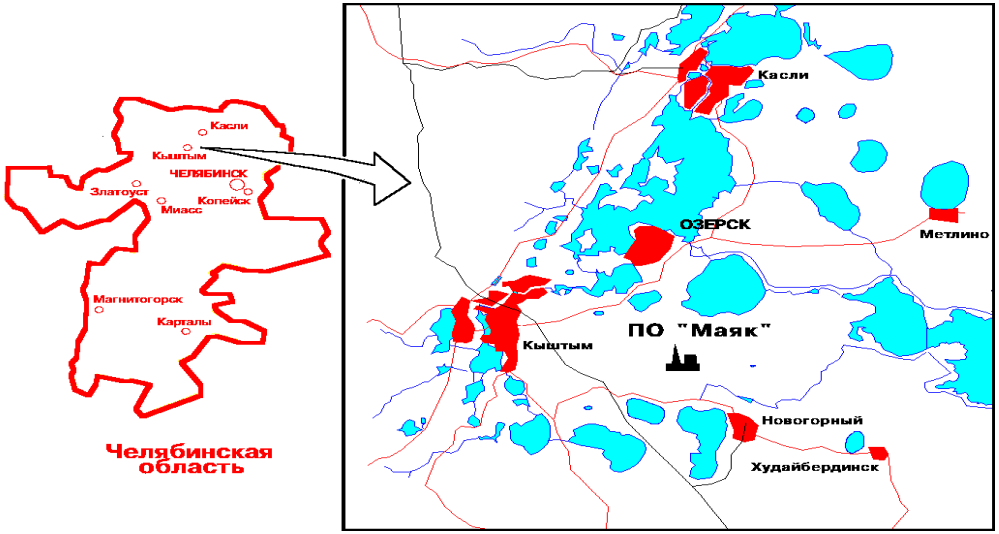
Global Uranium Mining and Milling Waste (million t., UNSCEAR-2000)



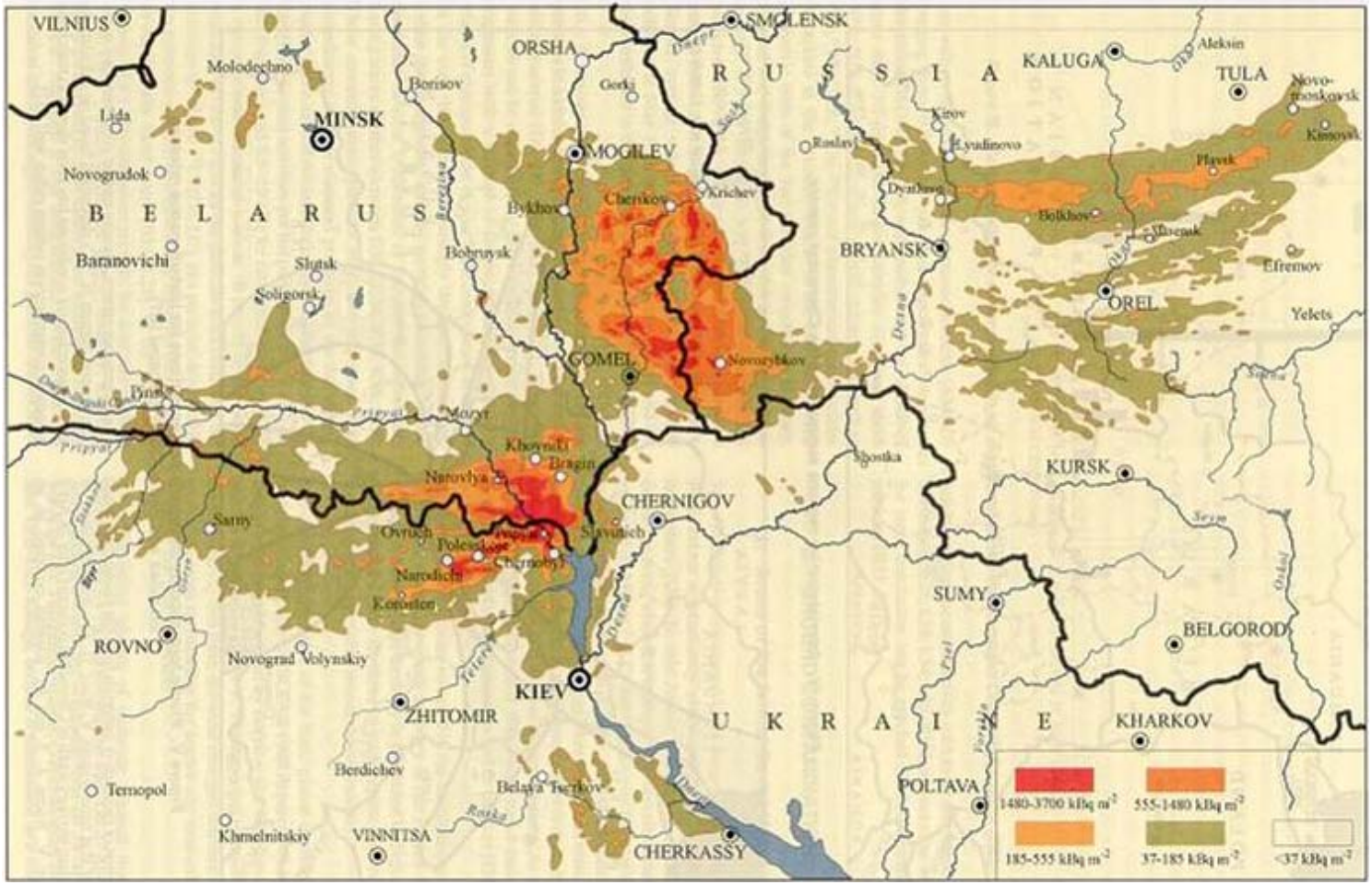
Places of Global Nuclear Tests
(UNSCEAR-2000)

