Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development

30-Mar-2009
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English - Or. English

NUCLEAR ENERGY AGENCY
RADIOACTIVE WASTE MANAGEMENT COMMITTEE

Forum on Stakeholder Confidence (FSC)

THE SYMBOLIC DIMENSION OF RADIOACTIVE WASTE MANAGEMENT

Report of a Topical Session held at the 9th Regular FSC Meeting (June 2008) and Related Desk Research

4-6 June 2008

The focus of the FSC "symbolic dimension" theme is to become better aware of symbolic content that may be carried by seemingly straightforward concepts that are used in association with the management of radioactive waste. Awareness of additional dimensions of meaning beyond dictionary definitions, and recognition that dialogue is shaped by more than just concrete realities, may help to find additonal ways of creating non-conflictual and constructive relationships amongst stakeholders.

On June 5, 2008 the FSC held a topical session on this theme. The session comprised three presentations outlining key concepts, related methods and case examples in radioactive waste management. Then discussions took place in two small groups and a plenary. This document contains the most important elements of the presentations and the discussions plus additional elements from ad-hoc research.

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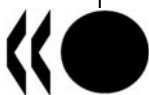
FOREWORD

The Forum on Stakeholder Confidence (FSC) on radioactive waste management has long been sensitive to the issue of differing stakeholder perceptions and positions. It has recognised the importance of understanding what is of particular concern to a community and addressing those issues. It has found that key concepts of radioactive waste management (RWM) (e.g. safety, risk, reversibility, retrievability) carry different meanings for the technical community and for non-technical stakeholders. It has also learned that some highly value-laden socio-economic concepts (e.g. benefit packages, community, landscape) are interpreted differently by different societal groups and that opinions and attitudes are not simply a faithful reflection of decision-making, actual events and communicated messages. Perceptions and interpretations of events and objects also play a role. Deep-seated values and norms, knowledge and beliefs, group identification, cultural tradition, and self-interest are some examples of factors that shape perceptions and interpretations. FSC members want their behaviour, decisions and writing to be highly coherent with the societal values embodied in waste management endeavours. The FSC intends to become better aware of 'symbolic' meanings (i.e. meanings that, for different groups, may resonate beyond the obvious) in their actions. Awareness of additional dimensions of meaning beyond dictionary definitions, and recognition that dialogue is shaped by more than just concrete realities, may help to find ways of creating non-conflictual and constructive relationships amongst stakeholders. For these reasons, the FSC has added "the symbolic dimension" as a new transversal theme to its programme of work.

On June 5, 2008 the FSC held a topical session on this theme. The session comprised three presentations outlining key concepts, related methods, and case examples in radioactive waste management. Then, discussions took place in two small groups and a plenary. This document contains the most important elements of the presentations and the discussions plus additional elements from ad-hoc research.

Acknowledgement

These proceedings have been summarised and further researched through the joint work of Claudio Pescatore, Anna Vári and Claire Mays.

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1. INTRODUCTION

Key concepts of radioactive waste management (RWM) (e.g. safety, risk, reversibility, retrievability) carry different meanings for the technical community and for non-technical stakeholders. Similarly, socio-economic concepts (e.g. benefit packages, community, landscape) are interpreted differently by different societal groups. Opinions and attitudes are not simply a faithful reflection of decision-making, actual events and communicated messages. Perceptions and interpretations of events and objects also play a role. Deep-seated values and norms, knowledge and beliefs, group identification, cultural tradition, and self-interest are some examples of factors that shape perceptions and interpretations[1]. Since the beginning of human history, *signs* and *symbols* have been widely used in order to help understand the world, communicate information and feelings, immortalise knowledge, carry traditions and facilitate group identification. The focus of the FSC "symbolic dimension" theme is to become better aware of symbolic content that may be carried by seemingly straightforward concepts that are used in association with the management of radioactive waste. Awareness of additional dimensions of meaning beyond dictionary definitions, and recognition that dialogue is shaped by more than just concrete realities, may help to find additional ways of creating non-conflictual and constructive relationships amongst stakeholders.

