

Document Preparation Profile (DPP)

1. IDENTIFICATION

Document Category:	Generic Safety Guide
Working ID:	DS468
Proposed Title:	Remediation Process for Areas with Residual Radioactive Material
Proposed Action:	Revision of “Remediation Process for Areas Affected by Past Activities and Accidents”, 2007, Safety Guide, IAEA No. WS-G-3.1
Review Committees:	WASSC, RASSC, NSGC
Technical Officers:	J. Rowat and G. Proehl, NSRW

2. BACKGROUND/RATIONALE

Some past activities and accidents have led to significant radioactive contamination of areas in many Member States, contamination which may represent a hazard to the public and the environment. These areas can be very large and call for major commitments of resources in terms of time, funding and personnel to remediate. While there has been progress made in the remediation of contaminated sites in many Member States, worldwide there are still a large number of contaminated sites yet to be remediated. This has been underscored by: (1) recent IAEA General Conference resolutions and topic sessions calling for increased attention to remediation of legacy sites remaining from past activities, e.g. mining and milling of uranium and thorium ores; and (2) the nuclear accident at the Fukushima Daiichi Nuclear Power Station in Japan which has brought increased attention to remediation after a nuclear emergency situation has been declared ended.

Remediation experience to date shows that a well-developed policy and strategy are necessary to ensure that remediation is sustainable. Planning remediation and decision making has to address issues such as the effectiveness of the actions in terms dose reduction and costs, their technical feasibility and the acceptance by the population involved. Optimization during the formation of a remediation plan can be a complex process as a wide range of factors have an impact on the process. In addition, an important aspect to consider is the role of confirmatory monitoring to evaluate the efficacy of the implemented remediation methods.

3. OBJECTIVE

The objective of this Safety Guide is to provide guidance on implementing the requirements for the remediation of areas contaminated by past activities and accidents, the requirements being those in the BSS (GSR Part 3) and safety requirements deemed applicable in other IAEA safety standards. It is intended to be used by regulatory bodies, operators and others responsible for remediating sites and, in the case of an accident, after an emergency exposure situation has been declared ended.

4. JUSTIFICATION

The Safety Guide *Remediation Process for Areas affected by Past Activities and Accidents*, IAEA Safety Standards Series No. WS-G-3.1, which was published in 2007, addresses the aforementioned situations. It provides guidance on implementing the Safety Requirements found in *Remediation of Areas Contaminated by Past Activities and Accidents*, IAEA Safety Standards Series No. WS-R-3 (2003). Since WS-G-3.1 was published, WS-R-3 has been subsumed into the interim edition of the BSS (GSR Part 3 (Interim)), 2011), the BSS introduce a new categorization of exposure situations with different radiological criteria. In addition, in the period since 2007, several other important safety standards and reference documents have been revised and published (e.g., ICRP Publication Nos. 103 and 111, GSR Part 1, SSR-5, and GSR Part 5). Hence, since 2007 there have been significant changes in standards relevant to WS-G-3.1.

The safety guide WS-G-3.1 should be revised so as to address the new safety requirements for remediation in GSR Part 3, to reflect good practice in the Member States and to address issues that have arisen after the Fukushima nuclear accident. In particular, the WASSC Working Group that met 27-28 October 2011 has identified the necessity for a revision of the Safety Guide. The revision should focus on the following issues:

