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The role of compensation in nuclear waste facility siting

A literature review and real life examples

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Content

Acronyms

DiP	Decision in Principle
EIA	Environmental Impact Assessment
FIM	Finnish Mark
FPH	Fortum Power and Heat
HLW	High-level waste
ILW	Intermediate level waste
IVO	Imatran Voima
LLW	Low-level waste
NPP	Nuclear power plant
SNF	Spent nuclear fuel
STUK	Finnish Radiation and Nuclear Safety Authority
TVO	Teollisuuden Voima

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1. INTRODUCTION

The local council of the municipality of Eurajoki approved the siting of a spent nuclear fuel (SNF) facility in January 2000 by 20 votes to 7.[1] Before the local decision the representatives of the municipality and the nuclear industry had agreed on a limited compensation package for the municipality in return for hosting the SNF facility. The package, which consisted of a number of agreements, was an extra benefit paid by the nuclear industry beyond the tax revenue available in accordance with the Finnish legislation. In 1999 the nuclear waste management company Posiva estimated that the property tax[2] due for the SNF facility would be 0.22 million € (1.3 million FIM) in 2010 (the construction phase), 1.8 million € (10.7 million FIM) in 2021 (the operating phase) and 1.5 million € (8.7 million FIM) in 2030 (Posiva 1999a, 163). Furthermore, Posiva estimated in the EIA report of that year that the yield from property and local income tax brought into the community by the SNF facility would affect municipal finances in various ways in different candidate municipalities. In the municipality of Eurajoki less than half of the increase in tax revenues would go towards the state's tax revenue equalization. Annual tax revenues would be 0.017–0.71 million € (0.1–4.2 million FIM) during the construction phase and 1.18 million € (7 million FIM) during the operating phase at Eurajoki (Posiva 1999a, 164). By way of comparison the annual budget of the Eurajoki municipality was approximately 16.8 million € (100 million FIM) in the late 1990s. Total tax revenue of the municipality was 13 million € (77.2

[1] Posiva submitted the application for Decision-in-Principle in May 1999. DiP was approved by the Council of State in December 2000 and ratified by Parliament in May 2001 (Kojo 2009). In 2008 and 2009 Posiva submitted two applications for Decision-in-Principle of the expansion of the SNF repository (Kojo, Kari and Litmanen 2009a).

[2] 2.2% of the property's taxable value (Posiva 1999a, 163).

million FIM) in 1998 of which the property tax from the nuclear power plant facilities was 20%. (Eurajoki 1999a, Table 5.)

The main objective of this report is to introduce and analyse the local decision-making process in the Eurajoki municipality regarding the siting of the SNF facility, within the framework of compensation theory. The compensation case Eurajoki offers excellent empirical data for analyzing how the negotiations on compensation were implemented at the local level. The successful siting process is particularly interesting as a number of survey studies have suggested that compensation for a radioactive waste repository does not change the percentage of individuals supporting the facility. On the contrary, some compensation proposals have even decreased the existing support. (Jenkins-Smith and Kunreuther 2001, 371.) Even among hazardous waste facilities radioactive waste facilities seem to be an exception. The explanation offered is that radioactive waste is regarded with a greater sense of dread than is the case for other hazardous waste.

Although monetary incentives and other benefits have been widely applied in the field of nuclear waste management in many countries (see Richardson 1998) the conclusion drawn is that compensation-based siting has to date experienced little success (Frey 1996 et al, 1298 based on Portney 1991). However, two recent examples, one from Finland and the other from Korea, indicate that compensation can play a decisive role in decision-making during the siting of radioactive waste facilities (Chung, Kim and Rho 2008; Kojo 2009). Furthermore, in Sweden a local benefit package was agreed between the nuclear waste management company Svensk Kärnbränslehantering AB and the two candidate municipalities, Oskarshamn and Östhammar in 2009 before the company announced the site. The novel aspect of this arrangement is that the

municipality in which the facility is not located (now known to be Oskarshamn) will receive 75% of the total benefit package (around €200 million) given that Östhammar will receive all the attendant benefits associated with facility development.

The main questions posed in this report are as follows: Why was the compensation package a success in the case of Eurajoki? What were the phases of the compensation negotiations? Who were the main actors and what kind of roles did they play? And finally: What can be learned from this case study in Eurajoki? Is it possible to identify some prerequisites for a successful compensation package?

Even though this document is focused on the role of compensation, it does not suggest that all siting dilemmas can be solved solely on the basis of compensation. For example in Eurajoki's case, other approaches were also applied. Approaches such as public involvement and risk communication were implemented, mainly by the developer, within the framework of the environmental impact assessment procedure (see Posiva 1999, 57–63; Hokkanen 2001; 2007; Leskinen and Turtiainen 2002). The conventional approach of impact mitigation could also be identified (Posiva 1999b, Appendix 5). Furthermore, it should not be forgotten that the Radiation and Nuclear Safety Authority (in Finnish Säteilyturvakeskus, STUK) also took some action at the local level (Hautakangas 1997; Varjoranta and Hautakangas 2000).

The structure of this report is as follows. In Chapter 2 the main theoretical concepts are introduced and defined. This is achieved by reviewing literature focused on high-level nuclear waste and hazardous waste facility siting and the benefits offered. Chapter 3 is focused on introducing and analyzing the local decision-making in the municipality of Eurajoki in Finland. This is mainly based on two conference papers (Kojo 2007a; 2008) which were written as part of

the ARGONA project. The Eurajoki case study is also reported as an article (Kojo 2009). The empirical data consists of working party minutes received from the municipality of Eurajoki. In Chapter 4 the conclusions of the Deliverable are presented. Matti Kojo was the main author of this Deliverable, with extensive contributions and comments from Phil Richardson, especially with reference to the real-life examples in Section 2.2.

2. THEORETICAL FRAMEWORK

The aim of Section 2.1 is to briefly introduce compensation theory. In Section 2.2 the focus is on the key underlying concepts. The concepts are illustrated with some real life examples. The examples are based on the field work by Phil Richardson and these have been previously introduced in Richardson (1998) and developed further in Chapman, McCombie and Richardson (2008) and in ongoing work in the EU-supported Cowam in Practice project. This introduction is then followed in Section 2.3 by discussion about criticisms and lessons learned related to the theory of compensation, with regard to the siting of socially undesirable waste facilities.

2.1 The basic idea of economic compensation theory

A number of authors have studied the compensation approach to the siting of different kinds of hazardous waste facilities (O'Hare 1977, Portney 1985; Sigmon 1987; Kunreuther and Easterling 1990; Gregory et al 1991; Easterling and Kunreuther 1995, Frey et al 1996; Jenkins-Smith and Kunreuther 2001; Chung, Kim and Rho 2008). The aim of the above literature is, as for example stated by Kunreuther and Easterling (1990, 252) to investigate "*the question of the appropriate role that providing benefits to a host community can play in improving the chances of siting a facility that is perceived to be potentially hazardous.*" The general theoretical aim of the compensation literature is to improve the application of the utility model in siting processes.

According to O'Hare (1977) the failure in practice in dangerous facility siting is the strategic problem resulting "from failure to pay compensation to neighbours who suffer costs". O'Hare states that the siting problem should be viewed as a special case of the problem of resource

allocation between small but concentrated and large but diffuse interests. The total benefits at stake are larger for the diffuse interests who favour the facility but the per capita risk that motivates individual action is larger for the concentrated group of neighbours who oppose siting. (O'Hare 1977, 418–419.) The foundation of his compensation proposal (auction) is a real market, traded in by communities, that will properly allocate facilities among possible locations. According to O'Hare there is no government capable of making the optimal location decision, due to political pressure by interest groups. These pressures and the fact that distribution of political power among interest groups differs from the distribution of the total costs of siting results in the alternative of beginning to compensate victims for the costs of localized nuisance. O'Hare (1977, 408) is aware of diverse governmental responses[3], e.g. extension of citizen participation in public decision-making, due to problems in facility siting but he ignores those and requires us to recognize the biases of real-world circumstances, that is, the uneven distribution of political power.

According to Portney (1985, 82 originally based on O'Hare 1977) the theory of compensation is based on the provision of economic incentives. It is assumed in the theory that public opposition, for example against siting a repository, stems from a basic imbalance in individuals' benefit/risk calculations. Opposition by nearby residents to the facility is assumed to be based on the idea that there is an imbalance between the high personal costs they are asked to bear relative to the

[3] O'Hare (1977, 408) listed a variety of governmental responses to public investment problems, such as facility siting, that seem to threaten a few for the good of the many. Governmental responses, as originally categorised by Altshuler and Curry, include: (1) Growth in interjurisdictional political cooperation, (2) extension of citizen participation in public decision-making, (3) efforts to make cost and benefit analyses more comprehensive and (4) increased opportunities for procedural and litigious activity by previously underrepresented and minority interests. Also Easterling and Kunreuther (1995, 167, 170–172) have also categorized strategies of finding ways to increase the acceptability of unwanted facilities. They introduced four categories: (1) public education, (2) mitigation, (3) trust-building and (4) compensation.

benefits that accrue to a larger outside population. Thus these individuals would regard their losses to be outweighed by the benefits. The costs consist of different kinds of perceived risks and unwanted impacts. According to compensation theory, any negotiated benefit, either monetary or non-monetary, should be expected to redress the imbalance. Compensation given to residents would eventually outweigh the perceived risks. The expected outcome of the theory is that any imbalance would be redressed and public opposition would abate. (Portney 1985, 82.) The theory assumes that individuals are willing and able to make a comprehensive risk/benefit calculation without leaving out any major factors and that all values, such as health impacts, could be compensated for in one way or another.

According to Frey, Oberholzer-Gee, and Eichenberger (1996, 1299) conventional economic analysis assumes that offers of monetary compensation increase the willingness to accept otherwise unwanted projects. To win the support of a prospective host community, the compensation has to be large enough to offset the net disutility imposed by the project. According to Frey et al. (1996, 1299) *net disutility* includes the risk as well as the expected economic impacts. As examples they identify loss of employment and declining property values.[4] In general negative impacts have been classified as follows: (1) economic losses, (2) impacts to human health, (3) decreases in quality of life and (4) degradation of the physical environment (Gregory, Kunreuther, Easterling and Richards 1991).

In the conventional approach to compensation theory it is taken for granted that that it is possible to increase the acceptability of locally unwanted projects by increasing the compensation if

[4] It should be noted that when, for example a political party or a municipal council is estimating the net disutility, the result is dependent on multiparty negotiations in which a number of actors with differing values and views are involved. The estimation process is different compared to that performed by an individual.

support is not achieved. (Frey et al 1996, 1299.) However this assumption has not been validated in practice. Hazardous waste, and especially nuclear waste, facilities have still been perceived as very risky. Frey, Oberholzer-Gee and Eichenberger (1996) propose that the bribe effect and the crowding-out of intrinsic motivation are the key factors in understanding the frequent failures of compensation schemes. Health and safety might also be seen as inherent rights that should never be traded off for material goods. Jenkins-Smith and Kunreuther (2001, 377) state that mitigation and compensation will only be effective for those individuals who do not have extreme views on risk and trust. For those who feel a facility is not risky and who have trust, there is no need for additional measures. On the other hand those who feel significant risk and do not trust the safety barriers are likely to view economic benefits and incentives as bribery. Jenkins-Smith and Kunreuther (2001 have proposed that there should be a closer connection between compensation and negotiations on safety concerns, as a way of improving input to the compensation strategy.

It should be borne in mind that compensation theory is dealing with perceived risk. This means that these are subjectively defined by, for example, local residents, and are based on different kinds of information, values and assumptions. Thus compensation theory does not assume that the risks that are to be compensated for would be unanimously defined by scientific risk analysis. It is therefore important to understand the difference between statistical risk and perceived risk. In brief, the former is computed by experts whereas the latter is defined by affected people.

Carnes *et al.* (1983, 346) stated that an incentive-based program is not a device that could supplant technological or other social considerations in the siting process. Kunreuther *et al* (1987, 372, 382) noted that the compensation mechanism must be viewed as only one of a set of policy tools dealing with siting. Other tools include health and safety standards imposed by

governmental agencies. In addition, the public participation mechanism needs to be coupled with compensation procedures designed to allow affected parties to evaluate alternatives and to determine the required compensation payments.

Kunreuther and Easterling (1990, 252) suggested ways to modify the expected utility model so that it would take into account certain behavioral factors. They concluded that before initiating a compensation process some threshold level of safety to nearby residents must be assured. Jenkins-Smith and Kunreuther (2001) also introduced the idea of applying a safety/benefit package which could be seen as an attempt to achieve this threshold level of safety.

Frey, Oberholzer-Gee, and Eichenberger (1996, 1298) state that an economic theory of compensation is incomplete because it neglects the influence of moral principles and thus the theory must focus on the interplay between moral considerations and market forces. According to their interpretation of the relationship between political and market behaviour moral issues play a larger role in politics than in the market. In the former, expressing moral issues is essentially costless relative to the latter. (Frey, Oberholzer-Gee, and Eichenberger 1996, 1310.)

2.2 The key concepts with illustrating examples

The objective of this section is to introduce some of the key concepts associated with the use of the terms benefit, incentive, mitigation and compensation in siting contentious facilities. The aim is to help the reader understand the use of these terms and the relationship between them. The real life examples of nuclear waste management arrangements provided represent very often diverse aspects of a number of theoretical concepts which themselves are not always

unanimously defined in the literature. The examples are classified under the theoretical concepts which, according to the authors, best describe the main function of the arrangement. A broad tripartite division has been proposed by Richardson (1998), comprising 'Cash Incentives', 'Social Benefit' measures and 'Community Empowerment' measures and generally adopted in the UK (Nirex 2005). These are discussed in more detail below, together with some illustrative examples of their use. Many of the examples are also introduced in Chapman, McCombie and Richardson (2008).

