



SUMMARY OF THE ACTIVITIES OF THE ISAM CONFIDENCE BUILDING WORKING GROUP

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Abstract.

During the early stages of the ISAM project confidence building was a relatively new topic in the radioactive waste disposal literature, but it was beginning to receive some attention. Although almost all safety assessment activities are intended to provide a level of confidence in the results of the assessment, considering the activities from the viewpoint of how they contributed to the decision making of various “audiences” was relatively new. The ISAM project included the Confidence Building Working Group (CBWG) to examine the topic of Confidence Building and this paper provides a summary of the working group findings.

1. Introduction

At the outset of the ISAM project several ideas were presented for the Confidence Building Working Group (CBWG) to consider as part of their overall effort to discuss and to some extent define activities which can be considered as providing ‘confidence’ in long-term safety assessment. Very early in the ISAM project it was understood that confidence building had not been well defined as a ‘distinct’ activity of safety analysis and there was a question whether it should be treated separately or was it something that was integrated within the process of safety assessment. It was recognized that many of the activities that are commonly performed in safety assessments are included to provide a level of confidence that the intended waste disposal will not adversely affect human health or the environment. These activities included:

- ‘Good practice’ including ‘good science’ and ‘good engineering practice’
- Comparing results of the assessment with national regulatory criteria and with international guidelines or other criteria (natural background radiation, other risks etc.) if applicable.
- Adoption of QA procedures.
- Use of a variety of methods for presentation of results.
- Application of sensitivity and uncertainty analysis.

The concept of confidence building and ‘confidence’ in assessment results can be captured in a few straightforward questions:

- How does the assessor gain a level of confidence in their own assessment results?
- How is a regulator provided with a level of confidence that allows a decision to be made on proceeding with a disposal facility?
- How is the public provided with a level of confidence that the impacts from a facility will be within acceptable limits?

In practice confidence building is achieved by a range of activities throughout the safety assessment process.

2. Confidence building in the safety assessment process

The context for discussing confidence building activities was the safety assessment process which was also defined early in the ISAM program (Fig. 1) and presents safety assessment as an iterative flow diagram where improvements in assessment and building of confidence occurs incrementally through each iteration. The concept of achieving incremental improvements in the confidence of an assessment through successive iterations of the safety assessment process was considered to be an important aspect of the process.

