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### Forum on Stakeholder Confidence (FSC)

#### ADDED VALUE AND SUSTAINABILITY FROM A RADIOACTIVE WASTE MANAGEMENT FACILITY

##### International reflections on building a durable relationship between a facility and the local community

*The report investigates features of waste facilities and sites – and the process of planning and implementation - that may enhance quality of life in both the short and long term and thereby help build a sustainable relationship between a local community and a facility. The report is proposed to communities and to national radioactive waste management programmes in order to facilitate the discussion of added value and sustainability.*

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## FOREWORD

The Forum on Stakeholder Confidence (FSC) was created under a mandate from the OECD Nuclear Energy Agency's Radioactive Waste Management Committee to facilitate the sharing of international experience in addressing the societal dimension of radioactive waste management. It explores means of ensuring an effective dialogue amongst all stakeholders, and considers ways to strengthen confidence in decision-making processes. The working definition given to the term "stakeholder" is: *Any actor—institution, group or individual—with an interest or with a role to play in the process.*

A special challenge is the need to assure safe radioactive waste management (RWM) over the long term. The greatest challenge indeed, both technical and societal, may be to create a local, operating facility that can fulfil that mission over generations. Alongside scientific knowledge and technical competency, and resources for implementing an agreed approach, there must be a continued willingness to live with and maintain the facility. In this goal, how may a facility and its site be better integrated with the community? How may the facility and site be made attractive for the long term? Ultimately, how may they improve a community's prospects for quality of life across the generations?

The local benefits to be drawn from a RWM facility have usually been discussed in terms of hosting fees and socio-economic development packages (accompanying employment, infrastructure, etc.). Their role is to offset real and perceived impacts. Beyond traditional benefits and land use compensations, however, there has been little exploration of the *added value* host communities/regions may hope to gain from the presence of the installation. The present study investigates features of waste facilities and sites that may enhance quality of life in both the short and long term and thereby help build a sustainable relationship between a community and facility.

Today individual communities and RWM partnerships (grouping community and technical stakeholders) have started to reflect on how to build a long-term sustainable relationship with a facility sited in their territory. Different countries and regions are likely to have different socio-political realities and therefore best practices for one region may not be best for another. Still, it should be possible to extend and structure this reflection through exchanging ideas on the international level. Numerous stakeholders from inside and outside the FSC, including local communities, have provided input to the present study. They suggested that sustainability and value-added themes are very new, and discussed most often in close relation with more familiar local development items. Front runners, however, show that structured enquiry can inform stakeholders about the long-term cultural and amenity value that may be added by a RWM facility, as well as economic opportunities to be seized in their context.

The report is proposed to communities and to national RWM programmes in order to facilitate the discussion of added value and sustainability.

## TABLE OF CONTENTS

FOREWORD.....	1
1. INTRODUCTION .....	4
2. ARGUING FOR ADDED CULTURAL AND AMENITY VALUE AS A MEANS TO A SUSTAINABLE RELATIONSHIP BETWEEN THE COMMUNITY AND THE RWM FACILITY .....	6
3. VALUE ADDED BY FACILITY DESIGN FEATURES .....	8
3.1 FUNCTIONAL DESIGN FEATURES.....	8
Multi-functionality .....	9
Adaptability and Flexibility .....	11
3.2 CULTURAL DESIGN FEATURES .....	13
Distinctiveness and Aesthetic Quality .....	13
Understandability or Associability.....	15
Memorialisation .....	16
3.3 PHYSICAL DESIGN FEATURES.....	17
Integration .....	18
Amenity.....	19
Accessibility.....	19
4. VALUE ADDED BY THE PROCESS OF PLANNING AND IMPLEMENTING RWM FACILITIES.....	21
Local Utility .....	21
Capacity-Building .....	22
Image refinement .....	24
5. CONCLUSIONS .....	26
ANNEX 1: STAKEHOLDER ACKNOWLEDGEMENTS.....	28
ANNEX 2: GLOSSARY OF TERMS AND FSC REFERENCES .....	30

## 1. INTRODUCTION

Broadly speaking, this report addresses two spheres of activity, and building bridges between them. One sphere of activity concerns developing installations for the long-term management of radioactive waste. Some people are specialized in this sphere of activity, comparable to other economic spheres concerned with delivering products and services. The second sphere is general, and concerns daily life where each of us seeks improved *quality of life*<sup>1</sup> and, finally, happiness. Everybody participates in this sphere of activity, which could be called the personal sphere.

A particular challenge to both these spheres is the length and complexity of the radioactive waste management task. Planning, siting, constructing, operating and, finally, decommissioning a radioactive waste management facility is not a simple linear affair and it takes decades to accomplish. It implies many different types of assessment, evaluation and decision, and involves many different types of actors. There will be evolution in the type of administrative assessments that will be required, in the level of technical knowledge, in the political climate. There will be a renewal of actors as new ones, as yet unborn, enter the scene. Of the essence are the societal durability of an agreed solution and its sustainability over the long term.

The logic of sustainable development suggests that a good solution must have ecological, economic, social and ethical value. Regarding a good RWM solution specifically, the Swiss expert group EKRA (for instance) imparts a hierarchy to such dimensions: the chosen solution must be founded first on an agreed level of safety for man and the environment, and then meet requirements for fairness (including fulfilling the “producer pays” principle), and finally address other aspects of individual and social acceptance. Many *stakeholders* consulted for this report have stated a similar hierarchy of concern. We will argue that all these dimensions benefit from early study and planning in a participative manner, and that the positive gains to be sought on each level may reinforce each other.

This report looks into features and strategies that maximise the chances for a RWM facility to fit into the personal sphere of those hosting it over the generations. A long-term relationship may be facilitated by designing and implementing facilities in ways that provide added *cultural* and *amenity* value to the *local community* and beyond. This contribution should not be seen as a late or secondary add-on, but as one of the conditions that will help assure safe management of radioactive waste over the generations.

Different cultural contexts may have varying approaches to these issues. This report aims to create awareness, and nourish a debate that can be fruitful independently of the cultural context. The report does not look into “*spin-off*”, thematically unrelated infrastructure projects that may accompany the building of a RWM facility, nor into *incentives* or *compensations*, although the present findings may be useful in these areas.

In the following section (2), this report summarises the argument in favour of developing a sustainable relationship between a community and a RWM facility by bringing to it added cultural and

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<sup>1</sup> *Italicized* words are defined and discussed in Annex 2 (Glossary).

amenity value. In section 3 the report identifies design considerations - functional, cultural and physical - that may help facilities and sites fit into their community in a welcome and sustainable manner. Each design feature is illustrated with examples. The fourth section discusses the benefits that may be gained from the very process of planning RWM projects that target sustainability and quality of life. These benefits - capacity building, local image refinement - should be understood as cultural *added value* in and of themselves. Finally, conclusions are highlighted.

Illustrations are drawn from FSC publications, a literature review, specific interviews and stakeholder responses to a questionnaire. Annex 1 acknowledges the many stakeholders who gave detailed input. Annex 2 is a glossary of terms (whose first appearance in the report is *italicized*) and identifies FSC references.

## **2. ARGUING FOR ADDED CULTURAL AND AMENITY VALUE AS A MEANS TO A SUSTAINABLE RELATIONSHIP BETWEEN THE COMMUNITY AND THE RWM FACILITY**

Sustainable development is “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. It is "...not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs"<sup>2</sup>. Many countries have committed to the sustainability principle.

Because the physical environment is our primary resource base, the first pillar of sustainable development (SD) is ecology: we ought not harvest resources faster than they can be regenerated, nor emit wastes faster than the environment can assimilate them. Two other pillars of SD are economic and social. Finally, while not always cited, the fourth pillar is ethical. SD targets not only material needs but also social, spiritual and cultural needs. Committing to sustainability implies not only ecological, economic and social choices but philosophical ones as well.

In the area of sustainable engineering and design, “industrial ecology” concentrates on optimising the flows of energy and matter within a given network. Ideally, the network becomes passively sustainable, needing no further input of energy/resources aside from what is consumed and produced during the industrial activity for which the network is constructed. Can radioactive waste in a management facility become a resource in this manner? Can it “nourish” another subsystem? The first answer is no; the preferred strategy is to isolate (concentrate and confine) radioactive waste. However, from a sustainability viewpoint, if radioactive waste cannot be recycled directly into a useable resource, then at least it should become a source of further development, through *added value* (economic, cultural, and/or in terms of amenity) .

The National Academy of Public Administration<sup>3</sup> explains that “Sustainability is also an opportunity. Each generation creates and uses resources (over and above natural resources) that are very future-oriented. The most important examples are the education system, opportunities for contributions to social and economic needs, the capabilities for research and scientific investigation, and literature that analyzes and records our understanding of our own acts. Each generation must use some of its current resources to enrich these intellectual resources for the ultimate benefit of future generations”.