Nuclear Landfills Lop Nor (China) & Semipalatinsk (USSR)

Villages along Techa River & Mayak area



^{137}Cs spots in Belarus, Russia and Ukraine following the Chernobyl NPP accident



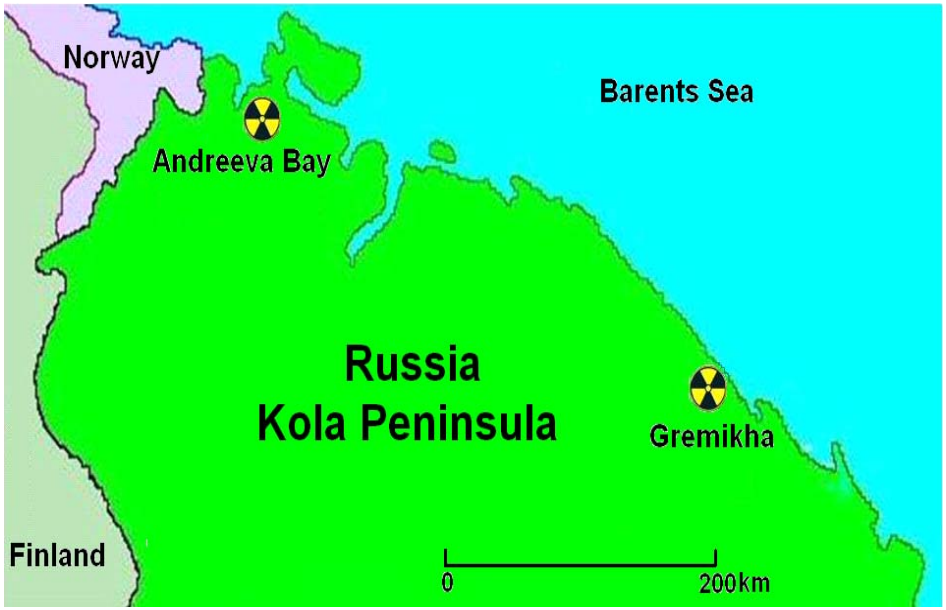
Radiation doses from man-made radionuclide releases

Source	Time period	Significant Nuclides	Mean dose (mGy, mSv)
Global fallout	1950-2020	^{137}Cs, ^{90}Sr, ^{131}I, ^{14}C, ^{3}H	1.1
Techa River, Russia	1949 - 2020	^{90}Sr, ^{89}Sr, ^{137}Cs, др.	50-2000
Marshall Islands	1954	^{131}I, ^{132}I, ^{133}I	Effective – up to 2000 Thyroid – up $200 \cdot 10^3$
Chernobyl, USSR	1986-2056	^{131}I, ^{134}Cs, ^{137}Cs, ^{90}Sr	Effective – up to 500 Thyroid – up to $10 \cdot 10^3$

