CARL THEMATIC REPORT

Fission or Fusion?

Reconciling Technical and Social Aspects of Radioactive Waste Management

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Contents

1 Introduction: the social aspects of radioactive waste management

For many decades radioactive waste management has been a controversial issue for nuclear nations. As such it has been mentioned the Achilles' heel of nuclear power (Blowers *et al.* 1991). The waste problem was however not part of the first era of civil nuclear technology development. On the contrary, it was assessed a minor problem compared to the much more complicated problem of domesticating nuclear fission for safe operation in nuclear power plants. In the 1950s and early 1960s it was not called waste just fission by-products and considered a resource (Sundqvist 2002). However, the waste as a problem, in all of its aspects, became manifest when plans for building repositories for final disposal was set up. In many countries this happened during the 1980s, when plans met strong local resistance and the concept of NIMBY (not in my backyard) was coined to give name to negative local responses. But not only local inhabitants raised voice to the plans, also some scientists and national environmental groups were critical, most of all to the attitudes hold by nuclear agencies responsible for taking care of the waste, downplaying involved risks and defining the issue as of a solely technical kind.

Today, more than fifty years after the first commercial reactor at Calder Hall in Cumbria, United Kingdom, started to produce electricity on the national grid in 1956, the waste problem is still not solved in any nuclear nation in the world. After the strong conflicts in the 1980s, leading to crisis for waste management, a unanimously held opinion grew strong, saying that the crises were caused by responsible agencies' neglect of the 'social aspects' of the waste problem. Enough attention was not paid to communicate the risks in a proper and understandable way to engaged citizens and responsible politicians on national as well as on local level, and the reasons behind the NIMBY-effect was not well understood: the problem is not that people fear what they know nothing about but that they have good reasons for being negative to live in the vicinity of a waste repository (Lidskog & Elander 1992).

During the 1990s and 2000s the waste programmes in many nuclear nations have been restarted from a more communicative basis, involving also social aspects. However, the progress has not been impressive. In the EU Commission Green Paper on secure energy supply, published in 2002, it is stated that the nuclear industry in the EU has still not found trustworthy solutions to its waste problems and that the future of the nuclear industry 'depends on finding a clear and unequivocal answer to the question of the processing and transportation of radioactive waste' (EC 2002: 7).

In this paper it will be analysed how the social aspects of radioactive waste management, after the new start trying to overcome the technocratic failure, have been incorporated in the national waste programmes in the four countries of Belgium, Slovenia, Sweden, and United Kingdom. Despite important historical differences in nuclear technology development as well as societal development, the four countries and their waste programmes all started from a technocratic viewpoint, focusing on technical solutions only. This framing met a growing opposition and after some time of reorientation the programmes have been restarted from a basis where also social aspects are included.

In the following questions are asked what the social aspects are about. How are social aspects understood, and what role should they have in relation to technical aspects? In short: what socio-technical combinations are strived for and achieved in the four countries?

Internationally, all four nations are today recognised for giving attention to the social aspects. Sweden is often considered a forerunner in managing spent nuclear fuel, while Belgium's programme in low- and intermediate level waste management is assessed a role model. After a severe crisis, lasting for almost a decade, the government committee set up in the United Kingdom in 2003 starting from 'a blank sheet of paper' is seen as an important effort to include the social aspects of radioactive waste management, while the process in Slovenia is often mentioned as one of few examples of responsible waste management in Eastern Europe (e.g. NDA 2007).

Before turning to the four countries, a theoretical framework on how to analyse the programmes and activities is presented. This is done in a two-step process. In the next section it is showed that the interdependence between different spheres, for instance between the social and the technical, is something that is generally paid attention to by today's social scientists. However, it is also argued that this is contrary to the more public discussion in society and the dominant view on how to understand technical projects. Some concepts to distinguish between different types of socio-technical combinations are also presented. In the third section of the paper two main types of possible combinations on how to integrate technical and social aspects are described: *separation* and *integration*. The fourth section is the empirical part of the paper. Here the four nations are described starting from the technocratic crisis they all were part of, but the focus is on the socio-technical combinations that could be found in their restarted programmes. In the fifth and concluded section the activities in the four countries are summarised in relation to the analytical framework. The two types and the country specific examples are discussed with the ambition to characterise, as well as comparing, the ongoing processes in the four countries from the types and given examples. It is argued that, contrary to explicit ambitions, there is still a strong tendency to separate technical and social aspects and closing down instead to open up the discussion on what the social aspects are and what their contribution could be. The paper ends by a short section summarising lessons to be learned.

2 The interdependence of social and technical aspects

Today social scientists describe a situation of a transformation of society where earlier differentiated and separated spheres of human activities, with an independent logic, become harder to maintain and demarcate (Gibbons et al. 1994, Hajer 2003, Pierre & Peters 2000, Rhodes 1997; cf. EC 2001). Instead of autonomous spheres of economy, politics and science there are networks of partnership, it is argued. Even scientific work, the most important icon of a pure and autonomous sphere of human activity, is understood as taking place in intimate networking between politics and markets, where the spheres are intertwined and driven by the same forces. New concepts like Mode 2 and Triple Helix are utilised for describing this interplay (Etzkowitz & Leydesdorff 1997, Nowotny et al. 2001). Scientific and technological work should be understood as a process of *co-production*, where different spheres are intertwined and driven by the same forces (Jasanoff 2004, Jasanoff & Wynne 1998).

In this situation it is important for social scientists to study how the reorganisation of the spheres of today's society takes place, where a technical project is no longer a pure technical project. Questions of what are the technical aspects and who is part of the technical expertise have to be answered in relation to a broader network of actors.

The French scholar Bruno Latour has strongly questioned what he calls the Great Divide between the natural world and the social world. According to Latour this divide, constituting what is called modernity, is based on two different practices that have to be kept apart. One is called *translation* and means to construct *hybrids* of nature and culture, associated in networks. With Latour's own example this means to mix together the hole in the ozone layer, atmosphere chemistry, industrial use of chlorofluorocarbons (CFC), refrigerators, politicians and international treaties, in one and the same network (Latour 1993: 1). The other is about *purification* where the two distinct ontological spheres of non-human nature and human culture are constructed and separated into the Great Divide. Such process of purification gives the picture that the hole in the ozone layer is not influenced by international treaties on prohibiting one specific kind of chlorine combination (CFC) (Latour 1993: 10-11). The two practices are contradictory, in that they together and simultaneously combine as well as separate nature and culture. This contradiction is the fundamental base of modernity. However, part of modernity's self-image is to rhetorically and officially put forward the latter while downplaying the former. In statements, culture is separated from nature, and science and technology from society, but in practice they are mixed together.

Latours's concluding argument is that today more hybrids than ever are made, due to the technological transformation of nature, and therefore it will be harder to publicly defend a purified world of separated spheres. Latour's solution is that we stop to be modern, which means to not disguise the hybrids that always have existed. From this critique of modernity it is easy to understand Latour's critical attitude against social scientists that focus on 'the social' as well as scientists and engineers' purified focus on 'nature' and 'the technical'. According to Latour, what should be done is to study how nature-culture hybrids are produced and maintained.

Latour's concepts as well as his vision give us a forceful background from where the current situation in radioactive waste management could be understood. There is a unanimously held opinion that this management for a long time has been in crisis in many nuclear nations due to the use of a too narrow technical approach. This means that the purification process, presenting a technical project separated from society, has gone too far. The nuclear agencies have alone made the hybrids between the social and the technical but this has never been discussed in a wider group of participants. What are now argued for are more hybrids and a bridge over the Great Divide, between the technical aspects and the social aspects of the project of taking care of the waste products, and that this should be carried out in a transparent way including all engaged actors. To make this possible citizens, politicians and NGOs are invited to participate in the work. But how is this carried out in the four countries of Belgium, Slovenia, Sweden and United Kingdom?

The aim of this paper is to analyse how the great divide between technical and social aspects is tried to be bridged by the means of a broader participation in activities related to radioactive waste management, i.e. what is called *stakeholder involvement* (CARL 2004). Most of all it is analysed what this involvement is about. What kind of phenomena and activities are subject of involvement? And how are these phenomena and activities understood? In short: are participation and involvement about hybrids or about separated objects?

But first we need to elaborate a bit further on the theoretical framework. First, a distinction between *upstream* and *downstream involvement* is made. From this it could be asked in what *phase* of technological development involvement is taking place. Secondly, the distinction

between *the content* and *the context* of a technological project is discussed. On what *issues* do involvement take place and are these issues assessed as part of the content or the context?

Invitation to involvement in technological development is often based on the aim of restoring public credibility for experts who have problems to get support for their knowledge-based recommendations and their technological products. In the field of human health and the environment, where risks are at the forefront, these restoring events seem to be common. From mass media we are well aware of the examples of nuclear power, GMO, stem cell research, radiation (EMF) from mobile phones and their base stations, climate change, and numerous of medical treatments. In these examples we meet experts that are questioned by other experts and/or by concerned lay people, as well as confused regulatory state bodies that make initiatives trying to restore the declining trust for involved experts. The focus on restoration means that the technical content are not opened up for broader involvement, what is expected from the general public and concerned lay people is help to implement the project, i.e. invitation to downstream work creating a more supportive context for a project where the technical content is strongly protected by technical experts.

From this background it could be concluded that the dominant focus on risk issues in practical work is i) on *separation*, where technical and social aspects are kept apart, ii) on *downstream involvement*, meaning broader invitation to help not with innovation but implementation, and iii) on the *distinction between content and context*, where public involvement is related to the issues part of the context.

This picture, however, is questioned by social scientists who argue that social aspects are always present during the innovation process and that there are no good reasons why these aspects should not be more broadly discussed during the development phase (Macnaghten, Kearnes & Wynne 2005: 2). If social aspects are always there, and there are no pure technological development, public participation should be part of the innovation process, at an upstream stage. If not, technical experts themselves, consciously or unconsciously, will make assumptions on the social consequences. Inviting broader participation at an early stage means that expected social consequences could be discussed at an earlier stage that could help avoid later controversies between technical experts and the public. The distinction between upstream and downstream involvement will help us to focus on the question when broader participation is taking place and when it is considered proper to take place.

In relation to nuclear waste activities upstream involvement is about taking part in ongoing innovation work. Some could say that this work is already finalised, that there today exists ready-made technology in the field. However, this is not the whole, neither the true, picture. A lot of research and development work is still going on and alternative technologies discussed. In connection to plans for geological disposal a lot of bedrock investigations and safety analysis are carried out, as well as technological development of canisters, seals and plugs. But upstream involvement could also mean to follow the threads backwards from where the technical project stands today. Finding a proper site for radioactive waste could be connected to the issue of proper methods of dispose of the waste, waste activities could be related to nuclear power, which could be followed to nuclear weapons and to energy production in general, and engaged citizens could ask for involvement also in activities on these ‘higher levels’. In following sections it will be analysed if, how and what kind of upstream involvement is taking place in the four countries.