- Transition from an emergency exposure situation to an existing exposure situation in consideration of public and workers exposure during remedial activities to achieve an end-state condition.
- Consistency of the Safety Guide with the recently published requirements in the BSS has to be provided. In particular, this applies to the requirements for the management of 'Existing exposure situations', for both, public and occupational exposure. Consistency has also to be provided with regard to the derivation and application of radiological criteria.
- Criteria for remediation. Practicable means to meet IAEA Safety Requirements should be discussed [application of the optimization process to existing exposure situations and remediation].
- Remediation [on and off-site] policies and strategies. Contingency measures to cope with remediation activities should be included in the radioactive waste management policies and strategies.
- More guidance has to be provided on the involvement of interested parties during the remediation process. The findings of ICRP Publication 111 (Application of the Commission's Recommendations to the Protection of People Living in Long-Term Contaminated Areas after a Nuclear Accident or a Radiation Emergency) need to be analysed and – if appropriate – incorporated into guidance.
- Experiences in remediation made after the Fukushima and Chernobyl (e.g.: Chernobyl Forum: Chernobyl's Legacy: Health, Environmental and Socio-economic Impacts and Recommendations to the Governments of Belarus, the Russian Federation and Ukraine, IAEA, Vienna (2006) accident need to be analysed and integrated.
- The discussion of Waste Management in WS-G-3.1 needs to be expanded. Taking into account the experiences to date after the Fukushima accident, remediation could be accompanied by generation of large amounts of various types of radioactive waste as very low level or exempt waste. The exact activity measurement in such waste might be difficult.

- The possibilities and limitations of clearance of waste generated during the remediation needs to be explored in detail

Additional issues to be considered when revising WS-G-3.1 are listed in the Annex.

The revised guide will also take into consideration and reference other work and IAEA documents that are under development, for example on facility safety, management systems, decommissioning, safety assessment, and radioactive waste management to consider additional safety aspects associated with severe accidents such as the Fukushima Accident.

It should be noted that in the first quarter of 2013 the IAEA will be organizing an International Expert Meeting on decommissioning and remediation after a nuclear accident. This meeting would be timely for the proposed revision of WS-G-3.1 and it is anticipated that the findings and recommendations of the meeting will contribute appreciably to its revision.

5. PLACE IN THE OVERALL STRUCTURE OF THE RELEVANT SERIES AND INTERFACES WITH EXISTING AND/OR PLANNED PUBLICATIONS

The proposed Safety Guide will be developed as part of the IAEA Safety Standards Series. Due account will be given to existing safety standards, for example those General Safety Requirements for governmental, legal and regulatory frameworks, radiation protection and safety of radiation sources, predisposal management and disposal of radioactive waste decommissioning and termination of activities. As applicable, it will be necessary to coordinate with the development and revision of other relevant IAEA Safety Standards and guidance issued in the Nuclear Security Guidelines.

The new Safety Guide will be based on the Safety Fundamentals and the relevant Safety Requirements that are found principally in the following safety standards:

- Fundamental Safety Principles (SF-1)
- Governmental, Legal and Regulatory Framework for Safety (GSR Part 1) Leadership and Management for Safety (DS 456, future GSR Part 2)
- Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards - Interim Edition, GSR Part 3 (Interim), Safety Assessment for Facilities and Activities, GSR Part 4.
- Predisposal Management of Radioactive Waste (GSR Part 5)
- Disposal of Radioactive Waste (SSR-5).
- Application of the Concepts of Exclusion, Exemption and Clearance (RS-G-1.7)
- Decommissioning and Termination of Activities (DS450, future GSR Part 6) Revision through addenda of GSR Part 1, NS-R-3, SSR-2/1, SSR-2/2 and GSR Part 4 (DS462)
- Several IAEA Safety Requirements are planned to be updated further to consider additional emergency safety aspects associated with severe accidents such as the Fukushima accident. DS468 will be developed considering applicable new safety requirements.

This publication will also provide more introductory materials to strengthen and elaborate the relations with other relevant Safety Guides.

This Safety Guide will also have link with relevant Safety Guides such as Radiation Protection of the Public and the Environment (DS432) and Communication and Consultation with Interested Parties

(DS460). Safety of transport is not part of this Safety Guide.

The safety guide is not related to issues regarding

Supersedes: Remediation Process for Areas Affected by Past Activities and Accidents, IAEA Safety Standards Series No. WS-G-3.1 (2007).