In the current phase of the FSC work opportunity is being created to probe the "symbolic dimension" with specialists and concerned stakeholders and through case studies. The present document details the ideas developed at the Topical Session on the Symbolic Dimension held at the ninth regular FSC meeting of June 2008. It also includes lessons to be learnt from both FSC and non-FSC literature. Basic underlying concepts are presented in Section 2. Section 3 examines the symbolic dimension of radioactive waste, including concepts such as safety and landscape. Section 4 briefly reviews systematic methods by which symbolism can be identified and analysed. Conclusions are drawn in Section 5.

2. SYMBOLS AND SYMBOLISM

Symbols are signs that represent or "stand for" something in an arbitrary manner, i.e. there is not necessarily an evident or direct, physical reason why the symbol and their meaning should be related. For example, words are symbols, and human languages are systems of symbols: the same animal is called "lion" in English, "simba" in Swahili, and "oroszlán" in Hungarian. In the Western world dragons are symbols of evil and chaos, while in Eastern cultures they symbolise the fertile power of thunder and rain. Symbols are thus connected to objects by the conventions, or the culture, of the social group within which a person lives.

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[1] See SKB (2007)

Symbolism is the application of symbols for various purposes (e.g. spiritual, political, aesthetic). Symbolism is a powerful tool for eliciting emotions, allegiances or rejection, and forming spiritual or political communities. *Religious symbolism* is the use of symbols, including archetypes, acts, artwork, events, or natural phenomena. Symbols help create a resonant mythos (or narrative) expressing the moral values of the society or the teachings of the religion, foster solidarity among adherents, and bring adherents closer to their object of worship. For example, the depictions of Ganesha, the Hindu god of education, knowledge, wisdom and wealth, represent ideas and characteristics of key importance: the big elephant's head accords with a cultural image of elephants as wise; another layer of symbolic meaning is that Ganesha's oversized head represents the soul, and its significance, as opposed to the smaller, human body. *Political symbolism* is used to represent and defend an ideological standpoint. Symbols can include banners, acronyms, pictures, flags, mottos, and countless other vehicles. For example, red flags have traditionally been flown by socialists and communists to represent the "blood of the workers", thereby criticizing unjust capitalistic exploitation of workers and glorifying their struggle for empowerment.

Symbols are thus frequently used to carry value-laden spiritual concepts, shared ideals, or political philosophies. Symbols belong to the domain of representation and communication; they allow us to "read" underlying values.

Because symbols are signs that represent or "stand for" something in an arbitrary manner, the relations between symbols and their signified are flexible and contextual changes may induce relatively quick changes to the meaning of symbols. The history of the Ignalina NPP (Box 1) is an example of fast shifts in political symbolism in the nuclear domain.

Box 1: The Ignalina Nuclear Power Plant

The Ignalina NPP is located about 200 kilometers from Vilnius, the capital of Lithuania. In the late 1980s, the most expedient way of protest against the Soviet Union was to do so on ecological issues. In this context the Ignalina NPP became an important issue for the emerging environmental movement. As the Soviet-operated plant was strongly associated with the hegemony of Russia over Lithuania, Ignalina was made a central issue in the fight towards national sovereignty. During this period the NPP became a symbol of Soviet rule (Vähä–Sipilä, 2004).

After Lithuania achieved independence in 1990, the Ignalina NPP quickly lost its former symbolic meaning. Since Russia imposed an energy embargo on Lithuania, it became clear that the country needed the power station, which generated 70–90% of its electricity (Löfstedt and Jankaustas, 2001). During the 1990s the plant played a crucial role in the economic development of the country. In this way it became a tacit symbol of economic achievement and independence.

In 1995, Lithuania applied for European Union (EU) membership. In the late 1990s it became clear that for safety reasons, the closure of the Ignalina NPP would be considered a prerequisite for the country's EU accession. This resulted in heated political debates on sovereignty and control, and in this context, the plant quickly became a direct symbol of national sovereignty (Vähä–Sipilä, 2004). The story it told was different from that of the 1980's or of the early 1990s.

