
Application of an intelligent decision system to nuclear waste repository option analysis

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Abstract: This paper presents how the evidential reasoning approach for multi-criteria decision analysis, with the support of its software implementation, Intelligent Decision System (IDS), can be used to analyse whether low level radioactive waste should be stored at the surface or buried deep underground in the territory of the community of Mol in Belgium. Following an outline of the problem and the assessment criteria, the process of using IDS for data collection, information aggregation and outcome presentation is described. The outcomes of the analysis are examined using the various sensitivity analysis functions of IDS. The analysis using IDS can generate informative outcomes to better support the decision making process in practice.

Keywords: belief decision matrix; decision support system; evidential reasoning approach; intelligent decision system; multiple criteria decision analysis; nuclear waste repository; risk assessment.

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Benny Carlé, Ir. received an Engineering Degree in 1985 at Free University of Brussels (VUB), specialisation Applied Physics. He had worked in software development as a Software Engineer, Project Manager and a Technical Director. He joined the Belgian Nuclear Research Centre (SCK•CEN) in 1994 as an IT manager. He has been active in the radiation protection since 1998. He has been a coordination of and collaboration in projects on international information exchange between decision support systems, stakeholders feedback on countermeasure feasibility, barometer research and implementing an ethical charter in the organisation. His current fields of interest are knowledge management and information/communication in decision processes, decision modelling with incomplete information and uncertainties, collaborative computing, participation of experts and stakeholders in decision processes, risk perception and communication.

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1 Introduction

Safe storage and disposal of nuclear waste is an important, urgent and at the same time very difficult issue to be tackled. Much research has been done to identify acceptable repository options and some viable ones have been proposed (Chapman and McKinley, 1987; Edwards, 1999; Gibb, 2000). Because of the uncertainties associated with many aspects of the proposed options, such as technical feasibility, long-term impact to environment, potential risks to human safety and health, and social acceptance, it is still not clear which option is the most appropriate solution.

In Belgium, two repository options are proposed to store low- and medium-level short-lived waste (Fentiman, Meredith and Veley, 2007) in Mol, a municipality located in the Belgian province of Antwerp. The first option is a surface repository which involves placing drums of radioactive waste in concrete modules constructed on the surface (Meus and Ceulemans, 2003; ONDRAF/NIRAS, 2006). It is designed to isolate the waste from people and the environment until the waste is no longer harmful to them. The other option is a deep repository in the clay layers underneath the nuclear site of Mol (Carlé and Hardeman, 2004). As the two options are frequently mentioned in the paper, they are simply referred to as Surface and Deep.

In an attempt to help the local community and government agencies to make a selection from the two options, a Multi-Criteria Decision Analysis (MCDA) was carried out in the Belgian Nuclear Research Centre (SCK•CEN). The study adopted a participative approach. A group of participants were recruited on a voluntary basis. The role of the researchers in SCK•CEN was to assist the participants to evaluate the two options objectively without any efforts to influence their judgements.

The study was carried out through a series of facilitated meetings to help the participants to clarify the concepts of the two repository options, identify criteria for evaluating the options and weigh the importance of the criteria. The evaluation of each option on each criterion was carried out by individual participants outside the meetings and collected for analysis.

This paper describes how a general-purpose MCDA tool, the Intelligent Decision System¹ (IDS) software, can be used to support the data analysis and decision making process. Using the tool and the data collected from the study, it is demonstrated how diverse group opinions can be taken into account for decision making purpose and how various types of uncertainties in the evaluation and subjective judgements can be rationally and consistently handled and analysed.

The IDS is developed on the basis of the Evidential Reasoning (ER) approach (Yang and Singh, 1994; Yang, 2001; Yang and Xu, 2002a). The ER approach is different from most MCDA approaches (Triantaphyllou, 2000). It uses belief decision matrices, of which the conventional decision matrices are a special case, to model MCDA problems. Belief decision matrices allow different formats of data with uncertainties to be used for decision making. It uses concepts from several disciplines, including value theory (Keeney and Raiffa, 1976) in decision sciences, theory of evidence (Shafer, 1976) in artificial intelligence and statistical analysis. A modified Dempster's evidence combination algorithm (Yang, 2001; Yang and Xu, 2002a), a non-linear statistical process, is used for aggregating the information in the belief decision matrix, so that more insightful information can be generated to support the decision making process. The outcomes of the ER algorithm include not only average performance scores of alternatives on each criterion, but also the distributions of their performance variations

which reveal the strengths and weaknesses of each option. When there are uncertainties in the input data, the ER algorithm can calculate the lower and upper bound of the score ranges of alternatives. Such score ranges show the combined effects of uncertainties in different parameters to the rankings of different options.

Theoretically, the ER algorithm for information aggregation requires only the satisfaction of the value independence condition (Keeney and Raiffa, 1976), which is easier to check and satisfy than the stringent additive independence condition as defined by Keeney and Raiffa required by the Multiple Value Function Theory (MAVT) (Keeney and Raiffa, 1976; Buchanan and Shortliffe, 1984; Lopez de Mantaras, 1990). Therefore, to the ER approach the number of the attributes is less of a concern than to the weighted sum approaches based on MAVT. For more information on the ER approach and its properties, readers are referred to Yang and Xu (2002a–b) and Xu, McCarthy and Yang (2006).

During the past few years, the ER approach supported by the IDS software has been used in a number of areas, such as business performance assessment, organisational self-assessment using different models (Siow, Yang and Dale, 2001; Yang, Dale and Siow, 2001; McCarthy, Greatbanks and Yang, 2002; Xu and Yang, 2003; Xu, Yang and Wang, 2006), safety and cost analysis (Wang, Yang and Sen, 1996; Liu *et al.*, 2002), contractor selection (Sonmez *et al.*, 2002) and engineering product design option selection (Yang and Sen, 1997).