In this perspective, RWM facilities and sites should not only avoid disrupting but should in fact improve community living conditions over time, taking into account the full life cycle (planning and construction, operation, monitoring and when appropriate, decommissioning). Such facilities can provide growth potential, not only economic but also in terms of amenity and cultural and intellectual resources accruing over time. Both the ongoing quality of life in the host community, and indeed future societal

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<sup>2</sup> United Nations World Commission on Environment and Development (WCED) (1987) *Our Common Future* (Brundtland Report), §27 and §30.

<sup>3</sup> NAPA (1997) *Deciding for the Future: Balancing Risks, Costs, and Benefits Fairly Across Generations*. Report by a Panel of the National Academy of Public Administration for the U.S. Department of Energy. Washington, DC: National Academy of Public Administration, June.

capacity to watch over the wastes there, depend on building a sustainable relationship with the RWM facility and site. All the pillars of sustainable development should be kept in view when considering such a sustainable relationship.

Communities do not gain added value and sustainability purely through financial compensation and development opportunities. Whilst those economic means are important, RWM projects also offer opportunities to improve well-being, consolidate knowledge, fulfil value ideals, elaborate community identity and image, and live out desired social relationships. Planning for a facility should seize these opportunities. Without durable cultural and amenity value a facility will have less potential to survive over the generations, even in the presence of socio-economic provisions and institutional controls.

As expressed by a local stakeholder representative:

“With local community support for a facility from the outset of design and to the end of construction, and the development of a lasting amenity for the local and regional area for generations, I believe that the management of the facility is more likely to be continued through a number of generations. As well it is less likely to be seen to be a burden to the local area or future generations, as there is a benefit derived for those future generations.”

It is thus topical and important to investigate features of waste facilities and sites that may enhance quality of life in both the short and long term and thereby help build a sustainable relationship between a community and facility. In this report, *local community* is a generic term to designate the collectivity of personal actors that become involved in deliberations about RWM facility siting and operations. It is a social group of any size whose members reside in a specific locality, share government, and often have a common cultural and historical heritage. Community is not tied firmly to a geographic area. Frequently today, extended local units, groupings of townships, or regions are brought to consider the place of a RWM facility or site in their territorial identity.

Integrative reflection on technical and socio-economic aspects, added cultural and amenity value to be sought with a RWM facility, is best started from the very first planning stages even before final siting agreement is reached. It takes time to work out new ideas, new potentialities, and where the communities' own interests lie. The information, concepts and ideas gained will form a part of the basis on which a local partner may agree to become a candidate community and then actively engage in the final siting stages. Institutions generally cannot commit to the final form of a RWM facility before a specific site is agreed, nor to the ultimate fate of the facility and site. As well, the relationship between a community and a facility or site will depend in part upon external events (for instance, safety performance in the nuclear or RWM realm; attitudes and statements by political actors; etc.). Still, feasibility studies and social science investigations early in the decision-making process can provide meaningful preparation. This orientation is supported by e.g. the *UNECE Aarhus Convention*.

Often it can be difficult to hold a mutually satisfying discussion on compensation and development measures, one that will create no perception of “*bribery*” by the implementer, nor of a “*mercenary*” attitude on the part of the community. Just as the Environmental Impact Assessment (EIA) has proved to be a good umbrella process for discussing stakeholders' concerns, the added cultural and amenity value theme could drive sustainability dialogues, reducing the spectre of bribery and facilitating more productive exchanges on compensation as well as other, long-term provisions.

### 3. VALUE ADDED BY FACILITY DESIGN FEATURES

This part of the report reviews each design consideration that helps configure a RWM installation to maximise its contribution to potential sustainability and well-being in the community. Relevant design features relate to functional, cultural, or physical aspects. Illustrations from stakeholder experience are given, including some from industries or areas outside RWM. It is important to note that while the design features can be separated out in tables, often, in practice, they are tightly linked.

Table I below lists the design features that add durable value to the facility and site. These features tend to maximise the potential of a facility to be “adopted” by the members of the host community, by fitting in, adapting to and, moreover, contributing directly to their preferred way of life.

**Table I.**

**Design features that help configure a RWM installation to maximise  
its sustainable assimilation by the community**

<b>Functional</b>	<b>Cultural</b>	<b>Physical</b>
Multi-functionality or polyvalence	Distinctiveness	Integration
Adaptability	Aesthetic quality	Amenity
Flexibility	Understandability (“Associability”)	Accessibility
	Memorialising	

#### 3.1 FUNCTIONAL DESIGN FEATURES

Function concerns the uses to which the facility and site may be put (Table II). Careful functional design can allow the RWM facility to serve not only its primary purpose of assuring safe and secure long-term safe management of waste, but also, to allow parallel uses of direct interest to residents and visitors.



**Table II.**

**Functional design features that help configure a RWM installation to maximise  
its sustainable assimilation by the community**

<b>Design feature</b>	<b>Characteristics</b>	<b>Value added</b>	<b>Possible strategies to achieve the desired feature</b>
<b>Multi-functionality or polyvalence</b>	The installation serves several functions at the same time: it assures its mission of safely managing radioactive waste and also supports other uses like recreation or education	Offers opportunities for a wider range of persons to come into contact with the installation and to bring it into their lives  Offers opportunities for the community to draw a range of benefits (prosperity, amenity...)	Designers and community stakeholders explore community needs for additional functions; work closely with regulators to reconcile demands for safety and for parallel uses
<b>Adaptability</b>	Foreseeable functions can be accommodated at acceptable or no cost	Supports the near-term multi-functionality of the installation	Designers choose appropriate materials and structures to accommodate foreseeable uses and make necessary transformations easy
<b>Flexibility</b>	New and unforeseen functions can be accommodated at acceptable cost	Supports longer-term multi-functionality, including completely transformed structure or uses	Designers anticipate that new functions will be introduced by future users; they assure robustness and avoid building in features that narrowly restrict potential uses

### **Multi-functionality**

In general, facilities designed by engineers have been mono-functional, dedicated only to serving their engineering purpose. Managers and politicians then relied on compensation and now-outdated ideals (glorious technological progress, the public good...) to win community acceptance. In contrast, FSC workshops in Canada and Belgium<sup>4</sup> have highlighted the desirability, and necessity, of integrating RWM facilities into people's way of life and vision for growth. Like mobile phones that also serve as personal planners and cameras, or living spaces employed for many different activities,

<sup>4</sup> NEA (2003) *Public Confidence in the Management of Radioactive Waste: The Canadian Context*. Paris: OECD.  
NEA (2004) *Dealing with Interests, Values and Knowledge in Managing Risk*. Paris: OECD.

RWM facilities may more easily become part of people's lives if they have multiple uses. Similarly to other products and services, if a RWM facility does not gain positive hold in the consumer cycle, it may soon be left aside or resented.

“Multi-functionality” means that the RWM facility or site can be used by the community for other purposes. These might provide economic benefit, enjoyment, learning or socializing opportunities. These functions may be exploited immediately by the community or in the future. In all these ways, the facility or site provides added value. We have found examples of added cultural, amenity, and scientific value, as well as traditional economic value.

There is a difference here with “spin-off” opportunities or unrelated infrastructure that may be offered to a community as an incentive or supplementary grant. Multi-functional facilities and sites (for example, scientific, cultural and recreational facilities built within site confines) are designed to deliver, in and of themselves, added cultural and amenity value closely tied to the RWM project itself. In this way, the added value helps to fit the RWM facility or site into community life over the generations.

- In Canada, the Port Hope End Use Advisory Committee developed a “vision” for multi-functional use of the Long Term Low Level RWM Facility. Significantly, they seek to create durable cultural and amenity value. Discussed options include an “interpretative centre” or museum. This would pass along history on the nuclear industry and “how we got to be what we are” in Port Hope. Another option is based on the assumption that green space will be the resource most lacking in 500 years, and one that certainly will be appreciated: the committee proposes a National Heritage and Passive Recreation Area (“permanent” flower gardens, walking paths, and observation stations). Finally, active recreation uses are being considered, addressing a more immediate need in the community.
- Two waste storage facilities in France, the Centre de stockage de l’Aube (CSA) and Centre de stockage de la Manche (CSM), function as tourist destinations, providing revenue to the region. At CSA, a museum-like visitors’ centre informs about local geology and archaeology, and the storage area can be toured. The extendible hangar design has been noted and copied by visiting farmers.
- In Nord Pas de Calais, France, a mining museum also contains a cultural centre, where lectures and concerts can take place.

Added scientific value is already being generated through multiple uses of RWM facilities.

- Underground installations offer unique opportunities to carry out research requiring an exceptional environment. Zero-gravity experiments are carried out at Japan’s Tono Mine underground laboratory, and the North America Deep Underground Science and Engineering Laboratory foresees a number of experiments unrelated to waste management that may be carried out at WIPP.
- Laboratory facilities at Spain’s El Cabril and WIPP in the US are available for use by universities and administrations. This up-to-date infrastructure serves for research and for regional environmental analysis or monitoring.