Words are examples of symbols, and human languages are systems of symbols. *Denotational meaning* of a word is the 'literal', 'obvious' or 'commonsense' meaning of it. It is the limited, strict sense that is communicated by e.g. a dictionary definition. For example, the denotational meaning of the word "car" is restricted to, e.g. "a road vehicle with an engine, four wheels, and seats for a small number of people". *Connotational meaning* is instead meaning that arises from more specific socio-cultural and/or personal associations to the sign. Connotational meaning carries the symbolic dimension of words and, as such, it may go far beyond the denotational meaning, or belong to a different register. For example, in Western cultures the notion of a car typically elicits the notions of virility and/or freedom (Chandler, 2006).

Words usually have at least one denotational (i.e. literal, dictionary) meaning that is shared among the people who use the language[2]. Thus the denotation of a word represents a convention, i.e. an agreement among a group of people that they will share that meaning of the word among themselves. Meanings of this type are said to arise through social convention. On the other hand, connotational (i.e. implied, 'subjective') meanings of words may differ among individuals or social groups, due to differences in cultural background, values, education, and personal experience, among others.

From the perspective of the FSC it is crucial to enhance the awareness of the connotational meanings of the words that are dealt with daily in the RWM domain: safety, landscape, water, etc. as well as the meanings attributed by stakeholders to the actions of RWM organisations. Awareness of these meanings may help suggest ways to create constructive relationships amongst stakeholders or help resolve divergence and conflict.

3.   THE SYMBOLIC DIMENSION OF RADIOACTIVE WASTE

A symbol is powerful to the extent that it transmits a meaning which resonates with people. Whether the meaning suggested is positive, e.g. technological achievement, or derogatory, e.g. danger and threat, a symbol is effective with ordinary people to the extent that it taps into something which is perceived to be meaningful and relevant by those people. In the following, illustrative examples related to RWM are presented, many of them drawn from the FSC literature and experience.

Waste as an epitome of the human adventure

Effective symbolism may reach into culture and myth that deeply govern the behaviour and attitudes of people. According to O'Connor (2003), radioactive waste itself has gained symbolic meaning over the past decades:

"It has to be wondered whether an *object*, and a *disposal process* that engages such an extensive, costly and meticulous scientific attention, that has become the focus of deep societal controversy for more than 50 years, and that is expected to remain the object of permanent surveillance for hundreds or even thousands of years, can be considered to be *just a waste?* The nuclear wastes, that most people have never seen, have become folkloric in the deepest sense of the term. The class 'nuclear waste' is an icon, a symbol of the great adventure (and the uncertain destiny) of our technological civilization" (p. 184).

Waste and its connection to shame and fear of secrecy

According to Jacques Arnould (2004),

"Radioactive wastes may induce a feeling of shame because they are very simply residues, dirtiness to which we do not attach other value than that of potential danger that they carry and the fear that follows.

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[2] A word may have more than one denotational meaning. In cases when a person must choose one meaning from a number of options he or she looks to the context of the word and the situation to make the decision.

[…]

[T]his is not waste like other waste: to hide it out of shame creates a new form of fear, the fear of secrecy, the fear of the kind 'we are not being told everything.'

[…]

This alchemy of passions, this mix of fear and shame likely constitutes one of the particularities of the social, cultural and ethical management of radioactive waste and, at the same time, one of its greatest difficulties! Is it so specific that it may not provide an analogy in order to enrich our reflection? I do not think so; it belongs rather to the domain, so vast and so varied, of the sacred and the profane, of the pure and the impure" (p. 38).

Waste and the breaking of the covenant to our descendants

The sense of shame evoked by Jacques Arnould (see above) can be placed in relation to the breaking of the symbolic pact or covenant that would link our generation with the succeeding ones, to whom we may no longer provide a heritage as rich in purely positive attributes as we wish. (See box 2.)

Box 2: The symbolism of legacy

The weight of the legacye.g.waste lasting a long period of time-engenders an almost pathological level of apprehension concerning the choice to be made as well as a marked sense of culpability. The engine of this culpability lies in the symbolism of legacy and the perverse effects that the waste introduces.

Legacy is, above all, a "gift", a transmission of riches across time. We share the wish to bequeath our children and their descendants only positive elements, "bits of ourselves": respect of self and others, sense of responsibility, appreciation of a job well done, etc.

To talk of radioactive waste in terms of legacy is to inverse the covenant: honour becomes dishonour, benediction turns into curse, riches become wastes, and any added value a reduction in value. The relationship amongst generations is inverted vis-à-vis the respect that is due to the preceding generations: radioactive waste operates in such a manner that future generations no longer have a debt to the earlier ones, but rather a credit.