Social scientists have also argued against the view that social aspects are of second priority, as a context for the content of a technical project. In connection to this the British sociologist Brian Wynne argues that *context* should be viewed as part of the *content*, which means to dissolve the distinction. In addition he wants to upgrade lay people knowledge to the same level as expert knowledge. Lay people (practicians) possess knowledge on the specific (local conditions etc.) that can add to the more abstract and general expert knowledge. Moreover, lay people are experts on evaluating the trustworthiness of expert knowledge. According to Wynne, this kind of knowledge, which tries to understand expert knowledge 'in the sense of its institutional dimensions', could always enrich, and also be an important contrast to, more specialised technical knowledge (Wynne 1993: 328). Two different framings could be distinguished: experts focusing on technical details and lay people most of all interesting in overall questions concerning meaning, purpose and trustworthiness. Examples of questions important for lay people are: Why should this be done? What is the purpose? What risks are acceptable? Who is responsible? What is not known? Such questions are not of secondary priority and are not beside of the scientific knowledge production and technological work. On the contrary, they are of fundamental importance and if taken seriously they imply that 'context becomes content' (Wynne 2003: 410). Wynne's argumentation encourage us to focus on how social aspects are assessed, as of second priority as a context or as of fundamental importance for the whole technical project as part of the content. In the following it will be analysed how the priority of the social aspects is assessed.

Is stakeholder involvement in radioactive waste management in the four countries of Belgium, Slovenia, Sweden and the United Kingdom about restoration (separation, downstream, and context) or is it also inviting stakeholders to engage in making hybrids in upstream activities, making the context an important part of the technological content?

It should be clearly stated that the classification of different types of combinations of social and technical aspects in radioactive waste management is based on a normative assumption that is critical to separation and argues for a more strong and integrative interplay, where social aspects are considered of first priority together with technical issues and where upstream engagement is valued. This assumption is based on results from social science research that has showed that separation is an illusion and a falsity that does not hold for scrutinised studies on how so-called technological projects are developed in society (Latour 1987, Collins & Evans 2002).

3 Two types of socio-technical combination: separation and integration

To make it possible to distinguish between different types of socio-technical combinations two main types are discerned.[1] The first shows a clear separation between social and technical aspects, i.e. processes of purification. It also shows downstream involvement where ready-made technologies are to be implemented. Conflicts and negative attitudes around the waste projects are understood as part of a context and not part of the technical project as such. Involvement is motivated from an instrumental angel, i.e. to increase legitimacy and create trust (Pidgeon & Rogers-Hayden 2007). This kind of interplay between technical and social aspects is called *separation.*

[1] The following section is influenced by Hagendijk & Kallerud 2003 and Hagendijk & Irwin 2006.

This *separated* type means that two different and separated practices are recognised and also that they have to be kept apart; the existence of two distinct ontological zones – the technical and the social – which are not influencing each other in their basic constitutions. However, in practice we find that these two separated zones, as well as the two 'separated groups' that carry out the practical work that maintain the zones as separated and specific, could be related to each other in different ways. Therefore, this type has several subtypes, describing how the two spheres are related to each other, but always kept apart. In the following four subtypes are described.

The subtype that could be seen as a basic point of reference spells out a *harmonious division of labour*, where both parties see the importance of the other and a mutual trust is recognised. But an important question remains to be answered: how are they combined in for instance a final decision on how to dispose of radioactive waste, in which the two zones have to be combined in one way or another?

Another subtype is the *agonistic*, in which we find opposed positions between those who defend the technical aspects and those who advocate the social aspects. The two parties, or at least one of them, do not accept the other's framing of the issue, and therefore want to influence the other party. This type has been quite common in many nuclear nations when a technocratic-framed waste programme tries to reorganise itself in a society where scepticism towards nuclear power has started to grow. This happened in all our four countries but at different times starting in the early 1970s. When nuclear power and nuclear waste management lost its innocence and became publicly and politically discussed and controversies arise, what could be called the failure of technocracy, strive for reconciliation grew strong. Technocrats that earlier had been delegated to take care of the issue now had to understand that communication with outside groups is a necessity in order to reach an agreement on waste management issues. The result of this often became the recognition of the social aspects as of crucial importance but with an agonistic communication between two groups that understood 'the social' in completely different ways. Neither this type answers the question on how the two spheres should be combined in a decision. This is however, made by the two subtypes presented below.

The third subtype is the *corporatist*, where real differences of stable interests are recognised and managed through negotiations. This means that this type is a combination of the two subtypes above. The different interests are of a potential agnostic kind, but negotiation (horse-trading) is used as a mechanism for managing the differences and possibly making them live together in a kind of 'harmonious' division of labour. The term 'corporatist' indicates that the state invites other groups, with other interests, to be part of a negotiating process. In this paper, however, this subtype is considered in a broader perspective. Often one party take initiatives on negotiations, usually the part that are responsible according to legislation or are the strongest in other respects. If this is the state, a private nuclear company or a municipality, should not be decided in advance. Important questions to ask are: Who invites to negotiations? What groups and organisations are invited to take part in negotiations?

The fourth subtype, the *educational*, is similar to the agonistic and corporatist subtypes, in that it reflects an imbalance, a tension or a disturbance, in the division of labour between the technical and the social. Similar to the corporatist, it suggests a mechanism for reconciliation, but in contrast to this it tries to change the interest of the other party, using educational means. In practice it could be hard to distinguish education from persuasion and manipulation. The using of educational means often is a mix of honest attempts to educate and ambitions to

restore trust in order to achieve support for the own project. However, if the technical party by educational means wants to delete the interest of other groups defending social aspects, communication is reduced to lubrication oil, where already defined and decided projects have to be accepted by the wider society. From this perspective people would accept a repository if they only possessed adequate knowledge. This example shows a strong separation between those 'who have' and those who 'have not'.

The second kind of interplay is showing examples of bridging between technical and social aspects. This kind of combination is called *integration*. Also this could be made in different ways. The first is the one that Latour describes as common in modernity: making hybrids in practice, while officially talking about separations. The second is Latour's vision of being brave enough to talk about translation and separation simultaneously and in an explicit way.

The integration type means that social and technical aspects are co-produced, i.e. that technical and social aspects are shaping each other through an interdependent process of evolution. Such co-production means that social aspects influences technical projects, while a technical project simultaneously supports and justifies the corresponding social project. People accept a technical project because it supports their social strategies. Developing a technical project also means shaping society.

Also separation could mean to work together on a common project, but by integration we mean something more: that the two aspects of the technical and the social are interrelated and not consisting of two distinct spheres. The two spheres are opened up and influenced by each other, that makes the boundary between them blurred: who is a technical expert or a lay person is not that clear to the involved parties; no one is a pure expert and no one is a pure lay person. Technical experts are part of a social project, that influences their work, and political representatives, environmental organisations and individual citizens make claims that are not only emotional, but based on technical details as well as opinions on what the technical project is all about.

The integration type means to up-grade lay people to the same level as experts. One reason for that is existing uncertainty and controversy in scientific and technological practice. Lay people are to be understood as co-producers in a social knowledge production process. Individual citizens as well as organisations outside the research community collect and organise as well as take a stand on controversial and uncertain results from the scientific community. This is not only about choosing one result before another, but gives possibilities for putting together new knowledge combinations that gives totally new pictures, that could lead to new incentives for political action and measurements.

According to this subtype, lay people's knowledge is not of secondary priority and is not beside of the scientific knowledge production. On the contrary, they are of fundamental importance and if taken seriously they imply that 'context becomes content'. Lay people's contribution is not only about enriching, or producing new combinations, but also about the framing of the issue as such.

4 Socio-technical combinations in four nations' waste management programmes

In this section the analytical framework described above is applied to radioactive waste management in Belgium, Slovenia, Sweden and the United Kingdom in order to study what types of socio-technical combinations are used in practice. It is, however, important to notice that the same event could be interpreted differently by two involved parties, as well as that two different types of combinations could be in work at the same time. The aim of the section is to characterise ongoing work in the four countries by the help of a framework of socio-technical combinations.

4.1 Sweden

The agonistic subtype

In the early 1980s the Swedish Nuclear Fuel and Waste Management Co. (SKB) formulated a systematic geo-scientific research programme of test drillings across Sweden with the aim of supporting the site selection process for finding a proper location for the final repository for spent nuclear fuel (the government agency PRAV was first responsible for the drillings but after 1981 SKB took over). The sites chosen were selected from a strictly geological point of view, which was made possible by a comparison of different regions and types of rock (primarily gneiss, granite and gabbro) (SKB 1986: 85-88). The original intention was to set about discovering the absolutely best and safest place to locate a final repository. SKB's planned solution for the final repository for spent nuclear fuel was to find the best bedrock in the country and build it there.

When the programme was terminated in 1985, geo-scientific investigations, including test drillings, had been conducted at about ten different locations (SKB 1992a: 49). The drillings resulted in political protests in most of the municipalities where they were conducted, even though they were advertised as more concerned with basic research and definitely not part of a site selection process. At several of these places the investigations were terminated at an early stage, and at others they were not able to start at all. This programme of geo-scientific research provoked widespread protests. At seventeen of the sites planned for investigation so-called 'rescue groups', local groups opposing test drillings, were founded (Lidskog 1994: 57).

The most well known of the drilling sites where conflicts occurred was Kynnefjäll in north Bohuslän, on the Swedish west coast. The drilling plan was strongly opposed by local residents, who formed the 'Save Kynnefjäll Action Group'. From a small cottage, strategically located, the approach roads in the area were guarded day and night (actually for almost twenty years, from April 21, 1980, to February 8, 2000), preventing further studies of the bedrock. From the perspective of the Kynnefjäll group, what was advertised as pure research was actually about 'who should have power over the local territory and under what circumstances a minority of people should have to bear the risks and consequences of a decision they have never supported' (the nuclear power programme) (Lidskog 1994: 57). Important for the group was to achieve national support for a local veto of siting plans and to campaign for a more democratically accountable approach to the controversial issue of siting nuclear waste. The Action Group succeeded in winning broad support from local political parties and the drills never hit the ground.

The strategy of not involving people, and defining the drillings as research of interest only to the company itself and its geo-scientific experts, a typical technocratic kind of framing the

issue, turned out to be a disaster for the nuclear industry. It was now clear to SKB that they could not handle the search for appropriate sites as a purely technical issue that they could decide over in isolation.