Observed health effects from environmental exposures

Source	Number of persons exposed	Observed health effect
Global fallout	**Few billions**	None observable against a very large background of cancer incidence
Techa River, Russia	**28 thousands**	**100 - 1000** cases of chronic radiation sickness. Leukemia and solid cancer under study
Marshall Islands	**Few hundred**	Tens of benign thyroid nodules, few thyroid cancers
Chernobyl, USSR	**Few millions**	**2000** thyroid cancers in children by **2000**, more are expected

Northwest, Site of SNF and RW Temporary Storage



Andreeva Bay

$1.3 \cdot 10^{17}$ Bq of SNF

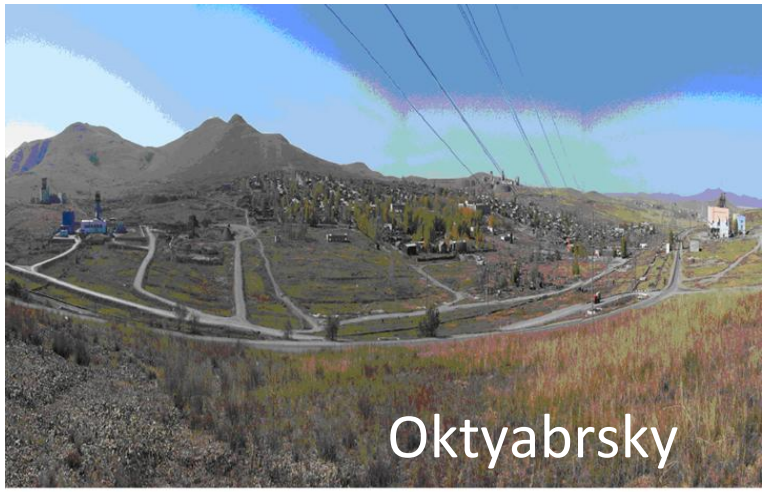
$6.0 \cdot 10^{14}$ Bq of RW