In this paper, the criteria identified by the participants in the study for assessing the two options are first outlined. Then the process of data collection and outcome analysis using IDS are described. Sensitivity analysis of outcomes to uncertainties in the evaluations and subjective judgements of participants is illustrated by examples. The features of the IDS for supporting such processes and further research are summarised in the conclusion remarks.

2 Assessment criteria and evaluation scales

To compare and analyse the deep and surface repository options, a group of volunteers who responded positively to the call for participation were recruited. A number of meetings were organised and several forms were created to allow participants to express their individual opinions (Carlé and Hardeman, 2004).

The first meeting on 25 May 2004 addressed the clarification of both options, the objectives of the analysis and the determination of a tree of relevant criteria. During the second meeting held on 3 June 2004, the evaluation scales for assessing each option on each criterion were determined. After then, a form was prepared and sent to each participant. The form provided clear description (definition) of each criterion and its scale for scoring. Participants filled in the form individually and anonymously by scoring both options on all sub-criteria.

During the third meeting on 23 June 2004, the relative importance of all criteria in the format of criterion weights was determined. The weights were determined in two steps, first the relative importance of all sub-criteria under a main criterion, and then the relative importance of the main criteria themselves. Each weight was determined by pairwise comparisons using predefined assessment scales. During the meeting, a facilitated consensus was achieved by iteratively discussing and voting these pairwise comparisons. The criteria tree and their weights (in brackets) are listed below.

Overall assessment of low level radioactive waste repository option:

- 1 Safety (45)
 - 1.1 Safety of the workforce (8)
 - 1.1.1 Risk of accidents (6)
 - 1.1.2 Risk of professional diseases (2)
 - 1.2 Safety of Population (24)
 - 1.2.1 Exposure to radiation (19)
 - 1.2.2 Emergency plan (5)
 - 1.3 External risks (8)
 - 1.3.1 Earthquakes (2)
 - 1.3.2 Assaults (2)
 - 1.3.3 Airplane crashes (2)
 - 1.3.4 Climate change (2)
 - 1.4 Accessibility (9)
 - 1.5 Controllability (24)
 - 1.5.1 Controllability itself (20)
 - 1.5.2 Need of controllability (4)
 - 1.6 Retrievability (19)
 - 1.6.1 Retrievability itself (19)
 - 1.6.2 Need of retrievability (3)
 - 1.7 Collective memory (6)
- 2 Environment (23)
 - 2.1 Ground water and food chain (52)
 - 2.2 Hydrologic impact (16)
 - 2.3 Impact upon the landscape (9)
 - 2.4 Other ecological impact (15)
 - 2.5 Environmental impact of material flows (9)
- 3 Health (9)
 - 3.1 Toxicity (53)
 - 3.2 Impact of a worst case scenario (32)
 - 3.3 Perception of hazards (16)

- 4 Technical feasibility (9)
 - 4.1 Robustness (30)
 - 4.2 Effect of inaccurate knowledge of inventory (21)
 - 4.3 Familiarity with the technology (16)
 - 4.4 Flexibility (32)
- 5 Economy (9)
 - 5.1 Land use (29)
 - 5.2 Global costs (23)
 - 5.3 Impact on the image of the region (12)
 - 5.4 Costs of a retrieval (36)
- 6 Social acceptability (5)
 - 6.1 Sustainability (60)
 - 6.2 Social basis (17)
 - 6.3 Potential for learning (11)
 - 6.4 Risk of abuse for other waste (12).

To assess the options on the criteria, evaluation scales or grades need to be defined for each criterion. As most criteria are subjective (except the Global costs and the Costs of a retrieval), a five-point scale of 0–100 was used. As the assessment is essentially a risk assessment, it was determined that the smaller the values the more preferable they are.

For most of the criteria, the values of the five points are linearly distributed and they take the values 0, 25, 50, 75 and 100, respectively. For criterion 4.2 ‘Effect of inaccurate knowledge of inventory’, a logarithmic scale (0, 35, 65, 85 and 100) was used. This is because for this criterion, a small decrease of the effects at the lower end is considered to be more significant and more appreciated than the same decrease at the higher end. For the following three criteria, it is believed that an exponential scale (0, 15, 35, 65 and 100) was more appropriate:

- ‘1.2.1 Exposure of the population to radiation’
- ‘1.2.2 Necessity for elaborating and maintaining an emergency plan’
- ‘3.2 Impact of a worst case scenario’.

This means that for those three criteria, a small variation in the lower part of the scale is considered less significant than the same variation in the higher part of the scale.

