

Building of Multilevel Stakeholder Consensus in Radioactive Waste Repository Siting

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ABSTRACT

This report considers the problem of multilevel consensus building for siting and construction of shared multinational/regional repositories for radioactive waste (RW) deep disposal. In the siting of a multinational repository there appears an essential innovative component of stakeholder consensus building, namely: to reach consent – political, social, economic, ecological – among international partners, in addition to solving the whole set of intra-national consensus building items. An entire partnering country is considered as a higher-level stakeholder – the national stakeholder, represented by the national government, being faced to simultaneous seeking an upward (international) and a downward (intra-national) consensus in a psychologically stressed environment, possibly being characterized by diverse political, economic and social interests.

The following theses as a possible interdisciplinary approach towards building of shared understanding and stakeholder consensus on the international scale of RW disposal are forwarded and developed:

- a) building of international stakeholder consensus would be promoted by activating and diversifying on the international scale multilateral interactions between intra- and international stakeholders, including web-based networks of the RW disposal site investigations and decision-making, as well as networks for international cooperation among government authorities in nuclear safety,
- b) gradual progress in intergovernmental consensus and reaching multilateral agreements on shared deep repositories will be the result of democratic dialogue, via observing the whole set of various interests and common resolving of emerged controversies by using advanced synergetic approaches of conflict resolution,
- c) cross-cultural thinking and world perception, mental flexibility, creativity and knowledge are considered as basic prerogatives for gaining a higher level of mutual understanding and consensus for seeking further consensus, for advancing the preparedness to act together, and ultimately – for achieving desired shared goals.

It is proposed that self-organized social learning will make it possible to promote adequate perception of risk and prevent, by diminishing uncertainties and unknown factors, social amplification of an imagined risk, as well as to increase the trust level and facilitate more adequate equity perception.

The proposed approach to the multilevel stakeholder consensus building on international scale is extrapolated to the present-day activities of siting of such near-surface RW disposal facilities which supposedly could have non-negligible trans-boundary impact. A multilevel stakeholder interaction process is considered for the case of resolving of emerged problems in site selection for the planned near-surface RW repository in vicinity of the Lithuanian-Latvian border foreseen for disposal of short lived low- and intermediate level waste arising from the decommissioning of the Ignalina Nuclear Power Plant.

INTRODUCTION

The increased demand of modern society for its quality of life, and – what nowadays is especially important - for the global security, for environmental safety as well as for observing a basic ethical principle of equity has already started to focus our attitude towards the recent proposals to develop shared multinational and regional projects in the use of nuclear energy technologies, in particular, on: a) siting and construction of shared multinational/regional repositories for RW deep disposal [1-3], as well as b) arrangement of shared Nuclear Power Plants (NPPs) and research facilities.

On the other hand, a permanently growing public concern about the decision making policy in RW management, as well as progressively intensifying involvement and participation in the decision making, together with an aggravated social acceptance of RW disposal policy and long-term safety has led to increasing complexity of RW management problems on the whole, being especially highlighted in the face of the currently occurring expansion of the decision making problem on the necessary international scale.

Recognizing that siting of a new shared nuclear facility is a key problem in the development of such projects, the necessity of reaching consensus among all involved parties in the choice of repository siting, including also geographically differing public communities, appears as an inevitable condition for successful realization of such shared project.

Beside with the progressively aggravated problem to reach consensus among all stakeholders of one country, in the forthcoming problem of siting of a multinational repository, a novel essential component of stakeholder consensus building appears, namely: to reach consent – political, social, economic, ecological – among international partners, in addition to solving the whole set of intra-national consensus building items.

In particular, according to the amended EC Waste Directive proposal [4], stating that EU Member States shall promote agreements in safe management of RW, as well as the recommendations of the subsequent EC research pilot project SAPIERR emphasizing a necessity to reach shared understanding and consensus among all local communities, regions and partner countries implementing shared repositories for RW deep disposal [5], an actual task emerges – to find out efficient solutions of such an interdisciplinary complex set of technical, societal, political, economic and psychological issues.

THE MAJOR STRATEGIC AIMS OF MULTILEVEL STAKEHOLDER INVOLVEMENT

In the framework of the newly emerged international scale of stakeholder involvement and consensus seeking problem, besides the multitude of structural levels of involved stakeholders, one can also foresee a multitude of necessary consensus reaching stages in long term-scale, taking into account that “development and implementation of a nuclear repository is a time-consuming process, which lasts usually a few decades. In such timeframes, interests of involved countries and relations between countries might change” [6]. In particular, mutually agreed-upon solutions should be developed for management of possible economic risks for all involved countries taking into account existing differences in the economic development and national financial and economic policies.