The link between scientific culture and "everyday" culture, too, can be made in multi-purpose, interactive facilities.

- At Äspö, Sweden's hard rock laboratory includes a demonstration component, providing knowledge to scientists through research and to the public through a hands-on museum experience.
- The Association of Swedish Municipalities with Nuclear Facilities (KSO) Secretariat gave ideas for cultural added value installations. In an environmentally oriented bio-geo-science centre or "Experimenter Facility", visitors could create things themselves with help of computers, see rock samples, play games with scientific content in physics, chemistry and biology, and learn about up-to-date geologic knowledge and even the history of the stone industry of the Oskarshamn area or iron-work industry of Forsmark. The geo-scientific centre could be complemented by a large outdoor stage (dug in the bedrock) for music and theatre performances in a true "Mountain King" concert hall. The new stage could have a geo-scientific trail with stations explaining bedrock types, fossils etc.

Radiation protection and safety needs push engineering solutions towards isolating the waste. Is it really possible to create a multi-functional facility while preserving safety? In principle the answer is yes: if this is taken into account from the beginning, architects and engineers can lay side-by-side the "hardhat and dosimeter" waste-management area with the part welcoming visitors for other pursuits. This is the case for the El Cabril and WIPP laboratories cited above, and for museums and visitors' centres at other repositories. The concept in principle can be extended to any installation, and a wider variety of uses imagined.

- In Canada, the Port Hope community worked with the federal safety authority to check the feasibility of the public-use projects they would like to see within the low level waste storage area.

### **Adaptability and Flexibility**

"Adaptability" and "flexibility" are necessary for achieving multi-functionality. They mean that designers do not lock the facility or site into a single purpose. Instead, they choose forms and materials that may allow a graceful transition to parallel or new, unforeseen uses.

- A typical example is seen in modern exhibit or theatre spaces that can be transformed according to need (walls and seats are modular and mobile). On the scale of an entire construction, the "innards" of the building—heat, waste and ventilation conducts—can be placed so as to facilitate new organization of the space. As for RWM installations, such a concept could be extended to the entire site, designing and placing protected areas in such a way that they do not hinder a large array of expected or unexpected site uses.
- In France, a tumulus formed of mining waste has been adapted into a ski slope. This required engineering foresight to provide the correct slant and access arrangements.

When creating a new facility, it is necessary to foresee the end of its useful life. If future needs are not anticipated, there is a risk that the facility will become a liability for the community. Proper foresight – on the end use of the facility and site, or technical provisions for quick transitions to other types of facilities – provides better assurance to the host community that there will be flexibility in future planning capacity.

- In Kävlinge, the town hosting Sweden's Barseback nuclear power plant (NPP), the municipality views that the operating reactor is a valuable asset and should go on running for economic and environmental reasons. If Government decides to decommission the

community does not want to be tied to a restricted, unproductive site for 30 years<sup>5</sup>. The municipal preference would be to turn the site very quickly into a new seaside housing area. The choice of land use reflects both the changing demography of the region and the municipal need to generate revenue. If the older type of reactor had been built with design provisions that favour a prompt dismantling – like current plants do – there would be shorter lead time to dismantle it and there would be a smoother transition to a final and accepted new condition.

- At Dounreay NPP in Scotland, the process of setting decontamination priorities and radiological target levels will take some years. Stakeholders are currently working to find agreement on which surface buildings should be maintained, which areas should be accessible to visitors, and which new uses should be created. Because at time of construction and in early years of operation the future need for such decisions was not taken into account, clean-up and transformation of site elements may be a heavy and costly task. The famous domed reactor building has been proposed as a national monument, but the cost associated with its maintenance under that regime appears too high, as would be the cost of dismantling or transformation. Today many local stakeholders with family employment ties are sentimentally attached to the landmarks of the now inoperant site, but in any case it appears that there is little choice to be made regarding whether to keep or eliminate the reactor dome. It may be an unused landmark, admired or not, for generations to come.

An adaptable, flexible facility can provide enjoyment during its operation and also make possible the transition to a full community facility when its industrial use is no longer needed. This preserves the potential for local culture to develop further according to future needs. Cultural identity takes decades to centuries to form. RWM projects should be sensitive to maintaining and also creating cultural identity. A flexible, multi-purpose facility can help achieve the latter, as it is likely to last for generations of social use and enjoyment.

- The city of Rome is an outstanding example of how cultural identity is formed through the layering of sites and buildings from many eras of history. Ancient religious sites were rebuilt over the centuries with churches that show architectural and decorative features from many successive eras, and they are still in use today. Throughout the historic centre, major facilities constructed to serve the institutions of their time have been adopted and transformed to suit successive needs. While some stand as museums, many more house today's institutions. Ancient vestiges and newer constructions co-exist in a living manner, integrated in today's practices. Remnants of the past are completely adapted in a vibrant modern community.

Facilities built to store today's waste must have the technical potential to last over the centuries. The visible layering of history in the city of Rome offers an example of how RWM host communities may hope to construct for the future. They can envision how today's site may best be given a form around which future developments may grow. Along with careful planning for radiological safety on-site, adaptability and flexibility leave development pathways open.

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<sup>5</sup>. Palmqvist, R. (2005) "The Municipality as a Stakeholder". In WPDD Topical Session on Stakeholder Involvement in Decommissioning, November 2005, NEA/RWM/WPDD(2006)5, see also NEA Webpage: <http://www.nea.fr/html/rwm/docs/2006/rwm-wpdd2006-5.pdf>

### 3.2 CULTURAL DESIGN FEATURES

Cultural value is found in arrangements that reflect and strengthen a given society's knowledge, tastes, aspirations, ethical views, or beliefs. It lies in all that is meant to help to transmit an honoured legacy, to communicate symbolic meaning, or to advance ideals. Three design features (Table III) are found to be part of how designers and communities can instil meaning into a RWM facility and site.

*Culture*, however, is not a fixed-for-ever set of features, and attention must be given too to what may help culture to develop further. This includes the education level of a society, the provision of features that allow for better socialising, and maintaining the memory of society's achievements and acquisitions through narrative lore and knowledge stores. The intangible features that appear to lie more in process than in design are discussed in the third main section of the report.

#### **Distinctiveness and Aesthetic Quality**

Attention should be given to making the facility less ugly, and more of an object of community pride. "Distinctiveness" means that the RWM facility or site is attractive, recognizable and like no other. The facility and site may become an icon, a feature lending a positive reputation and drawing visitors.

- The household-waste treatment facilities at Spittelau near Vienna were transformed into a delightful landmark when they were given a new outer shell by artist Hundertwasser.
- The Oskarshamn municipality feel that a future SNF and HLW facility could be a showcase for Swedish innovation and design. They call for a national architectural competition to be held.

"Aesthetic quality" means that the installation is nice to look at and to experience. In sum, one would be happy to pose for a photograph with the installation in the background. There are different ways to achieve this: through innovation, or through tradition.

- The Äspö surface buildings in Sweden look like handsome examples of regional architecture. They resemble classical wood houses and respect the traditional colour scheme of red siding, dark roofs and white trim.
- Artist C. Massart has visited waste facilities throughout the world and captured their particular beauty and identity in graphic works (photos, engravings, videos).

Table III.

**Cultural design features that help configure a RWM installation to maximise  
its sustainable assimilation by the community**

<b>Design feature</b>	<b>Characteristics</b>	<b>Value added</b>	<b>Possible strategies to achieve the desired feature</b>
<b>Distinctiveness</b>	The installation is at once attractive, recognizable and “like no other”	The installation may become an icon, a well-known, emblematic and admired feature of the place. People may draw pride from the presence of the installation; it can become a positive part of local identity	Artists and architects apply their highest creative and design skills; incorporate state-of-the-art and/or traditional materials; introduce innovative engineering...
<b>Aesthetic quality</b>	The installation is nice to look at and to “experience”	People may draw pleasure from the presence of the installation rather than avoiding it or rejecting it	Architect, artists and community stakeholders consult on desirable “look”, layout and landscaping
<b>Understandability (“Associability”)</b>	The installation and its functions are understandable	People can connect the RWM project and installation to various parts of their lives and their knowledge	Stakeholders (technical and societal) engage in an open, transparent and collaborative process to work out the RWM project  Information and education programmes
<b>Memorialising</b>	The facility and site are marked so that people (now and later) know both what is there and something about its context	People can integrate into their sense of place the meaning of what the site is and why it is there  Features of local identity and culture are preserved and showcased  Society’s choices and achievements are recorded	Interactive science museums  Art installations  Durable markers

## Understandability or Associability

“Understandability” means that people comprehend the facility and its functions—or that they have the means to learn about them. The psychologists’ term “associability” means that features of the installation can be tied in with existing knowledge and understanding.

Understandability must be built up through relationships with the facility and site. Providing transparent, accessible information about the site can enhance associability. This can be achieved through visits, demonstrations, mock-ups, and hands-on interactive exhibits, or through archiving and transmission of data.