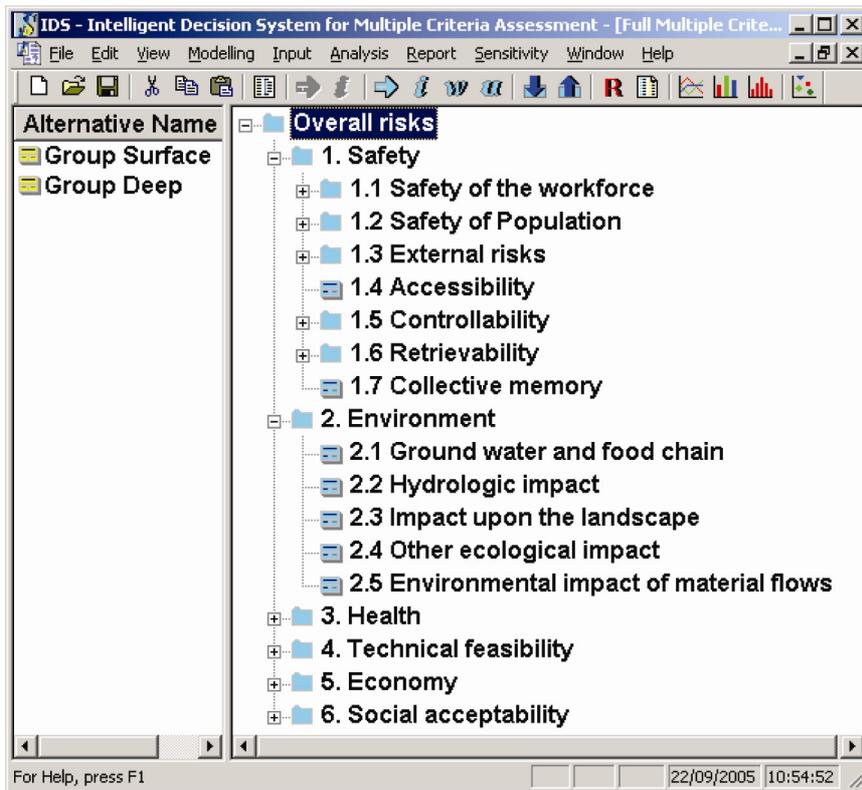
3 Using IDS to support the process

The IDS provides support to MCDA in problem structuring, data collection, information and group opinion aggregation, outcome presentation and sensitivity analysis. They are discussed in the following six subsections.

3.1 Problem structuring – model implementation

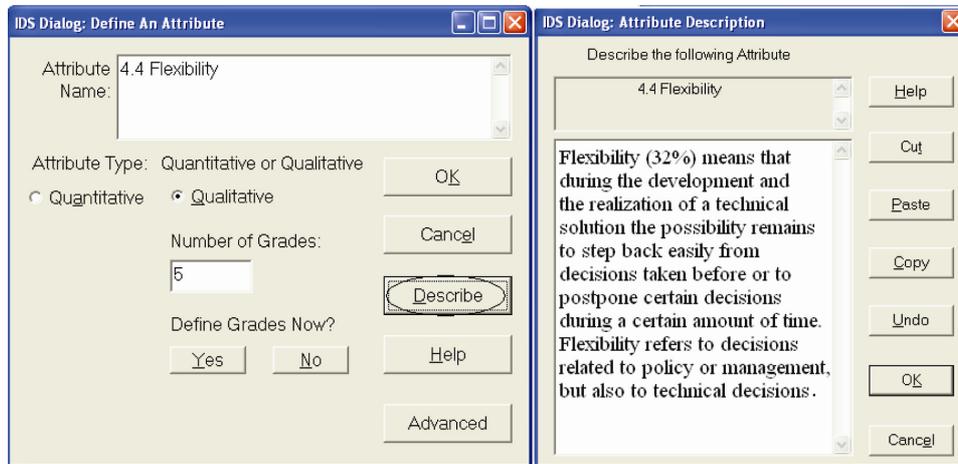
Problem structuring refers to the process of identifying alternative course of actions, or simply alternatives or options, criteria, criterion weights and evaluation scales for assessing options on criteria. Using IDS, the construction of a skeleton criterion tree is straightforward. The IDS main window is shown in Figure 1, where there are a tree view window for displaying the criterion tree and a list view window to display the alternatives. There are two alternatives: deep and surface repository of low radiation nuclear waste.

Figure 1 IDS main window and the tree of assessment criteria

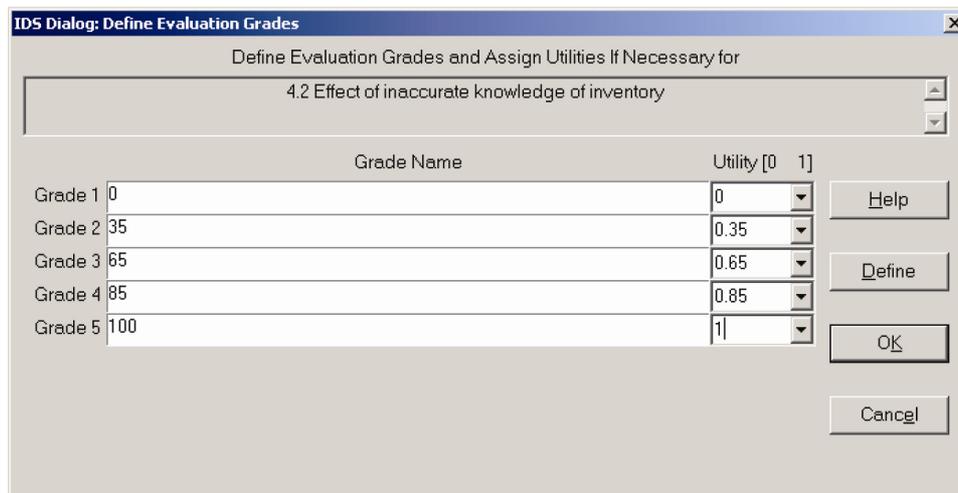


After the tree is structured, each criterion needs to be further defined. The definition includes an explanation of the criterion, whether it is a quantitative or qualitative type and the number of grades (or points) used for assessing it if it is qualitative.

For example, for the criterion '4.4 Flexibility', according to MONAs definition, it means that during the development and the realisation of a technical solution the possibility remains to step back easily from decisions taken before or to postpone certain decisions during a certain amount of time. Flexibility refers not only to decisions related to policy or management, but also to technical decisions. It is the explanation of the criterion and is recorded in IDS when defining this criterion (Figure 2). Such explanation will be displayed when participants try to assess each option on the criterion.

Figure 2 Criterion definition windows

As it is determined to use a five-point scale for assessing all the criteria, this means that all the criteria are of qualitative type and the number of evaluation grades is 5 (Figure 2). By default, it is assumed in IDS that the values of the five points (or grades) are linearly distributed and they are 0, 25, 50, 75 and 100%, which agree with what are used for evaluating most criteria, with 0% corresponding to the most favourable point and 100% the least favourable one. For the criteria evaluated using logarithmic and exponential scales, the values of the five points can be easily adjusted through the interfaces such as the one shown in Figure 3.