The harmonious division of labour subtype
After SKB abandoned its test-drilling programme in 1985, they began, after a respectable interval of time, to assert that, on the basis of the 10 investigations they had been able to carry out, it was clear that many sites in Sweden are geologically suitable for the construction of a final repository. In its 1986 R&D programme, SKB drew the conclusion that 'site investigations have shown that it is possible to find many sites in Sweden that are geologically suitable for the construction of a final repository' (SKB 1986: 86). This conclusion led SKB to claim that, 'other factors can be accorded greater importance in the siting' (SKB 1989: 27). SKB explicitly argued *against* the opinion that, with reasonable efforts, it would be possible, from a geological point of view, to find a *best* place (SKB 1989: 27). A rationale behind the changing SKB strategy was of course tactical, i.e. an adaptation to the social conflicts around the test drillings. If the bedrock is a less important safety barrier it will become easier for SKB to find the number of sites needed. A threat to SKB would be if an area, restricted in space, were judged as one of the best from a geological point of view, but the residents and local politicians strongly opposed a nuclear waste repository there. Swedish legislation, which includes the right of veto for municipalities on land-use issues, would then make siting highly problematic.

In October 1992 SKB took the final step of launching a new siting strategy based on voluntarism, while sending a letter to all 286 municipalities in Sweden (SKB 1992b). In this letter the work of managing and disposing of nuclear waste was presented. It was stated that *feasibility studies* were required in order to establish which municipalities were best suited as hosts of a final repository for spent nuclear fuel. If any municipality wanted to know more about nuclear waste management, or would be prepared to allow SKB carry out a feasibility study, they were asked to get in touch with SKB. The letter was openly worded, and it was pointed out that a display of interest would not mean future commitments. This new initiative from SKB, to contact all the Swedish municipalities, signalled the adoption of a site selection strategy offering priority to local involvement and social aspects. The study was viewed by SKB as a tool to start talking to citizens and their representatives (SKB 1997: 21).

In total eight feasibility studies were carried out in the years 1993-2000. In December 2000 SKB presented a comparison of the feasibility studies (SKB 2000). The result was that SKB wanted to make further studies at four sites, so called site investigations, but only Oskarshamn and Östhammar accepted. During the summer 2002 the two site investigations in Oskarshamn and Östhammar started and are planned to be finalised in the year 2008. In 2009, after an evaluation, SKB plans to send an application to the government for building a repository at one of the investigated sites.

Based on the key word of *voluntarism* SKB's new mechanism, feasibility studies, for integrating social and technical issues turned out into a success. By a stepwise process, municipalities on a voluntary basis were invited to define themselves as possible stakeholders in the process of siting spent nuclear fuel. The new SKB strategy made clear that 'other factors' (social factors) were of interest to the municipalities and that they had to decide about these by themselves, independently of SKB and the technical knowledge of the company. The municipality should decide on their own whether to take part in a study, and after the completion of the study once again decide by themselves whether to continue or not. This

meant a clear division of labour between SKB and the municipality, and also a separation between technical and social issues.

From the perspective of SKB the task is about investigating geological conditions for final storage of spent nuclear fuel. This task is defined as strictly technical and where lay people could not contribute. The SKB frame means that social factors constitute the context but are not part of the content. Moreover, the context SKB is not allowed to define. This is what is new and important in the feasibility studies. While municipalities discuss social factors, SKB evaluate technical facts and the geological potential of the municipality. The feasibility studies have resulted in two separated processes, one technical and one socio-political, the first run by SKB and the second by the municipality. This separation means also a strong divide between experts and lay people (see examples in SOU 2004:67, pp. 85-90). SKB acknowledges social factors as of crucial importance, but they have to be decided by the municipality, if they want to allow siting studies or not. If so, SKB, a company specialised in technology, will investigate the technical possibilities.

The municipalities did not dislike this situation. The topics most discussed in the municipalities have been labour opportunities, positive spin-off effects, and risks for negative effects (tourism, stigma). To a great deal it is assumed, and not discussed, that SKB and national authorities are taken care of safety issues. It is often asked in a rhetorical way how it could be if local politicians or ordinary citizens should guarantee safety.

During the feasibility studies as well as the site investigations SKB has framed the siting issue as a technical project. As already mentioned, the municipalities have not challenged this framing. It is not necessarily a bad position for the municipalities to just sit and wait for a scientific verdict – just tell us where the best site is – and then be free to react on this in the way they want. It also means that the competition between the municipalities could be downplayed. Today Oskarshamn and Östhammar are waiting for the SKB choice, which they assume will be based on science, at least they consider the decision to be outside the range of their own competence. They hope that a verdict based on science (evaluation of bedrock conditions) will be both true and just.

On the other hand, the two municipalities want to influence the studies and be involved in consultations. Beside safety issues there are questions in relation to the construction of a deep repository that are of interest to the municipalities and perhaps also more easy for a municipality to be involved in. Especially in Oskarshamn the issue on local development is of growing importance. In the summer 2006 Oskarshamn reorganised its working groups and set up a new group, solely focusing on local development. Topics taken care of by this group is on how to strengthen and support local business life, especially companies that could take advantage of all opportunities that comes up in relation to the construction work. If the local companies are successful to get contracts this of course means more labour opportunities for people in the municipality. What could be noticed from the theme of reconciliation between technical and social aspects is that the municipality plays a secondary role concerning safety issues while giving priority to issues of local development. Besides some local environmental issues, discussed on equal terms, a strong separation between technical and social issues has become a visible pattern during the ongoing site investigations, as well as the negotiated roles and competences between SKB and the two municipalities.

The corporatist subtype
The feasibility studies, above described as a harmonious division of labour, could however also be considered as of a corporatist type, while focusing on the different interests and negotiations at stake. When a municipality agrees to let SKB conduct a feasibility study it declares an interest in hosting a final repository for spent nuclear fuel. When SKB is invited by a municipality to carry out a feasibility study, its interest in this territory has already been declared and also its belief that it may be possible to locate a repository to this area. Therefore, both SKB and the municipality have reasons for participating in a feasibility study, and could be said to be *strategic actors*, though focusing on different aspects of the nuclear waste issue: the municipalities on employment opportunities, and SKB on possibilities to conduct more detailed investigations and finally construct a repository at this specific site. This situation indicates that a feasibility study is about a corporatist kind: SKB and the municipal council are negotiating their different interests. In this respect this subtype shows a possible next step for parties engaged in communication related to both the agnostic as well as the harmonious division of labour types. This shows that the subtypes are changing in relation to how the process evolves.

The educational subtype
The municipalities involved in siting studies had a lot of power when, on a voluntary basis, saying yes or no to the SKB offer to be part of a study. And when this is decided by the municipalities the social aspects have been of crucial importance. However, when the studies are carried out, both the feasibility studies and the site investigations, social aspects play a secondary role. Moreover, SKB, the part in control of the technical competence and with a technical storage concept strongly defended by the company as the most suitable – the KBS concept – has exerted itself to create social acceptance for this concept. SKB has a huge budget for information, which has been used in the feasibility studies. This agenda that SKB set up is very much about educating people on the technical content of the waste management. A clear division between experts and laypeople is maintained. According to SKB the strongest argument for convincing people to accept the work and plans of SKB is to invite them to visit the nuclear facilities already in operation. Therefore, SKB, in all feasibility municipalities, arranged study trips to the Äspö Hard Rock Laboratory and the interim storage facility for spent nuclear fuel (CLAB), both located in Oskarshamn. SKB knows what it wants to achieve and has managed to get acceptance for a ready-made technical concept. What has been open for discussion is not questions about the technical concept, long-term safety or bedrock conditions.

The integration type
This far we have found a strong demarcation between social and technical aspects in the Swedish case. Since 1980 SKB has tried to close the discussion on alternative methods, since 1992 the siting strategy has been based on voluntarism and since 2002 it is a question of Oskarshamn or Östhammar. The concerned municipalities have agreed to this, and in practice this means that SKB is in charge of proposing method and finding the most suitable site.

The ambition to challenge this situation has not been strong but three examples could be mentioned. Firstly, the public consultations arranged by SKB in relation to the Environmental Impact Assessment process (MKB) that is taking place during the site investigations in Oskarshamn and Östhammar as a formal requirement of the Swedish environmental legislation. According to SKB, the overall aim with the consultations is to give concerned parties possibilities to influence the design of the facilities and their location with reference to human health and the environment. This implies to ‘take advantage of the local knowledge of

citizens and organizations' (SKB 2003: 34). Everyone that wants to engage in the consultations should be given opportunity to participate and the aim of the consultations is to lead to a 'comprehensive and locally anchored Environment Impact Statement'.

According to SKB the consultations should have the power to decide on the demarcation and comprise of the Environment Impact Statement (SKB 2004: 28). It is the consultations that are responsible for framing the issue of final dispose of spent nuclear fuel in Sweden. According to legislation it is the responsibility of the implementer, SKB, to invite other parties to consultations, and present what they are planning to do. This implies that SKB is in possession of the agenda setting and in practice we can see that the roles between different parties are quite well established, despite the rhetoric that all voices counts equal and all topics could be discussed. For all participants taking part in the public consultations the boundary between experts and lay people is easily noticed. A 'firewall' is often raised between the SKB experts and the lay people from the municipalities: politicians, civil servants and citizens. Experts are given the right to tell, while lay people are listening and asking questions.

The second example is the Swedish NGO Office for Nuclear Waste Review (MKG) and its focus on a more strict assessment of a proposed final repository in relation to the requirements stated in the Environmental Code, since 1999 giving additional requirements to the nuclear activities and the legislation in this field: that the suitability of a site should be determined by its ability to protect human health and the environment, which places substantial demands on choosing best technology and most suitable site. MKG is a coalition of environmental groups set up in 2004 when the government decided to offer financial support, from the Nuclear Waste Fund, to non-governmental organisations participating in the EIA process connected to site investigations.

According to the MKG, SKB are not fulfilling the requirements in respect of the Environmental Code. The KBS method as well as the two sites in Oskarshamn and Östhammar are not chosen in relation to these requirements (Elam & Sundqvist 2006). The Code put demands on using best available technology and presenting alternative technology. According to MKG, this has not been done by SKB, for instance promising alternatives as deep boreholes has not been investigated. A politically driven process where the say of the municipality is given priority is criticised by MKG, which means that an environmental organisation defends safety more strongly than the technical actor SKB itself. The strong separation between technical and social aspects is criticised, but most of all that social criteria is given first priority. MKG is supporting a technically driven site selection process, based on environmental legislation defending sustainability, and is accusing SKB for supporting a politically driven process.

The third example is the work recently set up by the KASAM government committee. In this respect KASAM has given support to MKG's initiative on creating broader involvement in the discussions on technology and safety. KASAM is a small committee at the ministry of environment, and is most well known for arranging conferences on all aspects of radioactive waste management, not least on ethical aspects of long-term disposal of spent fuel. In 2007 KASAM organised a seminar where the alternative of deep boreholes was in focus, and alternative technology is a topic that SKB most of all want to see as closed (KASAM 2007). Moreover, KASAM has started 'a transparency project' focusing on all aspects of decision making, including also technical aspects, with the aim of making possible an increased understanding and involvement in waste management activities (Andersson 2007). The two

other, much more influential government authorities, SKI (the Swedish Nuclear Power Inspectorate) and SSI (the Swedish Radiation Protection Authority), are strictly focussing on evaluating technical issues. The KASAM initiative is therefore something new within the Swedish state. For more than 25 years the national parliament and the government have strongly delegated the work of proposing proper technology and suitable sites to the nuclear industry.

