

Radioactive Waste Management

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**More than Just Concrete Realities:  
The Symbolic Dimension of Radioactive  
Waste Management**

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NUCLEAR ENERGY AGENCY  
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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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, such as safety, risk, reversibility and 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, including benefit packages, community and landscape, are interpreted differently by diverse 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. They intend to become better aware of “symbolic” meanings of their actions (i.e. meanings beyond the “obvious” that may resonate for different groups). 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-confrontational 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 5 June 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. Discussions then took place in two small groups and a plenary. This report contains the most important elements of the presentations and the discussions plus additional elements from ad hoc research, with the aim of understanding the predominantly negative symbolism related to radioactive waste management and facilitating a more positive dialogue.

### *Acknowledgements*

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## 1. INTRODUCTION

Key concepts of radioactive waste management (e.g. safety, risk, reversibility, retrievability) carry different meanings for the technical community and for non-technical stakeholders. Similarly, socio-economic concepts (e.g. community, landscape, benefit packages) 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. “It is therefore also important to shed light on the ‘symbolism’ surrounding the final repository and its activities”<sup>1</sup> and, indeed, of radioactive waste management in general.

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-confrontational 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 as a whole, while Section 4 reviews the symbolic dimension of radioactive waste management concepts and terms. Section 5 briefly reviews systematic methods by which symbolism can be identified and analysed. Conclusions are drawn in Section 6.

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1. See SKB (2007), p.11.

It is in everybody's interest to build awareness of the importance of symbols and symbolism in our everyday endeavours, and of additional dimensions of meaning that reach beyond dictionary definitions and are grounded rather in social convention and cultural tradition. Ultimately there should be recognition that dialogue is shaped importantly also by these less obvious or conspicuous realities. The overall aim of the document is to understand the predominantly negative symbolism related to RWM in order to improve the dialogue with stakeholders and inform future discourse.



## 2. SYMBOLS AND SYMBOLISM

*Symbols* are signs that represent or “stand for” something in a manner which may or may not be grounded in material circumstances. Words are symbols, and human languages are systems of symbols: the same animal is called “lion” in English, “samba” 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. Objects also can be symbols. A ring may symbolize a bond (as does a wedding band, or a signet ring worn by members of a family, a group or an association). Words and objects thus take up symbolic meaning by the conventions, or the culture, of the social group within which a person lives.

*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. In *religion* symbols help to create a resonant narrative or story expressing the moral values of the society or the teachings of the religion, to foster solidarity among adherents and to bring adherents closer to their object of worship. In *politics* symbols are used to represent and defend an ideological standpoint. They can include banners, acronyms, pictures, flags, mottos and countless other vehicles.

Symbols thus are 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. Symbols are favoured tools of communication in modern mass-media cultures due to their important capacity for carrying complex meanings and their ease of assimilation by the public.

Because symbols are connected to words and objects by social convention, the relations between symbols and what they signify are flexible, and contextual changes may induce relatively quick changes to the meaning of symbols. The history of the Ignalina nuclear power plant (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 safety of Ignalina NPP became an important issue for the emerging environmental movement. As the Soviet-operated plant was strongly associated with Russia's domination over Lithuania, Ignalina was made a central issue in the fight towards national sovereignty. During this period the NPP became a symbol of unwanted 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 1980s or of the early 1990s.

#### *Denotative v. connotative meaning*

Words and objects may have both denotative and connotative meaning. The *denotative meaning* of a word or object corresponds to the “literal”, “obvious” or “commonsense” meaning. It is the limited, strict sense that is communicated by e.g. a dictionary definition. For example, the denotative 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.” Similarly a nuclear power plant is e.g. “an industrial facility in which electricity is generated by fissioning uranium atoms.” *Connotative meaning* is instead meaning that arises from more specific socio-cultural and/or personal associations to the sign. Connotative meaning carries the symbolic dimension of words and objects and, as such, it may go far beyond the denotative meaning, or belong to a different register. For example, in Western cultures the notion of a car typically elicits the notions of manhood and/or freedom (Chandler, 2007), and nuclear power plants can be seen as symbols of progress or human ingenuity, or take up additional symbolic meaning depending on the social context as exemplified by the story of the Ignalina nuclear power plant in Box 1.

Words and therefore objects usually have at least one denotative (i.e. literal, dictionary) meaning that is shared among the people who use the language.<sup>2</sup> 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, connotative (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 connotative meanings of the words that are dealt with daily in the RWM domain (waste, safety, disposal, compensation, etc.) as well as the meanings attributed by stakeholders to the actions of RWM organisations and to the objects, e.g. the facilities, that are associated with RWM. Awareness of these meanings may help suggest ways to create constructive relationships amongst stakeholders or help resolve divergence and conflict.