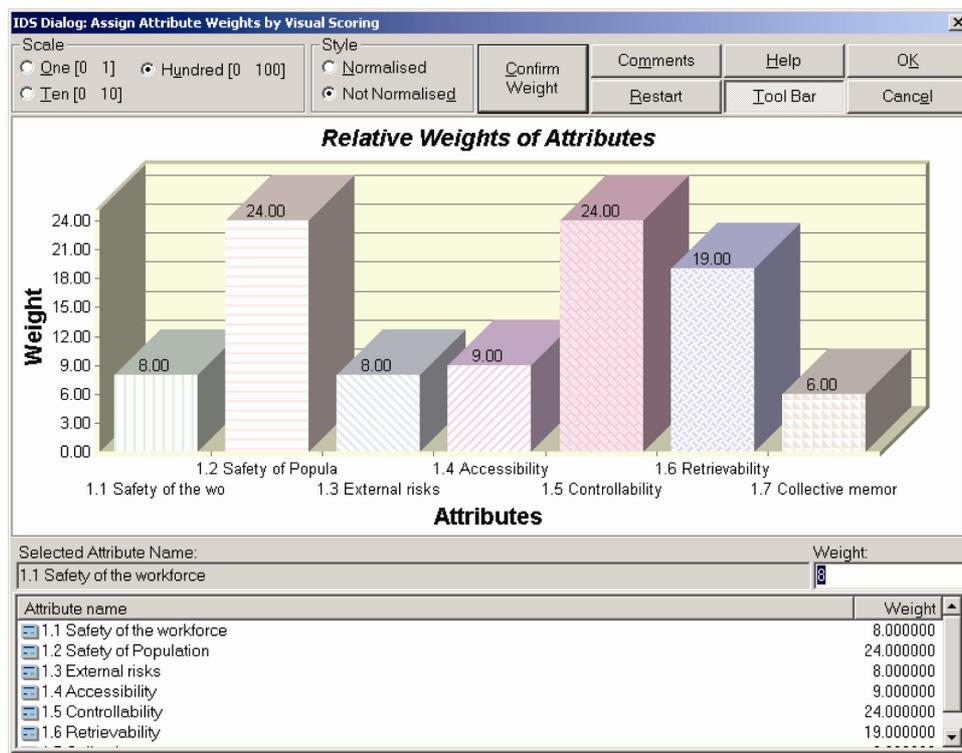
Figure 3 Adjust the values of the five evaluation points

For assessing alternatives on subjective criteria, the usual practice is to set a standard for each grade or score so that for different participants the score 25 means more or less the same level of risks. For assessing alternatives on a quantitative criterion, it is necessary to

identify the value range that the alternatives can take on the criterion. However, sometimes such objective information and knowledge may not be available or is difficult to obtain due to various limitations such as time and resources. It is indeed the case for the MONA nuclear waste repository option analysis problem.

In IDS, weights can be assigned to attribute through either pairwise comparison or interactive graph such as the one shown in Figure 4, where the bars can be dragged and dropped to the desired heights to represent the weight of the criteria. This is useful in both individual and group decision situations where users can see their views on criterion importance graphically.

Figure 4 Assign weights to criteria



3.2 Information collection

The assessment model implemented using IDS as described above can be distributed to individual participants to assess each option and record their scores and opinions. The assessment of each option normally involves collecting evidence, comparing evidence with any available standards, making judgements and scoring. Using the IDS implemented model for the assessment, not only the process is technically supported, but also cognitively supported.

Figure 5 shows the interface for assessing an option on the criterion ‘1.2.1 Exposure to radiation’. Technically, an individual participant needs only to tick appropriate grades and a belief degree will automatically appear beside each answer (Figure 5). A belief

degree represents the strength to which the grade is believed or evidenced to be appropriate for describing the option on the criterion. By default, IDS equally divides 100% belief degrees and assigns them to the ticked answers automatically. However, the participant may modify them if necessary and IDS will validate that the sum of the belief degrees is $\leq 100\%$.

Figure 5 An interface for inputting assessment information

Grade Name	Belief Degree [0 1]	How to Assess
	0 <input checked="" type="checkbox"/> 0.3125	OK
	15 <input checked="" type="checkbox"/> 0.5	Cancel
	35 <input checked="" type="checkbox"/> 0.1875	Help
	65 <input type="checkbox"/> 0	Alternative Definition
	100 <input type="checkbox"/> 0	Attribute Definition

To reduce subjectivity and inconsistency, the data input window (Figure 5) provides access to criterion and grade explanations entered earlier in the model-building stage through the attribute definition button and by placing the cursor on a grade name, respectively. The explanations act as guidelines to help assessors to tick the right answers and assign appropriate belief degrees.

Optionally, evidence and verbal opinions can be recorded using the provide evidence or provide comments buttons. The buttons display the evidence and the grade standards side by side so that belief degrees can be assigned based on how well the evidence matches the category standards. The evidence recorded can be used in the future as references for further assessment when more information becomes available.

As mentioned earlier, since there was not much detailed information for a participant to make accurate judgements, he or she may select only one grade that is believed to be most appropriate and therefore not to worry about the distribution of the belief degrees. At this stage, the belief structure is more useful in the group decision situation and in analysing the performance of each option on the higher level criteria. In a group decision situation, when different people select different grades, then the group opinion is more likely to be a distribution as shown in Figure 5, which displays the distribution of the grades selected by 16 participants when assessing the Surface option on the criterion '1.2.1 Exposure to radiation'. The performance of an option on a higher level criterion in the tree is determined by its performances on the lower level criteria which may be assessed to different grades, and therefore is also likely to be a distribution.

In addition to the flexibility in assessing an option more accurately, the belief structure and the ER aggregation process can make maximum use of different types of raw information, including probabilistic data, incomplete and missing data (Xu and Yang, 2004).

3.3 Group decision support

Individual participants may record their assessments of each option independently and anonymously using IDS. When an assessment is completed, individual files can be either examined separately or imported to a single file. After importation, the assessments made by individuals can be compared graphically or a collective assessment can be generated for each option by combining all the individual assessments made for the option.