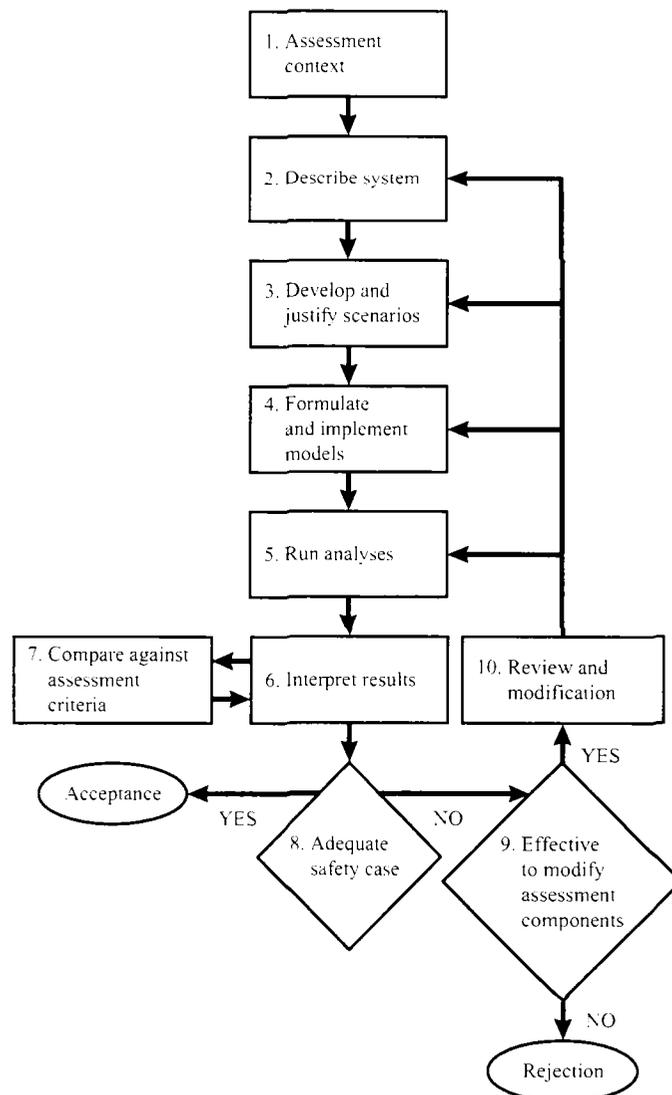


Figure 1: ISAM Safety Assessment Process Flow Diagram.

From the range of possible confidence building topics, ISAM focused on the following topics.

- What is confidence building and how is it included in safety assessment.
- Summarising the primary methods used to communicate safety assessment information.
- Developing some quality assurance procedures which can be readily and practically included in the safety assessment process.
- Analysis of results particularly summarising uncertainty and sensitivity analysis approaches and how they can be used to enhance confidence in the safety assessment.
- Providing a summary of regulatory requirements and criteria relevant for safety assessment, stated in national legal acts and regulations.

Each of these areas are now briefly discussed and the reader is reminded that much more detail can be found in the ISAM documents.

2.1. What is confidence building

The purpose of confidence building in the context of a safety assessment is to provide readily understandable qualitative and quantitative evidence that all aspects of the safety assessment are based on sound scientific and technical principles and have been carried out in a systematic manner which is amenable to independent review. The main objective in following a systematic process is one of gaining assurance and acceptability of the methodology, parameters and codes used, as well as belief in the results obtained from the safety assessment. Therefore, in practice confidence building is achieved by a range of activities throughout the safety assessment process.

There was also recognition that although the primary objective was to gain assurance and acceptance of the results of the safety assessment there are a variety of “audiences”, and what may be appropriate for communicating the results to one audience may not be ideal for another. Some of the audiences considered were: Regulatory Bodies; Academic and Scientific organisations; the Public; the Media; Government Bodies; Non-Governmental Organisations. The ISAM documentation looks at a variety of communication tools and the effectiveness of them.

2.2. Communication

It is clear that a variety of communication methods are actively being used by various organisations involved in radioactive waste disposal. It is difficult to identify a single most effective way to provide information and gather feedback from various audiences. Therefore, most organisations have used a range of methods that they have observed in use by others.

The ISAM project obtained information from participants on the topic of communications by means of a questionnaire. The survey results are presented in [2] but it should be noted that these survey results may reflect a bias as a result of receiving completed questionnaires mainly from those organisations which have a well developed communications programme. Included are summaries of the main audiences identified, the percentage of respondents communicating with each audience and the perceived importance of each audience from the point of view of the respondents.

2.3. Quality assurance

Quality Assurance (QA) is an important factor in building confidence in the safety assessment for a near surface disposal facility. QA is the means by which accepted systematic processes are incorporated as appropriate and applicable, into the safety assessment process. Application of QA standards is a means of helping to ensure that activities are properly planned, data and methods are properly documented, and an auditable trail is developed as the safety assessment proceeds. QA procedures provide a tool to ensure that sources of input data are traceable and that analyses are carried out in a reproducible manner. The use of QA does not necessarily ensure that the analysis is right, but the use of quality procedures does ensure that the decision process is documented, the staff carrying out tasks and reviews are identified, the method of arriving at conclusions is reviewed by identified people and there are clear signoff responsibilities.

It is important to note some of the previous IAEA documents on Quality Assurance. The IAEA issued a Code on *Quality Assurance for Safety in Nuclear Power Plants and Other Nuclear Installations* (IAEA Safety Series No. 50-C/SG-Q, 1996). This Code provides the basic requirements for establishing and implementing quality assurance programmes for the stages of siting, design, construction, commissioning, operation and decommissioning nuclear power plants. The IAEA issued Safety Guides to describe acceptable methods of implementing the Code. Safety Guide Q8 (IAEA 1996, p 169) is on *Quality Assurance in Research and Development* and Safety Guide Q9 (IAEA 1996, p 187) is on *Quality Assurance in Siting*. Much of the guidance in Safety Guide Q9 would be applicable to a safety assessment for a near surface disposal facility. Annex II of Safety Guide Q9 is *The Design, Testing, Application and Change Control for Computer Modelling*.