Being aware of the need of significantly larger amount of concerted efforts for reaching acceptance of multinational repositories (in comparison with national ones), one should emphasize a real necessity to develop and implement interdisciplinary research, as well as

advanced stakeholder involvement methods aimed at reaching consensus at all levels and finally – acceptance to arrange the repository.

Thus, in line with the inference deduced in the framework of the EC pilot project SAPIERR (Support Action: Pilot Initiative for European Regional Repositories) that “multiple siting options should be maintained over a long time and the ultimate selection of preferred sites should be an open process in which all technical, societal, economic and political issues are tabled simultaneously” [5] and with the consecutively derived general guidelines for siting of regional repositories, for the present analysis one should underline the following two factors, namely:

- 1) the necessity to ensure that consensus has been reached by participants on the need for or, at least, on the potential benefits of shared repository(ies) is a common goal, and finally - to gain sufficient level of political and societal support in the participating countries as well as acceptance by the third countries,
- 2) to establish the structures and the processes required to assure the agreed level of stakeholder involvement.

AN EXTENDED CONCEPT OF STAKEHOLDER FRAMEWORK

As in the present study we are faced to a qualitatively novel stakeholder class(es), for the analysis of stakeholder involvement and consensus reaching problems for the case of multinational repositories one should specify the basic structure and functions of main stakeholders. It seems reasonable to refer to recent approach [7], by emphasizing the following main items:

- 1) identifying and prioritising stakeholders,
- 2) identifying motivations of each stakeholder,
- 3) establishing benchmarks for stakeholder engagement activities,
- 4) developing and implementing the stake engagement strategy.

Thus, the first component characterizing the extended stakeholder community faced to solve the international task should be recognized as all relevant international administrative, professional as well public bodies, for example,

- a) EU and EC (for European countries),
- b) International business consortiums and projects, including those managed by EC,
- c) International associations of top-level intra-national stakeholders (WM agencies, National Regulatory Authorities) – as ARIUS (Association for Regional and International Underground Storage).

A quite novel problem is also laid on each partnering country as a whole to be considered here as the national (or a higher-level) stakeholder, represented by the national government, who now is faced to simultaneous seeking an upward (international) consensus, via interacting with international stakeholders and partnering national stakeholders, as well as a downward (intra-national) consensus via interacting with various-level intra-national stakeholders.

Although currently a serious legal framework has already been established (including the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, EC and IAEA documents [4,5,8]) guiding the partner activities towards arrangement of multinational facilities, these are namely the national stakeholders faced to interactions in a psychologically stressed environment possibly being characterized by diverse political, legal, economic and social conditions and interests.

In general, for the aims of the present study, taking into account that multinational repositories are foreseen mainly for disposal of spent nuclear fuel and nuclear material in the form of DSS, can be applied also the common outlines of the *Strengthening the Global Nuclear Safety Regime* [9] foreseen for nuclear installations, with the identification of relevant stakeholders and their groups and cited in [9].

At the same time, detailed specification of the structure of such novel stakeholder framework should be specified in the course of forthcoming development of the multinational facility concept and appropriate multinational programme, in particular, the institutional framework, resulting in identifying possible optimal structures for efficient programme management, legal forms for cooperation and “a study of the sharing of benefits and liabilities among partners in a multinational disposal initiative” [5].

AN APPROACH TO STAKEHOLDER INTERACTION ON INTERNATIONAL SCALE

Recently, numerous efforts have been taken in order to investigate a whole set of technical, economical, societal and environmental problems of RW disposal safety. Particularly, in a series of IAEA, OECD NEA and other documents [10-15], where particularly the possible ways and importance of stakeholder involvement and the actual necessity to understand their concerns have been underlined and considered.

Over and above, in parallel with significant developments in general approaches to consensus building issues [16], recently the problems of stakeholder consensus seeking in RW disposal [17] have also been considered, however, without considering the international scale factors.

In order to propose a possible routes for the emerging problem of stakeholder involvement and communication on the international scale, we will use here the recently considered synergetical approach to solve stakeholder interaction issues [18], aimed at self-organization of various stakeholder categories and their development into a harmonized stakeholder community having common strategic aims, in particular, via activating and diversifying interaction among stakeholders.

Likewise, as a key mode of this interaction mutual learning of various stakeholder groups has been indicated, with the aim to elevate their knowledge level, as well as to enhance mutual understanding. Finally, in turn, the whole process of mutual learning and educating of stakeholders emerges in a *knowledge creating stakeholder community* capable to use novel communication and knowledge management forms, for example, the Internet, at all stages and levels of decision-making.