4.2 Slovenia

The agonistic subtype
Just before Slovenia in 1991 became an independent state a site selection programme for low- and intermediate waste was started. The programme was designed in a technocratic way searching for possible sites from geographic and geological viewpoints. As part of this process the National Agency for Radwaste Management (ARAO) was set up as a government agency, responsible for disposal of all kind of radioactive waste (Polic, Kos & Zeleznik 2006: 8).

The process was divided into four different steps. The first was about exclusion. Unsuitable areas like national parks, urban areas, presence of valuable natural resources etc were excluded as sites of potential interests (Polic, Kos & Zeleznik 2006: 23-24). In the second step sites of interests from criteria such as geology and seismology, land use and water resources were identified. The third step was about identifying candidate sites where the sites from the second step were compared from the criteria of population, economical feasibility, transport and ecology. In 1993 five locations were selected as best possible, based on technical criteria only. However, when the selection was presented local municipalities strongly opposed the plans and showed 'extremely negative reactions' and all siting activities were stopped (Polic, Kos & Zeleznik 2006: 23). In the fourth and last step, that never occurred, field investigations were planned to be carried out at the selected sites to confirm their suitability.

After this failure ARAO made an evaluation of the siting programme which showed that the reason for the failure was insufficient and inadequate information to concerned municipalities as well as the general public. Information on the project was poor and representatives of local communities were not involved in the process. The evaluation also made clear that the programme did not have sufficient political support.

> A waste management policy that could have provided the needed link between the politicians and the investor did not exist. In fact, the period of the site selection process coincided with the time of tremendous changes in our country in the late eighties and early nineties. The changes in the political, social and economic system, in combination with the growing opposition to the peaceful use of nuclear energy, would require a different approach to the problem (Polic, Kos & Zeleznik 2006: 8).

Since the late 1970s negative attitudes towards nuclear power and nuclear waste have been strong in Slovenia. Growing ecological consciousness and decreasing trust in state administration are two reasons for this. In nation-wide opinion polls at the time for the siting process in the beginning of the 1990s, 76 per cent of respondents replied that they would not accept a low- and intermediate-level repository under any condition. The same number believed that it is right to resist its construction, 61 per cent perceived that a repository is not acceptable anywhere in Slovenia, and 43 per cent argued that they would resist a construction by physical force (Polic, Kos & Zeleznik 2006: 19).

Two different framings in agonistic conflict could be noticed. Representing the first, the nuclear industry and the state administration are protecting nuclear development and convinced that they manage to do this in a way that is good for the nation. Resistance among citizens and municipalities is interpreted as fear based on lack of knowledge. Representing the other, the anti-nuclear attitude among citizens is based on a negative attitude to the state saying that…

> the nuclear industry as well as government administration is corrupted, serving only their own interest. The nuclear industry cannot be trusted… it is a matter of distrust because people were not informed and involved in decision making about relevant issues (Polic, Kos & Zeleznik 2006: 16, 20).

The harmonious division of labour subtype

A new start of the siting process began in 1996 when a so-called mixed mode site selection process was set up by ARAO (Polic, Kos & Zeleznik 2006: 18, 25). After the failure of the technocratic framed process, in 1993, the situation was discussed at an expert-based workshop, including also social scientists, organised by ARAO where three different approaches to siting were presented: *technical screening*, *volunteer siting* and *mixed mode siting*. The first was already ruled out as part of earlier failure, but the advantages and disadvantages of the two latter were discussed in detail. One important difference is that in volunteer siting municipalities play the first card, and all bids are then evaluated to assess the technical feasibility of these sites, while in the mixed mode approach a rough technical screening is part of the first contact and negotiating between the ARAO and the municipality. A majority of the participants at the workshop supported the mixed mode approach and recommended ARAO to set up a process for low- and intermediate-level waste based on this approach.

The mixed mode approach could be viewed as a harmonious division of labour between technical and social aspects in radioactive waste management, where both are considered of crucial importance but of a different kind. The mixed mode approach includes four steps and the first, 'conceptual and planning stage', was carried out by ARAO in 1999 (Polic, Kos & Zeleznik 2006: 13). This included the development of a methodology for ranking areas. A programme for co-operation with the public was put forward and it was decided that the best way to communicate with the municipalities was by using an independent mediator, established 2002, who would conduct the negotiations between ARAO and the concerned municipality (Polic, Kos & Zeleznik 2006: 26). In the second step, 'area survey stage', concluded in 2001, the result from the rough technical screening was presented to the public on a map, where areas of potential interest were pointed out. More specified sites were pointed out in 2005 as part of a negotiating process with interested municipalities. The sites were agreed upon by both ARAO and the municipality. In April 2005 ARAO completed the selection process with eight applications from eight local communities. Two months later three of them decided to withdraw their applications (Polic, Kos & Zeleznik 2006: 30). The second stage was ended with five local communities that together were hosting 12 potential sites (www.arao.si).

In the third step, 'site characterization stage', field studies are carried out at maximum three different sites. The studies are carried out in agreement with the local community. In November 2005 the government decided that field studies should start at Čagos in the community of Sevnica, at Globoko in the community of Brezice and at Vrbina in the community of Krško (www.arao.si). In March 2006 the local community of Sevnica withdrew

from the process and the community of Brezice withdrew the potential site of Globoko but accepted to stay on with the other site of potential interest located within its area (www.arao.si). The siting process is still open for more communities to join, but in the autumn 2006 only at one site, at Vrbina in Krško, is field research carried out. The fourth stage is called 'site confirmation stage' and here the possible sites are confirmed by safety analysis and an environmental impact assessment. In addition, further research needed for these activities are conducted. Also this research is made in agreement with the local community (Polic, Kos & Zeleznik 2006: 13).

To ensure local participation a methodology of public acceptability assessment is used. This approach is focussing on 'those factors that could influence social aspects of the life in the local community' (Polic, Kos & Zeleznik 2006: 30). The factors assessed are possible impacts of a radioactive repository on activities, areas, infrastructure, and attitudes among inhabitants.

The mixed mode approach is giving the local municipality a clear and crucial role in the siting process. If they are not accepting to participate in the process they could not be forced to become involved. On the other hand participation is not at all about participating in technical work, it is just about being informed on these activities and react to what is presented by the experts. In fact, this approach and the way it is carried out in Slovenia is a clear example of a separation of technical and social issues, and local participation is only about downstream issues, accepting or rejecting technical proposals. However, what has been achieved is a clearly stated respect to local opinion, and predefined possibilities to enter the process as well as to withdraw from the process based on the municipalities' own decisions. But this role is reduced to consider ready-made technology from the perspective of local opinion. Moreover, rejection of studies is interpreted as resistance to the technical project.

The corporatist subtype

Negotiation is part of the mixed mode approach. By setting up a mediator this gives a mechanism for carrying out the negotiations. It is clearly stated that a municipality could not be forced to participate in the process, but that stimulating participation is a possibility (Polic, Kos & Zeleznik 2006: 26). The most important example to stimulate participation is the decision to compensate municipalities that take part in the process. In December 2003 a decree on compensation to local communities during field investigations, construction and operation of a waste repository was decided. During operation of a repository in total 2.3 million EUR per year is paid and ten per cent of this amount during field investigation and construction (Polic, Kos & Zeleznik 2006: 12). This decision has mostly been understood as a fair part of the process, while compensating the local community for restricted land use. Even if some has interpreted compensation as a kind of bribery, the decree this far has helped to continue the process and communities have been more positive to participate in the process since it was decided (Polic, Kos & Zeleznik 2006: 30, 32).

Compensation together with a mediator responsible to negotiate participation with the communities implies a corporatist type of socio-technical combination. The nuclear industry and the government want permission from a local community to be able to carry out field investigations and construction work, and offer municipalities compensation to achieve their interest. The establishment of a mediator also strengthens the focus on negotiation. In a study of Slovenian radioactive waste management it is argued that the role of the community is ambivalent 'due to the public opposition to the facility being sited in their community, but wishing to receive high compensation offered by the state to community willing to accept the facility' (Polic, Kos & Zeleznik 2006: 14).

The educational subtype
An educational view on the siting process is also evident in Slovenia. In opinion polls questions about knowledge is asked and it is highlighted that citizens are not well informed. For instance, in a 1990 poll 52 per cent of respondents believed spent fuel to be deposited in the repository discussed (a repository for low- and intermediate-level radioactive waste) (Polic, Kos & Zeleznik 2006: 19).

> The general underlying view is connected with the fear of radioactivity and general negative attitudes toward nuclear technology and LILW repository. As such it is also a useful tool for political manipulation… What is evident from these polls is a lack of information, relatively great fear and resistance to nuclear energy and connected issues (Polic, Kos & Zeleznik 2006: 3-4, 20).

Here we can notice a view part of the deficit model in risk communication stating that if only citizens were better informed about nuclear energy they would accept a repository. The strong focus in Slovenia on opinion polls, measuring technical knowledge among citizens and acceptance, implies an educational view on the public and the hope that better informed citizens means more positive attitudes to radioactive waste. This is a focus on downstream involvement and a secondary role given to the local communities, where their role is about accepting (or rejecting), and it is expected that their attitudes could be changed by relevant information.

The integration type
This far the integration type has not been evident in Slovenia. A division of labour type is strong, where local participants and social issues have a clear and strong position, but are separated from technical issues and technical competence. The mixed mode approach could more properly be called a separated mode approach.

A planned next step in the process, during the third and fourth stages, is to establish *a local partnership* in the communities. This new initiative looks as a way to give local participants a role also in relation to technical issues and the research that will be carried out during stage three and four.

> Together with the help of the mediator it [the local partnership] will serve as an umbrella for all activities during the site characterization and confirmation and will also be the platform for cooperation and for decision making of local stakeholders. The local partnership will consider the characteristics and expectations of the individual local community but will have to consider the form and mode of work, decision making contents, mode of independent studies, consultations and verification, time dependence and results of cooperation on individual steps. This will enable the process to continue with public consensus and without interruptions (Polic, Kos & Zeleznik 2006: 32).

What is of interest with both the mediator and the local partnerships, as said in the quotation above, is that these initiatives transgress the two frames of propose (industry-government) and response (local community), of being supportive and being resistant, of being technical and being social, and give opportunities to discuss socio-technical combinations within a new integrative frame. What the implication of this means is today not possible to evaluate because the local partnership has not yet showed its potential.

This is how low- and intermediate-level waste is managed in Slovenia. Today, all radioactive waste is stored in a provisional repository at the nuclear power plant at Krško (Polic, Kos & Zeleznik 2006: 12-13). However, it is only low- and intermediate-level that is planned for. No clear measures have been worked out in relation to final disposal of spent nuclear fuel, but

export is considered of interest. What kind of socio-technical combination this illustrates goes beyond the aim of this paper.