- In their final report, community members of the STOLA *integrative local partnership* (Dessel, Belgium) spelled out their requirements for accepting a facility: The repository project for low-level waste must integrate technical and social aspects, and moreover, must bring positive value to the community. STOLA set requirements to foster understanding of the facility and site, now and over the years. They stipulated that alongside a repository must be built a clearinghouse for information regarding radioactivity, its applications and consequences. A small interactive science centre should be part of this.
- France’s Centre de Stockage de la Manche can be toured and draws both tourists and regional inhabitants. Many industrial facilities, including nuclear power plants and operating waste management installations, hold “open door” days to build up relationships with the neighbours. Residents can visit the site, meet and talk with the people who work there, and participate in family activities that bring the facility closer to everyday experience.
- Cogema has demonstrated that it is possible to place cameras even in the “hot” areas of waste management facilities, allowing people to look in and form an image of what waste management really looks like (this feature must be considered in light of security constraints). Several implementers have displayed long-term containment structures for the waste so that people may distinguish these from more fragile engineering structures and build up their understanding of the waste containment systems.

Understandability can be enhanced if community members are involved in working out details of the site function. Communities may wish to develop their understanding through training, which also equips them to monitor the proper running of the facility over the years.

- Mayor J. Castellnou of Hospitalet, the Vandellós nuclear plant host community, told the FSC<sup>6</sup> that local confidence—in the host community and beyond—reposes on four pillars: safety, local training and knowledge development, socio-economic development, and future-oriented sustainable development mechanisms. Communities appreciate being part of checking for safety, and ask to be trained in the relevant areas. They thus build not only competence but also accrued, tangible safety mechanisms and the basis for long-term co-existence with the facility. This familiarity and control are part and parcel of the safety concept. Local stakeholders may one day be called to be the guardians of a facility or its memory.
- A regional university professor was given the role of “translating” the relevant technical concepts into plain language that local people on the Vandellós dismantling monitoring commission could understand. This increased members’ grasp on the issues they were to

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<sup>6</sup>. J. Castellnou in proceedings of the FSC topical session on “The link between RD&D and stakeholder confidence” held in June 2005, see OECD/NEA document NEA/RWMC/FSC(2006)4.

monitor. At the same time, these concepts became part of a local narrative, giving a new cultural presence to the facility.

Understandability may mean too that the community takes the presence of waste for what it is, not turning away from it. In questionnaires, most stakeholders contributing to this study indicated that they do not seek to camouflage the presence of radioactive waste in their community. A facility can be designed to show, rather than hide, the fact that waste is placed there.

- P. Gontier, ecological architect observed in an interview that “showing, not hiding” is a preference that has emerged relatively recently in the history of architecture and urban planning. It is both an ideological preference and a utilitarian one: when the function of an installation is hidden, it can be forgotten. He suggests that the best path to follow in designing a RWM installation is not to attempt to disguise its function, but, to render that function visible and understandable. In the architect’s opinion, designers should seek out an aesthetic code that is distinctly appropriate for nuclear power (or for RWM). They should not borrow aesthetics from other domains. Doing so would be anti-transparent; it would comfort the notion that RWM has something to hide. The installations should look like what they are. The building should display its “truth”, and moreover, “tell a story” in which the community will recognize itself. To discover the desired story implies consulting and involving the community.

The themes of “understandability” are closely linked to issues of “memorialisation”.

### **Memorialisation**

Sustaining a long-term care-taking relationship with a RWM facility requires that the memory of the site be preserved. “Memorialisation” means that both physical and cultural measures are taken to mark the site and tell its story, so that people will grasp and remember what is there.

For decades technologists have reflected on the need to preserve site memory by constructing durable markers. Whilst the markers have a protective function, “marking” the facility can also be a means to add cultural and amenity value. These are important considerations if the memory of the RWM facility and site is to be preserved over many, many generations into the far future—a future much longer than industrial experience to date.

- Artist C. Massart reminded the FSC Belgium workshop participants that we must archive information for the future, taking into account that present-day meaning will fade away or become unreadable. She showed how we can mark repository sites or facilities through symbolic, artistic means. In this way it is possible also to create new relationships, a new contemporary dialogue around waste management. Massart explained in an interview that everything that should be known, thought and retained about the actual repository site cannot be grasped in a single glance. The site cannot be fully archived with a simple label: neither a detailed technical presentation, nor an eloquent discourse on *what is here* and *what it has meant in our society* will assuredly be readable over tens, hundreds or thousands of years. Nor will simply reading produce in each person a maximum sense of “where he is” and the presence and form of the waste. Massart suggests we must multiply the means through which a visitor may approach and form a relationship with the repository site. The visitor may leave, each generation is likely to leave, without comprehending and possessing the full sense of what is there, but “at least our thoughts and questions are recorded”.



- When mines are closed they have been transformed into mining museums, offering a new tourism industry while memorialising the activity that meant so much to the region and shaped it.

Do long-term RWM facilities potentially resemble the cultural properties addressed by UNESCO World Heritage Commission? Will they one day be considered of “outstanding universal significance”, representing a “unique achievement”? World Heritage inclusion criteria (“testimony to a time and place – exerting considerable influence – associated with significant ideas, beliefs, events” – etc.) may aid in conceiving and designing RWM facilities. The criteria may help identify specific dimensions of cultural value (artistic, historic, social, and scientific) that a local community, and our society, would like to see associated with a repository project.

A number of local stakeholders have proposed that waste management facilities and sites should be accompanied by science museums, visitors’ or communication centres. Several complementary aims are addressed by these proposals: preservation of knowledge, demonstration of waste management concepts and solutions, public accessibility of information, site memorialisation, reinforcement of regional identity, generation of tourism revenue, and/or creation of recreational amenity.

- The municipality of Oskarshamn has considered a Science Centre or a Time Travel Museum looking at spans of hundreds or thousands of years in both historical and prospective terms.
- The idea of an on-site environmentally-oriented geoscience centre or “Experimenter Facility” was highlighted by Sweden’s KSO.
- STOLA recommended a communications centre in the vicinity of the repository site, to serve as the point of reference for information regarding radioactivity, its applications and consequences. An interactive science exhibit on radioactivity should be part of this centre.
- The Port Hope End Use Advisory Committee has put forward an idea to build an “interpretative centre” or museum. This would pass along history on the nuclear industry and “how we got to be what we are” in the local community: Port Hope was the site of a radium processing industry, then was stigmatised by legacy waste, and finally stepped forward to manage the waste on residents’ own terms.

Creating a museum is similar to other heritage endeavours. Steps include: study, selection, and valorisation of the essential elements that should be transmitted over time beyond those directly involved in building or living with the property. Museums allow others to observe and appreciate the technical and social qualities of the past (and to enjoy while learning). In the RWM realm, local proposals for museums may allow visitors and future generations to understand the technical dimension of the waste management activity. Even when this technical aspect is not memorialised, the culture (knowledge, tastes, aspirations, ethical views or beliefs) of the host community and their active part in building the centre or site recreational amenities can be made apparent to future visitors

### 3.3 PHYSICAL DESIGN FEATURES

The **physical** level of design (Table IV) is a familiar one for architects and engineers. They can seek to integrate the facility into its physical setting, to eliminate any threatening, repulsive character, and increase site and facility *amenity*.

**Table IV.**

**Physical design features that help configure a RWM installation to maximise  
its sustainable assimilation by the community**

<b>Design feature</b>	<b>Characteristics</b>	<b>Value Added</b>	<b>Possible strategies to achieve the desired feature</b>
<b>Integration</b>	The installation respects the “genus locus” (spirit of the place), fits into the landscape and complements it	The installation does not intrude on or disrupt people’s living space and their attachment to the place	Architects study and respect the “genus locus”
<b>Amenity</b>	The site includes features that enhance its attractiveness, convenience and usability	People may actively go toward the site and draw satisfaction from using it	Architects, artists and community consult on desirable landscaping and equipment
<b>Accessibility</b>	A large proportion of the installation surface is open, fences and barriers are reduced to the essential	People get a feeling of security and familiarity rather than a sense of threat	Architects, planners and regulators seek to reconcile protection and openness

### **Integration**

“Integration” means that care is taken to make the facility and site blend into the natural or built landscape. It should not be planned without regard for the harmony of the place.