Such inversion of values carries with it an inversion of moral duties. Take the duty of responsibility: within a naturalistic vision of the chain of human generations, it is the descendants who have to make prosper the inheritance that was received. In the case of radioactive wastes, the inversion of situations is disheartening because of what we are bequeathing, e.g. "the depletion of soil, the reduction of habitable space", which amounts to a reduction of what has been known to exist. As for the duty of continuity, it is also called strongly into question: the normal course of events would be to suppose that our own descendants will behave as we do and moreover will embetter the situation. Yet, for the issue we are dealing with, we are not bequeathing the best of ourselves nor the moral duty to continue what we started but, rather, a potential for "mutations, malformations". This is a total contradiction of the notion of continuity amongst generations (Loisel, 2004, p. 22-23).

The negative symbolism of RWM that arises in connection with the respect for future generations and in connection with the human adventure would suggest that added, sustainable value be given to the practice of radioactive waste management. It has to be recognised that the meanings of nuclear waste facilities can be explored at multiple levels. At the denotational level a facility is a concrete object, with its history, its building structure, and its technical characteristics. At the connotational level, the facility may earn meanings from those who live with it or see it. For local people it may become a symbol of the goals they want to achieve, including for example, prosperity, well-being, modernity, and safety. It may also

become a well-known, emblematic and admired feature of their region, and a positive part of their local identity. For visitors, it may become the symbol of hi-tech industry and modernisation, among others. At the same time, for some groups the facility may evoke the connotations of danger and stigma. Efforts made for improving well-being, consolidating knowledge, fulfilling value ideals, and elaborating community image are likely to encourage and justify positive connotations. The FSC has provided specific suggestions and recommendations to that effect, based also on the input of communities that are hosts or potential hosts to radioactive waste management facilities (NEA, 2007b). Examples of possible changes in attitudes through an appreciation of added value are reported in box 3.

Box 3: Examples of changing attitudes towards local nuclear installations

A recent example for radical attitude changes is the case of Dessel and Mol: before the start of the ongoing LILW programme these Belgian settlements did not want their community image to be linked to the nuclear industry and research activities present there. However, in their local partnership deliberations, Dessel and Mol came to suggest that there is a societal need to memorialize nuclear activities and to sustain and disseminate related knowledge. This observation underlies two central community demands for an integrated repository concept: a nuclear information clearinghouse and a radiation 'theme park' (NEA, 2007b).

Another example is Oskarshamn in Sweden, which has set about to emphasise positive aspects of their various nuclear hosting activities. "We are not accepting a waste dump; we are accepting a high technology facility for the purpose of protecting our environment and our coming generations. This should enhance and sharpen our local 'brand' profile already expressed by our motto *Oskarshamn. the municipality with energy*" (NEA, 2007b, p. 41).

Safety and risk and their link to survival

Safety and risk are key terms of RWM. Ferch (2009) shows that the term 'safety' has a variety of interpretations. For example, dictionary definitions refer to safety as 'freedom from danger, risk or harm', whilst regulatory organisations tend to implicitly define safety as 'freedom from *unacceptable* risk of physical harm or damage'. For non-specialists, however, the term 'safety' brings other, connotational meanings, as pointed out by series of risk perception studies (et al., 1986; Slovic, 1992). These studies have found that 'safety' draws the connotation of *familiarity* with the risk and the conviction of having *personal control* over the risk.

In addition to personal control, Slovic demonstrated that the existence of adequate *institutional control* also plays an important role. For instance, in a survey the single element that increased people's trust in nuclear plant management was that "an advisory board of local citizens and environmentalists is established to monitor the plant and is given legal authority to shut the plant down if they believe it to be unsafe" (Slovic, 1993; 2000). Ferch points out that according to some groups of stakeholders, a repository that is no longer under active control cannot be considered safe. This connotational aspect of the concept of safety may be at the basis of the continuous attention and requests for active monitoring and retrievability of waste.