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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.



### 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 that 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 a representation of the human enterprise**

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).

The evocative power of waste in general and radioactive waste in particular is generally negative. Their association to our technological world is exemplified by the art exhibition “Trash People at Gorleben” by H.A. Schult (September 2004), an “action art” installation placing 1000 life-sized silent warriors, made of modern and consumer-waste material, in the galleries of the Gorleben mine intended to accept German spent nuclear fuel and high-level radioactive waste. “We live in the trash time: We produce trash and we become trash.”<sup>3</sup> The artist is credited with raising environmental consciousness by having placed such issues at the centre of his art since the 1960s. Similar exhibitions have been organised at Paris' la Grande Arche, the Kremlin in

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3. <http://www.haschult.de/trash.html>.

Moscow, the Great Wall of China at Jinshanling and in Rome's Piazza del Popolo. Gorleben and radioactive waste were thus used to raise further international awareness on environmental concerns and the deeds of man.

On the other hand, the observation by O'Connor that radioactive waste is waste "that most people have never seen" resonates with the experience of waste management experts, who agree that it is important to provide the public with a clearer physical representation of the waste and the means brought to bear on its management. The experience of Sweden where this has been done on a large scale (see Box 2) has certainly contributed to the current high level of knowledge of radioactive waste and its issues, as indicated by the latest special Eurobarometer study (EC, 2008).

### **Box 2. The Sigyn experience**

In Sweden, the waste management company SKB (Swedish Nuclear Fuel Management Co.) decided in the early nineties to open to the public its vessel M/S Sigyn, normally used for transportations of radioactive waste (both low-level and high-level waste). An exhibition explaining the Swedish system for radioactive waste management, plans for the siting process for the high-level waste, etc. was built in the ship's cargo hall. People also had the possibility to meet the staff working on the boat and to talk to them about their experiences.

Although questioned in the beginning, both internally and externally, the exhibition idea turned out to be a success. Throughout the nineties, the ship visited Sweden's coast in the summer time, the content of the exhibition changing as the siting process for spent fuel developed. Encouraged by the positive experience, SKB opened up all its waste management facilities in the nineties and today has about 20 000 visitors each year. So far, more than 600 000 people have visited Sigyn, making the ship one of the strongest assets for SKB in terms of public confidence.

### **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 ensues.

[...]

“[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 that ‘we are not being told everything.’  
[...]

“This combination 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).

Mariano Molina (2008) brings forward the idea that the feeling of shame and secrecy comes additionally from an association that is made between radioactive waste and some of the properties of nuclear materials and nuclear energy. Namely, nuclear energy is viewed as a force that is omnipotent and destructive in its military uses; it may be seen as having apocalyptic consequences in case of failure of controls when it is used for peaceful purposes.

### **Waste and the breaking of the covenant with 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 3).

#### **Box 3: The symbolism of legacy**

“The weight of the legacy, e.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 guilt. The engine of this guilt 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 to 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 reverse 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.”

## **Waste management facilities as the source of added, symbolic value**

Negative symbolism has arisen around radioactive waste, notably in regard to ideas of the respect to be accorded to future generations. In this way, a negative symbolic value has been attributed to the practice of radioactive waste management.

Conversely, there are artists who find positive symbolic meaning in radioactive waste repositories. Cécile Massart has visited radioactive waste facilities throughout the world and captured their particular beauty and identity in graphic works (photos, engravings, videos). From her work we understand that radioactive waste has intrinsic cultural value in that it inspires artists to see a waste facility as an art object. She explains that it is important to preserve the memory of disposal, not just for safety reasons, but also because radioactive waste has unique societal significance (Massart, 2004).

Nuclear waste facilities can be explored at multiple levels. At the denotative level a facility is a concrete object, with its history, its building structure and its technical characteristics. At the connotative level, the facility may earn meanings from those who live with it or see it. For some groups the facility may evoke the connotations of threat and stigma. This may be emphasised, moreover, by architectural design and layout, if they mark the installation as an ugly, off-limits place of danger (NEA, 2007b; Pescatore and Mays, 2008). For others, and especially the local people, the facility may become a symbol of the goals they want to achieve, including, e.g. 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 high-tech industry and modernisation, among others. Efforts to improve well-being, consolidate knowledge, fulfil value ideals and elaborate community image are likely to encourage and justify positive connotations (see Box 4). However, it should be noted that durable change in values and perceptions is acquired only through constant and continued effort and that change is usually gradual in nature.