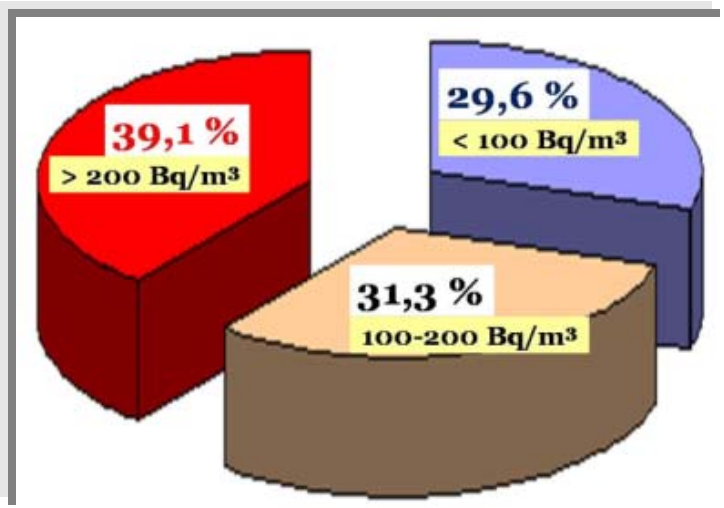
Gremikha

$1.3 \cdot 10^{16}$ Bq of SNF

$3.3 \cdot 10^{13}$ Bq of RW

NORM & TENORM

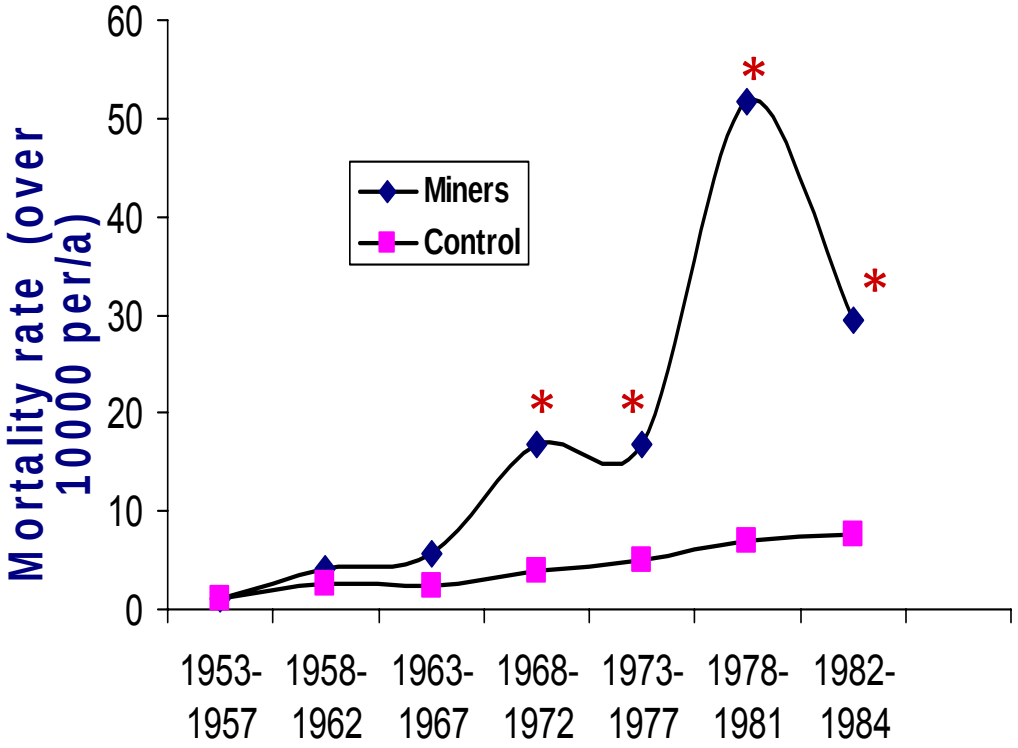




Rn equivalent equilibrium activity concentration in dwellings, Octyabrsky

Gamma dose rate up to 15 μSv/hour

Research in uranium mine



Lung cancer mortality of miners and control (male) population

* $p < 0,05$)

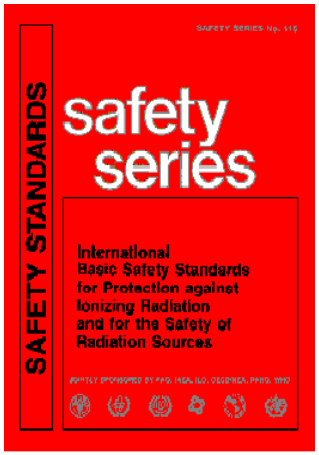
Part 2

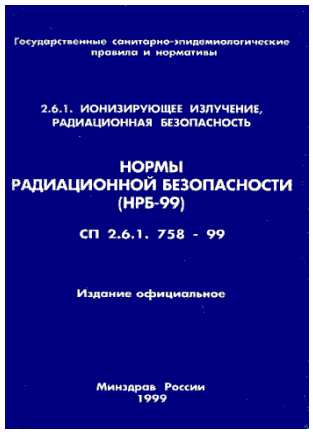
ФМБА РОССИИ

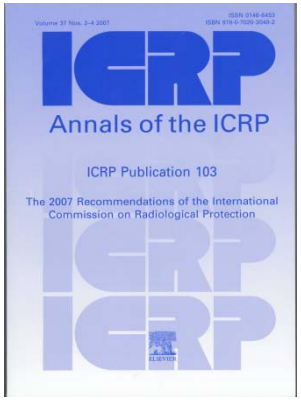
Nuclear Legacy Regulation: problems and trends

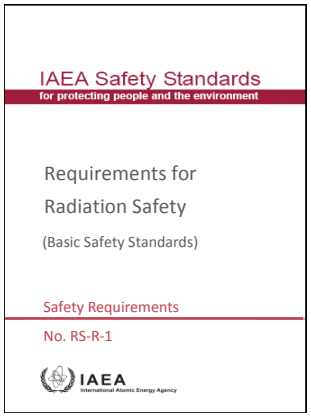
- Existing Regulation
- Regulatory Trends
- Federal Laws