4.3 United Kingdom

The agonistic subtype
In 1976 the UK Royal Commission on Environmental Pollution raised serious concerns on the radwaste situation, focussing on the accumulation of waste and lack of policy and progress in the area. At the same time the UK Atomic Energy Authority, responsible for nuclear energy research and development including radioactive waste management, started to search for suitable sites for hosting a repository for high-level nuclear waste (Simmons, Bickerstaff, & Walls 2006: 9). This searching was however not part of a planned and authorised policy, but framed only as scientific investigations. In December 1976 the UKAEA declared its interest to conduct drilling at Mullwharchar Hill in Scotland's Highland and in January 1978 UKAEA applied for planning permission. The declaration caused strong local opposition – protest marches and petitions with thousands of signatures – and the Council rejected the application. UKAEA appealed to the Scottish Secretary of State against the Council's decision, which led to the first Public Inquiry on radioactive waste in the UK. A Public Inquiry could be asked for when public concerns are raised in relation to government policy. The Mullwharcher Inquiry supported the Council's rejection of the application and in December 1981 the UKAEA ended its drilling programme after local opposition at several more sites where drilling were planned. Only at one site, at Caithness in Northern Scotland where the Dounreay nuclear site is located, the application for test drillings was approved by the local council (Simmons, Bickerstaff, & Walls 2006: 10).

In 1982 the nuclear industry established the Nuclear Industry Radioactive Waste Management Executive (Nirex), responsible for finding a long-term solution to the waste problem (Simmons, Bickerstaff, & Walls 2006: 11-13). In 1983 Nirex announced two possible sites for intermediate- and low-level waste. At one of this the landowner at a later stage rejected continuation of the project. The Government decided in 1985 that Nirex had to investigate at least three sites and in February 1986 Nirex identified three new sites. However, at all sites local opposition grew strong and in May 1987 the Government decided that no more investigations should be carried out at any of the identified sites. These events in the late 1970s and early 1980s clearly showed that a technocratic oriented siting programme, framed as only about scientific investigations, was not acceptable to local councils or the public.

After this failure Nirex had to admit the difficulties of getting public acceptance among local communities to host a radwaste repository, or even acceptance of test drillings for gaining knowledge of the bedrock. In this situation Nirex decided to search just one site for a repository of intermediate- and low-level waste (Simmons, Bickerstaff, & Walls 2006: 14-16). From a list of 537 sites Nirex started a nation-wide screening process. This was later reduced to a list of ten potential sites, ending in an announcement, in 1989, of two best sites at Sellafield and Dounreay, both already hosting major nuclear facilities, where investigations including drillings would be carried out. The screening process was not made in a transparent way.[2] Besides good bedrock, the two sites were assessed by Nirex as having advantages due

[2] In 2005 Nirex published the two lists together with the line of arguments (Simmons, Bickerstaff, & Walls 2006: 22).

to transportation and local support. Critics argued that Nirex focussed too much on social acceptability (the line of least resistance).

As part of bedrock investigations Nirex wanted to construct a rock characterisation facility (RCF), an underground laboratory, in Sellafield, but the application for planning permission was rejected by Cumbria County Council. The Council argued that an RCF should be viewed as part of building a repository and that the proposed site is geologically poor, and moreover that a repository in this area will have negative impacts on the Lake District National Park. Nirex appealed to the decision and a Public Inquiry was set up, but the decision in March 1997 upheld the view of the council that the site is unsuitable (Simmons, Bickerstaff, & Walls 2006: 17). This decision was ending the Nirex siting process.

The siting process started by UKAEA in 1976, and two times continued by Nirex was all the time framed in a technocratic way. The Nirex second attempt was more sensitive to public acceptability that explained the choice of the two sites of Sellafield and Dounreay. However, this choice of sites was not made in a transparent way and local communities or the public never became involved in the process. This lack of involvement led to a growing distrust against the nuclear agencies in the field of radioactive waste management. This made the Government to conclude that radioactive waste management 'is an area where it has proved particularly difficult to bridge the gap between scientists' assessment of risks and the honestly-held perceptions of the public' (Simmons, Bickerstaff, & Walls 2006: 13).

Obviously, two different kinds of framings were in conflict. The instruments to solve the agonistic clash between on the one hand the nuclear industry and on the other the local communities and the public were public inquiries and government decisions. A public inquiry is an arena where different voices and arguments could be listened to in public. During these year the inquires were an effect of established conflicts between already convinced actors. The role of the community council and the public was not about involvement just about a late downstream reaction to already presented plans and programmes. An inquiry gives the possibility to be involved but at a very late stage and not as part of the siting programme. In this respect the inquiries are clear examples of technocratic failures, agonistic interplay and downstream involvement.

Harmonious division of labour in UK never occurred

RWM in the UK could be assessed as going from an agonistic type of socio-technical combination to a mode of integration. A harmonious division of labour type, that have been a strong type both in Slovenia and Sweden has never been tried in the UK. One reason for this is that the failure in UK has been much more strong and dramatic than in most other nuclear nations, as well as the distrust of nuclear agencies. The UK programme, after the technocratic failure, therefore had to be restarted on a more radical ground than in other countries. A strongly separated type of socio-technical combination, saying that some kind of issues are only for local communities and citizens, while other issues are only for technical experts, never took place. After the failure in 1997 local actors as well as citizens have been given, and has taken, the chance to comment on and influence all types of issues, even technical details.

The corporatist subtype

A corporatist type of combination is most commonly occurring when the siting process comes closer to a local community. This has not yet happened in the UK, at least not after the restart of the programme after 1997. In 1978 the Caithness District Council, where the Dounreay

nuclear site is located, allowed the UKAEA to carry out test drillings. The agency was already an important local employer in the area and more activities could mean more labour opportunities. This kind of exchange between two actors, the one offering labour opportunities and the other accepting siting of facilities, is of a corporatist kind. The same could be said of the interests of Sellafield and Copeland District Council. That negotiation between these two parties has not taking place depends on Cumbria County Council and its interest to protect the Lake District National Park. However, the restarted siting programme is prepared for future negotiations between nuclear agencies and local communities, while it is stated in a report from 2006 that 'a package of community benefits' is seen as important for successful implementation (Simmons, Bickerstaff, & Walls 2006: 36). Another sign of possible corporatist interplay is the strong positions taken by important actors. Pre-determined attitudes are not good prerequisites for dialogue to occur or consensus decisions to be taken. On the contrary, the only way to deal with strong attitudes, if not possible to modify, is negotiation. As already said, how to solve this has not yet been an important topic in the UK, due to that implementation has not started.

The integration type

The public inquiries that played an important part in radioactive waste management up to 1997 could be said to be a possibility for different kind of actors to meet and discuss the same issues, even if the inquiries by necessity is not about dialogue but adversarial discussion. However, in this section the restart of the waste programme and how it has been carried out as an example of integrating social and technical aspects is described. In 2001 the Government launched a new consultation programme, Managing Radioactive Waste Management Safely (MRWMS), with the aim to develop a waste management programme with public support (Simmons, Bickerstaff, & Walls 2006: 28). The key focus was to involve as many as possible at an early stage.

The first stage of the programme was 'consultation on the scope of the problem and how people wanted to be involved in debate'. In March 2002 this stage was completed after several consultation techniques had been used: seminars, interviews, workshops and a citizens' panel. A report was summarising the given inputs.

In the second stage, in November 2003, a new advisory body was established, the Committee on Radioactive Waste Management – CoRWM. The objective of the committee was to give recommendations to Government on the best option, or combination of best options, for long-term management of radioactive waste management. Foremost this is about reviewing available options of disposal. And not least important, to carry out this in a way that is open, transparent and inclusive. The report to the Government had to be delivered in July 2006.

The committee decided to start from 'a blank sheet of paper', 'by considering all possible options for long-term management or disposal of the wastes' (Simmons, Bickerstaff, & Walls 2006: 30-31). After putting together a long list of all kind of options, public and stakeholder engagement (PSE) activities were organised to discuss all options (Simmons, Bickerstaff, & Walls 2006: 31-33). Part of the PSE activities was 'a national stakeholder forum' of 18 stakeholders from national organisations that met over two days; 'a nuclear site round table' of 95 stakeholders that met 8 times for 4 hours; 'open meetings', held close to nuclear sites; 'discussion groups', 8 groups with randomly recruited citizens; and 'written materials', made available on the web site. These activities led to putting together a shortlist of 15 waste management options grouped into three categories.

A second period of PSE activities took place with the aim of reviewing the list and classify and reduce the different options. This resulted in a list of four options: long-term interim storage, deep geological disposal, phased deep geological disposal, and near-surface disposal (for limited volumes) (Simmons, Bickerstaff, & Walls 2006: 34). This period also used new activities as website interaction. Responses from citizens were stronger during this stage.

During a third phase of PSE activities the aim was to compare the options and carry out assessments. In April 2006 CoRWM published a preliminary version of its recommendations and gave 6 weeks for stakeholder comments. Part of this recommendation was that geological disposal was the most appropriate option (Simmons, Bickerstaff, & Walls 2006: 36).

In the final report to the Government, the committee argues for an early closure of the repository in contrast to 'phased' disposal, while acknowledging that most stakeholders prefer phased disposal (Simmons, Bickerstaff, & Walls 2006: 36). In fact many environmental groups are critical to geological disposal as such and therefore also to early closure (cf. Simmons, Bickerstaff, & Walls 2006: 23). It is also said that some members of the Committee think otherwise, and it is foreseen that this discussion will carry on and that a final decision had not to be taken during the coming decade. A continuing public and stakeholder engagement process was proposed, participation on a volunteer basis (the right to withdraw from the process), as well as 'a package of community benefits' (Simmons, Bickerstaff, & Walls 2006: 36). The Belgium model of partnership between industry and community was proposed a good example (Simmons 2006: 2). Moreover, CoRWM recommended two bodies to be established: an independent 'overseeing' body and an implementing body (Simmons, Bickerstaff, & Walls 2006: 37).

> Taken together, the programme of public and stakeholder engagement activities developed by CoRWM has been perhaps the most ambitious set of consultative and participative processes engaged in by a public body in the UK… such early involvement in the decision making process is a novel development and sets CoRWM's PSE events apart from the usual processes in the UK context (Simmons, Bickerstaff, & Walls 2006: 37).

The CoRWM process shows an engagement process without a strong boundary between social and technical aspects, and with upstream work. This was formulated as a start from a blank sheet of paper: all kind of technical options and ethical considerations are discussed by everyone that wants to take part. However, already in the Public Inquiry in Cumbria a county council, environmentalists and members of the public discussed technical details, not least geological problems in a way that did not separate the issues into expert ones and lay people ones. This lack of boundaries and upstream work has also been criticised. Perhaps most strongly by the House of Lords Select Committee on Science and Technology that argued that CoRWM tried to reinvent the wheel and take up, once again, options that earlier had been ruled out by a number of authoritative bodies. Why spend a lot of times on technical infeasible strategies, the Committee asked (Simmons, Bickerstaff, & Walls 2006: 39).