Figure 5 shows an assessment generated by the software by combining the 16 participants' assessments. The distributed belief degrees (0.3125, 0.5 and 0.1875) assigned to the three grades (0, 15 and 35) reflect the fact that there were 5, 8 and 3 participants scored the risk of the Surface option on the 'Exposure to radiation' criterion to be 0, 15 and 35, respectively. Such combination is carried out for every criterion in the bottom (leaf) level of the criteria tree.

3.4 Information aggregation

The aggregation of the assessment information from lower level criteria to higher level criteria is through the ER algorithm (Yang and Singh, 1994; Yang, 2001; Yang and Xu, 2002a) which is built into IDS. In IDS, the aggregation process is automatic and is updated in the background whenever assessment information is entered or modified for any criterion. Therefore, the users of IDS are able to see the aggregated outcomes at any stage of the assessment, even before the assessment is complete on some criteria (Figures 4 and 5).

3.5 View assessment results

IDS can provide a variety of graphs to support data presentation and decision communication. For example, Figure 6 displays the aggregated overall risk scores of the two options based on the 16 individual opinions, which indicates that the Surface repository is slightly more preferred than the Deep repository by the group. Figure 7 shows the distribution of aggregated scores on the overall risks of the two options, again based on the scores provided by the 16 participants. The distribution for the Deep option is more dispersed than that of the Surface option. This implies that the Deep option has both more advantages and more disadvantages than the Surface option. IDS also provides a quick search function to reveal those high and low risk areas as shown in Figures 8 and 9, respectively.

Figure 6 Aggregated assessment scores indicating the Surface option is preferred

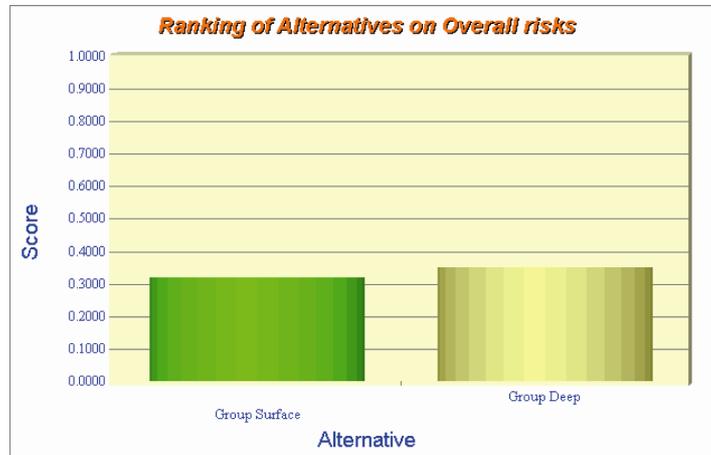


Figure 7 Aggregated assessment distribution showing composition of low and high risk areas

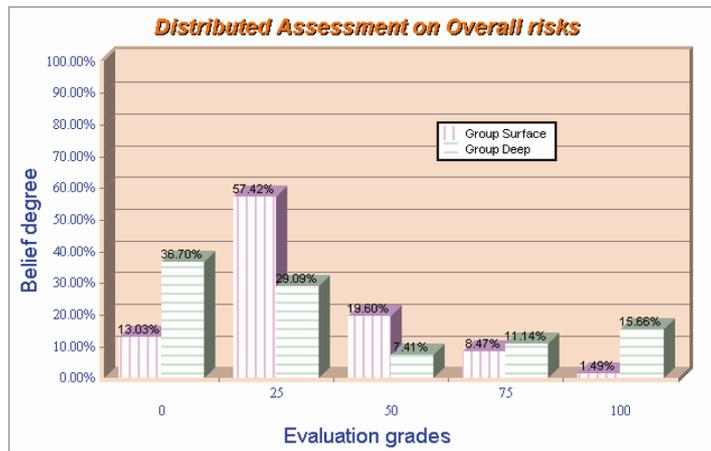


Figure 8 High risk areas for the Deep option

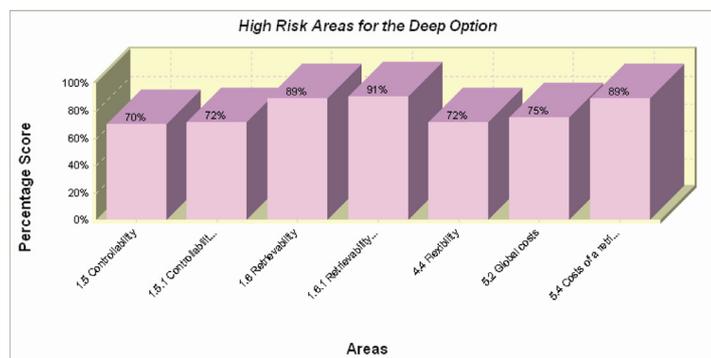
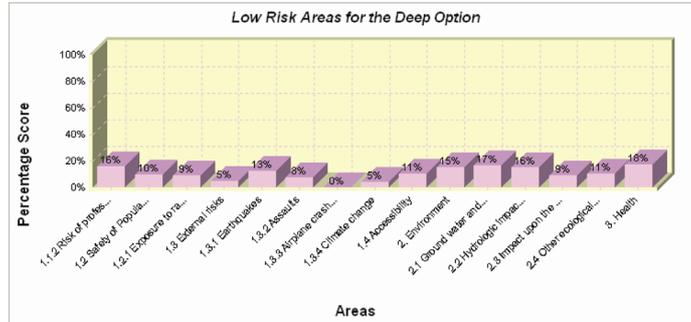


Figure 9 Low risk areas for the Deep Repository option



The comparison of the two options can also be made in the middle levels of the criteria tree. For example, Figure 10 shows that among the six main criteria, the Surface option is better than the Deep option on the three criteria: safety, technical feasibility and economy. It also shows that in terms of group preferences the largest discriminating power is in the environment and health criteria and the smallest in economy. IDS also provides a quick search function to identify the criteria with such largest and smallest discriminating power. Similar results can also be displayed for sub-criteria, as shown in Figure 11.