- Spain’s Vandellós I reactor was closed in 1990 and while awaiting a management facility, contaminated graphite is stored on-site in former reactor buildings that have been restructured and re-styled. The city of Vandellós is a beach resort and the existing building has been made more attractive in the local landscape through various means. In particular, the site is no longer intrusive to the view from an inland position: a special paint job makes the remaining building blend into the natural setting by matching the green of the forest line and the blue of the sea. Integration was improved by reducing the reactor building from 90 meters to 60 meters in height.
- In Sweden, implementer SKB has asked an architect to think about “industrial design with man in mind” for the future final repository for SNF. “What will it look like? A big square industrial structure?” The architect answers that it’s important to get to know the site where the buildings will stand, and the “genus locus” or spirit of the place. New buildings and industrial plants must be in harmony with the unique feeling each place has. “When we’re finished using the site we want to be able to leave it the way we found it. It should be able to resume its original appearance”. Security features may be integrated in the form of natural obstacles and differences of ground level. On the site investigated in Oskarshamn, the architect points out that nature is not pristine, but shaped by man over the centuries. He tries to capture the interplay between man and nature with the proposed placement of buildings,

where “man has already made his mark on the landscape, taken the land in his possession and tilled it for centuries; in this way the final repository can be a continuation of the site’s history, revitalizing it and keeping it to the same course it has been following for millenia”.

“Integration” is a physical design concept, but it also has meaning in socio-economic terms. The RWM facility and site should fit into and synergize other community undertakings.

- Port Hope’s End Use Advisory Committee stipulates that repository planning should consider long-term and integrated planning for, or compatibility with, the entire neighbourhood.
- The Oskarshamn municipality points out the “To to be effective the findings (on added value to be brought by a repository) must also be put in a broader perspective. All municipality activities are part of a larger picture and none can be treated in isolation”. Considering a repository “forces discussion on prioritisation”.

### **Amenity**

“Amenity” is any feature that enhances attractiveness and increases the user’s satisfaction. It will be achieved in all the ways a RWM facility or site can provide appealing resources for everyday use by the community. This can be related to multi-functionality.

- Port Hope’s vision for parallel uses of the low level waste storage area targets pleasant use of the area now and in the future. In the near term, the area can be used for sports. A more far-sighted use as a garden aims to preserve green acreage and its enjoyment for centuries to come.
- SKB’s industrial architect points out that designing a final repository is “like designing a small city, with restaurant, offices, overnight accomodations and everything”.

### **Accessibility**

“Accessibility” means that the site and facility are not barricaded, but are open and welcoming. People can go toward the installation without feeling unreasonable fear. Accessibility appears to be closely linked with feelings of safety. Safety is more than just a technical concept—it also has everyday meaning in the community.

- SKB’s industrial architect says “this is a facility you want to show off, not hide deep in the woods”. The access road must not give the impression that it is taking employees and visitors “to the site of some suspicious enterprise. Rather, the final repository should radiate openness, insight and transparency.”

Meeting radiological safety demands—the primary condition set by the stakeholders consulted for this study—is linked to how accessibility is managed. While technical features will provide the agreed level of protection, physical design elements will help create the feeling of security. A facility that is carefully designed and monitored for public safety is demystified if it offers parallel uses for the community. In particular, if a site that is licensed to operate can be freely visited, walked through, or enjoyed for other uses, it clearly must be safe. It no longer seems to impose restraints on the user, nor shuts people out in an alarming way. It accomplishes its goal of protection without emphasizing danger. This style of safety differs from the traditional implementation found in many contexts. RWM projects today often push safety away from a militaristic concept, towards an implementation that is more socially welcoming.

- The Vandellós waste store can be visited without extensive personal protection, and a confident feeling is produced by the ability to peer into the storage area through portholes.
- In a similar manner, the underground offshore facility of the Swedish Final Repository (SFR) for Radioactive Operational (L/IL) Waste can be visited essentially in street clothing.
- The Port Hope community determined early that the Long Term Low Level Radioactive Waste Management Facility should be completely accessible, thereby communicating assurance that it is completely safe. Since January 2005, the End Use Advisory Committee has developed framing principles for deciding how the facility should be designed. Those directly related to accessibility and safety are: “First and foremost, ensure the safety of the population; Assure them of the site’s safety; Make the site open and accessible; Ensure public oversight through accessibility”.

Although the cultural approach cannot in and of itself provide a demonstrable and technically based assurance, building a facility that is a positive, sustainable and accessible community feature could add an additional layer of defence-in-depth, one beyond those which technologists contemplate today. It would also provide an identity to those in local communities as guardians rather than outsiders.

Accessible installations serving multiple functions can be achieved only with the careful cooperation of the regulator and willingness to adapt or rethink regulations that were created in a different context. It is difficult to predict the future demand for safety as both knowledge and living conditions will evolve. Flexibility (on the functional level of design) may prove its value here as well.

#### 4. VALUE ADDED BY THE PROCESS OF PLANNING AND IMPLEMENTING RWM FACILITIES

This section discusses benefits that may be gained from the very process of planning and implementing RWM projects that target sustainability and quality of life. These benefits – local utility, capacity building, local image refinement – should be understood as added value in and of themselves. The added value is found principally on the cultural level, with economic value present as well.

##### Local Utility

As part of its basic function a RWM facility should serve the local community. “Local utility” means that the RWM facility provides jobs and stability to the community. Services may be provided as well.

- In Belgium, the STOLA local partnership stipulated that a low- and intermediate-level waste repository should be accompanied by a digital network, delivering free internet access to residents.

Local durable employment creates ties and bonds and memory—cultural benefits—as well as prosperity. Many communities point out the need to gain stable, durable employment with a RWM facility, and not just service jobs associated with a temporary influx of workers, or the creation of a small number of expert positions. Moreover, there may be special demands on local utility imparted by the long-term nature of RWM. How can high socio-economic potential and quality of life be favoured by the very presence of the RWM programme in the host community?

- UK implementer NIREX stresses the need for suitable long-term projects that would help support the sustainability of the RWM facility host community<sup>7</sup>. NuLeAF, the Nuclear Legacy Advisory Forum of the UK local government association, drafted a policy statement recommending benefit packages “with an emphasis on contributing to the sustainable development of the affected area and the well-being of local communities and their descendents”<sup>8</sup>.
- The multi-stakeholder research programme Cowam España has investigated the role of financial support to host communities in ensuring sustainable development. Moving beyond the concept of short-term compensation or incentives, future instruments should enable local and regional development, help the community assume responsibility for waste generated in the benefit of society at large, and also serve to create and maintain local knowledge and competence to monitor management over the coming decades and generations.

<sup>7</sup>. NIREX Nirex’s response to CoRWM’s second consultation document – *How should the UK manage radioactive waste?* (Ref. 472433) Didcot: UK Nirex Ltd.

<sup>8</sup>. NuLeAF Steering Group, *Implementing policy on the long-term management of radioactive wastes*, Draft Outline Policy Statement, 6 April 2006.

Local utility lessons may be drawn from other parts of the nuclear fuel cycle or other industries in which there is experience with declining industrial activity and decommissioning.

- In the far north of Canada where uranium is mined, the traditional aboriginal culture is still dominant locally. It is important to organize sustainable modern economic activity in harmony with ongoing traditional activities. A miner gets more community respect and satisfaction from being a skilled and experienced trapper. Cogema has recognised that miners should enjoy working conditions (time schedules, geographic placement) such that they can still devote themselves meaningfully to traditional skills. Local utility here implies provision of resources enabling people to preserve their environment and perpetuate the traditional culture despite modern economic pressures. Furthermore the uranium industry has committed to the long-term goal of offsetting diminishing mineral resources by the creation of other economic opportunities. Specialized academic and technical training allow greater numbers of northern people to move up into the mining management ranks. As their economic and educational level rises, the work force is becoming more flexible and competent. Successful northern-owned as well as joint-owned service industries have taken root.
- An existing European regulation<sup>9</sup> relative to mining in general stipulates that host compensation funds must not all be ear-marked for short-term needs, but must be directed in part to generating economic and cultural resources that will sustain the community over the duration.

In essence, any waste management facility is meant to move off the active register and be decommissioned one day. While the active period of construction and operation may generate palpable economic benefits for the host region, this is less likely during surveillance and decommissioning phases. Sustainability implies addressing the entire life cycle of a facility and site. Where diminishing economic returns are to be expected, the creation of added cultural (and amenity) value is all the more important.

### **Capacity-Building**

If the decision-making process is fair, inclusive and equitable, communities may draw cultural value from the very process of deliberating about hosting a RWM facility or site. This added value may lie in enhanced capacity to address *quality of life* issues, and increased *social capital*.

On first sight it is not easy to measure or quantify the cultural or amenity value that a facility could add to the community. Local democratic institutions however may assemble important information when deliberating on what it would mean to integrate a RWM facility into the community. They may gain a more complete view of community goals and resources. In particular, quality of life is a primary concern of communities when contemplating an industrial facility.

- A pertinent (counter) example is found in Clark County, Nevada (USA). Clark County includes the Las Vegas “Strip” and has expressed opposition to the federal high-level waste repository project. To support their argument that Yucca Mountain could adversely affect the fast-growing Las Vegas community, they have developed detailed economic, fiscal, social, environmental and public health and safety indicators. In so doing, Clark County has enhanced its self-knowledge and understanding of the elements that are important to residents and community identity. Clark County has accrued “cohesive integration of

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<sup>9</sup>. Regulation CE 1407/2002 of the European Council 23 July 2002.

community resources and (...) a system for long-term monitoring of impacts through community indicator tracking and evaluation". This results in improved decision making capability and adaptability that will serve whether or not the repository is authorized one day for construction.