2.2.1 Benefit[5]

All around the world an important safeguard generally offered to potential host communities is that the community should not find itself worse off than before the process began. This has in turn led to the development of a number of so-called 'impact mitigation' measures. Not least amongst these has been the offering of specific benefits packages to the community, not necessarily for bearing an increased risk, but simply for allowing itself to be considered. It is now generally the case that such benefits comprise a mixture of the purely financial and measures designed to assist the community to take part and ensure enhanced well-being beyond the lifetime of the facility in question.

[5] Based in part on Chapman, McCombie and Richardson (2008).

2.2.1.1 'Social Benefit' measures

These are compensatory measures intended to offset any stigma, perceived or actual, regarding either the community's participation in any stage of the siting process, or associated with the actual location, development and operation of the facility within the community or area.

These measures include such things as guaranteed property prices and guarantees of majority local hiring, as well as improvement to infrastructure such as roads and other services. However, these may appear to be pure incentives designed to attract a community in which such things may be absent or poorly developed, rather than offset a perceived or actual impact. Other measures, often contained within legal agreements, can include emergency preparedness training, and payments-equal-to-taxes (PETT). Again, some only become available after disposal operations actually begin.

Employment

In many cases the enhanced employment opportunities that will result from a repository development are advertised as potential benefits designed to encourage communities to become involved, although this can in some cases be perceived as disrupting an established employment profile, where an influx of outsiders can often be seen as a major detriment.

Examples:

- Canada ILW; 300 jobs are expected during repository construction
- France HLW; 350 jobs have been created at the Bure URL, as well as more from the associated economic development programmes

- Finland SNF; Posiva predict creation of up to 150 jobs during operation of the proposed repository at Olkiluoto

Infrastructure Improvements

In some cases the perceived impact of a repository concerns possible effects on local services, roads and related infrastructure. Here, improvements or upgrades are made to offset these potential impacts.

Example:

- US (WIPP): €14 million/a from 1998-2-12 to improve local roads and support infrastructure developments

Property Value Protection

There is often a strong perception in a potential siting community that the presence of a nuclear waste facility can reduce house prices and reduce the overall economic profile of a region. It is therefore not uncommon for benefit packages to include some form of property price protection, designed to compensate claimants for demonstrable decreases in value.

Example:

- Canada LLW; The Port Hope Agreement contains a scheme whereby property owners who can demonstrate that financial loss or mortgage renewal difficulties occurred between October 2000 and the termination of the siting program, expected in 2012, are eligible to claim compensation.

Integrated Development Projects and Miscellaneous Facilities

It is now increasingly common for community benefit packages to comprise integrated projects designed to benefit the community not only during the immediate siting process and subsequent facility operation, but long into the future (similar to Trust Funds), with structured development plans, comprising support industries, specialist services and linked research facilities seen in numerous programmes. It is normal that such benefits only become available following local agreement to host a facility and the granting of the necessary construction permits and regulatory authorisations.

Examples:

- Belgium LLW; as part of the integrated projects developed by the local community required for accepting a repository, Dessel called for a Community Digital Network and a Radioactivity Science Park and Communication Centre. In addition, they called for a Sustainability Fund, financed by the federal government, to support or implement projects that will contribute to improving the quality of the living, housing and working conditions of the Dessel population. The projects can cover various areas: social, economic, cultural, environment-oriented, health and welfare. The value of this Fund is currently the subject of negotiation.

- France HLW; Money from EDF, AREVA and CEA for an economic support programme for Meuse and Haute-Marne Districts.

- Spain Interim Spent Fuel Store (ATC); it is proposed to locate a Technological Research Centre adjacent to the facility, together with an Enterprise Park, with an overall total of some €50 million beyond the cost of the ATC.

- United Kingdom LLW; Approx. €10 million has been agreed for projects around the national disposal facility in west Cumbria, associated with an additional storage vault. Annual sums of around €1.5 million will also be paid during the operating life of the vault. The fund is now in existence.

- Finland SNF; TVO and Posiva arranged €252,000 funding for the Business Development Fund in Eurajoki during the period 1999–2004 and €150,000 during the period 2005–2009.[6]

Relocation of Developer

As part of the benefits offered to local communities for agreeing to host a repository, it is becoming increasingly common for the facility operator to offer to relocate its main operational headquarters to the locality. This is often seen as a vote of confidence in the safety of the facility. This is in addition to other benefits in terms of increased local taxes and improved employment opportunities associated with the move.

Example:

[6] See Section 3.3.

- Finland SNF; Although few other major benefits (cash/loan, infrastructure, community support) are being offered to the local area, as mentioned elsewhere, the main Posiva Oy offices have been moved to the area as part of the agreement regarding the old peoples' home.

Discounts (free electricity etc; ongoing health and environmental monitoring)

In some countries it is recognised that there should be some tangible compensation if a community fulfils a role considered to be in the national interest. This often consists of reduced utility fees etc. as well as schemes to incorporate regular monitoring of community health and environmental well-being are becoming more common.

Example:

- Lithuania LLW; In November 2007 it was agreed that communities in Visaginas Municipality, surrounding the proposed repository site near the Ignalina NPP, will benefit from reduced prices for electricity from the plant.

2.2.2 Incentive

In the broad sense defined "[*i]ncentives are a means of helping to achieve the best possible technical solution, one which might not otherwise be implemented because of social and political constraints*" (Carnes et al. 1983, 346). The definition by Carnes, Copenhaver, Sorensen, Soderstrom, Reed, Bjornstad and Peelle could be seen to represent the conventional technical approach in which the best solution is defined initially via technology, excluding any societal

context. Incentives thus aim at gaining acceptance for the technical solution, although they should not be seen as manipulation because an incentive is according to Carnes et al: ”*an integral part of a structured siting process, involving the creation of a mutually acceptable set of arrangements that make certain commitments and confer certain benefits for the acceptance of the proposed facility*” (Carnes et al. 1983, 329). Thus negotiations and benefit are at least closely related to incentives. Also definition by NEA (2007, 53) relates incentive directly to gaining acceptance as the concept is defined as “*a benefit to motivate local communities to accept a facility*”. Incentives can have either monetary or non-monetary form.

Carnes, Copenhaver, Sorensen, Soderstrom, Reed, Bjornstad and Peelle (1983, 330) categorize three incentive types defined briefly by their functions. These are as follows: (1) Mitigation: “*Actions geared toward preventing, reducing, or eliminating adverse impacts (costs and risks) before they occur.* (2) Compensation: “*Payment for actual damages in the event of an accident or anomalous event.”* and (3) Reward: “*Actions designed to award benefits to communities assuming risks for which others derive benefits.*” The interpretation of mitigation is technical in nature as the definition appears to be focused on impacts, not on perception of risk and mitigating it. However, mitigation is usually viewed as a pre-impact measure. Thus there is a difference to the institutional mitigation policies defined by Gregory et al. (1991, 671–672), which emphasize regulation and empowerment.

Carnes et al. (1983) make a clear distinction between compensation and reward as forms of incentive. The former is an ex post payment for *actual* damages, whereas reward is ex ante in character for bearing a risk. Reward and compensation both redistribute the benefits of facility siting. However, the definition of compensation is narrow, as it is reserved only for those

occasions in which actual damage has taken place. The definition of reward on the other hand presupposes that contracting parties could agree on the risks to be assumed as being present.

2.2.2.1 Cash (Monetary) Incentives

These are an incentive to a community to either become involved in a process, or to allow a development to continue, or both. In many cases the amounts concerned are fixed, having been laid down within some pre-existing legal instrument, whilst others are often open to negotiation after the initial expression of interest has been registered, as a way of maintaining community interest.

Lump Sums

These are payments made directly to the affected community in order to encourage participation. There may or may not be controls on what the money may be used for. Payments are often designed to be paid in instalments, subject to achievement of project milestones.

Examples:

- Canada ILW; €1.5 million
- France LLW; €5.5 million (at 1992 prices)
- France HLW; €20 million (distributed amongst many communities around the proposed facility)
- South Korea LLW; €241 million

- Taiwan LLW; €114 million
- UK LLW; approx €10 million

Annual payments

In many cases packages include regular payments, enabling local communities to estimate the benefit they could receive, depending on certain factors, such as the volume or activity of the waste emplaced. In some instances the amounts are specified within legal instruments.

Examples:

- Slovenia LLW; €5 million during operation
- South Korea LLW; €7.5 million (dependent on volume of wastes emplaced)
- Spain LLW; €1.6 million average (dependent on volume of wastes emplaced)
- UK LLW; €1.5 million during operation

Expert Support Packages

These are offered in some programmes to assist communities to commission reviews by independent experts, in order to demonstrate transparency in the way in which information is supplied to the community during a project. These funds often form part of the support provided as 'Community Empowerment', described in Section 2.2.3.1.

Examples:

- Canada ILW; €23 million of available support over the next 35 years.

- France HLW; €300,000/yr for Bure CLIS (the local review group).

- Sweden HLW; €217,000/yr. Local community review groups received funding from the National Waste Fund during the siting process (now complete).

Tax Revenue

In some cases, special taxes are payable to the local community as an additional incentive for involvement. Sometimes these are only available if a definite impact on local economic development can be demonstrated.

Examples:

- Finland L/ILW and SNF. Institutional monetary incentive, property tax income of nuclear facilities (2.2%). Since 2006 the property tax of nuclear facilities was excluded from the state's tax revenue equalization. Thus the tax income is paid for the host municipality without any reductions.

- France HLW; to fund the 2 Public Interest Groups (GIP's) for Meuse and Haute-Marne Departements, €10 million /yr 1999-2006, for each, corresponding to the tax due for 2 NPPs. In addition, since 2006 the Economic Development Tax and Technology Diffusion Tax has been payable, worth €20 million /yr each from 2007 until the repository site is confirmed.

Trust Fund for Future Generations

These are funds established which are intended to support the community in the long-term, in case the facility operation affects local economic development. Funds can also be established to

provide capability to carry out any necessary potential remediation in the future in situations where the original site operator is no longer in existence.

Examples:

- US LLW; EnviroCare (now EnergySolutions), Clive, Utah €22 million Bond and Perpetual Care Fund with €310,000 pa
- Belgium LLW; –not quantified to date, these were part of the conditions laid down by the selected host community, and are subject to future negotiation

Profit Sharing

It has been proposed in some instances to allow the host community to benefit from facility operation by some form of profit-sharing scheme, although in some cases this is paid as a levy directly to the relevant local government entity, who then allocate funds as appropriate.

Examples:

- US LLW, Barnwell, South Carolina; €9 million levy on annual fees in 2006
- US LLW, Clive, Utah: €3 million as levy on annual fees

2.2.2.2 Non-monetary incentives

Carnes et al (1983, 323) give as examples of non-monetary incentives independent monitoring and access to credible information in a site selection process. Non-monetary incentives are similar to the community empowerment measures (Richardson 1998) that are described below (see Section 2.2.3.1).

- Finland SNF: The candidate municipalities were asked to propose societal research subjects for the national nuclear waste research programme (JYT2001) in the late1990s.

2.2.3 Mitigation

According to Carnes, Copenhaver, Sorensen, Soderstrom, Reed, Bjornstad and Peelle (1983, 330) incentives are "*[a]ctions geared toward preventing, reducing, or eliminating adverse impacts (costs and risks) before they occur*". Gregory, Kunreuther, Easterling and Richards (1991, 671–672) have categorized two different kinds of mitigation policies: 1) Engineering mitigation and 2) Institutional mitigation. According to Gregory et al. (1991, 671) engineering measures "*are designed to reduce the residual statistical risks of a proposed facility and typically reflect well-defined probabilities based on the past performance of related systems*". Engineering mitigation measures could thus be seen representing the conventional technology and expert driven approach, which does not recognise the perception of risk by affected people. Engineering mitigation is however an essential part of facility design as it reduces statistical risks. Institutional mitigation policy "*seeks to regulate the operations of a facility or to directly empower the local citizenry in the facility siting decision*" (Gregory et al. 1991, 672). An example of strong empowerment of the local level is the veto right granted in accordance with Finnish Nuclear Energy Act of 1987.

According to Richardson (1998) some form of mitigation measures are offered *"to offset these perceived fears and potential financial impacts, should they occur. Such measures have also*

been offered not to compensate for risk or impact, real or imagined, but in recognition of the community's participation in an activity that is perceived as being in the national interest." Thus incentive is not aimed at compensating risks or any other negative impacts, but to encourage involvement in a siting process without any binding commitment. These kinds of incentive measures are similar to community empowerment measures (Richardson 1998) and to institutional mitigation (Gregory et al. 1991, 672). According to Chapman, McCombie and Richardson (2008) community empowerment measures include things such as local involvement in decision-making, capacity building, development of local partnerships to oversee the project and involvement support packages.

2.2.3.1 'Community empowerment' measures

These types of measures include those designed to allow a community to feel a sense of control over the siting, development and even operation of the facility. They usually include such things as establishment of local monitoring or review groups, especially where the community is a volunteer participant.

Also included here is the support available to enable local people, elected representatives, national and local journalists etc., to visit existing waste management facilities either nationally or internationally to gain familiarity with the proposed facility concept.

Examples now also exist of siting processes where these are developed in partnership with the prospective host community. Both local representatives and proponent join together in formal or semi-formal partnerships which examine the potential of the community to site a facility, and

develop integrated socio-economic projects designed to benefit the community in the long-term. A good example of this can be seen in Belgium.