The second stage of the MRWMS programme was ended by a government decision that accepted most of the CoRWM recommendations. It differed a bit in proposing a new organisation for the next phase, while it decided that Nirex, since 2005 a government body, should be fused with the Nuclear Decommissioning Authority (NDA), under the name of NDA, and as on 'overseeing' body the Government decided that CoRWM should be reconstituted, however, contrary to what the committee proposed, not being independent but advisory to Government (Simmons 2006: 3).

A critical issue for the future will be on how to handle the conflict between different kind of disposal options. Environmentalists are not convinced on geological disposal and many citizens find retrievability and late closure important to defend, while CoRWM and the Government strongly argue for geological disposal and early closure. The MRWS process and the CoRWM work have this far managed to work in a way that has achieved what was planned to be the most important objective: to discuss technical options in a way that inspires public support.

The third stage of MRWS, taking place during 2007, is about Government consultations 'on how to implement the option that has been adopted. It is currently expected that the final implementation stage, Stage 4, will begin sometimes in 2008. It is the most politically sensitive stage of the process that will present the most challenging test for the Government's MRWS programme' (Simmons 2006: 4).

4.4 Belgium

The agonistic subtype
In 1982 NIRAS/ONDRAF became operational as a government agency responsible for all radioactive waste management (Bergmans, Steenberge & Verjans 2006: 17). However, in Belgium spent nuclear fuel is not classified as radioactive waste and therefore not the responsibility of the agency (Bergmans, Steenberge & Verjans 2006: 13, 17). Since 1993 there is a moratorium on reprocessing of spent fuel in Belgium, but it is still unclear if reprocessing or not is the right way to go. The first mission for the agency was to plan for a new way to handle short-lived low-level and intermediate-level waste. Between 1960 and 1982 this kind of waste was handled by sea burial. In 1983 this treatment was ended due to an international moratorium on sea dumping of radioactive waste as an amendment to the London Convention on the prevention of marine pollution by dumping of wastes and other matters (Bergmans, Steenberge & Verjans 2006: 18).

In the NIRAS/ONDRAF technical programme on final disposal of the short-lived waste three options were considered of interest: surface disposal, disposal in abandoned coalmines, and deep disposal in clay environment (Bergmans, Steenberge & Verjans 2006: 20). Based on research carried out by the agency the federal government in 1991 decided that the preferred option should be surface disposal. In 1994 NIRAS/ONDRAF presented a report where 98 potentially suitable sites in 47 communities were identified. This was made from investigations of technical feasibility in different geological subsoils. Before publication and during the investigations no contacts with identified communities were taken. No one of the communities had experiences of nuclear activities and had never expected 'ending up on a long list of potential hosts to site a nuclear waste repository' (Bergmans, Steenberge & Verjans 2006: 21).

> By December 1994, all 47 selected municipalities had sent to NIRAS/ONDRAF or its tutelage minister a formal reply, contesting the suitability of their municipality to host a disposal facility and rejecting NIRAS/ONDRAF's request for further site investigations. This contestation was not only based on a concern for safety, public health or the environment. In many instances the lack of involvement of the affected populace was clearly stressed as a strong point of criticism (Bergmans, Steenberge & Verjans 2006: 21-22).

The engagement among local politicians, public demonstrations as well as activities by environmental organisations like Greenpeace, backed up the decision by the councils to take a stand against being investigated as a possible future host for radioactive waste.

In 1998 the Federal Government decided 'that NIRAS/ONDRAF should start looking for a potential site first and foremost in existing nuclear areas, former military sites and in any municipality that would be willing to volunteer… and develop methods, including management and negotiation mechanisms to integrate the repository facility at the local level' (Bergmans, Steenberge & Verjans 2006: 25).

This new strategy meant that social criteria became the most important in site selection. What was focussed upon was not to find the best technical site but a possible site where people accept investigations to take place. And to focus on areas already hosting nuclear facilities and former military sites was proposed a good idea because there were indications that inhabitants at these sites would held more positive attitudes than at other sites. However, in the first round this new initiative did not turn out well.

Shortly after the Government decision NIRAS/ONDRAF asked the Faculty of Social and Political Sciences at University of Antwerp and the research group SEED (Socio-économie, Environnement et Développement) at the Fondation universitaire luxembourgoise (later merging with the Department of Environmental Sciences and Policy at the University of Liège), in accordance to the Government decision, to develop a 'method to integrate the repository facility at the local level' (Bergmans, Steenberge & Verjans 2006: 25-26). However, in the meantime, when the university groups together with NIRAS/ONDRAF worked on this task, the local council in Beauraing, a Walloon municipality hosting a former military site, did contact the nuclear agency and showed its interest in hosting a facility for short-lived waste. NIRAS/ONDRAF carried out a preliminary site investigation that did confirm that this site was suitable for a surface facility (Bergmans, Steenberge & Verjans 2006: 25). In June 1998 citizens in Beauraing in a local referendum were asked whether to accept a low- and intermediate-level waste repository in the municipality if that meant that the municipality also received some kind of socio-economic compensation. Contrary to expectations of leading politicians, many citizens took part in the referendum (67%) and even more surprisingly an overwhelming majority (95%) voted against the project. After this clear evidence of political leaders with no contact with its constituents the municipality withdrew its candidacy (Bergmans, Steenberge & Verjans 2006: 26).

In December 1998 NIRAS/ONDRAF publicly announced a new siting strategy based on a method developed by the university groups. Part of the announcement was an invitation to 'any municipality interested to discuss and jointly study the possibility of hosting a repository for short-lived low- and intermediate radioactive waste on its grounds to come forward and enter into a 'local partnership' with the waste management agency' (Bergmans, Steenberge & Verjans 2006: 27). This new strategy, was not about siting a ready-made technical concept, but meant a possibility, under a shared responsibility, to discuss on an equal basis every issue of interest to any one participating. It therefore meant a radical shift compared to the earlier technical strategy pointing out 98 sites of interest but ending in a total rejection. The new strategy was given a bad start due to the debacle in Beauraing where municipal leaders were too keen to participate without communicating with constituents or waiting for the new NIRAS/ONDRAF strategy that almost was ready to present. The same could be said about NIRAS/ONDRAF that was too happy with a positive contact with a municipality and quickly carried out a preliminary site investigation. The two events of rejecting municipalities, the

first based on the list of 47 municipalities, assessed as technical feasible, and the second a single municipality with too positive political leaders, clearly showed the need for a change that not only uses technical criteria or only asking about acceptance from political leaders.

The harmonious division of labour subtype
Similar to the situation in the United Kingdom the process in Belgium could be described by a shift from a separated and agonistic type of socio-technical combination to a mode of integration. A harmonious division of labour type that have been strong both in Slovenia and Sweden has not been visible in Belgium. One possible reason for this was the NIRAS/ONDRAF contact with university researchers who presented a more radical model than perhaps would be the case without this kind of expertise. However, the Government decision that sparked off the shift framed the socio-technical combination in a way that was carried forward by the researchers, namely of *integrating the technical facility at the local level*. Under the umbrella of a local partnership there is no strong possibility to establish a clear division of labour of tasks, roles and duties between participating partners. The whole idea with the partnership is to bridge between the parties and the different aspects of waste management.

However, the situation in Belgium concerning high-level waste could be considered a good example of division of labour. For many decades responsible organisations (since 1982 NIRAS/ONDRAF) had worked on the development of technical concepts on geological disposal. In December 2001 NIRAS/ONDRAF presented a report where the achievements this far was summarised. The report (SAFIR II) was reviewed by both national and international experts that argued that the programme is 'well developed and sufficiently advanced to address the siting issue' (Bergmans, Steenberge & Verjans 2006: 34). However, NIRAS/ONDRAF in the report underlines that dialogue with stakeholders and the public has never taken place in relation to high-level waste (Bergmans, Steenberge & Verjans 2006: 39-40). The programme this far has been developed by technical experts alone, and because the 'siting stage' has not been started stakeholders and citizens have not been eager to scream for involvement. The technical concept has been worked out in detail, assessed by reviewers as advanced, and is protected by responsible experts soon planning 'to address the siting issue', i.e. to achieve social acceptance for a ready-made technological concept. This is a good example of a division of labour, including plans for downstream involvement with ready-made technology.

The integration type
As already mentioned, in December 1998 NIRAS/ONDRAS announced a new strategy based on the local partnership approach and voluntary participation. Soon four municipalities, all of them already hosting existing nuclear activities, showed interest in participating: Mol, Dessel, Fleurus and Farciennes (Bergmans, Steenberge & Verjans 2006: 27, 49). This meant to enter into a joint effort with NIRAS/ONDRAF in order to study and design a repository project, as well as develop an integrated project proposal that should be acceptable for all involved parties. Then the municipal council decides on the proposal and if found acceptable the Government make a final decision.

After this positive reaction from four municipalities, social scientists from the universities of Antwerp and Liège started to find out if the decisions in the councils were supported by organisations and citizens in the municipalities. From the many interviews carried out a proposal of an organisation of local partnerships was presented (Bergmans, Steenberge & Verjans 2006: 49). This resulted in the establishment of three partnerships: STOLA in Dessel

(1999), MONA in Mol (2000), and PaLoFF in Fleurus and Farciennes (2003). The area of possible interest in Fleurus and Farciennes was located in between the two municipalities and they therefore decided to set up a joint local partnership where both municipalities were represented (Bergmans, Steenberge & Verjans 2006: 61). However, they decided to have their own local project (most focussing on local development). The area was an old mining site and it was unclear if it at all was suitable for storage of radioactive waste. Before setting up a partnership NIRAS/ONDRAF was asked to carry out a preliminary site investigation to find out if this was the case. This investigation was followed by a committee where the municipalities and local technical experts were represented. When NIRAS/ONDRAF presented results that showed that the site was suitable, and the committee agreed to this, a formal partnership was set up.

The aim of a partnership is to jointly study and develop an integrated repository project (Bergmans, Steenberge & Verjans 2006: 50-54). This means that technical and social aspects are considered inseparable and should be assessed by the partnership. What we find is an explicit ambition to jointly work from a socio-technical combination of integration. Technical concepts, the conditions of siting a repository (technical, environmental, aesthetical aspects etc should be considered), and socio-economical effects are all assessed jointly by the partnership. Furthermore, a local project with the aim of bringing added value to the local community became part of the partnership. This part could be considered as a built-in compensation for hosting a repository. An important part of the work was to communicate the work and its results to the local population. The partnership was the carrier of all kind of investigations and proposal, developing as well as assessing results. It was the sole forum for negotiations and decision-making, to bear in mind that the municipal council and the government at a later stage are to decide on the issue.