A constructive local multi-stakeholder discussion of how RW is to be managed creates social capital that may remain available to the community. Where there is municipal leadership and motivation to join in this discussion, skills, knowledge, networks and trust are created. These constitute a cultural fund on which the community may draw in other circumstances (not least importantly, in the later phases of RW management).

- The Belgian LLWM partnerships draw upon the accumulated experience of the diverse participants. They have created social capital in the form of inter-stakeholder networks, shared knowledge, and mutual trust. Significantly, the Belgian communities want to realize their investment by using the committee structure to address other unrelated local topics. They have maintained the existing structures to face new steps in the RWM siting process (Dessel was designated in July 2006). STOLA was replaced by STORA, a new association acting as Dessel's "eyes and ears". Mol proposes a permanent participatory body to defend its role as neighbour to the repository, and also to assure the dialogue on high-level RWM when that comes onto the federal agenda.

Europe's Cowam 2 project focussing notably on long-term governance of RWM<sup>10</sup> concludes that alongside socio-economic and legal provisions, community capacity to monitor their facility must be maintained over the generations. "Sustainability funds", intended to improve quality of life over the decades, are being suggested by partnership initiatives in Belgium. In Spain, such funds should be used to enhance community capacity to play a future guardianship role.

- Cowam España suggests that RWM stakeholders including local and regional authorities should focus on devising mechanisms for social learning, economic development and environmental protection over the long term; these would be supported by grant funds. Spain's planned National Interim storage facility could serve in this connection as a tool for research, training and social learning. (Note that experience is already accumulating in Spain in the decommissioning area: in the context of dismantling Vandellós-I, a multi-stakeholder Municipal Monitoring Commission oversaw work progress, safety, waste management, environmental surveillance, and contracted personnel issues<sup>11</sup>.)

Waste management facilities and sites diminish the green acres available to a community and their resource capital must be replenished in another way. The resource most obviously associated with RWM is knowledge. Integrated waste facility projects can generate added value on the intellectual and cultural plane, increasing the ability of future generations to take decisions.

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<sup>10</sup>. Cowam 2: Communities and Waste Management, a European Commission part-sponsored research contract (2004-2006) coordinated by Mutadis (Paris): [www.cowam.org](http://www.cowam.org). Work Package 4, "Long-term Governance", notes that it is very difficult to look beyond some three to five generations when considering sustainability. Yet mechanisms must be set up to increase the potential for society, and the host community in particular, to meet future challenges as they emerge.

<sup>11</sup>. J. Castellnou, J. (2005) "*Dismantling of the Vandellós-I Nuclear Power Plant*". Paper presented at the Workshop held in Spain by the OECD NEA Forum on Stakeholder Confidence, November, 2005. (proceedings in preparation)

- Belgian local partnership STOLA laid out a requirement for knowledge resources. The repository must integrate a nuclear information clearinghouse and a science museum, such that the knowledge associated with nuclear industry and RWM can be made accessible to those who wish to manage and reduce risks. Two “layers” of cultural value are thus provided: knowledge is disseminated (for any use the visiting public may wish to make of it), and, knowledge is kept available for the specific needs of societal risk management.
- Nye County, Nevada (USA), the county situated closest to the federal Yucca Mountain Project (YMP) site, has a cooperative agreement with the US Department of Energy to collect data and perform research vital to the project, for example regarding ground water movements. Nye County has over a dozen recognized expert earth scientists, and subcontracts some tasks to universities. The studies not only serve YMP, but also increase the knowledge base regarding ground water resources for future regional development. Should the repository be built, it is anticipated that the influx of scientists with a high educational demand for their families will produce added value for the entire community through reinforcement of the rural school system.
- Carlsbad, New Mexico (USA), where the WIPP repository is sited, has already begun to draw the cultural benefits of hosting a highly-educated workforce. The local community stakeholders point out that the workers from the national laboratories and contractors are involved in all aspects within the local community. Their involvement enhances and improves the culture within the community.

### **Image refinement**

In the 60's, the siting of nuclear facilities conferred upon host communities a strong positive sign of being part of the future but there was no active local role in the siting process. The welcoming attitude linked to technological enthusiasm eroded in the 1970's and siting became viewed as imposing a burden on an unwilling host. Now, in several countries, the process has been turned around. Whether they volunteer or are approached by implementers, whether they address a waste legacy or envision integrating a new RWM activity, many communities are taking an active role. They increasingly expect a projected facility to fit their concept of safety and amenity, and are willing to work hard to achieve that. In this process, communities are looking not only to protect their *identity* and *image*, but to create a positive community *brand or profile* with the RWM facility as a visible component. If the town or region must be identified in the public mind with a RWM facility, this ought to be a true article of local pride. Such an objective leads to creativity: communities imagine cultural elements that will define the project as an asset in an overall development vision.

- The Municipality of Oskarshamn (Sweden) decided early on to “stretch” the implementer to gain assurance that the repository project proposal is the best from multiple perspectives. Oskarshamn has the ambition to engage in a partnership with the industry and not be seen as a “target for decisions taken elsewhere”. Alongside checking technical aspects, they have formed working groups to reflect on maximizing benefits should the repository be sited. The implementer SKB thus is funding several studies conducted by national experts to develop the basis for siting decisions not only on technical criteria but also on added-value activities.

A repository may not be compatible with a local image. In the Municipality of Storuman in Sweden there was a significant opposition feeling that the image of “Europe’s last wilderness” was not



compatible with representations of a nuclear waste repository<sup>12</sup>. For an industrial community, in contrast, a repository may have the potential to enhance the local image.

- Oskarshamn is taking active part in a social science project looking at ways to integrate a repository with the community identity and image. “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*”.
- Port Hope area municipal councils decided to take an active role when federal efforts failed to find a new host for legacy low-level radioactive wastes. Elected officials approached the federal government with local solutions based on local values and desires. They then entered into a Legal Agreement for the long-term management at three sites. In this way the communities transformed liabilities into assets. Valuable cultural changes occurred through this search for a solution to a long-standing environmental problem. The communities have developed their identity and image as problem-solvers. Once stigmatized as a contaminated community, Port Hope has gone on to develop a new image as a tourist destination and “a great place to live, work and play”.

In many countries, the communities that have gone furthest in considering a RWM facility project are those which already count a nuclear installation within their territory. These may be called communities with “industry awareness”. This should not be seen primarily as a sign of economic dependency, and certainly not as a willingness to sacrifice safety<sup>13</sup>. Instead, it should be recognized that host communities have already integrated the industrial activity and cognitive understanding into their local culture. This has been referred to in the past simply as “familiarity” but in fact it may be called an existing cultural basis for facility development. In these communities solid support to engage is often found among the public. Where others see RWM facilities as threats these communities see the potential of something to be proud of, an advanced facility that solves a national environmental problem relating to an energy source that is also familiar to the community. Developing joint solutions consists of building on and adding to that existing cultural basis.

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<sup>12</sup>. Tourist Entrepreneur Stig Stand, Storuman 1994, quoted in the Oskarshamn questionnaire response to this study.

<sup>13</sup>. J. Hetherington, “Community Involvement: Stakeholder Learning in the UK and Canada” in *Public Confidence in the Management of Radioactive Waste: The Canadian Context*. Workshop Proceedings, Ottawa, Canada, 14-18 October 2002. Paris: OECD

## 5. CONCLUSIONS

Any long-term radioactive waste management project is likely to last decades to centuries. It requires a physical site and will impact in a great variety of ways on the surrounding community over that whole period. Short-term fixes to facilitate a project and installation are not good enough. Of the essence are the societal durability of an agreed solution and its sustainability over the long term.

The greatest challenge, both technical and societal, may be to create a local, operating facility that can fulfil its mission over the generations. Alongside scientific knowledge and technical competency, and resources for implementing an agreed approach, there must be a continued willingness to live with and maintain the facility. Moreover, RWM projects must support the sustainable development of the host community and its long-term capacity to go on hosting the facility. In these goals, how may a facility and its site be better integrated with the community? How may the facility and site be made attractive for the long term? Ultimately, how may they improve a community's prospects for quality of life across the generations?

Communities do not gain added value and sustainability purely through financial compensation and development opportunities. Whilst those economic means are important, RWM projects also offer opportunities to improve well-being, consolidate knowledge, fulfil value ideals, elaborate community identity and image, and live out desired social relationships. Planning for and operating a facility should seize these opportunities.

Today individual communities and RWM partnerships (grouping community and technical stakeholders) are reflecting on how to build a long-term sustainable relationship with a facility sited in their territory. Different countries and regions are likely to have different socio-political realities and therefore best practices for one region may not be best for another. Still, it should be possible to extend and structure this reflection through exchanging ideas on the international level.