Local Involvement in Decision Making

It is now becoming common for community partnerships to be established, involving local elected bodies, interest groups, citizen groups etc. and which are given the opportunity to influence certain details of the project, usually as regards the associated integrated economic development projects.

In many cases the local community possesses a right of withdrawal from a process, or a veto at certain defined points in the decision making process, usually via referenda or other forms of plebiscite.

The local community partnership often receives financial support to allow it to oversee the project and ensure that local views and concerns are taken into account throughout.

- Belgium LLW; The local partnerships established in 3 communities were provided with various forms of support, including €247,000 p/a to run a local office, €74,000/yr to carry out socio-economic studies and €74,000/yr to assist in design considerations

- France HLW; The local CLIS (review group) has an annual budget of €300,000.

Capacity Building

Somewhat similar to the above, this type of benefit also includes measures designed to allow the oversight group or partnership to become more knowledgeable about the issues involved, through activities such as organisation of meetings, discussions with independent experts, and visits to operating facilities. In some cases support is made available to assist other groups to become involved in the process.

Examples:

- Sweden HLW; the Review Groups established in the 2 potential host communities are funded directly from the National Waste Fund. The amounts varied as the process advanced.

  In addition, since 2004, Swedish NGO's have been able to receive support to enable them to take part in the siting process. A lump sum of €320,000/yr is available for all eligible groups to share, depending on the size of their membership.

- Finland SNF; five NGOs (three of them local) were funded once by the Ministry of Trade and Industry for information activities in relation to SNF management. The total amount provided was €34,650. Funding decisions were made in April 1999. Posiva submitted the DiP application in May 1999.

Development of a Local Partnership

As mentioned elsewhere, it is becoming common for community partnerships to be established in a repository siting process, in order to help develop local ownership and (e.g. in Sweden see Lidskog and Sundqvist 2004; in Finland Kojo 2009). They are usually based on a contractual agreement between the local community and either government or the implementer specifying the amount of resources available to allow participation.

2.2.3.2 Involvement support packages

The various payments and funding arrangements already mentioned are sometimes amalgamated into a single agreement to support local community involvement in a siting process without being financially impacted. These packages can therefore include items discussed already, such as secretarial support, use of experts, management costs for partnerships etc.

Examples:

- Belgium LLW. Here, €250,000/yr was available to support the partnership during the initial feasibility work, followed by €125,000/yr following agreement to site a facility (subject to current review).
- Canada LLW. Here all costs incurred by taking part in the process are covered by the federal waste management office.
- Canada ILW. Here consultants, reviewers and experts can be hired as part of €23 million of available support over the next 35 years.

Public involvement measures which have become highly popular during the last decade in the nuclear waste management sector (see NDA 2007; Päiviö Jonsson and Andersson 2009, 7–24) are another example of institutional mitigation. For example the Swedish efforts, which are perhaps the best known, started already in the early 1990s (Elam, Lidberg, Soneryd and Sundqvist 2009). Crucial elements of institutional mitigation policy are the willingness of agencies and authorities to overcome the minimal legal requirements in implementation and procedural effectiveness in actual decision making.

Examples:

- Finland SNF; The local liaison group between the municipality of Eurajoki and Posiva
- Sweden SNF; Development and implementation of the RISCOM Model[7]

2.2.4 Compensation

Gregory, Kunreuther, Easterling, and Richards (1991, 671) defined compensation as: [a] *some kind of payment to the host community, either in dollars or in services, to affect a desired redistribution of the facility's benefits and costs.*" According to their view "[*c*]*ompensation measures emphasize cost-sharing and the redistribution of gains, utilizing payments of money or*

[7] The RISCOM Model of transparency aims to offer a framework to improve the quality of stakeholders' communications. The model has emerged as an outcome of Habermas' theory of communicative action and Stafford Beer's organisational theory. (Andersson et al. 2004, 7–14.)

goods to address concerns of equity and fairness" (Gregory et al. 1991, 673). The first observation from this definition is that compensation can have either monetary or non-monetary form. As monetary benefits do little to enhance the attractiveness of a facility, as Kunreuther and Easterling (1996, 610) demonstrate, they suggest using mechanisms other than money to transfer some of the facility's benefits to local residents.

According to the definition by Gregory et al. (1991, 671) the receiver of the compensation is the host community. In many surveys (see Kunreuther and Easterling 1996, 606–608) the residents of the host or neighboring municipalities are surveyed as to the acceptability of the compensation measures. This should be borne in mind as there is a clear difference between political decision-making settings where local politicians take siting-related decisions as opposed to the residents directly. Although local politicians are influenced by the opinions of the residents, their voters, it could be hypothesized that the sensitivity of representatives to their voters is a crucial character of the local representative decision-making system. If there is a high level of trust in representative democracy and sufficient trust in safety, and a weak opposing movement against siting, the approval of the siting and the compensation package is in practice entirely in the hands of local politicians. This kind of setting might explain the success in the municipality of Eurajoki.

In their book "The Dilemma of Siting a High-Level Nuclear Waste Repository" Easterling and Kunreuther (1995, 175) define compensation as "*a procedure for redistributing some of the benefits of the facility to those individuals who are directly impacted by its construction or operation.*" This accomplishes two purposes as they (1) offset the negative impacts of the facility and (2) reward the host community for its responsible behaviour. This definition by Easterling

and Kunreuther focuses compensation on those individuals who are directly impacted, which suggests that there are some ways to estimate total levels of impacts between individuals.

There are different forms of compensation. The classification of monetary and non-monetary forms was described previously. Gregory Kunreuther, Easterling, and Richards (1991) have identified six types which are as follows: (1) direct monetary payment, (2) in-kind awards which directly replace resources that are expected to be lost due to the construction of the facility, (3) contingency funds which aim at covering any losses that might occur due a future accident or release of hazardous materials (a kind of a insurance), (4) property value guarantees which protect against any decline that might occur in the value of property near facility, (5) benefit assurance which is a guarantee of direct or indirect employment for community members and finally (6) economic goodwill incentives, which includes expenditure on projects identified as important for local residents.

Examples:

- South Korea L/ILW; Government's financial support of 200 billion Won (US$ 315 million) for the city of Gyeongju to locate a radioactive waste disposal facility (Chung, Kim and Rho 2008, 1024–1025).

- Finland SNF; The compensation package around the Vuojoki Agreement is a mixture of a long-term lease enabling direct monetary payment of €6.39 million and other economic goodwill incentives for benefiting the local community (see Section 3.3; Kojo 2009).

- Sweden SNF; The Oskarsham – Östhammar – SKB Agreement in which Oskarshamn will receive 75% of the total benefit package (around €200 million) given that Östhammar will receive all the attendant benefits associated with facility development

2.3. The lessons learned

The main lessons from these experiences of the compensation approach are, as Sigmon (1987, 178) stated, that a negotiated compensation prescription offers no easy solution to the siting dilemma. Recent experience repeats this conclusion, although there is a growing number of examples where decisions on facility siting have been made and where compensation has been a contributory factor (e.g. Finland, Korea). Kunreuther and Easterling (1996, 615) subsequently concluded that compensation strategy is subject to serious limitations when it comes to facilities that the public regards as particularly risky or of questionable legitimacy. Carnes et al (1983, 345) noted that "*an incentive may have consequences contrary to its stated purpose*" and because of that incentives "*should not be adopted and applied without prudent analyses*". Therefore other approaches are also needed for successful siting. Easterling and Kunreuther (1995, 167) have categorized strategies of finding ways to increase the acceptability of unwanted facilities. They introduced four categories: (1) public education, (2) mitigation, (3) trust-building and (4) compensation.[8] Also a requirement for legitimacy and fairness of the siting procedure was

[8] Easterling and Kunreuther (1995, 170–172) defined the categories as follows: the objective of public education is to convince the public that the probability of negative events is less likely and/or the consequences of those events are less severe than they might have feared. Mitigation is defined as different ways of reducing adverse impacts by limiting the degree to which the public is exposed to toxic materials. Trust-building means increasing the accountability of the relevant agency by explicitly improving its organizational capabilities and reforming the

emphasized by Kunreuther and Easterling (1996). As Carnes et al (1983, 346) noted, "*an incentive-based program is not a device that would supplant technological or other social considerations in the siting process*". But where compensation was applied as a part of a site selection process, what does the literature tell us? Lessons learned have been categorized here into the following categories:

1) General preconditions including issues such as features of the political context and waste disposal system,

2) Perceptions regarding safety and trust,

3) Legitimacy and voluntariness,

4) Moral evaluations and

5) Compensation strategy and local negotiations.

The first category provides a holistic picture whereas the others are more focused on particular issues. However, the categories overlap to some extent. For example, protection of public health, safety, and the environment is also mentioned as an element of the overall siting strategy (Carnes *et al* 1983, 344).

2.3.1 General preconditions

incentives. Easterling and Kunreuther emphazise that the management of an organisation must also possess a strong reputation as regards competence, conscientiousness and honesty.

One important lesson here concerns the need to pay attention to features of a country's political and cultural context. According to Kemp (1992, 28–29) the general attitude to the role of compensation in planning for industrial development is one of the key factors. He states that in countries with less centralised and less formalised town and country planning, and where commercial considerations are to the fore, compensation arrangements can be both common and varied in character, with the USA given as an example. Kemp also emphasises that certain features of the waste disposal system should be kept in mind. He recognises a difference between systems that are run on a "much more aggressively commercial basis" and those relying on "more central control". Kemp (1992, 29) states that the difference here is that more centralised control of the system ensures that regulation of wastes is not dependent on commercial arrangements.

How then can the differing features of the political context and waste disposal system be taken into account? For example Kunreuther, Linnerooth-Bayer and Fitzgerald (1996, 157, 161) remind us in their article on procedural legitimacy and fairness of siting strategies that a good siting process and a fair outcome will vary across individuals, interested parties and regions and that the views of moral justice and iniquity will differ between actors. They introduce the concepts of technical- and welfare-efficiency approaches, where the former means that the costs and risks of a facility as specified by experts are at a minimum at the chosen site. According to this approach siting criterion include the lowest cost and risks. The approach works best in hierarchical top-down political systems. The latter approach emphasizes residents' perception of risks. Thus a welfare-efficient solution refers to a site where the public's perceptions of risks and cost are lowest. Similarly, the best site would be the one with the lowest compensation required

by the community. Kunreuther, Linnerooth-Bayer and Fitzgerald (1996, 157) suggest that the approaches mentioned above could be combined.

Some general prerequisites for a compensation arrangement have also been identified. According to Carnes *et al* (1983, 344) the purpose of an overall siting strategy would be the creation of a mutually acceptable set of arrangements that make certain guarantees and confer certain benefits in exchange for the acceptance of the proposed facility. The strategy outlined consists of three basic, non-negotiable principles or prerequisites: (1) protection of public health, safety, and the environment, (2) a meaningful role for affected local governments in the siting process, and (3) a recognition of negotiation or bargaining as an appropriate if not overriding element in the decision-making process.

Sigmon (1987, 175) refers to a list (by O'Hare, Bacaw and Sanderson 1983) of characteristics indicating a favourable situation in which siting disputes should be amenable to a solution involving negotiation and compensation. These are as follows: (1) the siting dispute involves few parties, (2) potential opponents are geographically defined, (3) potential opponents are cohesive, (4) mutually acceptable outcomes exist, (5) impacts are clearly traceable to the project, (6) impacts are mitigatable or reversible, (7) the parties can offer a binding commitment, and (8) the parties are not initially hostile. Surprisingly Sigmon's list excludes consideration of safety, but this can be seen, however, by reading between the lines, in that the list includes the requirement for mutually acceptable outcomes. These are unlikely to be reached if the contracting parties disagree strongly in the perception of safety of the facility.

2.3.2 Perception of safety and trust

Trust in safety would seem to be a crucial factor for a successful compensation arrangement. Portney (1984, 416; 1985, 88) noted that the theory of compensation through economic incentives probably underestimates the role or magnitude of people's risk assessment in the overall benefit/risk calculation. According to Portney public policy aimed at altering the net result must pay more attention to the cost portion of the benefit-risk calculation. The conclusion drawn was that the technique of mitigating risks and then convincing people that those risks have in fact been mitigated, must be better taken into account in development of public policy toward siting hazardous waste treatment facilities. Otherwise the potential for success through compensation would seem to be quite low.

According to Kunreuther and Easterling (1990, 256) the initial precondition prior to initiating a risk-benefit trade-off process is that if residents trust the agencies responsible for constructing and operating the facility, then they will be confident that the risks are low. Kunreuther and Easterling state that standard risk assessments provided by experts will not be sufficient to achieve this trust. Thus, a threshold level of safety must be assured by building trust in the responsible agencies. Trust will produce a lower risk perception among local residents, and only then could there be attempts to initiate a trade-off process. Mitigation of facility risks is thus an essential step early in the site selection process, and one which improves the effectiveness of a compensation strategy by decreasing the bribe effect. (Kunreuther and Easterling 1996, 615.) However, a recent study by Sjöberg and Herber (2008, 41) proposes that social trust is less important than epistemic trust and antagonism. According to Sjöberg and Herber epistemic trust is related to concerns about the validity of the scientific basis for risk regulation. Thus, risk

communication should not only aim at developing more trust in the people and organizations responsible for risk management. There should not be too much trust placed in social trust. The differences of cultural contexts of risk communication were analysed in the WP4 of the ARGONA project (see Drottz Sjöberg 2009). For example in Finland there has traditionally been a high trust in institutions (see more about the legitimacy of Finnish democracy Melin 2009).