Figure 10 Compare options on the six main criteria

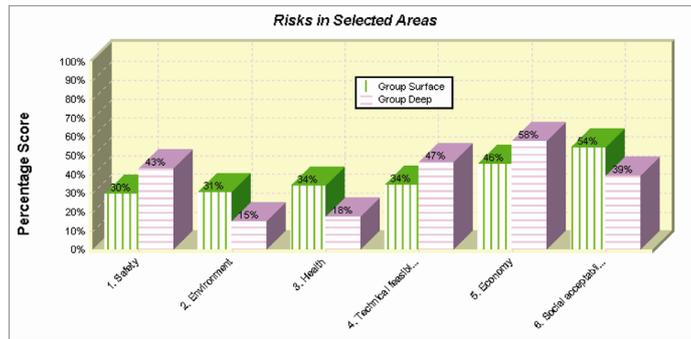
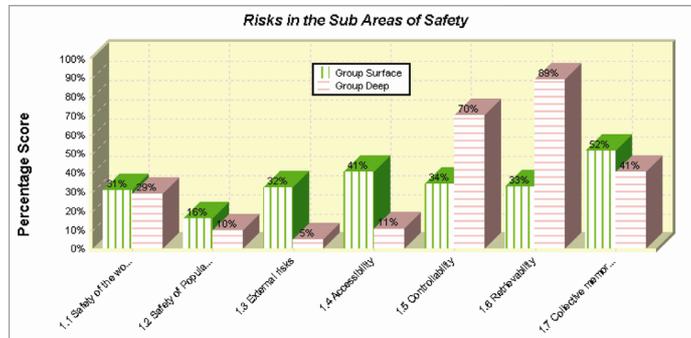
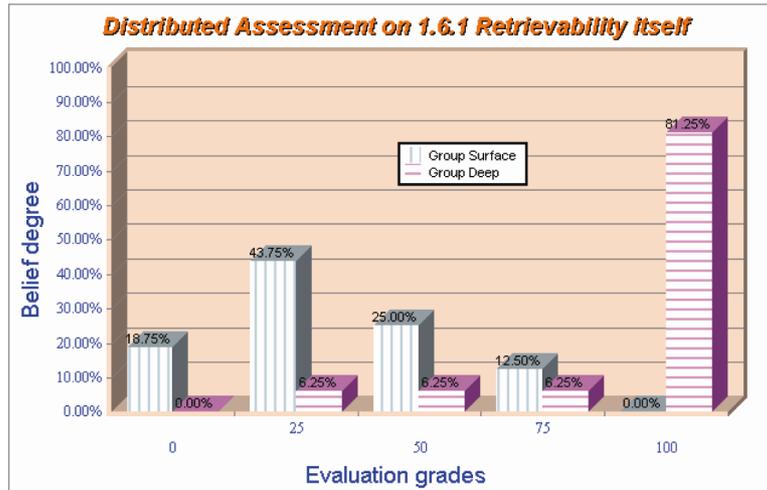


Figure 11 Compare options on sub criteria



In the group decision situation, assessment distribution graphs generated for the criteria at the leaf level of the tree can reveal the diversity of the group opinions. For example, the distribution in Figure 12 demonstrates that as far as ‘Retrievability’ is concerned the opinions of the group on the Surface option are more widely divided than on the Deep option.