A number of basic elements for designing a facility that would favour building a sustainable relationship between a facility and a local community have been identified based on the analysis of numerous stakeholders' input and FSC experience. The design elements include functional, cultural, and physical features. Amongst the functional features multi-functionality or polyvalence may be singled out, meaning that the facility is built to serve multiple uses. Other important features include adaptability and flexibility. Amongst the cultural features distinctiveness may be mentioned, indicating that the facility RWM facility or site is attractive and like no other, and may become an icon, a feature lending a positive reputation and drawing visitors. Other cultural features include aesthetic quality and "associability", whereby features of the installation can be tied in with existing knowledge and understanding. "Memorialising" means that both physical and cultural measures are taken to mark the site and tell its story, so that people will grasp and remember what is there. Physical features include integration, amenity, and accessibility, which can help the facility and site correspond to the local definition of a safe, unthreatening environment.

Finally the report examined the added value that may reside in the very decision-making and implementation process. Implanting any RWM facility should benefit the community in terms of prosperity, but moreover the increased stability and cohesiveness gained in the best of cases represent

cultural added value. Other cultural benefits that may be accrued are an enhanced educational level in the host community related to the influx of highly skilled workers. Not least important, when host communities demand training and participate in monitoring site development and operations, they are building their capacity to act as guardians and therefore ensure another layer of defence-in-depth.

The very process of working out the desired features of a RWM facility and site also can bring added value to the community. This has been the conclusion of local stakeholders who take an active role in site investigations, or who participate with implementers in formal partnerships. Social capital – networks, norms and trust – is built up, equipping the community to face other decisions and issues. Local stakeholders may also focus their work on community identity, image and profile. Even when not favourable to hosting a RWM facility, communities can use the opportunity to develop quality-of-life indicators and reflect on the direction they want to take in coming years.

Examples from the RWM field and other industries indicate that the path towards building facilities that favour a sustainable relationship with the community is practicable. Still, sustainability and value-added themes are clearly a new topic in stakeholder discussions. It is hoped that this study report, with input from a wide range of contexts, may be beneficial to both communities and national RWM programmes.

## ANNEX 1: STAKEHOLDER ACKNOWLEDGEMENTS

This study benefited from direct input by 32 different stakeholder sources representing 20 localities or RWM programmes. Some stakeholders filled out a questionnaire or gave written comments, whilst others granted a telephone interview (from end 2005 to mid 2006). We invited all FSC participants to provide input, and we sought out the opinion of some stakeholders from outside the FSC. Our aim was to obtain a variety of views, not a fully representative sample. Alongside this input, we relied on the FSC stakeholder workshops and topical sessions held through June 2006 and also conducted desk and internet research.

We are grateful for the participation and input by many stakeholders and experts:

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Liz Stewart and Mark Stevenson (Port Hope, Canada)  
David Swanson (Nye County, Nevada)

Thanks are due to those who granted an interview, or who took the time to write detailed, thoughtful responses to the study questionnaire. A finding is that sustainability and value-added themes are a new topic in stakeholder discussions. Not all dialogues today include these themes, sometimes because stakeholders perceive that other outstanding concerns (safety foremost among these) must be taken care of first. Where added cultural and amenity value are discussed, it is often in close relation with more familiar local development items. Front runners, however, show that structured field studies can identify potential added value as well as economic opportunities. Tangible and intangible effects on community “identity, image and profile”, too, can be assessed. Working groups can provide meaningful proposals to be submitted to implementers, regulators, and municipal authorities, and many stakeholders expressed satisfaction with this process.

Special thanks are offered to the local stakeholder representatives and experts who participated in June 2006 in a topical session entitled “ *Forming a Sustainable Relationship to a Waste Facility*”: Roland Palmqvist (Mayor of Kävlinge and President of GMF; Peter Wretlund (Mayor of Oskarshamn); Ursula Rüetter-Fishbacher (Social Researcher) , Prof. Erik van Hove (Un. of Antwerp, retired) and to the specialists who granted interviews: Pascal Gontier (Ecological architect, Paris), Cécile Massart

(Art Professor and Artist, Brussels, Belgium), as well as to FSC members: Yves Le Bars (Cemagref, France), Steve Chandler (UK Environment Agency), Elizabeth Gray (Scottish Executive) Elizabeth Atherton (Nirex, UK), Hideki Sakuma (Nagra, Switzerland), Auguste Zurkinden (HSK, Switzerland), Michael Aebersold (BFE, Switzerland).

Various observations inspired the FSC to think about how to build a sustainable long-term relationship between a RWM facility and the community:

- Professor M. O'Connor pointed out the importance of the relationship between the community and "the waste" itself<sup>14</sup>.
- Professor E. van Hove emphasized that the facility should not be seen solely as a waste-management instrument; an attractive, multi-functional facility has more chances to become a positive part of community life, contributing to enjoyment and local pride<sup>15</sup>.
- Artist C. Massart showed how a waste facility can become an art object and how it is important to preserve the memory of disposal, not just for safety reasons, but also because radioactive waste has unique societal significance<sup>16</sup>.
- The Sellafield enquiry of 1997 mentioned as one community objection to RWM surface buildings that they would impact negatively upon the amenity of the host region.

This study was discussed at FSC meetings in 2005 and 2006. The report was written by Claire Mays (Symlog) and Claudio Pescatore (NEA) with valuable guidance by Prof. Erik van Hove.

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<sup>14</sup>. O'Connor, M. (2003) "*Building relationships with the wastes*", in NEA (2003b) (see Annex 3 for references).

<sup>15</sup>. Van Hove, E. (2004) "*Valorisation of a repository in an added-value project*". In NEA (2004a).

<sup>16</sup>. Massart, C. (2004) "*How Plural Interests, Values and Knowledge Could be Translated into a Concrete Radwaste Disposal Project Design: An Artist's Vision*", in NEA (2004a).

## ANNEX 2: GLOSSARY OF TERMS AND FSC REFERENCES

In this glossary some basic terms encountered during the study (italicized in the main body of the report) are defined and discussed. At the end of the annex are listed the FSC publications from which some citations have been drawn.

**Added value** - The increase in worth of a product or service provided by features and benefits over and above those representing the “core product”.

**Amenity** - Feature of real property that although not essential to use, enhances its attractiveness and increases the user’s satisfaction. It is a positive enhancement to living environment conditions, providing convenience, comfort, satisfaction or appeal.

Natural amenities include a pleasant or desirable location, scenic surrounding area, etc. Human-made amenities include recreational and other facilities for collective use.

**Bribery** - An offer of money, goods or services in order to persuade a second party to perform an action in the interests of the party offering the bribe, or to sway the second party’s opinion or decision.

Persons objecting strongly to the presence of radioactive waste may view compensations or other socio-economic benefits as “the wages of risk”, or bribery to persuade a community to accept a management facility which they view as inherently unsafe.

**Community identity** –Internal view that members have of their community

**Community image** – View the outside world has of the community

**Community profile or brand** - Strong points and values that the community wants to be known for

Communities look to gain a positive identity and meaningful installations. Working out desired cultural value can be part of a process of clarifying community identity. Cultural value can be used to enhance community profile or brand and to shape the image of the community.

Identity, image and “branding” are becoming more important with the circulation of people and goods in the global economy. Countries, regions and communities are all concerned with their image. A successful image must be rooted in a corresponding identity – it is virtually impossible to create a positive public image if that is not the deep identity experienced by the community. Constructing identity and image is a long-term effort and commitment.

**Compensation** - Repayment for any necessary expenditures or losses associated with the siting and operating of a facility.

Compensation and incentives may be financial or non-financial and can be provided at one time only or on a continuous basis during the siting, construction, or operation of the facility (OECD/NEA, 2004b).

There is consensus today that potential host communities should actively define the right site “package” including not only financial but also other accompanying measures<sup>17</sup>.

In some contexts, land-use compensation schemes have been decided by national actors and detailed formulae for calculating sums due are used or even cast in law. In Spain, unusually, communities hosting nuclear power plants are compensated primarily in relation to the volume of (spent) nuclear fuel currently stored on local territory.

In questionnaire responses regarding dialogue among technical and societal partners, some stakeholders stated that compensation “is not discussed”: “the word has never been used”; “points concerning compensation have not yet been raised”. This suggests that local development, sustainability and quality of life issues are recognized to be prospective, not one-to-one compensation issues.

**Culture** - “The set of distinctive spiritual, material, intellectual and emotional features of society or a social group, encompassing, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs”<sup>18</sup>.

**Incentive** - A benefit to motivate local communities to accept a facility.

**Integrative local partnerships** – Committee structures in which technical and community stakeholders come together to work out an integrated RWM project (setting physical and safety characteristics, socio-economic and cultural/amenity requirements).