Easterling and Kunreuther (1995) analysed the question of whether public acceptance of a repository varies as a function of an individual's belief about the impacts of the facility. If traditional economic theory is taken as a starting point, the argument would be that individuals oppose having a repository nearby largely because they expect the facility to impose serious risks to their health, their environment, and their economy. (Easterling and Kunreuther 1995, 101.) Easterling and Kunreuther assessed the relation between an individual's willingness to vote in favour of a local repository and his or her perception of the facility's risk to human health and the environment. Their survey data (1995, 102) suggested that voting is, for example, sensitive to one's belief about the likelihood of underground water contamination. They also concluded – in line with the benefit-cost model – that voting preference is significantly predicted by the expected economic and psychosocial consequences of the repository. Thus, those individuals who expect the facility to stimulate economic growth in nearby communities were more likely to vote in favour of a repository. (Easterling and Kunreuther 1995, 103.) According to them (1995, 103–104) the risk of groundwater contamination and the expectation of economic benefit were two of the most important predictors of the voting behaviour. However, the public's concerns regarding the risk of a HLW repository are not only limited to their own personal welfare. Easterling and Kunreuther (1995, 106) demonstrate that the potential for serious impacts to future generations provides an independent source of opposition. They emphasize that

acceptance of the repository will not follow even if the risk to self is perceived to be nonexistent. Opposition will occur if the risks to others are perceived serious, regardless of how much risk individuals expect for themselves.

Jenkins-Smith and Kunreuther (2001, 373) remind us that failures of compensation have been interpreted as evidence that the expected-utility models provide inaccurate or incomplete descriptions of public responses to facility siting. They hypothesized that a compensation package would be much more palatable if it were combined with safety measures. Thus they propose applying the benefits/safety package approach instead of speaking of compensation only. A compensation strategy which combines safety measures and compensation into a locally negotiated package differs from the approach in which mitigation and compensation policies are viewed separately.

2.3.3 Legitimacy and voluntariness

Kunreuther and Easterling (1996) emphasize mitigation of perceived risks and legitimacy of the process. A particularly important measure is to address the public's safety concerns through mitigation. Furthermore, they suggest that it is important to induce more legitimate decision-making through voluntary siting, where the magnitude and type of compensation can be negotiated in advance (Kunreuther and Easterling 1996, 615.) They therefore propose a voluntary siting process with a negotiated compensation package. A key aspect of a voluntary procedure is, according to them (1996, 617–619), that no community is forced into accepting a facility against its wishes.

Easterling and Kunreuther (1995, 108–109) also emphasize that the acceptability of a certain technology is based not just on outcome-oriented factors - that is costs and benefits - but also on factors such as voluntariness of risk, degree of risk awareness, possibilities to avoid exposure or to take precautionary measures. These factors reflect the process through which a risk is actually imposed on individuals. According to Easterling and Kunreuther these factors indicate appraisals of legitimacy. Easterling and Kunreuther (1995, 108) state, based on Bernard Cohen, that traditional formulation of the acceptability problem focuses on the probabilities and consequences associated with potential adverse events. Based on analysed survey data they criticize this approach saying that consequential decision models provide an incomplete explanation of public acceptance and, furthermore, they state that broader societal issues also enter into the individual's decision. Thus the perceived legitimacy of the proposal to build a repository also moderates an individual's utilitarian-based judgement, not just the perceptions of risk to health and the environment, although these do play a major role in an individual's decision-making (Easterling and Kunreuther 1995, 114).

2.3.4 Moral evaluations

Frey et al (1996, 1310) identified three factors that influence the acceptability of compensation offers. Those offers related to decisions made in the political sphere are dominated by moral evaluations. The factors are as follows: (1) The conventional 'decide-announce-defend approach' crowds out civic duty in the candidate municipality and gives room for the bribe effect due to the compensation proposals. Frey et al believe that binding siting decisions are taken too early, thus causing many failures. (2) When a bribe effect dominates the debate, developers should not give

up too soon. Frey et al state that a compensation package meeting the needs of the residents can only demonstrate its effectiveness given sufficient time. (3) Frey et al suggest clearly distinguishing financial incentives from bribes in order to minimize the perceived moral cost of accepting compensation. The type of compensation given, such as in-kind compensation, should benefit the community as a whole. Widely-shared benefits would weaken the bribe effect as it is seen to be less of an attempt to buy votes in a particular constituency, for example.

Easterling and Kunreuther (1995, 106–108) conclude that concern for future generations appears to be an especially strong determinant of preference in the realm of nuclear technology. The survey data they analysed suggests that women are especially protective of the welfare of future generations.

The difference between men's and women's risk perception was reported in a recent survey carried out in the Municipality of Eurajoki and the neighbouring six municipalities in Finland in June 2008 (Table 1.). The mean value of women's risk perception concerning the well-being of future generations was 2.86 whereas men's mean value was 2.31. The differences between the groups were highly significant (sig. < .000). (Kojo, Kari and Litmanen 2009a.)

Table 1. Comparison of risk perception towards the SNF repository between men and women in the municipality of Eurajoki and neighbouring municipalities, Finland (mean value, scale ranging from 1 = I don't perceive a threat to 4 = I perceive a great threat, differences between the groups are highly significant, sig. < .000).

Dimension of risk perception	Mean value, men	Mean value, women
General safety	1,94	2,42
Own or family's safety	1,88	2,28
Safety of future generations	2,41	2,97
General health	2,07	2,61
Own or family's health	1,98	2,52
Health of future generations	2,42	2,99
General well-being	1,9	2,35
Own or family's well-being	1,82	2,33
Well-being of future generations	2,31	2,86

Based on the literature, Easterling and Kunreuther (1995, 107) provide two explanations, reflections of psychological mechanisms, why many individuals take into account the impact to future generations. The first suggests that people often consider that their moral obligation is to those who do not have a voice in the decision-making process. According to Easterling and Kunreuther (1995, 108) traditional benefit-cost analysis presumes a greater moral obligation to current generations. The second explanation is the notion of "generativity" originally proposed by Erik Erikson. According to this psychological mechanism, individuals seek to prevent outcomes that threaten the welfare of their progeny.

2.3.5 Compensation strategies and local negotiations

Carnes et al (1983, 345) emphasize that siting and incentives should be assessed from a community perspective, because of the significance of local community acceptance of the repository. One way to do this would be to encourage community self-examination of the costs, risks, and benefits of the repository and the prospective incentives. Kunreuther and Easterling (1996, 618) describe planning grants given to the communities that expressed an interest in

hosting a facility as designed "*to initiate a process so that the community or region would have input into the process and could specify conditions, including compensation arrangements, that would make the site acceptable to it.*" Planning grants can be non-binding in character, meaning that accepting such a grant does not imply a community's commitment to accept a facility. This strategy of independent assessments is similar to the concept of community empowerment and is predicated on the availability of suitable funding arrangements.

In addition to the community perspective, Carnes et al. (1983, 346) point out the difference between a uni-dimensional incentive and a multi-dimensional incentive package, where the latter is a package of incentives containing more than monetary payments, as described by Richardson (1998) and Chapman et al. (2008). According to Carnes et al (1983, 346) a multi-dimensional incentive package is more responsive to local concerns as intra-community variation in perceived costs and risks can be taken into account. Intra-community variation is also reported by Sigmon (1987, 177), following an analysis of Monitored Retrievable Storage (MRS) siting case studies in the US that the dichotomy between the local interest and the developer's interest on siting is oversimplified. According to Sigmon, the design of compensation mechanisms requires far more creativity than required by a two-party negotiation. Thus Sigmon called for readiness for multiparty negotiations in response to the multifaceted nature of local concerns.

Jenkins-Smith and Kunreuther (2001) conclude that the type of safety and benefit measures and the order in which they are framed make a difference in the level of local acceptance. They suggest that benefits should be presented initially in the form of some type of non-monetary return to the community. Otherwise, and especially if compensation is offered after mitigation measures, the compensation is likely to be interpreted as a bribe. They emphasize the importance

of negotiating safety concerns and compensation agreements with local interests as an essential ingredient of a successful siting process. (Jenkins-Smith and Kunreuther 2001, 380.)

Based on survey data Jenkins-Smith and Kunreuther (2001, 380) also suggest that linking the type of compensation to the characteristics of the facility may be important in efforts to gain acceptance. However, their study showed that the attractiveness of all compensation measures decreased the riskier the facility was perceived to be by respondents. Typically, a facility for nuclear waste is perceived as risky. The study covered eight different measures, such as large grants to local government, tax rebates to residents, compensation for property value losses and reimbursement for new public services.

3. A COMPESATION CASE STUDY: SITING OF THE SNF REPOSITORY IN FINLAND

The structure of the analysis of the Finnish case study is as follows: In Section 3.1 the development of the Finnish site selection process is introduced. It vital to understand how the site selection strategy was changed over the decades and how these changes provided room for local negotiations to take place. In Section 3.2 the analysis is focused on the development of the relationship between the candidate municipality and the nuclear industry. This section describes how the partnership between the municipality and the nuclear industry was deepened. The negative statement on SNF repository siting in 1993 was first negated in 1994 and only four years later a positive statement was issued by the local council of Eurajoki municipality. These Sections provide an overview of the political context in which the siting decision was made. Finally, in Section 3.3, the phases of the compensation negotiations that took place between 1998–2000 are analysed. In Section 3.4 conclusions are drawn.

3.1 The site selection process of the SNF repository[9]

The current Finnish nuclear power programme consists of four nuclear power plant (NPP) units built in the 1970s and early 1980s. Two of these units are situated in the town of Loviisa and two in the municipality of Eurajoki. A new NPP unit, 1600 MW European Pressurized Reactor, is under construction in Eurajoki, though badly delayed. The NPP in Loviisa is operated by Fortum Power and Heat Ltd (FPH, the former Imatran Voima Ltd, IVO) which is a part of the Fortum consortium. The main owner of Fortum is the State of Finland. The other nuclear power

[9] The section 3.1 is based on the conference paper "Local negotiation on compensation. Siting of the spent nuclear fuel repository in Finland" (Kojo 2007a; see also Kojo 2009) presented in the 10th ICEM, 2–6 September Bruges, Belgium.

company in Finland is Teollisuuden Voima Ltd (TVO), which operates the NPP in Eurajoki. The main owners of TVO are Pohjolan Voima Ltd which in turn is owned by heavy industry interests such as forest companies and Fortum with approximately 26 % of shares of TVO.

Finnish nuclear waste policy was formulated in the late 1960s, when an agreement by the governments of Finland and the Soviet Union was signed regarding the use of peaceful nuclear energy. This arrangement included the principle that the Soviet Union undertook to deliver the fuel and receive the resultant SNF from those reactors, which had been delivered to other countries. Thus IVO returned the spent nuclear fuel from Loviisa NPP to the Soviet Union, and later to Russia, during the years 1981–1996. (Sandberg 1999, 45–46.) In the 1970s and early 1980s TVO also negotiated reprocessing agreements, e.g. with COGEMA and BNFL (Björklund, Westerholm and von Bondsdorff 1994, 145–149).

The Government of Finland took a decision in 1983, according to which the primary alternative was to store waste from reprocessed spent fuel or spent fuel as such irreversibly abroad. The reason given was that the small amount of spent fuel produced in Finland. IVO's nuclear waste management was already in line with government policy since the company had transported spent fuel to the Soviet Union. The decision of 1983 did, however, require that the NPP licence holders, TVO and IVO, should be prepared for final disposal in Finland. The decision concerned the disposal of any spent fuel not transported for permanent storage abroad. The governmental decision left the door open to a disposal alternative in Finland. This was crucially important for the TVO Board, which had dismissed negotiations on reprocessing as too expensive. (Björklund, Westerholm and von Bondsdorff 1994, 145–149; Kojo 2005, 44–47.)

The Government's decision of 1983 also included a timetable for site selection. The three periods of the research programme were as follows: 1) 1983–85 site identification surveys for the choice of investigation areas, 2) 1986–1992 preliminary site characterisation and 3) 1993–2000 detailed site characterisation in areas proven most suitable in the previous stage. The Government's timetable was based on the timetable presented in TVO's programme (Raumolin 1982, 5, 7) for the final disposal of spent fuel.

In 1983 TVO began its research and development programme, which also included measures for site selection. This was an idealised model, where the selection of investigation areas was to be based on step-by-step phased studies (Litmanen 1994, 23). In Finland a total of 327 target areas were mapped. When choosing suitable bedrock, the general principle was to choose the most solid rock blocks based on the information gained from the bedrock research, the so-called "block-within-a-block" principle. The target areas were reduced to 162 on the basis of environmental factors, and to 61 on geological principles. In these 61 target areas, 134 investigation areas were specified. These 134 investigation areas were then divided into three groups in parallel with the geological classification by TVO, on the basis of population, landownership and transport facilities.

TVO submitted the area selection research material to the authorities in the latter part of 1985. The company identified a total of 102 rock blocks suitable for further research. Of these 101 were *"a result of the systematic selection and elimination process"* (Vieno, Hautojärvi, Koskinen and Nordman 1992, 22). On the basis of a statement by the Ministry of Environment, 17 areas were eliminated and 12 were redefined mainly because of conservation area plans. The Centre for Radiation and Nuclear Safety stated that the selection ought to pay special attention to

geological variations in the areas. Furthermore, Olkiluoto, in the municipality of Eurajoki, was chosen on the basis of a separate definition. According to the company's safety analysis the site of the NPP was in a special position because of its short transport distance. The other reason given was the fact that because of the rock block identification method, coastal areas were sparsely represented, as the approach used was not suitable for coastal areas. Thus, a total of 85 rock blocks, located in 66 municipalities, was listed. (McEwen and Äikäs 2000, 9.)