A local partnership should have a broad local representation. Politicians, organisations and individual citizens were invited to take part. The three partnerships were organised in a similar way. A General Assembly, an Executive Committee and several Working Groups were set up (Bergmans, Steenberge & Verjans 2006: 65-67). NIRAS/ONDRAF had one representative, the director-general, in every Assembly. It was considered important to also bring in members of the municipal council, because of the council's position as the decision-maker after completion of the project. The Assembly met only twice a year. The Executive Committee organised the daily work, including the coordination of the working groups. All local people participated on a voluntary basis but two full time project coordinators were employed by each partnership to 'take care of administrative and communicative tasks and to support the working groups both logistically and scientifically' (Bergmans, Steenberge & Verjans 2006: 66). The Assemblies consisted of 29-38 members, the Executive Committees of 9-14 and the Working Groups of 10-15 members.

In MONA and STOLA three technical working groups (implementation and design; safety; and public health and the environment) and one group for local development were established. In PaLoFF there was two technical groups (implementation and design; public health, safety and the environment) but each municipality had its own working group on local development. However, at a later stage an additional joint group on local development was created.

Within this strong focus on integration we also find examples of separation. The different tasks given to the working groups reflect a division of labour between technical and social aspects. This was also present in the role of NIRAS/ONDRAF. The agency was given a veto

on technical feasibility (Bergmans, Steenberge & Verjans 2006: 70). The budget for the partnerships was approximately 250.000 EUR per year (Bergmans, Steenberge & Verjans 2006: 70), but NIRAS/ONDRAF had its own budget and was responsible for carry out all necessary research and development on technical and safety aspects in relation to a repository. This gave NIRAS/ONDRAF a strong position as the architect of the technical design. This was most clearly showed in Fleurus-Farcienne where the possibility of a specific design was presented to the two municipalities before the local partnership was established (Bergmans, Steenberge & Verjans 2006: 56). This was actually decided as a necessary condition before the two municipalities accepted to take part. Technical proposals from NIRAS/ONDRAF was often the starting point for the different groups that used their own budgets on reviewing, inviting experts, order additional research, and finally decide on issues (Bergmans, Steenberge & Verjans 2006: 70).

In January 2005 the municipal council in Dessel decided in favour of the integrated project proposal presented by STOLA and in April 2005 the council in Mol did the same for the MONA proposal. The partnerships succeeded to present a common project proposal that was well anchored in the communities. 94 per cent of the members in these two partnerships answered that they had been listened to and been taken seriously (Bergmans, Steenberge & Verjans 2006: 57). And 80 per cent of the citizens in Dessel said they have confidence in the STOLA partnership (Bergmans, Steenberge & Verjans 2006: 53). In February 2006 the council in Fleurus decided to not accepting the proposal and since the agreement was that both municipalities had to accept for a continuation to take place the site is no longer a candidate for hosting radioactive waste (Bergmans, Steenberge & Verjans 2006: 28).

In May 2006 NIRAS/ONDRAF sent a final report to the Federal Government with Dessel and Mol as candidate sites. As already decided as part of the three partnerships, the agency did not recommended a specific technical option or a specific site. Already one month later the Government decided that a surface disposal in Dessel would be the best option. After the decision 'a confidential' NIRAS/ONDRAF report was brought to attention in which the agency made statements in favour of Dessel. As already mentioned the agreement between the agency and the municipalities when set up the partnerships was that the agency should not make a choice between the sites. The partnership in Dessel is however happy with the decision and is prepared to continue the work on a repository project, while the situation for people in Mol shows how trusted relations that have taken years to build up could quickly be broken (Van Hove & Van Steenberge 2006).

5 Conclusions: Critical issues of integration and separation

To final dispose of radioactive waste, technical and social aspects have to be adapted to each other within the frame of a common project. But how to make geology, safety analysis, politics and public opinion fit together in a project of finding a safe final resting place for radioactive waste?

In this concluded section the socio-technical combinations found in the four countries will be discussed from a normative based approach saying that integration of social and technical aspects is happening in practice all the time. To *not* acknowledge this means to present a picture of separation. In the following five critical issues in relation to integration and separation are discussed, but already at the start two consequences of separation could be mentioned. First, if separation is defended, what is assessed as the technical side of the

boundary also contains social aspects, and what is assessed as on the social side contains technical aspects. Then, the important thing is to find out what kind of social aspects are disguised into technical ones and vice versa. Secondly, to disguise social aspects as technical implies narrowing participation to technical experts. Interesting enough, separation, therefore, never means that technical and social issues are separated, they can never be, but that the making of socio-technical hybrids are relegated to experts' backstage work, while a purified and divided world are publicly presented (cf. Hilgartner 2000: 12). Thereby, separation is an illusion.

Furthermore, to achieve successful implementation people has to be involved, the more the better. To restrict participation is problematic if searching for success. To implement means most of all to communicate, to involve, to extend participation and to be prepared for changes. To be successful in relation to so-called technical project means to be able to hold together an expanded contradictory and heterogeneous environment, and this is the opposite to think technology is finalising itself, that it is autonomous, 'that it had to be protected from its environment' by technical experts wanting to keep it for themselves (Latour 1996: 287).

There is a lot of evidence from involved actors in the four countries of Belgium, Slovenia, Sweden and the United Kingdom that integration of social and technical aspects are the only choice because the technical and social aspects of radioactive waste management *are* intertwined, and that separating is a falsity. Two voices from the Belgium STOLA partnership express this quite neatly:

> It is absolute necessary to integrate: safety is technical, feeling of safety is social, and these go hand in hand (participant STOLA).
>
> You have to look at the whole picture. When we as citizens talk about social aspects and conditions, they all have to do with technical matters. You cannot separate them (participant STOLA).

In what follows, five critical issues in relation to separation and integration are raised and connected to what is happening in the four countries. This far we have found that separation is common practice in Slovenia and Sweden, while in Belgium and the United Kingdom many examples of integration could be found. This could be a first preliminary result, but before making this the true and final result we have to elaborate a bit further on activities in the four countries by the help of the critical issues that will give us a more complex picture.

5.1 The concealment of social aspects

Separation often implies that technical agencies make social choices within technical choices in a non-transparent way. In this case we get two types of social aspects: those, which are explicitly recognised as such and understood as being of a non-technical kind, for instance public opinion, and those, which are implicitly disguised as part of technical issues. The latter could be illustrated by examples from Slovenia and Sweden where separation is a common type of socio-technical combination. In these two countries power has been delegated to municipalities. Or put more properly, the right for municipalities to plan their own future has been recognised, and in at least Sweden this has been the case in accordance to legislation for many years, but lastly also the nuclear industry and the state have acknowledged this situation. Today municipalities are given the right to accept or reject to be part of the process of finding a solution to the waste problem. They could by themselves decide on the social implications of hosting a final repository for radioactive waste. This could be described as a

division of labour where the industry and the state focus on technical safety, while the municipalities keep to the social issues.

However, it is wrong to argue that the SKB in Sweden is only focusing on technical issues. SKB has strategically reassessed its view on safety issues and bedrock conditions, i.e. from best site to suitable sites. This means that the company had tried to adapt technical aspects to social ones. This reorientation resulted in a mechanism called feasibility studies that in a fundamental way changed the relation between the bedrock and the choice of possible sites. This adaptation (some would call it a downplaying) of bedrock to what is socially achievable, codified in the SKB sentence 'that it is possible to find many sites in Sweden that are geologically suitable for the construction of a final repository', is not a pure scientific result. If the bedrock is a less important safety barrier it will become easier for SKB to find the number of sites needed. This strategically choice SKB made alone.

In Slovenia the choice of the mixed mode approach, including a first rough technical screening, also means to assess and decide on social issues, where a broad discussion, including municipalities and citizens, is lacking. Why choosing such a strategy? What is the motivation behind it? How to develop a method for ranking areas? These questions are not pure scientific, but also very much about what is achievable in a society where nuclear waste is considered an unwanted product not to be engaged with. Where separation is the existing combination, these questions tend to be considered technical and be decided by technical experts alone.

When these kind of issues arise within an integrative socio-technical combination they could more easily be dealt with as socio-technical choices and discussed more broadly among equal parties representing different interests and knowledge competences. But is this what is happening in Belgium and the UK? Examples show that a partnership is no guarantee for avoiding a situation where technical experts take care of socio-technical issues of crucial importance. The Belgian PaLoFF partnership was not established before NIRAS/ONDRAF presented a study of technical feasibility, including design of the repository. The partnership was not made part of these strategic assessments. This shows that the tendency for technical experts to take care of strategically important issues alone, including social choices disguised as technical issues, could all the time be the case, but is most common within a separated socio-technical combination.

MESSAGE:
TECHNICAL EXPERTS MAKE SOCIAL CHOICES WITHIN TECHNICAL CHOICES
THIS MEANS CONCEALMENT OF SOCIAL ASPECTS
THIS IS A PICTURE OF STRONG TECHNICAL EXPERTS

- First critical issue: the concealment of social aspects
- Problem: concealment
- Solution: identify the social in the technical and do not be afraid to discuss technical issues as social choices, or even better as socio-technical choices. What to be afraid of? That lay people can add something of value and learn something?

5.2 Social aspects of second priority

What seems to be hard to avoid in all socio-technical combinations, but also this time foremost in the separated type, is that the social aspects, when discussed and focused upon in purity, are made second priority. This means that social aspects are considered something to add, at a later stage, to already developed and defined technical projects. This has been called downstream involvement, i.e. adding social flavour to existing technological programmes. One reason for this to happen is that the technology is mature; technological waste programmes were founded already back in the 1950s, and at that time the problem, as an integrated project, was delegated to technical experts (Sundqvist 2002: 65-66). Responsible politicians expected experts to make social choices and formulate strategies. And of course they did.

When much later public consultations were created, giving the impression that all options remained open for discussion, it was neglected that many actors long ago made up their minds on important and strategic issues, as technical options and best possible sites. It is easy to notice that basic assumptions and strategic choices have remained unchanged over time. So what about all these consultations? What are they about? Clearly they are not very often about taking new decisions on strategic issues.

In Sweden the Government Committee AKA presented its results in 1976. In this a technical option similar to today's KBS 3 concept was presented as best possible and it was said that siting studies should be started in the two municipalities of Oskarshamn and Östhammar, already hosting nuclear facilities (SOU 1976:32). Since this time, more than forty years ago, and hundreds – or thousands – of consultations later, and a nation-wide searching process including feasibility studies in different regions of the nation, SKB has arrived at the same position.

The CoRWM committee in the United Kingdom said they started from a blank sheet of paper, but was criticised by technical experts for reinventing the wheel because geological disposal is the only viable solution to the majority of the expert opinion. The CoRWM final report also argued for geological disposal, later confirmed by the Government decision, despite critical comments continuously raised by several stakeholders in the many consultations.

MESSAGE:
SOCIAL ASPECTS – CONSIDERED OF SECOND PRIORITY – ADDED LATER ON AS A TOOL FOR ACHIEVING ACCEPTANCE TO READY-MADE TECHNOLOGY

- Second critical issue: social aspects of second priority
- Problem: strategic decisions already taken and not open for reorientation
- Solution: discuss what could be changed and what could not be changed, and *why*?