The FSC has provided specific suggestions and recommendations for building a sustainable relationship between a facility and its host community, through providing added value beyond benefits and land use compensations. Traditionally those necessary benefits take the form of hosting fees and socio-economic development packages (accompanying employment, infrastructure, etc.). The new approach, incorporating input by communities that are hosts or potential hosts to radioactive waste management facilities, embraces a broader view of increasing the quality of life in the region (NEA, 2007b).



Examples of possible changes in attitudes through improving the image of a host community and an appreciation of economic and/or symbolic value to the community are reported in Box 4.

**Box 4: Examples of changing representations of local nuclear installations**

A recent example of change in the symbolism of nuclear facilities is found in Dessel and Mol: until recently 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 to create an integrated repository concept for the storage of low and intermediate level waste, Dessel and Mol came to suggest that there is a societal need to memorialise nuclear activities and to sustain and disseminate related knowledge. This observation underlies two central community requirements on a future disposal facility: it must be accompanied by a nuclear information clearinghouse and a radiation “theme park” (NEA, 2007b).

Another example is found in Oskarshamn in Sweden, where the municipal council has set about to emphasise positive aspects of the 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). Building further on this determination, the municipalities of Oskarshamn and Östhammar have indicated their desire that any disposal facility should also create added value for the community. In a recent letter of intent to the two municipalities, SKB, the national waste management agency, identifies as added value “improved facilities for visitors, support for business development, investments in training and skills development and special efforts in the energy field” (SKB, 2008).



#### 4. THE SYMBOLIC DIMENSION OF RADIOACTIVE WASTE MANAGEMENT CONCEPTS AND WORDS

Key concepts of radioactive waste management (e.g. safety, risk, reversibility, or retrievability) carry different meanings for the technical community and for non-technical stakeholders. Similarly, socio-economic concepts (e.g. benefit packages, community or landscape) are interpreted differently by different societal groups. Resulting 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.

##### **Safety and risk and their link to survival**

*Safety and risk* are key terms of RWM. Ferch (2009) points out 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, connotative meanings, as pointed out by a series of risk perception studies (Slovic *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.

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 the 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).

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 (2009) points out that according to some groups of stakeholders, a repository that is no longer under active control cannot be considered safe. This connotative aspect of the concept of safety may be the basis for repeated societal requests for active monitoring and retrievability of waste.

The close linkage of familiarity and control to the concept of safety suggests the wisdom of a policy tending towards the integration of RWM facilities within the fabric of the host community (safety by integration), in contrast to one tending towards the isolation as much as possible of facilities from their environment (safety by exclusion) (NEA, 2007b; Pescatore and Mays, 2008; see also Box 5).

**Box 5: 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 the memory of such facilities 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* (Pescatore, 2008). At its most basic level, human survival depends on adequate water, food and shelter. Any threats to them would shake our sense of security. Box 6 illustrates this with reference to a case study in *water resources*. Box 6 also indicates how understanding symbolism associated with basic needs could potentially result in concrete adjustments to regulatory approaches.

### **Box 6: Water resources and high-level waste (HLW) disposal**

Kraft and Clary (1993) analysed the transcripts of public hearings (1984-86) 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. A total of 1 045 individuals testified, and the full text of their responses was analysed in terms of a number of dimensions. Testimony was 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 radiological exposure pathways through water, air and direct exposure. 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 (Kotra, 2008).

### **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 need a “piece of land” or territory in which to lead their 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. 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 in response to perceived changes in the character of the home region can help to explain the vehement protests of inhabitants or persons against proposed RWM facilities, for example in Nidwalden Canton (Switzerland) (Fritschi, 2003), or in Storuman and Måla (North Sweden) (NEA, 2007b).

Box 7 recalls the presentation by Prof. Y. Luginbühl highlighting the many dimensions of the concept of landscape, including its historical one.

#### **Box 7: 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 1 000 respondents. He found that this word often represents a utopian 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 14<sup>th</sup> century, the cycle of paintings by Lorenzetti of Siena, for example, 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). It is also worth noting that the word “landskap” itself emerged in Holland in the middle 15<sup>th</sup> 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.

Especially important to the FSC is to note that there exists a European Landscape Convention<sup>4</sup>, 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 be sensitive to the meaning of landscape within facility siting procedures.