Russian Regulative Basis









Up-to-date Protection Ground

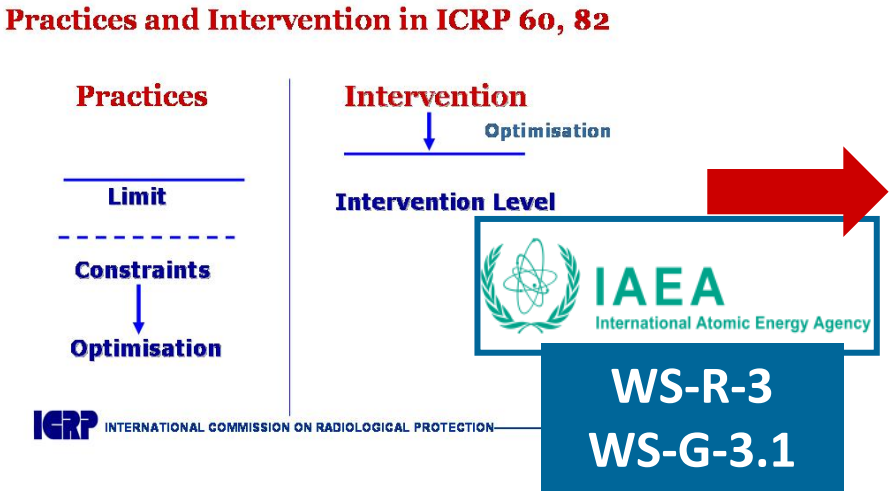
- **ICRP:** Recommendations on Radiological Protection (Publication – 103), 2007
- **IAIE:** Basic Safety Standards, 1996, under revision now
- **Russia:** NRB, 1999, to be reviewed

National radiation protection standards of many states, including Russia, are based on the ICRP and IAEA documents

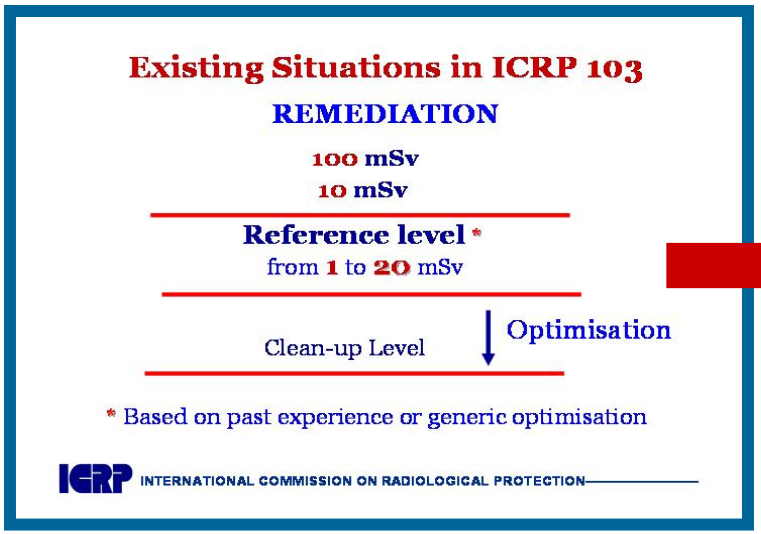
ICRP: Existing Exposure Situation

- Exposure already exists, when decision is to be made on radiation protection
- Prolonged exposure due to
  - **excess radiation background**
  - **after radiation accidents**
  - **following previous radiation substance handling (including nuclear weapon manufacturing and tests, etc.)**
- In many respects, consequences of the Chernobyl accident resulted in generation of such independent exposure situation

Regulatory Trends



- criterion of non-intervention **10** mSv



- reference level from **1** to **20** mSv

Legal Basis for Rulemaking

- Special Environmental Remediation Programs of the Territory under Radioactive Contamination, **2001**
- Transfer of Lands from One Category to Another, **2004**
- Use of Lands under Radioactive or Chemical Contamination, Establishment of Security Areas, **2004**

NORM Standards in Russia

- Intervention level in drinking

Radionuclides	Bq / kg
Pb-210	2.0-1
Po-210	1.2-1
Ra-226	5.0-1
Th-232	6.0-1
U-234,5,6,8	2.9 – 3.1

- Mineral water : U 1,8 mg/l (44,4 Bq/l)
  Ra-226 – 18,5 Bq/l
- Effective dose NORM - <100 µSv/y

Part 3

International Cooperation

- Supervision
- Monitoring
- Control
- Emergency Preparedness

USA

UK

- Safety culture
- Exchange of experience

Regulatory Documents for SevRAO Facilities

- Requirements to provide radiological protection of the personnel and the public
- Criteria and norms on remediation of sites and facilities contaminated with man-made radionuclides
- Arrangement of the environmental radiation monitoring in the operational area of the STSs
- Requirements for industrial waste management
- The Operational Radiological and Medical Criteria for the Initiation of Emergency Protective Actions