As part of the ISAM working group activities a Parameter Input Control Form and a Document Review Form were developed along with the corresponding procedures. This in part was in response to widely expressed need for “concrete” examples of how QA measures could be used in safety assessment [1,2].

2.4. Analysis of results

The focus of the CBWG in the area of analysis of results was uncertainty and sensitivity analysis. Safety assessment for low-level waste facilities requires the interaction of a large number of disciplines in order to model environmental phenomena necessary to evaluate safety of disposal. The physical systems involved can often be very complex. The initial purpose of the safety analysis is to better understand the system under study. Eventually, as the system behavior becomes understood more fully, the assessment is used to support regulatory decisions. Corresponding to the specific goals of the project the objectives for uncertainty and sensitivity analysis will also vary, depending on the stage of the analysis and as required by regulations.

Difficulties in decision making arise due to the uncertainties that are inherently related to environmental phenomena modeling. The ability to identify and correctly quantify the uncertainties as well as the most important parameters in the LLW Safety Assessment, as well as reducing the level of uncertainty where possible and as warranted, is of vital importance for good decision making. It is impossible to guarantee with absolute certainty that one has made the correct decision, but we can improve the possibility of choosing the right decision by improving the means of quantification and identification of the uncertainties in the safety assessment calculations.

Uncertainty analysis is recognized as a key factor in the decision process for safety assessment. The identification of sources of uncertainties as well as the types of uncertainties are necessary in order for the analyst to find the best way to quantify and consequently improve the degree of confidence he or she can have in the safety analysis.

Understanding uncertainty will also be a major factor in the acceptance of the safety assessment case by technical audiences including the regulatory authorities.