Some features of the voluntary approach were also adopted in the site selection process, when TVO approached possible candidate municipalities in writing in 1985. The company informed all the 66 municipalities in whose local area a potential research area was situated. However, the site selection was not based solely on the voluntariness of municipalities as was the case in Sweden in 1992 (Sundqvist 2002, 115–117).

TVO chose the Kalliolampi area in the municipality of Ikaalinen as its first research area in March 1986. However, the company very soon withdrew from Ikaalinen because of local resistance. The Chernobyl accident in April 1986 also had an impact on the political atmosphere. During 1986 the company conducted discussions on the research project with local representatives based on contacts made by the local authorities following TVO’s information letter. The aim was to ascertain the municipalities' possible voluntary attitudes, or even their willingness to commit themselves to a long-term site characterisation. (McEwen and Äikäs 2000, 9.)

TVO began preliminary site characterisation for the selection of a site for a repository for spent nuclear fuel in 1987. TVO selected five research areas: Olkiluoto in Eurajoki municipality, Veitsivaara in Hyrynsalmi municipality, Kivetty in Konginkangas municipality, Romuvaara in

Kuhmo municipality and Syyry in Sievi municipality. The sites selected represented different geological environments as was required by the Centre for Radiation and Nuclear Safety. TVO also argued that these Municipalities were prepared to accept the conducting of the research. (McEwen and Äikäs 2000, 10; Kojo 2005, 51.) The criteria were thus mainly geological, but some kind of voluntariness was also taken into account by TVO.

In 1992 two sites (in Hyrynsalmi and Sievi) were excluded from detailed characterisation, as their bedrock structure was found to be more complicated than in the other areas, and it was thought that further investigation would not yield sufficient information to reduce the uncertainty (Posiva 1999b, App. 7. p. 12). Thus, detailed site characterisation only included three sites: Olkiluoto in Eurajoki municipality, Kivetty in Konginkangas municipality and Romuvaara in Kuhmo municipality. At this phase local acceptance was not sought; in Eurajoki and Kuhmo the municipal councils stated that they would not accept disposal of nuclear waste in the municipality.

In 1997 a new site was selected. TVO and IVO had established the nuclear waste management company Posiva in 1995, because IVO's nuclear waste transports to Russia ended in 1996, when the export and import ban on nuclear waste included in the Nuclear Energy Act came into force at the same time as the expiry of the return agreement (Sandberg 1999, 50–51, 58–59). The new site at Hästholmen in Loviisa municipality was chosen in the same way as Olkiluoto due to its special position as a location of IVO's NPP. In 1997, at the beginning of the Environmental Impact Assessment procedure, a Posiva geologist concluded that the candidate municipalities *"are not placed in an order of preference based on any tables, if the bedrock of all of them is suitable. In the Finnish system we must be able to rely on the research results, and the decision*

must be made based on them. In the end the decision is political." (*Loviisan Sanomat* 31 January 1997.) The selection of Loviisa opened up the competition for the location of the repository between the two nuclear communities, Loviisa and Eurajoki.

Posiva applied for a Decision in Principle for the final disposal facility in May 1999. Olkiluoto was the only site included in the application. Posiva stated in the application that in all four areas researched it was possible *"to show sufficiently large and sufficiently integrated rock capacities, where the conditions are chemically and mechanically sufficiently suitable and stable to provide a sufficient barrier to prevent the release of radioactive substances, and which are suitable for the construction of final disposal facilities"* (Posiva 1999b, App. 5. p. 28). The conclusion of the safety analysis was that "*no surveyed area can be regarded as clearly safer than the others, neither does the safety analysis give any reason to discard any of the alternatives"* (Posiva 1999b, App. 5. p. 40). In other words, Olkiluoto was not chosen on a geological basis.

The company stated, that *"in evaluating the suitability of the site, attention must be paid not only to the geological conditions related to long-term safety but also to the aspects of the implementation of the final disposal. An essential factor regarding the implementation is also to gain local acceptance for the operation"* (Posiva 1999b, App. 7. p. 15). Thus political criteria became more important factors for site selection than geological and environmental criteria.

3.2 Development of the cooperation between Teollisuuden Voima and the Municipality of Eurajoki[10]

The nuclear waste issue had already been discussed in Eurajoki in the 1970s. The prerequisite of the municipal council for approval of the plan to build a nuclear power plant in Olkiluoto was that SNF should not be stored in Eurajoki. This view was based on the information provided by the nuclear power company TVO, which planned to reprocess and dispose of the spent fuel abroad. Consequently the general view that the nuclear waste would not remain in Eurajoki persisted in the municipality over the years, although the role of reprocessing in Finnish nuclear waste policy changed. In March 1980, after a struggle over the extension of the plan for the NPP area in Olkiluoto, TVO gave a written undertaking not to store spent nuclear fuel in the area. Opponents insisted that the construction plan should include defined limitations regarding the storage of radioactive waste, as it had not been registered anywhere. Later on, the opponents of final disposal recorded an objective in the Eurajoki municipal report that the Municipality should act such that the waste did not remain in Eurajoki.

This objective was a subject of a new controversy in the early 1990s as the opponents wanted to make the wording of the sentence forbidding final disposal more specific. Obviously they aimed at convincing TVO that the Olkiluoto site would not be selected for detailed characterisation. Although the wording was initially made more precise, proponents of TVO's plan managed to remove the sentence expressing a negative attitude to final disposal from the municipal report in

[10] The Section 3.2 is based on the conference paper "Local negotiation on compensation. Siting of the spent nuclear fuel repository in Finland" (Kojo 2007a; see also Kojo 2009) presented in the 10th ICEM, 2–6 September Bruges, Belgium, 2007.

1994. It was argued that the sentence forbidding disposal in Eurajoki would undermine the interaction between TVO and the local authorities. (Kojo 2004.)

The relationship between Eurajoki Municipality and TVO became closer after the neutralization of this forbidding wording. In August 1995 a cooperation agreement was signed. The agreement aimed at building cooperation in finding solutions for the goals of the contracting parties. According to the agreement the Municipality would ensure that decisions related to the activity of the company were made objectively and without delays, and TVO would ensure that the interests of the Municipality were promoted and taken into account in the company's activities. According to the agreement TVO also undertook to compensate the Municipality's proven costs due to the activities of the company. The most important goal for Eurajoki was to safeguard the amount of real estate income, as tax income was decreased due to the new tax legislation enacted in 1991.[11] TVO aimed at safeguarding its preconditions for operating the NPP, including nuclear waste management. By the agreement the parties attempted to establish a better basis for mutual understanding of each other's interests. (Kojo 2007b.)

According to the chairman of the Eurajoki council, preparations for forming the Municipality's opinion regarding the DiP application began around 1996. Posiva's Managing Director stated, in February 1996 in the Eurajoki Municipality and TVO liaison group, that the earlier the decision on the disposal site could be made the better it would be for both the power company and Posiva.

[11] Financial ties are an important factor in understanding the development of the relationship between TVO and Eurajoki. During the period 1984–1990 TVO paid total local presumptive tax of around 18.5 million €. Annually, the amount paid by TVO was about a third of Eurajoki's revenue income. The practice of levying the presumptive tax on business income was abolished from 1991 onwards, which caused Eurajoki Municipality a loss of 2.35 million € in revenue income in 1991 and 1992. The Municipality was, however, compensated by the State for the loss of income. The presumptive tax was replaced by a real estate tax based on the value of the property. The setting of the real estate tax was not straightforward as such, due amongst other things to the annual age reduction of the nuclear power station buildings. (Kojo 2004, 143).

The local authorities replied that Eurajoki wanted to be one of the alternatives in the selection. The reply was unofficial and cautious, because the opinions of the councillors were clearly divided.

The matter was taken up again in the liaison group[12] in March 1997, when the liaison group discussed *"further development of the prerequisites for the cooperation between the municipality and TVO"*. The concrete project was the final disposal plan. In April 1997 Posiva confirmed, that in the Environmental Impact Assessment procedure, the candidate Municipalities' visions would also be taken into account. One of the effects of Posiva's active quest for local visions was that the formulation of a municipality strategy was initiated in Eurajoki. The formulation of the strategy was influenced not only by discussing the selection of the final disposal site, but also by the weakened financial situation of Eurajoki Municipality and the desire to safeguard tax revenue.

The opening of the dialogue by the nuclear energy industry about the future image of the municipality did indeed produce results. The preparations led to the discussion of the project concerning the new old people's home which would replace the Vuojoki Mansion old people's home. The Municipal Manager proposed the idea to the liaison group in August 1997. However ideas concerning the utilisation of the Vuojoki Mansion had already been discussed in public. On the same occasion reference was made to the project of the municipality's multipurpose hall. In October 1997 the Eurajoki council decided that the Municipal Manager and the Planning Secretary would make a proposal for the programme and a timetable for the development of a

[12] A liaison group concentrating on bedrock research was established by the Municipality of Eurajoki and TVO (since 1996 Posiva) towards the end of the 1980s. The liaison group between Eurajoki and Posiva also acted as a follow-up and steering group of the Environmental Impact Assessment procedure during 1997–1999.

municipal strategy. The task set by the council was to create long-term visions of the future of Eurajoki municipality.

To draft the municipality's strategy, an extended working group from Eurajoki Municipality and the business community was established, and met for the first time in January 1998. In the extended liaison group, two local councillors and the Municipal Manager concentrated on examining the opportunities and threats presented by Olkiluoto to Eurajoki's municipal strategy. The threat perceived resulting from Olkiluoto was the fact that nuclear waste would remain above ground in Eurajoki, or that it would be transported to another locality, and that the Municipality would lose the tax revenue in both cases. The competition between Municipalities and the fear of loss of income featured prominently in the preparation of the strategy. The selection of Loviisa as a new candidate site in 1997 heightened the competition between the Municipalities. Another threat was seen in the Government's action. If the Government took a decision on the disposal of nuclear waste, Eurajoki would not have a leg to stand on when negotiating with the nuclear energy industry. Should Eurajoki block the final disposal with its right of veto, the three thought it would be possible that the Government could decide on the disposal of the waste. This would mean that the waste would stay in the municipality, but possibly without any compensation. Such a threatening scenario could only emerge if no other Municipality accepted the final disposal project either. One aspect of the final disposal is the possibility for the Municipality could negotiate an additional financial benefit, to be paid as compensation until the real estate revenue took effect. As an example of the compensation for the early years of "low income", reference was made to the old people's home project.

The progress of the final disposal project was also seen as helpful to the establishment of a third NPP unit in Olkiluoto. The real estate tax of the new nuclear power station unit, the annual amount of which was expected to amount to 2.5–3.4 million €, was seen as safeguarding the Municipality's permanent independence, whereas termination of nuclear energy production in Olkiluoto would mean loss of the tax revenue and compromise the municipality's independence. The possible environmental or image risks caused by the final disposal repository were not included in these threats. On the contrary, it was feared that the refusal to invest millions would damage the image of the municipality on a national level. There were also fears of the discontinuation of electricity production in Olkiluoto, so much so that it was feared that Eurajoki could lose its *"relative advantage"* as plants replacing nuclear energy do not have corresponding political opposition, and they can therefore be built elsewhere. In other words, Eurajoki wanted to remain as an oasis of the nuclear energy industry. In the catastrophic scenario, the Municipality's financial status would be weakened if no further construction work took place in Olkiluoto, and the activity slowly ceased. The future of Eurajoki was thus inextricably linked to the nuclear energy industry in Olkiluoto.

A result of the work of the extended Eurajoki Municipality liaison group was the presentation of the strategy plan, presented to the municipal council in September 1998. In December 1998 the Eurajoki municipal council approved the Olkiluoto vision as part of the municipality's strategy by 20 votes to 7, and including a positive view of additional nuclear energy as well as the final disposal repository.

3.3 The phases of the compensation negotiations in Eurajoki in 1998–2000[13]

The Vuojoki working party was established in January 1998.[14] It was established because of discussions related to the further development of prerequisites for the co-operation between the municipality and the nuclear industry. In the first phase the working party was consisted of nine members: five from the municipality, one of them was the municipal manageger and the rest local politicians, two from Posiva and two from TVO. Later as the negotiations were intensified due to the initiative of the municipality to approve the SNF repository siting the party was enlarged.

The development of the requirements during the compensation negotiations can be viewed in four phases: 1) setting the targets for the working party (early 1998), 2) the initiative of the municipality (August 1998 – January 1999), 3) compensation for the decreasing tax revenue (February – April 1999) and 4) compensation to offset the loss due to the new appeal of TVO (January 2000).

3.3.1 Setting the targets for the Vuojoki working party

The first phase in the development of the requirements, setting the targets for the working party, covers the period from the establishment of the working group 22 January 1998 to the middle of May 1998. During that time the members of the working party discussed the views of the

[13] The Section 3.3 is based on the conference paper "Compensation as Means for Local Acceptance. The Case of the Final Disposal of Spent Nuclear Fuel in Eurajoki, Finland" (Kojo 2008) presented in the WM2008 Conference, February 24–28, 2008, Phoenix, AZ.