6. OVERVIEW

This Safety Guide provides guidance on implementing the requirements for the remediation of areas contaminated by past activities and accidents. It is intended to be used by regulatory bodies, operators and others responsible for remediating sites and, in the case of an accident, after an emergency exposure situation has been declared ended.

The situations dealt with in this Safety Guide are existing exposure situations for areas that have been contaminated as a result of human activities and that could cause prolonged radiation exposure. In this context, the term “areas” is used in its broadest sense and can include land, water bodies and industrial sites. These areas may have been contaminated as a result of inadequate practices for radioactive waste management, accidental radioactive discharges to the environment that did not meet regulatory requirements, nuclear accidents, atomic weapon tests, and incidents involving releases of radionuclides by users of radioactive materials or past practices that were not subject to an adequate regulatory control.

The Safety Guide also applies to land contaminated by radioactive discharges from facilities that were managed in accordance with less stringent requirements than those that are applied today. It could also be relevant in the event of a malicious act involving radioactive material. This Safety Guide does not apply to facilities that are currently under regulatory control and that may have had emergencies that have contaminated small areas within the facilities.

This publication provides recommendations for protective actions and remedial actions that are intended to reduce existing prolonged exposure due to contamination and to avert potential prolonged exposure to the likelihood of such exposure from related contamination applying the graded approach. This includes remedial actions such as the removal of source of exposure (including the management of the removed source), as well as other long term protective actions such as restrictions on consumption of foodstuffs produced in the area and restriction of access to land areas or of land use.

It covers other important measures linked to remediation activities such as i) the need for monitoring programmes, which provide valuable input for restrictions (e.g.: food consumption, land access) as supporting actions to assist the reduction exposures, although these do not contribute directly to the reduction of exposure; and ii) the need for considerations for the management of radioactive waste that also contains non-radiological hazardous contaminants. Although the non-radiological hazards should be assessed in conjunction with radiological hazards to find an optimal remediation strategy, the scope of this publication does not include the manner in which this can be accomplished.

7. PRODUCTION SCHEDULE: Provisional schedule for preparation of the document, outlining realistic expected dates for:

STEPS	Projected Dates
STEP 1: Preparing a DPP	Done
STEP 2: Approval of DPP by the Coordination Committee	Q2 2012
STEP 3: Approval of DPP by the Safety Standards Committees or the relevant group where appropriate	Q3 2012
STEP 4: Approval of DPP by the CSS	Q4 2012
STEP 5: Preparing the draft	Q1 2013
STEP 6: Approval of draft by the Coordination Committee	Q1 2014
STEP 7: Approval by the Safety Standards Committees for submission to Member States for comments or the relevant group where appropriate	Q2 2014
STEP 8: Soliciting comments by Member States	Q4 2014
STEP 9: Addressing comments by Member States	Q2 2015
STEP 10: Approval of the revised draft by the Coordination Committee Review in NS-SSCS	Q4 2015
STEP 11: Approval by WASSC, RASSC and NSGC for submission to the CSS or the relevant group where appropriate	Q2 2016
STEP 12: Endorsement by the CSS	Q2 2016
STEP 13: Establishment by the Publications Committee and/or Board of Governors (for SF and SR only))	
STEP 14: Target publication date	Q4 2016

8. RESOURCES

Staff: 20 staff weeks

Consultants: 18 consultant weeks

ANNEX

1. Summary of issues to be addressed

WS-G-3.1 contains good guidance that remains current and relevant, particularly to remediation process and planning; the substance of the guidance presently in WS-G-3.1 is expected to remain largely unchanged and to be carried over into the revised Safety Guide.