By exploring the meanings further, we may find that the concept of familiarity (rooted in 'family') brings the connotation of knowledge, predictability, continuity, and ties with present and future. Personal control, on the other hand, draws the connotation of knowledge, access to information, ability to intervene, and being in charge (Pescatore, 2008).

The close linkage of familiarity and control to the concept of safety suggests a policy of integration of RWM facilities within the fabric of the host community (safety by integration) in contrast to the earlier dominant approach which intended to isolate those facilities from their environment as much as possible (safety by exclusion) (NEA, 2007b)(see also box 4).

Box 4: Integrating RWM facilities with their environment

O'Connor (2003) suggests that links should be created between RWM facilities and both current and future generations. He proposes that future generations should be offered the possibility to become guardians of radioactive waste facilities. O'Connor points out that we should help preserve memory of such facilities and as well as the competence to carry out future interventions if needed. Strategies for living with radioactivity, he argues, should include three components:

1. The Science Dimension – the development, application and maintenance of scientific knowledge and technical competency to measure and to control the present and eventual exposure of living beings to radioactivity.

2. The Social Dimension – the envisaging and invention of the ways that the relevant community (or communities) will relate to and interact with the sites and the wastes.

3. Political/Economic Partnerships – permitting to mobilize the relevant knowledge and resources for the implementation of an agreed societal solution to the disposal and watching over the wastes" (O'Connor, 2003, p. 6).

The term 'safety' also evokes the connotation of *survival.* Survival has several aspects, such as drinking water, food and shelter. Any threats to them would shake our sense of security. Box 5 illustrates this with reference to a case study in *water resources*. Box 5 also indicates how understanding[3] symbolism associated with basic needs could potentially result in concrete adjustments to regulatory approach.

Box 5: Water resources and HLW disposal

Kraft and Clary (1993) analysed the transcripts of public hearings organised by the US Department of Energy (DOE) related to the selection process for a HLW repository in the states of Wisconsin, Maine, North Carolina and Georgia[4]. Texts were classified into several categories, including e.g. anticipated repository impacts, political/social concerns, technical criticisms, DOE competence and credibility, and the degree of opposition to the facility. In analysing the concerns associated with the perceived repository impacts, it was found that the threat to water resources was the most frequently mentioned concern, occurring in 36% of public statements. This was followed by concerns about economy and public health (mentioned by 26% and 23%, respectively).

The special significance of water resources is also exemplified by the former controversy around the regulations concerning the Yucca Mountain HLW facility. At one time the US NRC was planning to adopt generic safety criteria that would cover all potential exposure pathways. However, there was broad opposition to this approach: the local population expressed its preference for establishing a separate water protection standard. This indicates the importance of water for the local population in an arid area, where water is tied to life and survival[5]. The NRC decided in the end to formulate a separate standard.

The multiple meanings of land and landscape

The notion of *land/earth* is also related to survival, due in part to the fact that basic foodstuff arise from the soil and in part to the fact that people do need a "piece of land" or territory in which to lead their

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[3] Methodologies developed for analysing the symbolic aspects of communication will be addressed in later sections of this paper.

[4] At the hearings, held between 1984-86, a total of 1,045 individuals testified, and the full text of their responses was analysed in terms of a number of dimensions.

[5] This observation was offered by J. P. Kotra during her oral presentation (2008).

lives. As linguistic analysis shows, the concept of land/earth includes many more (and more subtle) aspects including for example physical, economic, social, and sacral ones (Banczerowski, 2001).

The land where we were born and brought up or where we currently live is usually regarded as an extension of the family home. The feeling of *home* may extend to a large area. Home is much more than the compound in which we lead our lives: it evokes a number of connotations related to love, beauty, amenity, peace, tradition, memory, achievement, and family (Pescatore, 2008). We are resistant to abrupt changes to our home town or region because these are a threat to our established quality of life, as well as to our feeling of familiarity and control (Pescatore, 2008). Adverse emotions towards perceived changes in the character of the home region, for example in Nidwalden Canton (Switzerland)[6], and/or against profound alterations of the landscape can help to explain the vehement protests of inhabitants or persons opposed to the building of several planned RWM facilities, for example in Storuman and Måla (North Sweden) (NEA, 2007b).

