



Ongoing challenges: Emergency Management and Management of Radioactive Waste

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Severe local and regional problems and global disruptions









Chernobyl NPP 1986



Contamination of land



Fukushima compared to Chernobyl: comparable Cs-deposition levels but over smaller area After Vandenhove et al., 2012



Fukushima, 2013/12/17

Before





After





Intensive decontamination work was carried out in the Fukushima Prefecture:

Before and after the work in Tamura City (IAEA, 2015) Systematic monitoring of locally grown rice (IAEA, 2015)

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- Economic implications due to stigmatization of rice from the Fukushima Prefecture, even if the Cs-level complied with the limits for food
- Monitoring of all rice bags in the Fukushima in the subsequent years to regain confidence of the consumers



Generation of waste during decontamination work







ENEP Management of nuclear emergencies

 Effective response arrangements and capabilities are essential

- Minimize the radiation doses to people from nuclear and radiological incidents and emergencies.
- Introduce situation-specific protective action as evacuation, sheltering, relocation and application of stable iodine, as necessary
- Remediation activities to limit long-term exposures to the population

- IAEA has developed Safety Standards for Emergency Preparedness and Response and for Remediation of contaminated land
 - These standards have been used in many countries to set up National regulations



IAEA Safety Standards:

- Emergency Preparedness and response
- Remediation of affected areas

IAEA Safety Standards		
for protecting people and the environment		
Arrangements for		
Preparedness for a		
Nuclear or Dediclorical		
Nuclear of Radiological		
Emergency		
Jointly sponsored by		
A (A) (A) (A) (A) (A)		
IAEA WHO		
Safety Guide		
No. GS-G-2.1		

Preparedness and Response for a Nuclear or Radiological Emergency John Standard Contraction Contract Part Contraction Contract Part Contraction Contra

General Safety Guide No. GSG-11

IAEA Safety Standards for protecting people and the environment

Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency

IAEA Safety Standards for protecting people and the environment

Remediation Process for Areas Affected by Past Activities and Accidents

Safety Guide No. WS-G-3.1 Developed in cooperation with International organizations as e.g.

- World Health Organisation
- Food and Agricultural Organisation
- UN Environmental Programme



International Conventions on Emergency managements coordinated by IAEA

- Convention on Early Notification of a Nuclear Accident
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency





Key aspects of the Safety Standards

- Roles and responsibilities of National and International Organisations
- Radiological criteria
- General arrangements for getting prepared for emergency managements
 - Requirements for infrastructure and logistics
 - -Training, drill and exercises
 - -Organizational procedures
- Activation of a general emergency
- Need for hazard assessment
- Monitoring
- Interaction with Technical Support Organizations



ENEP Emergency management - a multi-disciplinary challenge







Scientific preparedness for emergencies (incomplete selection of activities)

- Analytic of radionuclides in a wide range of media
 - Air, soil, water, food, construction material
 - Detection of alpha-, beta- and gamma-emitters

Environmental monitoring

- What? Where? When? How long? How often?

- Assessment of radiation doses for a wide range of exposure groups and conditions
- Scientific basis for the selection of short- and longterm measures
 - Effectiveness in dose reduction
 - Technical feasibility
 - Costs and side-effects
 - Social and cultural implications
- Advice on lifting of restrictions and termination of measures
- Providing advice
 - To the affected people
 - To address general concerns by the population
 - To farmers
 - To the food industry
- Health effects of radiation



Maintaining and developing competence in radiation related topics is essential

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

...... Whatever the future of nuclear generation programmes, i.e. regardless of whether new nuclear power plants are built,

..... there will be an **ongoing requirement for several decades** in the regulatory bodies and the industry

..... to recruit qualified staff to fill the vacancies left by retirements and to preserve the present knowledge base.



Management of radioactive waste

Generation of radioactive waste

- Operation nuclear facilities
- Decommissioning of nuclear installations
- Use of radioisotopes in science, industry and medicine

Safety of radioactive waste

Such waste needs to be managed in a way

..... that keeps people and the environment

..... safe over long periods of time



Elements of radioactive Waste Management





IAEA Safety requirements and standards

IAEA Safety Standards

for protecting people and the environment

Disposal of Radioactive Waste

Specific Safety Requirements No. SSR-5





Safety Standards on Safety Assessment

	IAEA Safety Standards	IAEA Safety Standards	IAEA Safety Standards
IAEA Safety Standards for protecting people and the environment	Predisposal Management of Radioactive Waste	Decommissioning of Facilities	Disposal of Radioactive Waste
Safety Assessment for Facilities and Activities	General Safety Requirements Part 5 No. GSR Part 5	General Safety Requirements Part 6 No. GSR Part 6	Specific Safety Requirements No. SSR-5
General Safety Requirements No. GSR Part 4 (Rev. 1)	IAEA Safety Standards for protecting people and the environment The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste	IAEA Safety Standards for protecting people and the environment Safety Assessment for the Decommissioning of Facilities Using Radioactive Material	IAEA Safety Standards for protecting people and the environment The Safety Case and Safety Assessment for the Disposal of Radioactive Waste
	General Safety Guide No. GSG-3	Safety Guide No. WS-G-5.2	Specific Safety Guide No. SSG-23 (例 IAEA International Company)

University of Tsukuba

Disposal Options for Radioactive Waste



Near surface

- For short-lived RAW, low-activity sources
- Available in many countries
- For all types of RAW and sources,
 - in particular spent fuel and waste from reprocessing
- Not yet available in most countries
- For all types of Disused Radioactive Sources
- A possible safe and secure solution without waiting decades for geological disposal
- Very relevant for countries with DSRS that will not have geological disposal
- Not yet available





Disposal of radioactive waste – An ongoing challenge

- Nuclear techniques are applied since more than 70 years
 - -All generate at least small amounts of RadWaste
- Disposal facilities
 - Few facilities exist for low- and intermediate level waste
 - No facility is available so far for high level radioactive waste
 - In Sweden and Finland, licensing of a facility for high level waste is ongoing.
- Planning, licensing and construction of disposal facilities
 - A long and complex endeavour requiring a multidisciplinary approach
 - Geology and hydrology
 - Engineering
 - Radiation Protection and Radioecology
 - And others

Sound scientific education in these fields is the absolute precondition for successful realization of disposal facilities



ENEP Conclusion

• The ENEP project covers two important topics

- Management of the consequences of nuclear accidents
- -Disposal of radioactive waste

Both topics are important issues in many countries

 Little success has been made so far on disposal of RadWaste, mainly due to anxieties and low acceptance by the public

Whatever the development in this fields might be,

..... It requires well educated and skilled scientists in radiation related field to work on these challenges

• The ENEP programme is one important step in developing scientific offspring in these important areas.