This section of the Annex provides list of issues to be addressed in the revised and updated Safety Guide:

- a) Ensure consistency with the new BSS regarding the control of public and occupational exposure in existing exposure situations;
- b) Elaborate upon the responsibilities as given in the BSS;
- c) Provide guidance on the derivation of radiological criteria (reference levels for exposures to the public and for derived activity concentration in environmental media) for remediation in existing exposure situations;
- d) Provide guidance on communicating exposure or risks to the public in existing exposure situations;
- e) Emphasize the involvement of interested parties, the relationship of the reference level and the optimization process and assimilate the findings of ICRP 111, if applicable;
- f) Provide guidance on dose assessment for exposure scenarios before and after remedial action, and dose assessment for workers who carry out proposed remedial actions;
- g) Provide guidance on the integration of the optimization process in decision making in the remediation process, in order to find an appropriate balance between exposure to the public, technical feasibility, economic and social impacts, and acceptance of the public;
- h) Elaborate the necessity to develop realistic approaches for dose assessment to enable the adequate use of dose assessment results in the optimization process;
- i) Licensing processes for the management of radioactive waste after remediation: needs to be aligned to national regulations, but also taking into account the need to have management options (such as characterization, handling, processing, storage or disposal) in shorter term than the usual duration of the licensing process;
- j) Discuss risk based approach to be applied to management of remediation actions in existing exposure situations;
- k) Make general updates to document to reflect current IAEA terminology, definitions, references etc.;
- l) Address protection of the environment, which has evolved since 2002, e.g., ICRP 103 and 108. Integrate the consideration of the protection of the environment, if applicable;
- m) Address the regulation and management of mixed residues (i.e., those that contain radiological and non-radiological hazardous contaminants);
- n) Make connection to decommissioning and radioactive waste management, and how the waste generation during remediation will follow the requirements and affect the remediation planning and implementation;
- o) Include the relevant lessons learned from Fukushima and Chernobyl;
- p) Provide guidance on issues related to the generation of large amounts of very low level or exempt radioactive waste;

- q) Explore the possibilities and limitations of re-use and clearance of material and waste generated during the remediation;
- r) Provide guidance on the prioritization of remedial options;
- s) Provide guidance on decision-aiding techniques;
- t) Concepts and examples of on-site and off-site remediation.

2. Revised Table of Contents

The Table of Contents shown below is based on WS-G-3.1 — it is a provisional Table of Contents and hence is expected to change as revision of WS-G-3.1 progresses. The provisional Table of Contents reflects anticipated changes in the revised Safety Guide; new sections, subsections and appendices could be added, deleted or merged in future drafting sessions.

1. INTRODUCTION

- Background
- Objective
- Scope
- Structure

2. PROTECTION OF PEOPLE AND THE ENVIRONMENT

- General issues
- Radiological protection of people
- Radiological protection of the environment
- Non-radiological considerations

3. ADMINISTRATIVE, LEGAL AND REGULATORY FRAMEWORK

- National policy and strategy
- Responsibilities
- Licensing process

4. OVERVIEW OF THE REMEDIATION PROCESS AND INITIAL DECISION MAKING

- General issues
- Overall approach in the remediation process
- Historical site assessment
- Justification of remediation
- Radiological criteria for remediation (Reference levels and optimization)
- Site characterization

5. PLANNING OF REMEDIATION

- General issues
- Optimization of remedial measures
- Remediation plan
- Radiological surveys
- Monitoring and site characterization
- Development of exposure scenarios
- Dose assessment
- Safety case and environmental assessment
- Funding of remediation
- Involvement of interested parties

6. OPERATIONAL ASPECTS OF REMEDIATION

General issues
Staff and training
Organization and administrative control
Radiation protection of workers during remediation
On-site and off-site monitoring during remediation
Waste management
Preparedness for emergencies occurring during the remediation work
Site security
Management systems
Ensuring compliance with requirements

7. POST-REMEDATION MANAGEMENT

Release of area
Monitoring and surveillance plan
Record

REFERENCES

ANNEX: Experiences from remediation of contaminated areas

- Chernobyl
- Fukushima
- Windscale
- Clean-up in the US (e.g. NUREG/CR-7029)
- Goiania
- Maralinga
- STS Kazakhstan