#### **The connotative meaning and usage of some key words**

Words used to indicate facilities for the temporary or final isolation of 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 ambiguity in terms, the evolution in terminology over time, and attempts to use terminology that reduces negative connotations:

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4. Council of Europe, ETS n° 176 (entry into force 1 March 2004). “The Convention aims to encourage public authorities to adopt policies and measures at local, regional, national and international levels 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 many languages there appears to be ambiguity between the terms “storage” and “disposal” and an explicit legal distinction is sometimes made between them”, where “storage” means that the facility is temporary, while in the case of “disposal” the facility is potentially definitive. Yet, in a number of countries RWM (especially low- and intermediate-level waste) facilities are called “storage centres” even if there is no intention to retrieve the waste.
- 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. Terminology was changed in Finland from “final repository” to “repository” for this type of reason. In France, Parliament enshrined the reference word in law. The word “stockage”, which is used to mean “disposal”, at the same time evokes the meaning of “storage” (of e.g. merchandise for later sale). In fact, in denotative *French*, “*stockage*” is a temporary store.
- In some countries “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 management” replaced the words “waste disposal” to reflect a change from an engineering project (design and build a repository) to an ongoing societal process that includes designing and building a repository as only one of the elements of an evolutionary and adaptive process.
- 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 “storage facility”, the media use “cemetery”; in many countries opponents use the word “dump”.
- The very word “waste” has negative connotations, implying that it is something dirty. Therefore there are countries (e.g. Japan) where RWM institutions avoid using 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, the use of the word “expert” has also been challenged. 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 have moved away from using the term “expert” so as to avoid giving the message that only these individuals have knowledge that needs to be taken into account; instead it is argued that many categories of citizen have perspectives which need to be considered. The term has been replaced by the word “specialist”.
- Another controversial word is “compensation”, which may suggest that some harm is offset or some loss is 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 socio-economic 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. 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 inter-generational equity and democracy (Ferch, 2009).



## 5. 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 Three Mile Island (TMI) accident nuclear power was linked to the notions of 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 reported in Box 8.

### Box 8. 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. 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 the 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 framing was only strengthened by the Chernobyl accident (Gamson and Modigliani, 1989).

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. Indeed there is currently a reappraisal of all energy sources and nuclear power is being proposed as one of the actions that are required in the near future to ensure that over the next decades sufficient supplies and types of energy will be available to meet both growing world electricity demand and greenhouse gases constraints (Grimston and Beck, 2002; NEA, 2008).

## **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<sup>5</sup> in such a way as to encourage certain interpretations and to discourage others” (Wikipedia).

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 attempts**

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 Box 9 below.

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

**Box 9. 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 judgement 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 10. Example of application of text mining in the RWM dialogue in Japan**

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

- keywords of panel discussions;
- progression of topics;
- statements shown to have major influence on subsequent discussion, and their source;
- participants' understanding level.

The analysis highlighted the role of both the skill of the facilitator and 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 defined *a priori* by the researcher); or structured (where structured questions are applied to elicit views about *a priori* defined dimensions, or texts are analysed in terms of pre-defined structures) (See Box 11).

### Box 11. Example: Competing interpretations of “compensation/incentives” in Hungary

In an open-ended 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).

## 6. CONCLUSIONS

Radioactive waste carries an important symbolic dimension: it can be associated with our uncertain destiny as the actors of technological civilization, as well as with concepts of uncleanness and secrecy. Similarly, the vocabulary and concepts of radioactive waste management 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 the notion of landscape is linked to survival and would call for reassurance from regulators that specific resources are protected through specific standards, even if generic standards might already protect these resources. Sometimes indeed the sources of satisfaction or concern are deep, as when the concept of local territory is linked to that of home, amenity, accomplishment and protection, or as when radioactive waste comes to suggest a broken covenant with our descendants.

Alongside negative imagery, artists have pointed out intrinsic beauty in the waste management activity, and local communities are choosing to integrate this activity into their brand image rather than to suffer from stigma. A new design mentality will make management installations symbolise safety through accessibility, and the traditional image of compensation for loss will be pushed aside by adding value and improving quality of life in facility host communities.

It is in everybody’s interest to build awareness of the importance of symbols and symbolism in our everyday endeavours, and of additional dimensions of meaning that reach beyond dictionary definitions and are grounded rather in social convention and cultural tradition. Ultimately there should be recognition that dialogue is shaped importantly also by these less obvious or conspicuous realities. The value of dialogue is to expose people’s different meanings and have this interface result in new meanings that transcend those held by each of the individuals. This recognition is helpful for finding 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 exist approaches and methodologies to identify symbols and explore interpretations.



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