Figure 12 Diversity of group opinions on retrievability

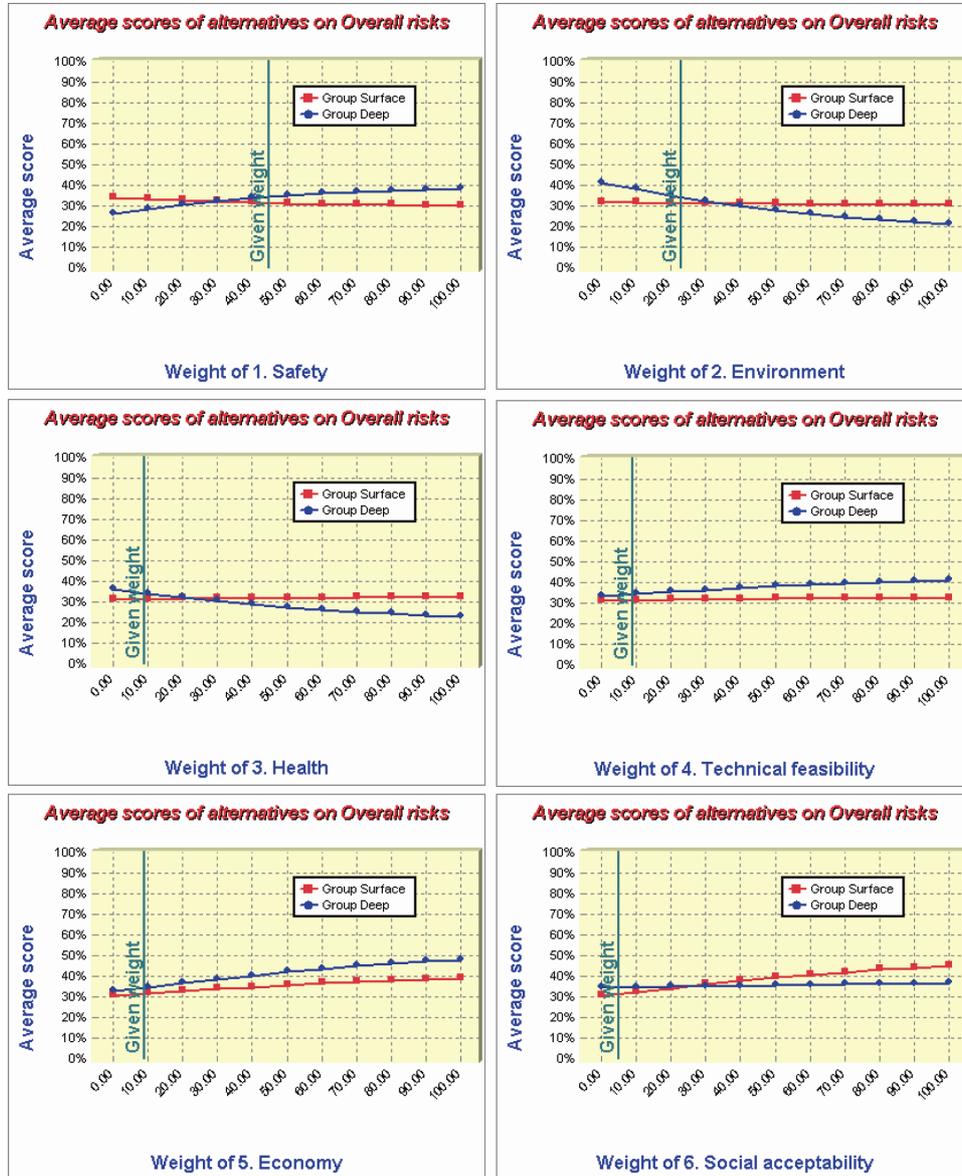


3.6 Sensitivity analysis

Sensitivity analysis examines the robustness of outcomes under uncertainties. In this section, the robustness of the preference order of the two options is examined under the following two sources of uncertainties. One is in the weights of criteria and the other in the scores of each option on each sub-criterion.

Table 1 (Carlé and Hardeman, 2004) lists some statistics of the weights given by a group of participants to the six main criteria, where the column ‘Av.-extr.’ means the average without the extreme values and the rest of the columns are self-explanatory. To analyse the sensitivity of the preference orders of the two options to various criteria weights, the aggregated scores of each option on the top criterion is plotted over the valid range of the criteria weights in Figure 13. The weight is changed for only one criterion at a time and the weights of other criteria are fixed at the given weights, which are the group consensus weights. In the analysis, if the sum of the weights is not 100% due to the changes or errors from approximation, the weights are then normalised by dividing each weight with their sum.

Figure 13 Sensitivity of preferences to weights of the six main criteria (for colours see online version)



In Figure 13, the slopes of the score lines are quite flat, with a degree of non-linearity which is one of the characteristics of the ER algorithm (Yang and Xu, 2002b). Generally speaking, the slopes of the lines represent the sensitivity of the scores to the changes of the weights: the steeper the slopes, the more sensitive the scores.

Table 1 Weights assigned to the six main criteria by a group

<i>Main criteria</i>	<i>Average (%)</i>	<i>Median (%)</i>	<i>2nd smallest (%)</i>	<i>2nd largest (%)</i>	<i>Av.-extr. (%)</i>	<i>Group consensus (%)</i>
1 Safety	43	44	29	61	46	45
2 Environment	17	17	7	32	18	23
3 Health	14	11	6	26	14	9
4 Technical feasibility	11	9	5	22	12	9
5 Economy	7	6	2	11	6	9
6 Social acceptability	7	6	3	15	7	5

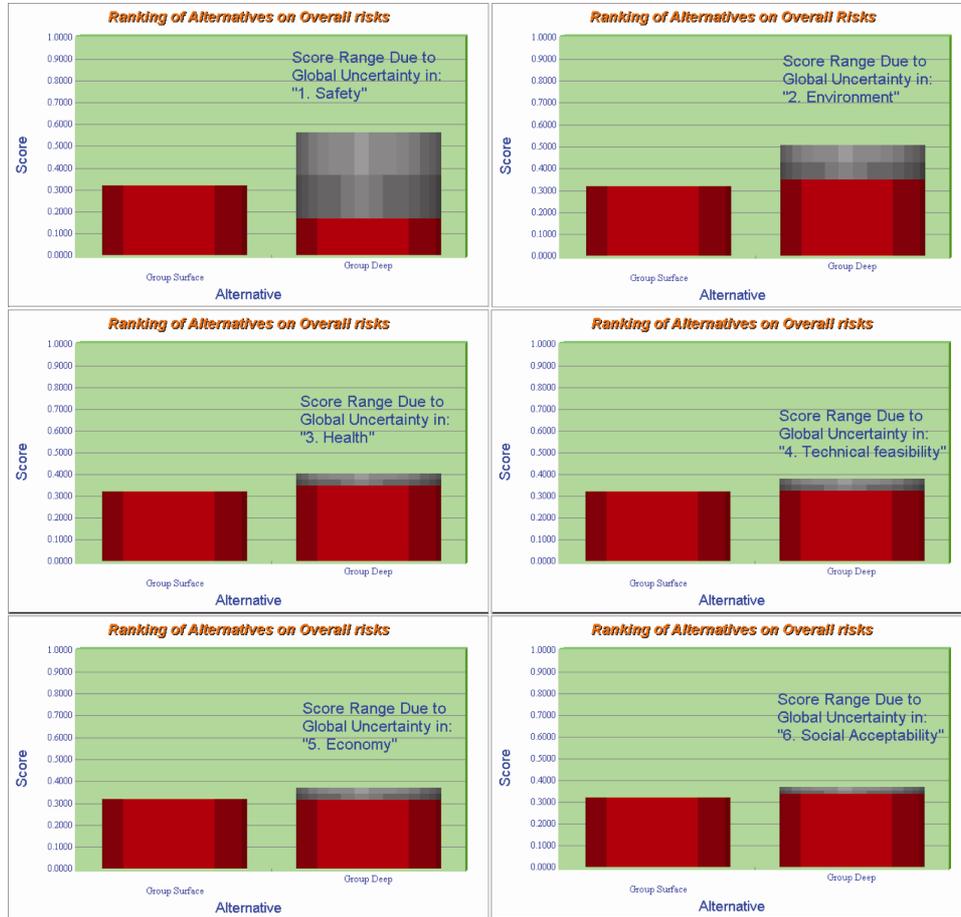
The robustness of the preference order of the two options depends on whether the two score lines cross each other near the given weight. For the criteria '4 Technical feasibility' and '5 Economy', no matter how their weights change, the Surface option is always slightly more preferred than the Deep option, because the score line of the surface option always stays below that of the Deep option. It can also be observed that if the weight of the safety criterion is reduced to the second smallest of 29% or the weight of the environment criterion is increased to the second largest of 32%, then the Deep option would become almost indifferent to the Surface option. For the other criteria, the preference order of the two options hardly changes when the weight of a criterion changes from its 2nd smallest to its 2nd largest (Table 1). Therefore, we may say that the preference orders are quite insensitive to the weight changes.