[14] The working party held 21 meetings between the establishment of the party on 22 January 1998 and on 24 January 2000 when the municipal council of Eurajoki decided to approve the positive statement on the DiP application of Posiva for the SNF repository. The municipality of Eurajoki and TVO had also other liaison groups for interaction (see Kojo 2008, 5).

municipality and the companies on ownership and governance issues of the mansion. The starting point of the municipality was to replace the old people's home located in the Vuojoki Mansion with a new building and to use the mansion for activities serving nuclear waste management and nuclear energy production. The companies stated that the planning of the new old people's home was the responsibility of the municipality and that the working party should focus only on finding a beneficial use for the mansion creating added value for the municipality, Posiva and TVO. For example according to the Posiva the mansion and the use made of it should create a positive image both for the municipality and the companies. The mansion was not seen useful as office space. TVO wanted the municipality to have say in the use made of the mansion in the future, too. According to TVO the compensation issues should also be considered e.g. because capital transfer tax might be raised to an intolerable level. (Vuojoki Working party minutes of 22 January 1998.)

The parties agreed that they would present their respective alternative development ideas for the mansion. The other possible co-operation parties would also be consulted. The negotiating parties agreed on the processing schedule and the four sub-targets of the Vuojoki working group: 1) specified alternatives for the use to be addressed in the next meeting, 2) processing of the governance and financial plans for the mansion by August, 3) discussion of the renovation plan and the cost estimate by November and 4) the report of the working group was to be completed by the end of 1998. The parties agreed that the media would be informed in a moderate way. (Vuojoki Working party minutes of 22 January 1998.) For example, in the second meeting the parties decided to inform outsiders in general that the working party had been organized and that it was planning alternative ideas for the use of the mansion.

By the end of spring 1998 the working party had concluded that it would be advisable to separate the activities in the mansion and the ownership for the sake of flexibility. A foundation in charge of the activities would be easy for non-owners to join, too. Moreover, a foundation could gain status as a generally beneficial undertaking. Ownership would be organized by establishing a real estate company. The municipality could then sell the shares to the other owners. (Vuojoki Working party minutes of 13 May 1998.)

3.3.2 The Iniatiative of the Municipality of Eurajoki

According to the minutes, the representatives of the Municipality in the Vuojoki working party held their first meeting on 6 August 1998. In the meeting the members were acquainted with the renovation plans for the Vuojoki Mansion. The most important issue, however, was the decision to ask for a mandate for the negotiations from the political groups of the Social Democratic Party, the Centre Party and the National Coalition Party on the local council. The aim was to get compensation for the Vuojoki Mansion. The compensation should cover 1) the cost of building a new old people's home and 2) a moderate payment covering the planning phase of the repository, 2000–2010, when no real estate tax would be paid. It was planned to inform the local council, the local board and the leading civil servants later in autumn. (Vuojoki Working party, meeting of the representatives of the municipality, memo of 6 Aug 1998.)

This phase of asking for a mandate and setting aims for the compensation negotiations was an input of the preparation of the new municipal strategy of Eurajoki. The task set down by the local council was to create long-term visions of the future of the Municipality of Eurajoki. The preparation began in early 1998 within an extended liaison group between the representatives of

the Municipality of Eurajoki and the local entrepreneurs. In February 1998 during the preparation of the strategy the repository was interpreted as an option. The municipality could negotiate an additional financial benefit, which would be paid as compensation until the real estate revenue took effect (according to the timetable, in 2020). As an example of the compensation for the early years of "low income" a reference was made to the old people's home project. (Kojo 2009.) In June 1998 the local Social Democrats demanded that the municipality should decide as soon as possible whether or not it would approve the locating of the repository in Olkiluoto. According to the party group of Social Democrats a positive attitude would enable the development of basic health and social services of the municipality. A health and social services building was mentioned as an example. The new strategy, the Olkiluoto Vision, was approved by the local council by votes 20 to 7 in December 1998. The vision contained a positive attitude to the construction of a new NPP unit and a final repository (Kojo 2007a; Kojo 2007b). Thus the vision was a strong signal of readiness to approve the locating of the repository in Olkiluoto.

The aims for the compensation negotiation were specified by September. The requirements now included the renovation cost of the mansion and the payment covering the planning phase could be paid as funding for developing the business life of Eurajoki. The representatives of the municipality in the Vuojoki working party decided to get an estimate of the price of the new old people’s home before negotiating with TVO. In the meetings of the liaison group of the Municipality and TVO the company was regularly informed on the progress of the planning of the new old peoples’ home. The representatives of the municipality also decided to discuss with the Minister of Trade and Industry, Antti Kalliomäki, and the Minister of Finance, Jouko Skinnari, both Social Democrats, on the promise of paying real estate tax before the operation

phase of the repository. The promise was included in the Energy Strategy of 1997 (The Council of State 1997, 47). As the best option for governance they envisaged the real estate company taking care of the facilities and a foundation taking care of the activity. A foundation was seen as a flexible solution enabling new actors to join. (Vuojoki Working party, the meeting of the representatives of the municipality, the memo of 30 September 1998.) The view of the municipality on ownership and governance was also set as a starting point to be further developed for the final report of the working party (Vuojoki Working party minutes of 6 October 1998.)

The first compensation negotiations between the municipality and TVO and Posiva took place on 15 January 1999 in accordance with the compensation aims defined by the representatives of the municipality in the Vuojoki working party earlier. The first reactions of TVO were not recorded, but as the negotiations progressed TVO did not reject the initiative. (Vuojoki Working party, the meeting of the representatives of the municipality, the memo of 15 January 1999; Vuojoki Working party, the meeting of the representatives of the municipality, the memo of 18 February 1999.) Nor was the initiative a surprise for the company. The plans related to the final disposal and Posiva were prepared by the Director of Finance of TVO and the Municipal Manager on the mandate from the liaison group of the municipality and TVO issued in February 1997. In this phase the financial problems of the municipality due the decreasing state subsidies and real estate revenue were known. (Co-operation Group between the Municipality of Eurajoki and TVO minutes of 24 Feb 1997.) The possibility to start planning an old people's home project replacing the existing one in the Vuojoki Mansion was announced in the liaison group of the municipality and TVO in August 1997 under the issues related to the nuclear waste management. Thus the idea of using the Vuojoki Mansion for bargaining was born sometime between April and August

1997 because according to the minutes of the co-operation group the municipality had no plans to replace the old people's home with new one in April. (Co-operation Group between the Municipality of Eurajoki and TVO, minutes of 21 April 1997. Co-operation Group between the Municipality of Eurajoki and TVO, minutes of 25 August 1997.) According to the minutes of the Vuojoki working group the second round of the compensation negotiations took place one month later, on 18 February 1999. The representatives of the municipality in the Vuojoki working party decided to keep their compensation aims unchanged, which indicates some kind of bargaining on behalf of the nuclear industry. During the negotiations TVO and Posiva had proposed leasing the mansion. (Vuojoki Working party, the meeting of the representatives of the municipality, the memo of 15 January 1999; Vuojoki Working party, the meeting of the representatives of the municipality, the memo of 18 February 1999.) The municipality was willing to do so – thus it did not demand the establishment of a real estate company seen as the primary option in autumn – but it wanted the rental income and loan arrangements to be paid in advance. A long-term commitment was also emphasized. A draft of a leasing and loan agreement was delivered to the members of the working party at the end of February. (Vuojoki Working party minutes of 26 February 1999.)

3.3.3 Compensation for the decreasing tax revenue

The initiative of the municipality had opened up a new phase in the compensation negotiations. The atmosphere became even tenser due to the tax appeal of TVO concerning the real estate tax of the NPP facilities in 1993. The appeal was submitted in early 1999. Later, at the end of December 1999, after the Supreme Administrative Court had rejected the appeal of the

municipality against the judgement of the Administrative Court on the TVO's appeal regarding the real estate tax of 1993, TVO appealed against the real estate tax of the NPP facilities for the tax year 1994. The Managing Director argued that the Board of TVO and the operative management might have been called to account unless an appeal from taxation had been submitted to the Administrative Court. (Kojo 2004, 127–158.) In addition, as the outcome of the appeals the economic dependency of Eurajoki on TVO intensified.

The intensive negotiations of the working party lasted two months until the end of April 1999. The participants at the meeting on 26 February decided that in future the real estate tax issues would be handled in the working party, too.[15] The original aim of the Vuojoki working party was thus broadened. Therefore the importance of the working party increased as it became an arena for negotiating on the means for compensating the possible decrease of tax revenue in such a way that both TVO and the municipality would benefit. According to the minutes the Managing Director of TVO participated in person in the negotiations at the working party meeting for the first time on 26 February 1999. The municipal accountant and later also the chair of the local council joined the working party. (Vuojoki Working party minutes of 26 February 1999.) The minutes do not record if the representatives asked for a new mandate for the negotiations because of the new task. On the other hand the working party was strengthened by the new members.

TVO's Managing Director presented a plan for a tax compensation package in March 1999. According to the plan TVO would pay in compensation a 20 per cent share capital loan and a 0.5 million € capital loan investment for an ice hockey stadium project in Eurajoki. Furthermore, the

[15] Interestingly at the meeting of the liaison group of the municipality and TVO on 1 March 1999 a decision was made that the task of the Vuojoki working party was enlarged by giving all the issues related to the possible disposal plan to be handled in the Vuojoki working party. A similar decision was already made in the working party a week earlier on 26 February. The example indicates the use of power by the Vuojoki working party.

message of the top management of TVO was that fixing the Vuojoki loan arrangement would be possible for taking care of the tax compensation. A sub-working group had also considered different options for tax compensation, e.g. the funding of the Eurajoki Business Development Fund, housing production in Eurajoki, the development of the local upper secondary school as a mathematics and natural sciences oriented school and sponsoring local events and associations thus reducing the support supplied by the municipality. (Vuojoki Working party minutes of 9 March 1999.)

However, the municipality had some new initiatives related to compensation. The Municipal Manager presented the plans to take fiscal legal initiatives related to the real estate tax of the repository and for not counting the real estate tax as part of taxation equalisation. The municipality required that these initiatives should be processed before the municipality's statement on the siting of the repository in Eurajoki. TVO and Posiva heavily criticized the municipality's plan, arguing that the initiatives jeopardised the Vuojoki Agreement, because the companies could not influence on the initiatives and furthermore that the planned schedule for the DiP application might be delayed due to preparation and processing. (Co-operation Group between the Municipality of Eurajoki and TVO minutes of 24 February 1997; Kojo 2007a.) The negotiating parties agreed to a waiting period of two weeks.

The Municipality did not, however, withdraw the initiatives, but was ready to adjust some details. The companies stated again that the DiP procedure could not wait for the processing of the initiatives which moreover might cause delays and unexpected political repercussions. The companies tried unsuccessfully to convince the municipality that the initiatives should be included in the statement on the DiP application. (Vuojoki Working party minutes of 23 March 1999.) The municipality submitted the initiatives to the Ministry at the end of March. However,

the companies gained a very important change in the arguments evinced by the municipality to justify the higher real estate tax. In a draft the municipality referred to the increased safety risks of the final disposal, but due to the comments by the industry this argument was removed from the final wording of the initiative document. (Vuojoki Working party minutes of 23 March 1999 and of 26 March 1999; Eurajoki 1999b.)

The draft of the leasing and loan agreement was further discussed and agreed on in the two meetings of the working party in April. Thus it was the delay of the Decision-in-Principle procedure and political uncertainty which might have followed the fiscal initiatives that the companies were most worried about. The outlines of the tax compensation of 1993, consisting of 0.5 million € loan as part of the Vuojoki Agreement (totally 6.39 million € + 0.5 million €) and the remaining 0.5 million € as a shareholder loan for the new ice stadium company, were agreed on in the working party while the details were settled in the sub-working party. (*Satakunnan Kansa*, 5 May 1999; Vuojoki Working party minutes of 23 April 1999.) As a summary on the agreement package the Managing Director of Posiva stated that all the economic benefits the municipality had required from Posiva related to the repository for spent nuclear fuel were recorded in the agreements. The rental income on the mansion and the loan for the new old people's home were interpreted also to cover the "some other payment" during the research and construction phase of the repository, which was required by the municipality in the fiscal initiative to the State. (Vuojoki Working party minutes of 23 April 1999; Eurajoki 1999b.) The municipal board of Eurajoki proposed that the local council approve the Vuojoki Agreement on the condition that Posiva should consider Eurajoki as the sole site for the repository. This condition was not discussed according to the minutes in the working party. The local council approved the proposal on 3 May by 20 votes to 7. The agreement was signed by Posiva and the

Municipality of Eurajoki on 26 May 1999. At the same day Posiva submitted the Decision-in-Principle application to the Council of State.

At the end of 1999 the Vuojoki working party were delegated by the liaison group of the municipality and TVO to prepare a proposal for the continuation of the programme for future work. The programme was presented in the Vuojoki working party in the end of November and in the liaison group a few days later. The aim of the programme was to prepare a sufficiently detailed plan to ensure that the renovation would not be delayed and that the organising of the activity for the mansion would be completed in time. (Vuojoki working party minutes of 30 November 1999.)

3.3.4 Compensation for covering the loss due to the new appeal of TVO

In January 2000 the most urgent issue in the Vuojoki working party was the negotiation of the tax compensation related to the appeal of TVO from the real estate tax of 1994. The new appeal meant that the municipality needed to reimburse TVO to the extent of 1.19 million € in March 2001. The reimbursement was a severe setback for the liquidity of the municipality. The preparation of a proposal for tax compensation for 1994 was given as a task for the working party (Co-operation Group between the Municipality of Eurajoki and TVO, the minutes on 3 December 1999) thus TVO was well prepared for the negotiations as the representative of the company had already a mandate from the Board of TVO to negotiate on buying the share of the municipality of the Olkiluoto and Orjasaari water area for 0.84 million €. The company also undertook to pay 50,000 € per year for five years to the Business Development Fund in

Eurajoki.[16] Furthermore, TVO was ready to help the liquidity of the municipality with a loan of 2.35 million € at an interest rate of 0.75 x euribor 3 months or 6 months. The requirement of the municipality was that tax compensation worth 1.19 million € in total should be agreed before the meeting of 24 January, at which the local council would decide on its statement concerning the DiP application for the repository. According to the municipality the compensation should be 1.19 million €, but TVO could decide the means for its implementation. TVO also undertook to pay the cost of the activities of the schools in Eurajoki that were held in the ice stadium. TVO negotiated the payment directly with the ice stadium company. The total cost was not mentioned in the minutes. (Vuojoki working party minutes of 10 January 2000; Vuojoki working party, the meeting of the representatives of the municipality, minutes of 18 January 2000.)