Norms of remediation

Variant of remediation	Category of persons	Dose constraint, mSv·y^{-1}			Dose limit from (NRB-99)
		Due to residual contamination	Due to new operation involved radiation sources	Total	
Conservation	Workers	2	-	2	20
	Public (SA territory)	0,1	-	0,1	1
Conversion ("brown lawn")	Personnel group A	3	7	10	20
	Personnel group B	1	1	2	5
	Public (SA territory)	0,1	0,15	0,25	1
Liquidation ("green field")	Public (former STS territory)	1	-	1	Lack of norms in NRB-99
	Public (the rest territory)	0,1	-	0,1	

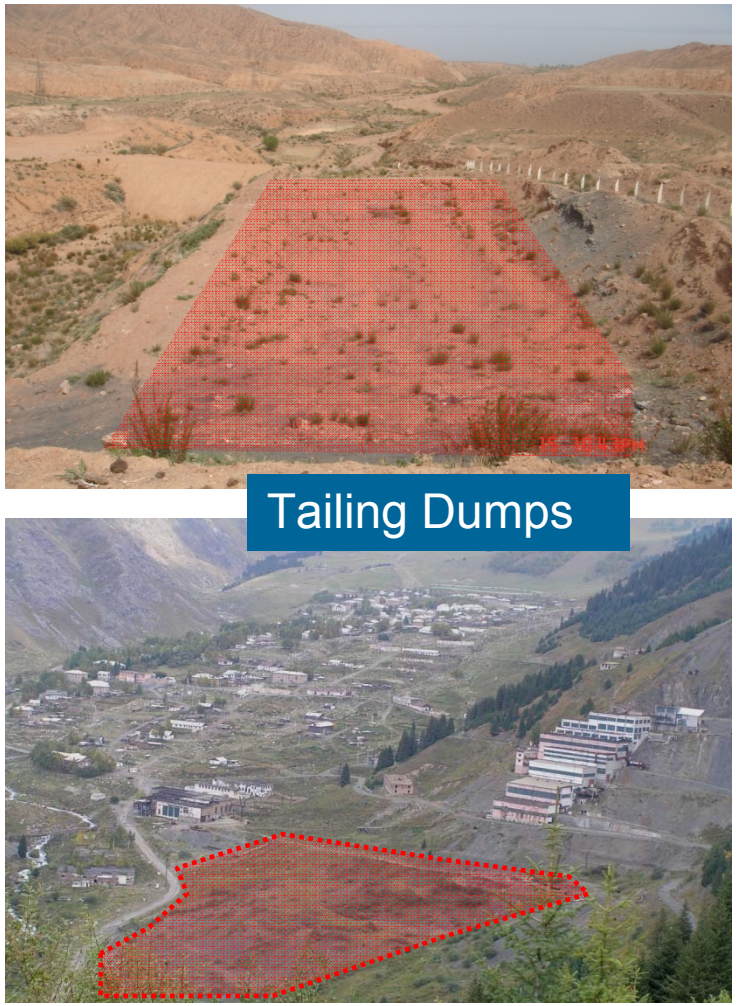
(2006) taking into account the up-to-date ICRP approaches

Russian-Norwegian Agreement

Uranium Legacy

- Territorial Reclamation of the Eurases members under exposure of uranium mining and milling facilities

Countries	S, km²
Kazakhstan	51,7
Kyrgyzstan	6,5
Tajikistan	3,0
Uzbekistan	2,8



Tailing Dumps

Part 4

ФМБА РОССИИ

Conclusions & Recommendations

- **Regulatory, scientific and organizational outlooks**

Conclusions

1. Past defense activity, accidents, poor storage of RW to excess contamination of some Russian areas
2. Radiation effects in the environmental media have been found in limited areas - after the Chernobyl and Mayak
3. ICRP and IAEA developed the RP system in the existing exposure situation
4. To introduce a chapter on RP of the public in the existing exposure situation into the national standards

Recommendations

- To focus the IAEA attention on the necessity of the document devoted to the public health and environmental protection
- To promote development of the international connections on studying of experience in the environmental remediation regulation