Box 6 recalls the presentation by Prof. Y. Luginbühl highlighting the many dimensions of the concept of landscape, including its historical one. Especially important to the FSC is to note that there exists a European Landscape Convention[7], addressing notably the need to establish procedures for the participation of the general public and other stakeholders in the creation and implementation of policies for protecting, managing and planning landscape. The Convention also encourages the integration of landscape issues into all other relevant areas of policy. These are indications that it is appropriate that the RWM community lend attention to the meaning of landscape within facility siting procedures.

Box 6: Material and immaterial meanings of 'landscape'

In an interview study across Europe, Luginbühl (2007; NEA, 2007a) investigated the meanings attributed to the word 'landscape' by over one thousand respondents. He found that this word often represents a utopic vision of a beautiful territory for social life. Luginbühl also examined aesthetic records throughout the ages, finding comparable links between societal values and landscape. In the 14th century, the cycle of paintings by Lorenzetti of Sienna defined 'good' and 'bad government' by portraying the effects of each upon the rural or urban landscapes of each parable. These paintings drew an association between the values of liberty (freedom to shape the landscape and have access to its resources) and beauty (social peace and harmony with nature). The word 'landskap' itself emerged in Holland in the middle 15th century, at a time when prosperity was made visible (and recorded in the Netherlandish school of paintings) in land well-managed and richly covered with crops and herds.

Experience of connotational meaning and usage of some key words in radioactive waste management

Words used to indicate facilities for the temporary of final isolation of the radioactive waste tend to vary from country to country suggesting culture specific connotations. In subgroup discussions at the June 2008 Topical Session, FSC members set forth a number of examples regarding the evolution in terminology over time:

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[6] This observation was offered by M. Fritschi during his oral presentation (2003).

[7] Council of Europe, ETS n° 176 (entry in to force 1 March 2004). "The Convention aims to encourage public authorities to adopt policies and measures at local, regional, national and international level for protecting, managing and planning landscapes throughout Europe. It covers all landscapes, both outstanding and ordinary, that determine the quality of people's living environment." (Council of Europe, 2004)

- In most countries a distinction is made between 'storage' and 'disposal', where 'disposal' means that, in principle, no long-term care is required. Yet, in a number of countries (e.g. Hungary) RWM (especially LILW) facilities are called 'storage facilities' or 'storage centers' even if retrievability is not required. Belgium provides an interesting case: for the same activity the term 'final disposal' is used in French, while 'storage' is used in Flemish.

- The term 'final disposal' has been widely used until recently, drawing on a connotation of ability to dispose of the waste and walk away from it. The terminology has been changed recently in several countries to 'deep facility', in order not to be seen as precluding activities such as retrievability and monitoring. In France, Parliament enshrined the reference word in law. The word "stockage", which is used to mean "disposal", also evokes the concept of "storage". In fact, in denotational French, "stockage" is a temporary store. Terminology has been changed from 'final repository' to 'repository' for similar reasons in Finland.

- In some countries (e.g. U.K., Canada) 'waste disposal' has been replaced by 'long-term waste management'. This reflects the evolution of ideas in response to societal expectations. For instance, in the case of Canada's NWMO, the words 'waste disposal' replaced the words 'waste management' to reflect a change in the design of the waste management plan being implemented.

- Different stakeholders tend to use different expressions bearing different connotations for the same type of facility. For example, in Spain the implementer applies the term 'disposal facility', the media use 'cemetery'; in many countries opponents use 'dump'.

- The very word 'waste' has negative connotations, implying that it is something dirty. Therefore there are countries (e.g. Japan) where RWM institutions are avoiding this word in their official documents and communication. A more neutral or technological term is preferred, as e.g. in Italian 'scorie' (by-products) instead of 'rifiuti' (refuse).

- In many socio-technical areas, there has been a challenge to the use of the word 'expert'. This word evokes the positive connotation of knowledge and competence but may also suggest that, by contrast, 'lay persons' are ignorant and incompetent. In Canada, RWM institutions moved away from using the term 'expert' in order to avoid giving the message that the person has answers to all questions. It has been replaced by the word 'specialist'.

- Another controversial word is 'compensation', which may suggest that some harm will be offset or some loss will be repaid. In several countries (e.g. Hungary) this term has been replaced by 'incentives' or 'benefits' that bring along the connotation of market and economy. Also the expression 'regional development scheme', which is associated with large-scale socioeconomic progress, has increasingly been used by institutional actors.