Further analysis using the three set of weights given in the average, median and av.-extr. columns of Table 1 also yields the same preference order.

It should also be noted that the two score lines are quite close to each other for each main criterion. This indicates that the two options are very much comparable and none of them clearly dominates the other as assessed by the group of participants using the current criteria framework. To differentiate these two options, either wider consultation exercises or more objective criteria or both may need to be considered.

When there are uncertainties in the scores of an option on some criteria, the ER algorithm allows the users not to score the option on the criteria. If this is the case, it is assumed in the algorithm that the option can take any scores in the allowable ranges for those criteria. Consequently the aggregated scores on the top criteria will be a range instead of a single value, as shown in the grey areas in Figure 14. The ranges reveal the sensitivity of alternative rankings to uncertainties in all unknown scores in different criteria. Analysis of the combined effects of uncertainties in different parameters to the outcomes is normally referred to as global sensitivity analysis, in contrast to local sensitivity analysis found in most literature, in which uncertainty is considered for one factor at a time (Saltelli *et al.*, 1999). From this point of view, the ER approach provides a means for global sensitivity analysis. To distinguish the uncertainty in a single parameter only, the combined uncertainty in two or more parameters is referred to as global uncertainty in the paper.

Figure 14 Score ranges of the Deep option caused by the global uncertainties in each of the six main criteria

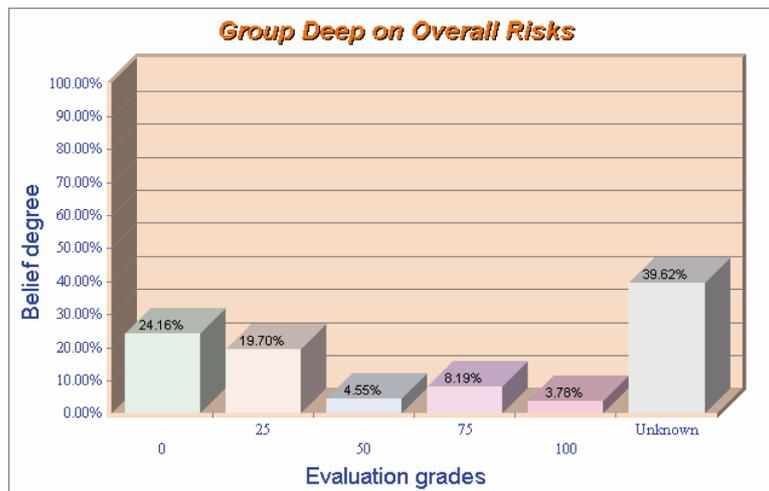


In Figure 14, there are six sub graphs. Each graph plots the overall scores of the two options. In each sub graph, it is assumed that for the Deep option, the scores on one of the main criteria, including all of its sub-criteria, are completely unknown. For example, in the first sub graph it is assumed that the scores of the Deep option on all the sub criteria of the safety criterion are unknown and can be any values between 0 and 100. For the other main criteria, the scores are the same as the combined group scores as discussed in Section 3.3. The distribution of both known and unknown information is displayed in Figure 15. The aggregated overall score of the Deep option is a range between 17 and 57%, as shown in the grey area of the first sub graph in Figure 14.

From the six sub graphs shown in Figure 14, it is clear that the uncertainties in the scores of the Deep option on the safety criterion and its sub-criteria can make a very significant impact on the preference orders of the two options. The impact of the uncertainties in the scores on the environment criteria is the second most significant. However, the impact of the uncertainties in the scores on the other four criteria is much less significant. Similar analysis can also be carried out for the Surface option. The

results show again that the safety criterion is most influential. The above analysis shows that more attention should be paid to get wider public opinions on the assessments of the two opinions on the safety and environment criteria if they are further investigated.

Figure 15 Aggregated assessment distribution with unknown information



4 Concluding remarks

In this paper, it is described how the multi-criteria decision software IDS can support the analysis of whether low level radioactive waste should be stored at the surface or buried deep underground at Mol in Belgium, in both individual and group situations. IDS generates a ranges of outcomes graphically, such as aggregated scores, the distribution of advantages and disadvantages of each options, and the sensitivity of outcomes to various uncertainties. It can search for and display the strong and weak areas of each option or the areas where the two options are most different or similar. Such visualised information can help the decision makers to compare the options side by side from different aspects and help to understand what are the risks involved in each alternative course of actions.

Currently the analysis of the two options is based on the judgements of the voluntary participants rather than scientific evidence or wider public opinions. Based on the data collected, the analysis indicates that the Surface option is slightly preferable to the Deep option by the group and this preference order is relatively robust to the changes of weights of the six main criteria. However, the preference margin is very small and is sensitive to the uncertainties in the scores of each option on many criteria, especially the safety and environment criteria. Therefore, further research is necessary in order to reach a clearer decision. There are a number of sub-criteria in the main criteria, such as safety, environment, health and economy, which could be assessed more objectively using figures generated from historical data analysis or statistical forecasting. Analysis based on such objective evidence can reduce uncertainties caused due to subjective judgements and also significantly increase the confidence of decision makers in the outcomes.

Although the outcomes from the study could not confirm a clear winner, it helped to identify a well-structured set of factors (criteria) which are important to the selection, and obtain insight into the degrees to which the various criteria contribute to the selection.

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Note

- 1 A free test version of IDS is available from the website: www.e-ids.co.uk.