The representative of TVO stated that TVO neither deemed it necessary nor did it want a separate umbrella agreement on the issues addressed because the separate agreements would lead to the desired legal effects. Neither did TVO wanted to link the agreements in any way to the real estate tax issue, because the company could not compensate for legally mandated taxes. (Vuojoki Working party, the meeting of the representatives of the municipality, minutes of 18 January 2000.) Thus, agreements were not presented as a package.

The positive statement on the Decision-in-Principle application of Posiva prepared in the Vuojoki working group was approved by the local council of Eurajoki by 20 votes to 7 on 24

[16] In 2004 TVO and Posiva decided to pay the Business Development Fund in Eurajoki a further 150,000 € during the period 2005–2009 (*Satakunnan Kansa* 19 August 2004).

January 2000. The decision of the local council became legally binding on November 2000, when the Supreme Administrative Court rejected the appeals against the judgement.[17]

3.4 Conclusions of the Eurajoki case study

The main objective of this report is to introduce and analyse the local decision-making process in the Eurajoki municipality, Finland regarding the siting of the SNF facility, within the framework of compensation theory. Local negotiations between the municipality of Eurajoki, the nuclear waste management company Posiva and the nuclear operator TVO, which is also the biggest shareholder in Posiva, offer an excellent case study to allow a better understanding of the development phases and contextual factors of local compensation negotiations. The main questions posed are as follows: Why was the compensation package a success in the case of Eurajoki? What were the phases of the compensation negotiations? Who were the main actors and what kind of roles did they play? And finally: What can be learned from this case study in Eurajoki? Is it possible to identify some prerequisites for a successful compensation package?

Lessons learned from the compensation theory literature were categorized into the following categories[18] which also help to understand the Eurajoki case.

1) General preconditions including issues such as features of the political context and waste disposal system,

[17] There were two appeals against the decision of the local council. The appeals were submitted in February to the Administrative Court of Turku, which rejected them in May 2000 and later to the Supreme Administrative Court.

[18] See Section 2.3.

2) Perceptions regarding safety and trust,

3) Legitimacy and voluntariness,

4) Moral evaluations and

5) Compensation strategy and local negotiations.

Table 2 summarizes factors that had impacts on the local negotiations on compensation in Eurajoki. Practises of mitigation, incentive, benefit and compensation in the case of Eurajoki are introduced in Table 3. First, general preconditions[19], such as political context in Finland, and role of local level in nuclear waste management in accordance with the Nuclear Energy Act gave the municipality a powerful position as the local council was vested with right of veto which could not be overruled by government. The municipality was also invested with a strong tradition of representative decision-making, but with very little public engagement. Thus the municipality had a clear and independent position in the negotiations. Furthermore, it was clear that the negotiations on site selection could be carried out directly with the nuclear industry. No direct government involvement was needed, although the second government of Prime Minister Paavo Lipponen (Social Democratic Party) had expressed its support for nuclear waste management in line with the policy decision of 1983 in the 1999 government programme. The policy decision included site selection by 2000. The possibility of 'governmental actions', that is the fear of

[19] Former Director General of STUK, Professor Antti Vuorinen (2008) has also listed the factors, which seem to be important in gaining public acceptance in Finnish nuclear waste management. (1) Coverage and clarity of objectives of the regulation, (2) Clarity of responsibilities, (3) Local self-government, (4) Legal obligation to be independent in managing with nuclear waste in Finland, (5) Legal ban to import nuclear waste, (6) Clear and long standing time schedule, (7) Clear and reliable financing system for waste disposal, (8) Triennial review of waste disposal developments, (9) Independent international reviews of disposal development, (10) Openness, using normal channels for interaction with the public, (11) General reliance on the stability of Finnish rock as a part of Scandinavian plate and (12) Confidence on regulatory system of nuclear safety.

Table 2. Summary of the case study of Eurajoki.

Categories	The case of the Municipality of Eurajoki	Impacts on the local negotiations on compensation
1) General preconditions		
Political context	Nordic welfare state with relatively high public trust in societal institutions Strong local government based on representative democracy and preparatory power of civil servants Weak culture of public participation	Basic trust in societal decision-making although the EIA procedure was criticised for example in respect of the breadth of coverage
Role of local level in NWM	The municipal council was granted the right of veto over nuclear facility siting in accordance with Nuclear Energy Act of 1987. No independent expertise in the municipality	Right of veto forced the industry to cooperate with the municipality, cooperation groups between the nuclear industry and the municipality established
2) Safety and trust		
Protection of health and safety	Trust in STUK and Posiva in safety related issues	Trust in STUK and Posiva about safety helped discussions to focus on economic aspects
3) Legitimacy and voluntariness		
Site selection strategy	Site selection based on pragmatic approach in which the investigations by Posiva were reviewed by STUK	Eurajoki originally opposed the siting in Olkiluoto until 1994, but subsequently issued a positive statement on the DiP application in 2000 following agreement on economic issues
Public participation in NWM	Public involvement took place as part of the EIA process and public hearing as part of DiP process	Compensation was not discussed in either of these processes
4) Moral evaluations		
Opposition group	In the late 90s over 30% of the residents of Eurajoki disagreed with siting in Olkiluoto, however there was no strong, coherent local anti-siting group	Two appeals against the municipal decisions afterwards but no external pressure (for example in local media) on local negotiations, unlike was seen in the municipality of Loviisa
Media	Posiva had good connections with media	Local media framed agreements in positive way
5) Compensation strategy		
Potential benefits of the SNF repository	Jobs, real estate tax revenue, the Vuojoki Working Party established for negotiations	Eurajoki heavily dependent on tax revenue paid by TVO with respect to the NPP, liquidity problems in late 1990s due to reform of taxation system resulted in desire to gain from repository development
New build of nuclear power plants	Debated since the 1980s, in 1998 the municipality announced a positive attitude to locating the new NPP unit and the repository in Olkiluoto	Eurajoki wanted to safeguard its relative advantage as a Finnish nuclear oasis and potential location of the new NPP unit

Table 3. Practices of mitigation, incentive, benefit and compensation in the case of Eurajoki.

Main type	Sub type	Under control by	
		public sector (the state, the municipality)	**the nuclear industry (TVO and Posiva)**
Mitigation			
- Engineering*			
- Institutional	Local involvement	*Nuclear Energy Act (veto right), EIA Act*	*Implementation of EIA procedure*
	Capacity building	*Funding NGOs***	*Co-operation group with the local politicians*
		STUK's local information activities, municipality representatives in publicly funded nwm research program	*Study visits*
Incentive			
- Monetary	Tax revenues	*Real estate tax of nuclear facilities*	
Social benefit Measures	Employment	*Tax income*	*Posiva predict creation of up to 150 jobs during operation of the proposed repository*
	Infrastructure Improvement	*Renovation of the Vuojoki Mansion*	*Renovation of the Vuojoki Mansion*
			Construction of an ice-hockey stadium
	Development projects		*Funding of the Eurajoki Business Development Fund*
	Relocation		*Posiva headquarters from Helsinki to Eurajoki*
	Public relation		*Sponsoring local associations*
Compensation	Loan		*Posiva loaned money for the municipality and leased the Vuojoki Mansion owned by the municipality. Loan paid back with rent income.*
			TVO granted a loan for the municipality to help it to overcome liquidity problems.
	Transaction		*TVO bought a water area owned by the municipality*

* Not in the scope of this study.

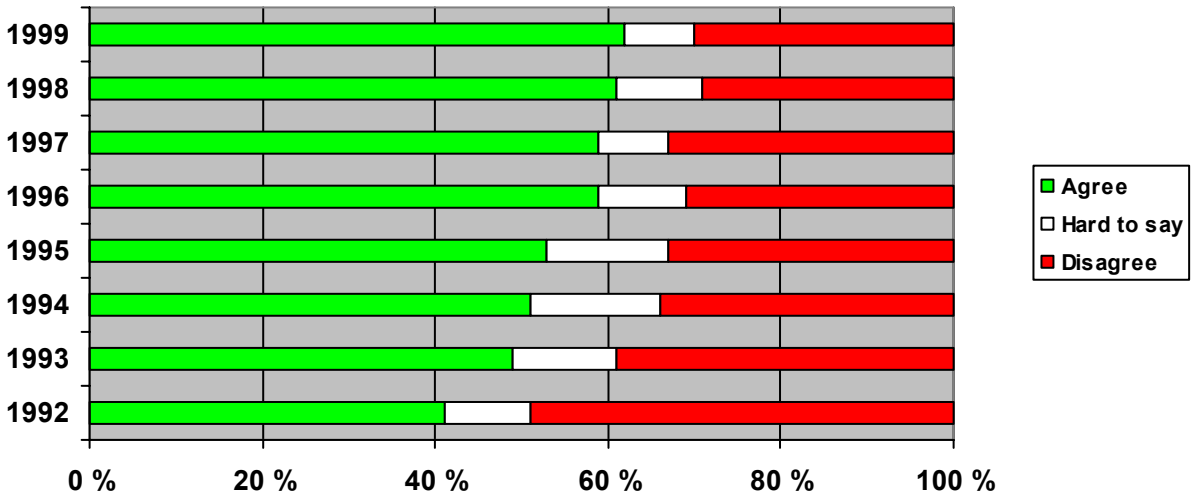
** One time funding by the Ministry of Trade and Industry in 1999.

involvement of the government in site selection (see Kojo 2009, 179), was one motivation for some local politicians to keep the initiative in their own hands.

Second, one should take into account that the compensation negotiations did not take place out of the blue. The relationship, social trust, between the key actors had developed over a long period and there had been different phases. In the early 1990s the municipality of Eurajoki was still against locating the SNF repository in its area, but by the end of the decade the local council had begun to take a positive view (see Kojo and Richardson 2009; Kojo 2009, 174–185.) Thus, in a relatively short period of few years the attitude of some local councillors was changed. However, as has been indicated in the compensation theory literature, money alone does not necessarily guarantee success in a site selection process. This was the case in Eurajoki, too. The leading local politicians had enough trust both in STUK and in Posiva in relation to health and safety issues and therefore the siting negotiations could take place. Also public opinion changed gradually towards more positive attitude in the late 1990s. However some 30% were still against the repository siting in Olkiluoto (see Figure 1).[20]

[20] According to a postal survey 42% of the residents of Eurajoki agreed with the statement "Nuclear waste produced by TVO and Fortum should be disposed of in Olkiluoto". 24% were neutral and 36% disagreed with statement. The survey was carried out in June 2008. (Kojo, Kari and Litmanen 2009b, 5; Kojo, Kari and Litmanen 2009a.) TVO and Fortum are the owners of Posiva.

Figure 1. Distribution of opinions within Eurajoki in 1992–1999. Those interviewed replied to the question: "If the research shows that my municipality of residence is a safe place for the disposal of nuclear waste, I would accept the disposal of the Finnish nuclear waste in the area of my municipality."



Source: Based on surveys by Pentti Kiljunen; see Kojo 2006, 67.

Third, the Finnish site selection strategy became more pragmatic in the 1990s which gave room for local negotiations between the nuclear industry and the candidate municipalities (Kojo 2009, 168–174). This change, possibility of local negotiations, obviously made the siting process look like more legitimate at least from the point of view of local politicians in Eurajoki. Although the nuclear industry had had its eye on the Olkiluoto site for years, the crucial initiative for compensation negotiations was taken by some local politicians. Thus, in the final phase the municipality volunteered. The leading politicians were able to have intra-community negotiations and they were given mandates for negotiations from their political groups. The co-operation agreement of 1995 between the municipality and TVO and the Olkiluoto Vision of 1998 had paved the way for the final step (Kojo 2009, 177–180). Thus, the supporters of the plan

were active in local decision-making. There was interest not only in the location of the SNF repository but in the development of nuclear industry in general. The local politicians in favour of the Finnish nuclear industry could even be regarded as some kind of mediators (see Elam et al. 2009, 6–9) acting within the local representative decision-making system. These persons had close relationships with the nuclear industry but at the same time they were also well aware of the interests and needs of the municipality. Perhaps partly due to this dual position the compensation request of the municipality was modest (e.g. compare this to the financial support worth US$ 315 million offered in South Korea for locating a radioactive waste facility, Chung et al. 2008, 1024).

This local understanding of the interests of the nuclear industry has also been explained with cultural integration. The NEA report (2007, 40–41) states that readiness to consider hosting a radioactive waste management facility should not be seen as a sign of dependency. Instead, the reason for this lies in cultural integration. Communities with already located nuclear facilities within their territory have according to NEA report an existing cultural basis for facility development as they have integrated the industrial activity and cognitive understanding into their culture. The NEA report (2007, 40–41) states that "developing joint solutions consists of building on and adding to that existing cultural basis." However, according to the survey date collected in Eurajoki in 2008 this cultural integration is not self evident and it seems to be actor dependent. Thus a nuclear utility needs to “earn” its trust and it seems to be difficult to exploit local existing cultural basis by a new comer. Furthermore, ‘industry awareness’ seems to be stronger among certain social groups. (Kojo, Kari and Litmanen 2009b.)