The recommendations to Government by UK CoRWM includes a chapter on implementing a RWM strategy. This committee gives high marks to the integrative local partnership approach. “One of the advantages of the partnership approach is that it achieves an environment in which host communities can engage with an implementing body without feeling victimised by a national process over which they ultimately have little control<sup>8</sup>. CoRWM therefore believes that a partnership approach should be developed in order to achieve community involvement. Partnerships should be based on an open and equal relationship between the potential host community and the implementing body. (...) International research shows that it is important that the host community has a sense of ownership of the facility that will be built and is therefore involved as early as practicable in the generic technical aspects of the design. (...) CoRWM therefore concludes that representatives of the potential host communities should be involved in determining both the broad technical aspects of the proposed facility as well as the socio-economic aspects aimed at ensuring the well being of the community”<sup>19</sup>.

Stakeholders in several countries are turning to integrated projects, focusing on both technical and societal aspects of facilities. Technical partners and local partners alike treat these as interdependent and inseparable elements. Local stakeholders review or help build up the proponent’s technical concept, satisfying themselves as to the level of protection that fits their demand; in parallel they work out expectations and requirements for RWM to function in the local context. The stakeholders envision living with the facility during its active period and beyond,

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<sup>17</sup>. See Kotra, J. (2003) “*How to Address Social Concerns? Round Table Discussions during Session II of the FSC Workshop in Canada*”, in NEA (2003).

<sup>18</sup>. UNESCO Universal Declaration on Cultural Diversity, 2001, 2004. Online at <http://unesdoc.unesco.org> (consulted 19 September 2006).

<sup>19</sup>. CoRWM (2006) *Managing our radioactive waste safely*. CoRWM’s recommendations to Government. London: Committee on Radioactive Waste Management, July 31, pp. 136, 137.

considering simultaneous or end uses of the site. They mark out the development opportunities provided by hosting a facility. Beyond jobs, heightened economic activity, and “spin off” infrastructure development, local communities envision added cultural and amenity value, in the perspective of ensuring satisfactory quality of life for the present and future generations and ultimately a durable and sustainable relationship with the relevant facility.

NIRAS/ONDRAF, participating as implementer in the Belgian local partnerships, explains:

“The discussion bears on a mixture of technical criteria, traditional socio-economic aspects and added value. The essence is to develop an integrated disposal project, so the local community decides what it considers to be the necessary conditions (technical, environmental, aesthetic) for a disposal and they develop an accompanying local project that seeks to bring added value to the community. The outcome differs from community to community. The partnerships become the carriers of the site investigations and repository design and deal with all related issues such as safety, social, economic and ecological impact, urban planning.”

Even where such integrative partnerships do not exist, cultural benefits accrue to the community taking an active part in defining desirable design features. A most positive outcome can be “consensus or agreement between parties with regard to the need to obtain support [for a concept or demand] from the national level, and to apply democratic rules in decision making”, or the demonstration that “local participation works, giving added value to a democratic decision making process, making it possible to reach consensus among members with quite different approaches to nuclear energy and RWM. Maybe this contributed to the upgrading of the level of public acceptance of the site [proposal]”.

One challenge of working closely in a formal or informal technical and societal partnership, as pointed out by a stakeholder contributor, is “initially to find a functional working format and to understand each others’ language”.

Another challenge, according to a questionnaire response, is “maintaining the interaction between the partnership members and the local community (local organisations and the public in general)”.

Partnerships call on the national or federal level to respect their work and take it into account in their decisions. The loose articulation between the partnership and this higher level of authority may be a source of “frustration” or weakness.

**Local community** - Generic term to designate the collectivity of personal actors that become involved in RWM facility siting deliberations.

“Local community” is understood in this report as a social group of any size whose members reside in a specific locality, share government, and often have a common cultural and historical heritage. Community is not tied firmly to a geographic area. AkEnd has proposed that the area that volunteers to host a RWM facility should be self-defining and calls it a “social, cultural and economic unit” with no clearly marked geographic borders<sup>20</sup>. Frequently today, extended local

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<sup>20</sup>. AkEnd (2002) *Selection procedures for repository sites*, AkEnd. Available from Bundesamt für Strahlenschutz, Salzgitter, Germany (e-mail: info@bfs.de).



units, groupings of townships, or regions are brought to consider the place of a RWM facility or site in their territorial identity<sup>21</sup>.

Administrative character, location, mode of government, history and shared economic and cultural practices are complemented by further dimensions of “community”. Each member’s sense of belonging may be linked to a perception of the “spirit of the place”, and by identifying with the group established there. Local community should be understood too as the extension of each member’s personal sphere. The community is a network of personal relations. It is one space in which our lives take place, alongside other specialized spheres (for instance, the sphere of our employment, or the spheres delivering to us services and goods). By considering “local community” in a holistic manner, we may gain a better understanding of what is needed for a RWM facility to fit in, be welcomed, and be maintained there in a sustainable manner.

**Quality of life** – A state of physical, psychological, and social well-being.<sup>22</sup>

Physical well-being relies on working conditions, recreational opportunities and health care access. Psychological well-being depends on harmony between one’s cultural identity and one’s actual living conditions. Social well-being depends on the ability to share in cultural practices with one’s peers. In the formal RWM decision process, quality of life may be addressed through social impact assessment (SIA), which more and more is applied in parallel with the required environmental impact assessment (EIA). Quality of life is addressed too when communities develop a vision of the cultural and amenity value they expect to draw from a RWM facility or site.

**Safety** - The condition of being protected against failure, damage, error, accidents, or harm.

Safety is a physical criterion addressed by the exact sciences. As well, safety is a social construct.

Communities and societal groups may have their own requirements defining what is acceptably safe. These requirements may go beyond the level of protection set by national or international norms. Regarding a RWM facility, community requirements may imply technical features or mechanisms that might not be called strictly necessary from an engineering or optimisation point of view. Conversely, a community may attach special cultural importance to design features that could challenge the desired level of safety. In each case, the regulator will provide expertise and feedback enabling the partners to reconcile all the requirements.

Regulators have begun to recognize that the community is a vital partner in monitoring and assuring safety over the long term, with precise knowledge of the site at all phases before, during and after facility development, and the high motivation to preserve local health and way of life. It is in everyone’s interest to adapt the RWM facility to the community and thereby improve its chances of being taken care of by the succeeding local generations as well as by technical people.

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<sup>21</sup>. D. Ipsen told the FSC: “Regionality becomes more important as an arena of socio-economic development. (...E)conomic and cultural globalisation (reinforces) regionality as a basis for success in the competition for resources and geographical status. (...) To involve people in the design of the future mainly means to give people and active role in local and regional development. In the context of (RWM), this means that the handling of nuclear waste will have to be better integrated in the general regional processes” (p. 69). (“Civil landscapes and changing modes of participation”, in NEA 2000.)

<sup>22</sup>. M. Simard (2002) “Urban Quality of Life and Industrial Project Management: The Case of Alan Aluminium Smelter in Alma, Quebec, Canada” in *Public Confidence in the Management of Radioactive Waste: The Canadian Context*. Workshop Proceedings, Ottawa, Canada, 14-18 October 2002. Paris: OECD

Safety is a rolling concept. In the past, terrorist attacks were formally excluded from safety analyses because their likelihood was considered unquantifiable; today, they are a major item of societal concern. It is difficult to predict the future demand for safety as both knowledge and living conditions will evolve.

**Social capital** - Features of social life - networks, norms, and trust - that enable participants to act together more effectively to pursue shared objectives.<sup>23</sup>

**Spin-off** – An economic venture underwritten or made possible in the context of a larger undertaking.

Many projects today are accompanied by appreciable spin-off projects funded by RWM implementers or other institutions. These might be described as “icing on the cake” – good things that come along with the facility but which are not an essential part of it. Instead, the report focuses explicitly on “the cake”: how the conception and design of RWM facilities and their sites themselves may generate value for a community or for society as a whole. This is a new perspective on the “good neighbour” concept: traditionally project proponents make themselves agreeable by supporting demands coming from the community; here, the facility itself would be designed to facilitate the networks and activities that are important to community members, and contribute to them positively.

**Stakeholder** - Any actor—institution, group or individual—with an interest or with a role to play in the process<sup>24</sup>.

**UNECE Aarhus Convention** United Nations Economic Commission for Europe Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, adopted 24th June 1998 in Aarhus, Denmark.

An elaboration of principle 10 of the Rio Declaration, the convention “links environmental rights and human rights. It acknowledges that we owe an obligation to future generations. It establishes that sustainable development can be achieved only through the involvement of all stakeholders. It links government accountability and environmental protection. It focuses on interactions between the public and public authorities in a democratic context”<sup>25</sup>.

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<sup>23</sup> R. Putnam (1995) “*Bowling Alone: America’s Declining Social Capital*”, *Journal of Democracy*, vol. 6, no 1, p. 65-78.

<sup>24</sup> See Deliberations of Working Group 3 on “*Stakeholders and the Public: Who are they?*” in *Stakeholder Confidence and Radioactive Waste Disposal*. Paris: OECD. (2000)

<sup>25</sup> [www.unece.org/env/pp/welcome.html](http://www.unece.org/env/pp/welcome.html), consulted 7/27/2006.

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