- 'Reversibility' is another concept that has generated heated debates. Some interpret reversibility as a means for facilitating the correction of potential mistakes in the future, which would imply that it primarily addresses uncertainty regarding the long-term safety of waste management facilities (Ferch, 2009). Others, however, argue that reversibility draws on the positive connotation of flexibility and freedom of choice provided for future generations. According to this interpretation, reversibility represents a commitment to the values of intergenerational equity and democracy, which has been turned into a powerful political symbol.

4.   METHODS FOR IDENTIFYING SYMBOLS AND EXPLORING INTERPRETATIONS

Since the beginning of the nuclear era the terms 'nuclear' and 'atomic' have had varying connotations. Before the TMI accident the notion of nuclear power was linked to cheap energy and technological development. This was disrupted by the TMI accident, and later by the Chernobyl catastrophe, the images of which became associated with nuclear installations. Since the mid 1990s the image of 'nuclear' has become more positive again, bringing the connotations of clean energy and environmental protection (Nisbet, 2006).

Gamson and Modigliani (1989) claim that on most policy issues there are competing interpretive "packages" available and policy discourses can be seen as symbolic contests between interpretations. For example, an analysis of the US media discourse on nuclear power has identified a number of interpretive packages, quantified their presence in various media sources and investigated interactions between framing efforts and public opinion (Gamson and Modigliani, 1989; Nisbet, 2006). These are explained in box 7.

Box 7. Examples of framing nuclear energy in the US media discourse

Before the 1970s nuclear energy production was communicated almost exclusively in terms of the 'progress' package, which interpreted nuclear power as an important tool for technological development and economic growth (Gamson and Modigliani, 1989). During the oil crisis of the 1970s a second pro-nuclear framing package turned up in public discourse, which referred to nuclear power as a way to energy independence. In the mid 1970s, however, opponents started to re-interpret nuclear energy. Three competing framing packages emerged: (i) the 'soft paths' package emphasised energy conservation and decentralised energy sources; (ii) the 'public accountability' package contained the argument that nuclear industry operates in secrecy and cannot be trusted, while (iii) the 'cost-effectiveness' package listed a number of unsolved problems (for example, RWM), concluding that nuclear technology is not cost-effective. After the TMI accident of 1979 the 'runaway' package emerged, which portrayed nuclear power as a Frankenstein's monster beyond the control of humankind. The latter frame was only strengthened by the Chernobyl disaster.

Analysing recent US debates around nuclear power Nisbet (2006) found that framing packages used in recent public discourse are strikingly similar to those that were applied two decades ago. FSC members observed that such frames have been transferred to the radioactive waste debate, as well. For example, opponents created the phrase "mobile Chernobyl" for the transport of nuclear waste.

Understanding Framing

A *frame* in social sciences "consists of a schema of interpretation, that is a collection of stereotypes, that individuals rely on to understand and respond to events" (Wikipedia). In our minds there exist a number of competing frames: the interpretation of an event or object may depend on the frame that is applied. For example, if somebody rapidly closes and opens an eye, we may attribute this to a purely "physical" frame (he blinked) or to a social frame (he winked).

Framing is "an inevitable process of selective influence over the individual's perception of the meanings attributed to words or phrases. A frame defines the packaging of an element of rhetoric[8] in such a way as to encourage certain interpretations and to discourage others" (Wikipedia).

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[8] Such elements of rhetoric include metaphors, exemplars, catchphrases, depictions, and visual images, among others (Gamson and Modigliani, 1989).

At the societal level framing refers to the social construction of collective frames by stakeholders (e.g. institutions, the business community, political/social movements), or by media sources. When done by stakeholders, it is likely to advance their causes or views. For example, after George W. Bush took office, the phrase 'tax relief' was often used in communiqués coming out of the White House. In this frame, the use of the concept 'relief' suggests that taxes put strain on the citizens (Lakoff, 2004), while alternative frames (e.g. 'tax responsibility' or 'tax revenue') may emphasise other interpretations of taxes (e.g. indispensable sources of infrastructural support).