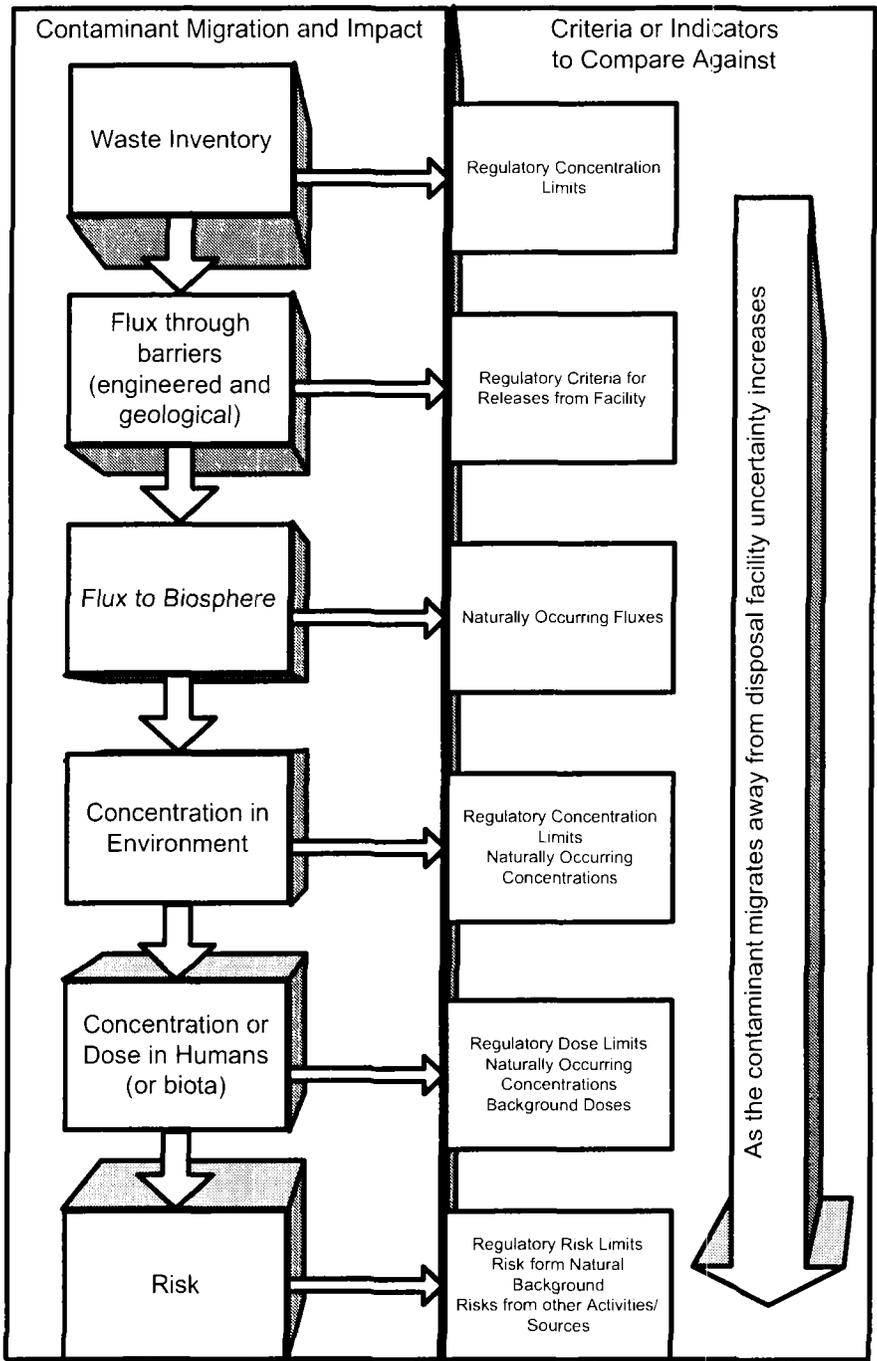


Figure 2: Typical assessment outputs and regulatory criteria and safety indicators
(Based on IAEA TECDOC-767)

2.5. Regulatory requirements and safety assessment criteria

Determining how participants have documented safety analysis: what is included in a safety assessment report and why; what are the regulatory criteria used in different jurisdictions and in addition to regulatory criteria use of other indicators of safety that have been included in safety assessments.

Regulations for radioactive waste disposal do vary from one jurisdiction to another. In general two categories of regulations are found: prescriptive dose-based or concentration based; and performance or risk based criteria. The following diagram illustrates the various regulatory and other criteria that have been used for safety assessment.

Confidence can be built by demonstrating an understanding of the existing regulatory requirements set by the regulatory body be they prescriptive or performance based. Such requirements can relate to the: facility design; waste types to be disposed; safety indicators to be calculated and associated limits/targets to be met; duration of institutional control periods; and any guidance or requirements relating to the scenarios to be assessed; and hypothetical group(s) (critical group(s)) to be protected, possibly including the description of the pathways and human behaviour parameters. The CBWG documented regulatory and other criteria in use in the jurisdictions represented by the participants.

3. Summary

The purpose of confidence building in the context of a safety assessment is to provide readily understandable qualitative and quantitative evidence that all aspects of the safety assessment are based on sound scientific and technical principles and have been carried out in a systematic manner which is amenable to independent review. The main objective in following a systematic process is one of gaining assurance and acceptability of the methodology, parameters and codes used, as well as belief in the results obtained from the safety assessment. In practice confidence building is achieved by a range of activities throughout the safety assessment process.

References

- [1] INTERNATIONAL ATOMIC ENERGY AGENCY (2002). Improvement of Safety Assessment Methodologies for Near Surface Disposal Facilities. Results of a Co-ordinated Research Project. Volume I: Executive Summary. Draft TECDOC, International Atomic Energy Agency, Vienna.
- [2] INTERNATIONAL ATOMIC ENERGY AGENCY (2002). Improvement of Safety Assessment Methodologies for Near Surface Disposal Facilities. Results of a Co-ordinated Research Project. Volume III: Test Cases. Draft TECDOC, International Atomic Energy Agency, Vienna.