5.3 Fragmented and incremental process (isolated integration)

In the CARL Belgian country report the crucial question of the stability of an integrative socio-technical combination is raised (Bergmans, Van Steenberge & Verjans 2006: 73). The fact is that integrative initiatives are taking place as part of a long-standing process where important things happen beside these initiatives. How can the risk of becoming an isolated island be avoided? And how could the results from integrative processes be taken care of when once completed? These are important questions for every one engaging, for a shorter or

longer time, in different kinds integrative activities. This is not an easy task to deal with and unfortunately history frightens. This has to do with general questions of keeping memory alive, in a proper way taking care of the results, and getting a possibility of grasping the whole picture. What is needed has been conceptualised as a *guardian of the process* giving the whole picture and keeping memory alive (Andersson & Wene 2006).

One example is the problem to deal with the whole issue, and that integrative initiatives risk to be used on specific and isolated topics that are part of a process that is much bigger than the topics these initiative covers. The experiences and results of these processes tend to not be taken care of within the bigger process. This gives the impression that integration is used as a response to crises and when these are overcome by integrative initiatives things go back to normal business, i.e. technical experts advising government decisions. In both Belgium and Slovenia partnerships are established, but only in relation to short-lived waste. Spent nuclear fuel and high-level waste has not been part of any kind of integrative initiatives. In Slovenia the focus is very much on siting, while technological options are not much discussed with involved municipalities.

Another example is the possibility for a strong decision maker, what Habermas (1971) calls decisionism, to independently decide in a way that does not rely on what has been achieved by earlier integrative initiatives. The decision taken by the Belgian Government in June 2006, about choosing surface disposal in Dessel as best option, illustrates this quite well. The same could be said about the SKB decision in December 2000 to choose two areas in Oskarshamn and Östhammar as sites of interest to further investigate. This decision was taken before all the municipalities involved in feasibility studies had completed their reviews of the SKB final reports, and SKB used criteria for motivating the decision that were not part of the discussion during the feasibility studies (Sundqvist 2002: 210). The whole consultation process in relation to the site investigations in the two municipalities, as earlier described as possible examples of integration in the Swedish case, are taking place in a larger process much based on separation. The municipalities are not involved in the development of the SKB R&D programme. It is too early to evaluate the UK situation, but it would be interesting to see to what degree the process set up by CoRWM is an isolated crisis response within a larger frame of strong parties wanting to realise geological disposal, as soon as possible and close to Sellafield. It has already been noted that the Government decision in some respect differ, both in relation to the CoRWM final report and to important results from the PSE (public and stakeholder engagement) activities. In fact, in all four countries, after years of more or less nation-wide consultations, we seem to be back where it all began, in Oskarshamn/Östhammar, Dessel, Krško and Sellafield. These examples indicate that integrative activities to a large extent are motivated from an instrumental angel, used to increase legitimacy. The result is a picture of incrementalism.

However, what could positively be said about Sweden and the United Kingdom is that these two countries, contrary to Belgium and Slovenia, have ongoing programmes including stakeholder activities for all kind of wastes, including spent fuel and high-level waste.

MESSAGE:
INTEGRATIVE INITIATIVES TEND TO BE ISOLATED ISLANDS USED TO OVERCOME CRISIS ON SPECIFIC TOPICS

- Third critical issue: fragmented and incremental process (isolated integration)
- Problem: integration often takes place within a broader technocratic frame. But how to keep alive the alternatives of integration?
- Solution: take care of integrative examples. A guardian of the process is needed to keep memory alive

5.4 Integration disguising separation

Invitation to integration activities, such as partnerships, is often based on the aim of restoring public credibility for scientific and technological project. In the field of radioactive waste management these restoring events are common, as part of crisis management. The focus on restoration means that old boundaries between technical and social aspects are protected, while rhetorically promising collaboration among equals.

In the United Kingdom, participants in PSE activities felt there was 'real danger of disappointed expectations… feelings that processes are little more than tokenistic and manipulative exercises to legitimate pre-defined policy or decision-making positions', and that these are 'little more than a legitimation exercise or, at worst, a cynical strategy of stakeholder co-option or exhaustion which therefore do little to achieve a genuine resolution of the problems of legitimacy historically associated with radioactive waste policy in the UK' (Simmons, Bickerstaff & Walls 2006: 62-63).

This example gives us a picture of a technical programme run by technical experts using other stakeholders and the public for getting support, as its only contribution to the programme. In fact, a strong separation between technical actors and all the rest is maintained, however disguised by talk and activities presented as integration and stakeholder involvement.

In the Belgium partnerships everyone knows that the position of NIRAS/ONDRAF is of a special kind, and not only one partner among other partners in a common partnership. The agency is viewed as the architect and the one that has answers to technical questions due to its strong technical competence. In Slovenia ARAO is the manager, and by the help of the decree of compensation it could be more attractive for municipalities to join what is mentioned as a common partnership. There is a risk that partnerships become a new label for an old division of labour, where technical agencies are not only strong in relation to their technical competence but also protect fundamental strategic socio-technical choices as their own business.

MESSAGE:
NOT ONLY ISOLATION: STRONG EXPERTS ALSO MAKE SOCIO-TECHNICAL CHOICES INSIDE INTEGRATIVE INITIATIVES, DISGUISING THEMSELVES AS EQUAL PARTNERS

- Fourth critical issue: integration disguising separation
- Problem: technical experts are not equal partners
- Solution: be aware of the differences in power (resources) and competence

5.5 What about social science

This last critical issue has not been explicitly dealt with earlier in the paper, but when time is arriving to conclude the CARL research project it could be proper to mention a few things about the role of social science in the field of radioactive waste management, and more specifically what the contributions could be in relation to the reconciliation of its technical and social aspects. This far we have repeatedly argued that the kind of social science research this paper is based on does not accept a social and technical divide. What has also been clear is that a separation is commonly found in radioactive waste management, even when integrative activities are set up and involved partners strive beyond separation. However, upstream involvement is the only way to take seriously the ambition to democratise the ongoing technological transformation of society. But what should this be about? How could it be made, and who would support these kinds of efforts?

The benefits from social studies aimed at promoting upstream public participation could be the avoidance of conflicts, controversies and 'resistance' at a later stage. But what should be emphasised is the ambition Andy Stirling mentions 'the social appraisal of opening up the process of technology choice'. This…

> … poses alternative questions, focuses on neglected issues, includes marginalized perspectives, triangulates contending knowledges, tests sensitivities to different methods, considers ignored uncertainties, examines different possibilities and highlights new options… Yet only in this way… can we ensure the robust informing of governance processes and the achievement of appropriate levels of transparency and accountability in technology choice – unhindered by the smokescreens of justification (Stirling 2005: 229).

What a move upstream will mean is open to interpretation, and there will be different opinions of the value of social science techniques to support this ambition. Some will focus on the possibilities 'of earlier anticipation and more effective management of risks, impacts, and consequences'. A second argument is about putting forward for scrutiny the 'fundamental questions about driving human purposes, ownership, control, and responsibility'. A third effect could be 'the stimulation of greater self-reflection within science about its own assumptions and expectations, effectively about its own cultural forms' (Macnaghten, Kearnes & Wynne 2005: 14). The results from upstream activities will not be clear-cut or easy to formulate into recommendations of best way forward. But the good thing is that decisions based on upstream involvement will be more robust and sustainable than those based on downstream involvement.

MESSAGE:
SOCIAL SCIENCE SUPPORTING UPSTREAM INVOLVEMENT MEANS NO EASY SOLUTIONS OR CLEAR ADVICE ON BEST OPTIONS, BUT 'PLURAL AND CONDITIONAL ADVICE' (STIRLING 2005).

- Fifth critical issue: is a social science supporting upstream involvement needed/wanted?
- Problem: to all those who support a social science for assistance in down stream implementation, a social science promoting upstream involvement is a non-contributor (in fact a trouble maker)
- Solution: upstream involvement will lead to greater self-reflection in expert work. Experts will get the possibility to reflect on their hidden assumptions and discuss the social choices involved in their work and therefore become more social sensitive. This is a good way to go to achieve the greater public legitimacy that for so long has been searched for by using the opposite way of trying to educate and convince lay people by using 'pure' scientific fact

6 Summary of messages on critical issues

FIRST MESSAGE:
TECHNICAL EXPERTS MAKE SOCIAL CHOICES WITHIN TECHNICAL CHOICES
THIS MEANS CONCEALMENT OF SOCIAL ASPECTS
THIS IS A PICTURE OF STRONG TECHNICAL EXPERTS

- First critical issue: the concealment of social aspects
- Problem: concealment
- Solution: identify the social in the technical and do not be afraid to discuss technical issues as social choices, or even better as socio-technical choices. What to be afraid of? That lay people can add something of value and learn something?

SECOND MESSAGE:
SOCIAL ASPECTS – CONSIDERED OF SECOND PRIORITY – ADDED LATER ON AS A TOOL FOR ACHIEVING ACCEPTANCE TO READY-MADE TECHNOLOGY

- Second critical issue: social aspects of second priority
- Problem: strategic decisions already taken and not open for reorientation
- Solution: discuss what could be changed and what could not be changed, and *why*?

THIRD MESSAGE:
INTEGRATIVE INITIATIVES TEND TO BE ISOLATED ISLANDS USED TO OVERCOME CRISIS ON SPECIFIC TOPICS

- Third critical issue: fragmented and incremental process (isolated integration)
- Problem: integration often takes place within a broader technocratic frame. But how to keep alive the alternatives of integration?
- Solution: take care of the integrative examples. A guardian of the process is needed to keep memory alive

FOURTH MESSAGE:
NOT ONLY ISOLATION, STRONG EXPERTS ALSO MAKE SOCIO-TECHNICAL CHOICES INSIDE INTEGRATIVE INITIATIVES, DISGUISING THEMSELVES AS EQUAL PARTNERS

- Fourth critical issue: integration disguising separation
- Problem: technical experts are not equal partners
- Solution: be aware of the differences in power (resources) and competence

FIFTH MESSAGE:
SOCIAL SCIENCE SUPPORTING UPSTREAM INVOLVEMENT MEANS NO EASY SOLUTIONS OR CLEAR ADVICE ON BEST OPTIONS, BUT 'PLURAL AND CONDITIONAL ADVICE' (STIRLING 2005).
Fifth critical issue: is a social science supporting upstream involvement needed/wanted?

- Problem: to all those who support a social science for assistance in down stream implementation, a social science promoting upstream involvement is a non-contributor (in fact a trouble maker)
- Solution: upstream involvement will lead to greater self-reflection in expert work. Experts will get the possibility to reflect on their hidden assumptions and discuss the social choices involved in their work and therefore become more social sensitive. This is a good way to go to achieve the greater public legitimacy that for so long has been searched for by using the opposite way of trying to educate and convince lay people by using 'pure' scientific fact

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