Methods for investigating framing efforts

Framing packages can be identified by analysing written documents or audio-visual records (i.e. text analysis). Text analysis methods cover a spectrum between completely algorithmic and exploratory procedures. Algorithmic methods follow an unambiguous and completely defined step-by-step procedure, while in exploratory work there is no specific procedure to follow but instead we look for leads. Algorithmic analysis can be fully automated (using e.g. computer word-search and clustering), but often text analysis is performed by the researcher (through word-counting or through other more interpretative means). Most frequently, algorithmic and exploratory methods are combined, as in the example described in the box below.

Box 8. Examples of text analysis applied for the US media discourse on nuclear energy

A non-algorithmic text analysis method was used to investigate the occurrence of various interpretive packages in the US media. Packages were broken down into specific idea elements, and the coder had to look for specific ideas in the text rather than making a global judgment on which package the text represents. After coding media samples (television segments, newsmagazine accounts, cartoons, and opinion columns), the frequency distribution of various packages in various media sources was calculated (Gamson and Modigliani, 1989).

Text Mining is an advanced, algorithmic variant of text analysis. It is a computer-aided search for new, previously unknown information within texts. A key element is the linking together of the extracted information to form new facts or hypotheses to be explored further (Hearst, 2003).

Box 9. Example of Application of Text Mining in the RWM dialogue in Japan

Recently, a Text Mining software has been developed in Japan for analysing dialogues and extracting useful knowledge from the texts. The software was used for analysing panel discussions at symposia held in various regions, in association with a possible geological disposal facility. The software provided the following outputs:

Keywords of panel discussions

Progression of topics

Statements shown to have major influence on subsequent discussion, and their sources

Participants' understanding level

The analysis highlighted the role of the skill of the facilitator, the depth of the discussion, and the need to tailor topics to the characteristics of the venue region. These findings will be used when designing future communication efforts (Kobayashi, 2008).

Methods for investigating interpretations

Interpretations of symbols can be explored from individuals' or groups' responses. There are two basic ways to systematically identify symbols and explore interpretations: (i) individuals or groups are interviewed directly, or (ii) individuals' or groups' spontaneous responses to certain problem situations are studied. In the former case, typical research instruments include interviews, focus groups, and surveys, while in the latter case, text analysis of written documents or audio-visual records are the most frequently used methods. In both cases, methods can be open-ended (where no – or very little – structure for the analysis is a priori defined by the researcher), or (semi-)structured, where (semi-)structured questions are applied to elicit views about a priori defined dimensions, or texts are analysed in terms of pre-defined structures (See Box hereafter).

Box 10. Example: Competing interpretations of 'compensation/incentives' in Hungary

In a semi-structured interview study with Hungarian stakeholders of RWM, the following interpretations of 'compensation/incentives' were found (Ferencz et al., 2003):

Offsetting negative impacts (i.e. repayment for any necessary expenditures or losses associated with the siting, construction and operation of a facility, see also NEA, 2007b);

Price of taking risk (i.e. price paid to communities for taking economic, health, social, etc. risk);

Payment for services (i.e. affected communities are compensated for making a service to the country);

Bribery (i.e. an offer of benefits in order to persuade the affected communities to accept the facility, which is in the interest of the party offering the bribe, see also NEA, 2007b)..

CONCLUSIONS

The topical session and the additional desk research have confirmed that radioactive waste management, like many other activities in society, is rife with words and concepts that carry symbolic meaning. Sometimes the symbolic meaning is obvious as when the word "dump" is used instead of "disposal facility", sometimes it is less obvious as when "landscape" is linked to "survival" and calling for reassurance from regulators that specific resources are protected through specific standards, even if generic, wider standards might also do. Sometimes the sources of satisfaction or concern are even deeper, as when the concept of local territory is linked to that of home, amenity, accomplishment and protection and as when radioactive waste comes to suggest a broken covenant with our descendants.

It is in everybody's interest to build awareness of additional dimensions of meaning beyond dictionary definitions, and to recognise that dialogue is shaped by more than just concrete realities. This recognition is helpful to find additional ways of creating constructive relationships amongst stakeholders and is already shaping the work of the FSC. To this effect, it is also of interest to observe that there are approaches and methodologies to identify symbols and explore interpretations.

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