Fourth, in moral considerations it is interesting to ask why no strong bribe effect took place in Eurajoki. It should be noted that in Eurajoki there was no strong external pressure by any local opposition group during the compensation negotiations (Kojo 2006, 67–70). Thus the media reported on progress of the negotiations based solely on press releases from the contracting parties. Posiva in particular seemed to have very good connections with journalists whereas the local opponents were labelled more or less as 'village idiots' (Tommola 2001, 87–90, 93–95). When reporting the agreements and the role of municipality the discourse of local media emphasized the systematic nature of the municipality decision-making and the level of co-operation. Negotiations were framed in a positive light in accordance with the strategy of the municipality. In other candidate municipalities the media reported negotiations in Eurajoki in a framework of competition between the candidates. Eurajoki was portrayed as a rule breaker, playing a rough game and Posiva was also criticized. (Häkli 2001, 111–113.) For example, in January 2000, the main Finnish newspaper, Helsingin Sanomat, presented the municipality as greedy because of the Vuojoki Agreement. The newspaper stated that the municipality sold the safety of the present and forthcoming residents for a few million Finnish Marks (*Helsingin Sanomat,* 26 January 2000). Thus the 'bad guys' were not the nuclear industry for buying acceptance, but the local politicians for being too eager for extra benefits. However if compared internationally the compensation required by the municipality was actually very modest. Another factor which might have decreased the bribe effect in Eurajoki was that the type of compensation, which was rather unusual, consisting of a loan and transaction arrangement (see Table 4). Selection of the compensation type was part of the compensation strategy chosen by the contracting parties in order to avoid paying a monetary lump sum. Although a number of agreements were signed, the agreements were not presented as a package, but the main focus was

on arrangements around the Vuojoki Mansion. The other agreements are perhaps not well known and thus are not even mentioned when these local benefits in Eurajoki are reported (see for example NDA 2007, 37).

Fifth, although there was clear understanding of the interests of the nuclear industry there was also a heavy local economic dependency on it. In the case of Eurajoki the reform of the tax income system of nuclear facilities had caused economic problems to the municipality (Kojo 2009, 178), thus the need to safeguard tax incomes was a clear motivation for local councillors to approve the siting. It was not only question about siting a nuclear waste facility, but about safeguarding the long-term interest of both the municipality and the nuclear industry. Although the municipality would get the tax revenue income, the local council also wanted to have extra benefits, which were negotiated with Posiva and TVO in the Vuojoki Working Party. A community perspective was incorporated in the negotiations as the leading local politicians were the driving forces of the compensation initiative. The details of intra-community negotiations are not known but if there were problems the municipality was still able to carry on the negotiations with the nuclear industry. The formal recognition of the local negotiations was provided when the Finnish government approved the site selection in the DiP of 2000. In practice, recognition of the local negotiations by the industry occurred at the latest in the mid 1990s when the co-operation agreement of 1995 was signed. The state did not interfere directly with the local negotiations on compensation because the outcome was in line with the site selection strategy. On the contrary, it can be said that the state also dangled a carrot, in the government energy strategy report of 1997, in the form of considerable real estate revenue already before the operation phase of the SNF repository (The Council of State 1997, 47). Thus there was a clear governmental cash incentive in the form of tax revenue. In addition, the municipality of Eurajoki

was active in trying to get more benefit from this development by negotiations on the level of the tax rate and on tax equalisation principles.

4. DISCUSSION

4.1 Conceptual approach

According to Portney (1985, 82 originally based on O'Hare 1977) the theory of compensation is based on the provision of economic incentives. It is assumed in the theory that public opposition stems from a basic imbalance in individuals' benefit/risk calculations. Opposition by nearby residents to the facility is assumed to be based on the idea that there is an imbalance between the high personal costs they are asked to bear relative to the benefits that accrue to a larger outside population. Thus these individuals would regard their losses to be outweighed by the benefits. The costs consist of different kinds of perceived risks and unwanted impacts. According to the compensation theory compensation should be expected to redress the imbalance. Compensation given to residents would eventually outweigh the perceived risks. The expected outcome of the theory is that any imbalance would be redressed and public opposition would abate. (Portney 1985, 82.)

Compensation theory has been criticized for neglecting other approaches, moral principles and safety concerns. Carnes *et al.* (1983, 346) state that an incentive-based program is not a device that could supplant technological or other social considerations in the siting process. Kunreuther *et al* (1987, 372, 382) also note that a compensation mechanism must be viewed as only one of a set of policy tools dealing with siting. Frey, Oberholzer-Gee, and Eichenberger (1996, 1298) state that an economic theory of compensation is incomplete because it neglects the influence of moral principles and thus the theory must focus on the interplay between moral considerations and market forces. According to their interpretation of the relationship between political and market behaviour, moral issues play a larger role in politics than in the market. In the former,

expressing moral issues is essentially costless relative to the latter. (Frey, Oberholzer-Gee, and Eichenberger 1996, 1310.)

The question of compensation raises the need to compare the different definitions and interpretations given to the some basic concepts such as benefit, incentive, mitigation and compensation. In many cases concepts overlap each other causing further confusion in the local debate on benefits, which itself is already highly controversial issue, even taboo in some situations and localities. Furthermore, the real life examples of different kinds of benefit packages discussed in this deliverable and elsewhere (see Chapman, McCombie and Richardson 2008; NDA 2007) indicate that there is a need to reconsider the concepts as these often fail to match the practice. Such a clarified vocabulary could be one step towards more transparent and open discussion on the potential benefits associated with the siting of nuclear waste facilities.

The reviewed literature suggests several definitions of compensation (Table 4). The main similarity is that the definitions emphasize redistribution of both benefits and costs. However, there are also differences for example in arguments why compensation should be paid. Carnes et al (1983, 330) emphasize compensation of actual damages and NEA (2007, 52) any necessary expenditures or losses associated with facility whereas Gregory et al (1991) have a wider philosophic view stressing equity and fairness of siting. The authors also have differing views on who should be compensated. Carnes et al (1983) and Gregory et al (1991) emphasize the community whereas according to Easterling and Kunreuther (1995) those individuals who are directly impacted should get the benefit. A further question is how community should be defined. Is it just the administrative unit or should the community be defined as covering all those people

affected by siting and a facility or a repository. This raises the question how to identify those affected. Who question in meaning who should pay is however not touched in the definitions.

Table 4. The definitions of compensation.

Concept	**Definition (authors)**
compensation	*Payment for actual damages in the event of an accident or anomalous event.* (Carnes et al. 1983, 330)
reward	*Actions designed to award benefits to communities assuming risks for which others derive benefits.* (Carnes et al. 1983, 330)
compensation	*Some kind of payment to the host community, either in dollars or in services, to affect a desired redistribution of the facility's benefits and costs.*" *... Compensation measures emphasize cost-sharing and the redistribution of gains, utilizing payments of money or goods to address concerns of equity and fairness*" (Gregory et al. 1991, 671, 673)
compensation	*a procedure for redistributing some of the benefits of the facility to those individuals who are directly impacted by its construction or operation* (Easterling and Kunreuther 1995, 175)
compensation	*Repayment for any necessary expenditures or losses associated with the siting and operating a facility. Sometimes conceptualised as "equity offsets".* (NEA 2007, 52)

The third important difference is how compensation should be implemented. It is important to note that compensation is not just about lump sums of cash, but as Gregory et al (1991) mention services can also be offered as a possible means of compensation. The better awareness of the different definitions of the word 'compensation' helps one to understand how certain definition might effect on practical arrangements and discussion around implementation.

There are also other concepts – benefit, incentive and institutional mitigation – which come close to the idea of compensation. The main functions of these concepts are introduced in Table 5 below.

Table 5. The main functions of benefit, incentive and institutional mitigation.

Concept	Main function
Benefit	*To ensure that the community should not find itself worse of than before the process.* (Richardson 1998)
Incentive	*Means of helping to achieve the best possible technical solution one which might not otherwise be implemented because of social and political constraints.* (Carnes et al. 1983, 346)
Institutional mitigation	*Seeks to regulate the operation of a facility or to direct empower the local citizenry in the facility siting decision.* (Gregory et al. 1991, 672) *To offset ... perceived fears and potential financial impacts, should they occur. Such measures have also been offered not to compensate for risk or impact, real or imagined, but in recognition of the community's participation in an activity that is perceived as being in the national interest.* (Richardson 1998)

4.2 From bribe effect to pride effect?

Nuclear waste management has faced lack of societal acceptance in many countries during last decades. As a response to the problems participatory approaches has been developed and implemented. However, the nuclear waste management programmes in Finland and Sweden that have so far proceeded, have included not only participatory methods but also local benefit packages. Table 6 introduces key aspects of the practise applied in the Eurajoki case.

Table 6. Aspects of development of a compensation strategy package.

Aspects	Practise in the case of the municipality of Eurajoki	Suggested aspects to be taken into account
Initiator of negotiations	In the final phase this was local politicians, who also wanted to take into account the interests of the nuclear industry. The aim of the 'partnership' was to create added value for all the contracting parties.	A community perspective is recommended in order to identify and address local needs and interests.
Intra-community negotiations	Local politicians asked for a mandate for negotiations from their groups. The mandated politicians held their own meetings during the negotiation process with the nuclear industry.	A broad political mandate is recommended in the early phase of the negotiations to provide cross-party confidence and consistency.
Role of nuclear industry	Both Posiva and the nuclear operator TVO were involved as contracting parties.	Multiparty negotiations are needed, as is clarity about the role of all stakeholders.
Role of the state	The governmental energy strategy of 1997 hinted at the possibility of paying real estate tax for the repository in advance. Legislative initiatives were taken by the municipality concerning the real estate tax and tax equation procedure.	There will almost certainly still be a need for some negotiations even if benefits are related to legislative requirements. It is important to identify the relevant responsibilities in these situations.
Role of other candidate Municipalities	There was a competition with Loviisa, with negotiations with the industry taking place behind closed doors.	Cooperation of all candidates is recommended in order to avoid competition and secrecy, perhaps along the Oskarshamn - Östhammar 'model'.
Role of local residents	Did not have a role, they were only informed by media based on press releases from the negotiators.	At the very least the local public should be informed from the very early phases onwards.
Health and safety	Despite trust in STUK and Posiva, politicians still planned to refer to increased safety risks as an argument, but withdrew the idea following comments by industry.	Local perception of safety is very important. Safety should be discussed and demonstrated clearly before initiating any negotiation on compensation.
Institutional mitigation / incentives / local empowerment measures	Not discussed during the negotiations.	Need to make a clear distinction between incentives aimed at local empowerment without any binding obligations (voluntariness) and possible other benefits.
Means of sharing benefit	Number of tools and agreements applied (cheap loans etc).	Need for a community perspective to negotiate the suitable tools, with the possibility of multidimensional packages.
Moral	Two appeals against the municipal decisions but no strong bribe-effect perceived by the community.	Need to make a clear distinction between community benefits and support and bribery. Vocabulary related to forms of benefits should be clarified and defined also from

Furthermore, suggested aspects to be taken into account in development of local compensation strategy are also provided in Table 6. The authors of this deliverable do not believe that it would be possible to give detailed recommendations regarding compensation strategies that would fit in all political settings. As for example Högselius (2009, 259–261) indicates that the type of political system of a country plays a major role for divergent choices of SNF strategies. Also Kemp (1992, 29) recognises a difference between systems that are run on a "much more aggressively commercial basis" and those relying on "more central control". Kemp (1992, 29) states that the difference here is that more centralised control of the system ensures that regulation of wastes is not dependent on commercial arrangements. As Finland could be seen as an example of the later system it is interesting to note that at the local level compensation negotiations played such a big role (see Chapter 3). Thus, the possible compensation strategy needs to fit in the political setting. However, a list of general guidelines can be drafted (see Table 6) that should be followed whenever possible. The guidelines are as follows:

- Local perceptions of safety are very important. Safety should be discussed and clearly demonstrated before initiating any negotiation on compensation.
- A community perspective is recommended in order to identify and address local needs and interests. Such a perspective is also needed in order to negotiate the suitable components of a package.

- A broad political mandate for local negotiators is recommended in the early phase of the negotiations to provide cross-party confidence and consistency.
- Multiparty negotiations are needed, as is clarity about the role of all stakeholders in the decision making process. The negotiations should be transparent.
- The local public, including NGOs, should be informed about the negotiations from an early stage.
- Involvement of all candidate host communities is recommended in order to avoid competition and secrecy.
- It is necessary to make a clear distinction between community benefits and support and allegations of bribery. There is also a need to make a clear distinction between incentives aimed at local empowerment without any binding obligations (voluntariness) and possible other benefits. Vocabulary related to forms of benefits should also be clarified and defined from a local perspective.

The Eurajoki case, and the subsequent Östhammar case, have demonstrated how a SNF repository project can move forward. In the municipality of Eurajoki there are even some signs that a project that once seemed very unpopular can ultimately become the object of local pride. However, it is good to keep in mind that tendency towards 'industry awareness' seems to be stronger among certain social groups and that there is a split in attitudes. The variation in attitudes to nuclear waste issues between the genders is evident in Eurajoki. (Kojo, Kari and Litmanen 2009b; Kojo, Kari and Litmanen 2010.) The case study demonstrates that there seem to be ways the bribe effect can be avoided and perhaps become a local pride effect. A durable

relationship between the host municipality and the nuclear waste facility cannot however be based solely on compensation.

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