Such web-based communication of all-level stakeholders on the international scale could be of especially high importance for the aims of self-organization of stakeholders already on a multinational level and promoting activities for their mutual understanding and consensus reaching. In particular, just for the case of geological repository development such web-based approach, being an advanced way for all stakeholders to access permanently updated data, has already been markedly developed and applied “as a tool for information sharing among stakeholders with the aim to provide socially informed decision making” [19,20].

The global scale web-based communication possibilities will be especially useful tools for the development of international cooperation, in the framework of Global Nuclear Safety Regime [9], between national and intra-national stakeholders (i.e., governmental authorities in nuclear safety, operators, etc.), thereby developing functioning of international stakeholders, in particular, beside the intergovernmental organizations IAEA, OECD/NEA, such entities as:

- a) multinational networks among regulatory authorities, namely:
 - International Nuclear Regulators Association (INRA),
 - Network of Regulators of Countries with Small Nuclear Programmes (NERS) – being especially important for cooperation of small countries having the need and interest in shared disposal solutions;
- b) multinational networks among operators, such as World Association of Nuclear Operators (WANO);
- c) stakeholders in international nuclear industry, such as:
 - The World Nuclear Association (WNA),
 - Suppliers of services and equipment,
 - Non-governmental organizations, public and media.

Such multinational organizations and entities are called to form a proper structural framework for development of Multilateral Nuclear Approaches (MNA), inter alia foreseeing to create “multinational, and, in particular, regional, MNAs for new facilities based on joint ownership, drawing rights or co-management for front-end and back-end nuclear facilities”[9].

Besides, the development of partnerships between international and local organizations [21] as one of the key elements of democratic dialogue - via observing the whole set of various interests - as a prerequisite for reaching shared understanding of a disputable problem and finally promoting multi-stakeholder consensus building, taking into account a whole set of possible challenges [8], has been proposed, in particular:

- i) different national legislation and time schedules,
- ii) transportation policy and negative public reaction being a potential source of probable disputes and controversies among partnering countries,
- iii) cost allocation.

POSSIBLE SYNERGETICAL MECHANISMS OF SEEKING STAKEHOLDER CONSENSUS

Assuming that possible emergence of various technical, economic and societal disputes and controversies beyond the national borders could be considered as a characteristic for a multinational scale interdisciplinary problem, we will further develop the recent synergetical approach [18] to stakeholder interaction problems RW management and disposal field, based on the thesis of informational self-organization (SO) processes, forming a knowledge-creating community.

The Key Principles – Self-Organization and Chaos and Their Use

Beside with the SO phenomena of stakeholders, also the whole process of development of a multinational entity - the concept, the decision on the siting, the design plan, etc. - could be considered as a self-organization phenomenon of the involved stakeholders as well as their material premises, soundly displaying two main components of SO [22], namely, cooperation and competition. In our case this will be manifested as cooperation and competition among individuals, public groups, companies and institutions as well as whole institutions, taking into account that disputes and controversies (among stakeholders) are possible natural consequences of general development (of their interactions and of the whole facility arrangement plan).

In view of this, an actual present-day task to be solved seems to be the following one: to learn to guide such SO processes more efficiently, in particular, to generate optimal balance and

interrelations of relative weights of cooperation and competition elements being manifested in mutual affairs among various subjects and different assemblies of them.

Furthermore, according to one of the key premises of synergetics, these are just chaotic structures which could represent the basic origins of SO and of generation of novel structures, in particular – a new type of relations and a higher level of mutual understanding among people. So, the elements of chaos supposedly can give birth to such a novel element of order as a new type of consensus [23] which can manifest itself in shared understanding of complex problem situations as well as in preparedness to act together.

For the aims of the present study, an important element of the desired chaos could be a constructive (positive) chaos of managerial nature manifested in a non-rigid flexible approach to the choice of final host country, which would allow the involved parties to develop, via the step-by-method, correct and update their own proposals and opinions towards finding an optimal solution. This would completely comply to key proposals [1,5,6] about the basic stages of arrangement of such facilities and the main tasks to be solved, with a strong recommendation to pend the choice of the host country till the latest stages.

Actually, such flexible approach in the siting strategy and management will actualize a role of one important prerequisite of minimization of possible misunderstandings and controversies – namely, an existence of intermittent chaos in relations among interacting parties [24]. One could imagine that elements of such chaos could be appeared, at least to some extent, on all stakeholders levels and namely, in the form of mutual flexibility among interacting persons (stakeholders) as well as their ability to flexible creative thinking and problem solving. Persistent availability of such capacity would ensure that one person SO processes will not destroy the other's internal SO, thereby preventing or softening the origin of controversies.

The Fuzziness and Fuzzy Logic

The considered flexibility in the strategic issues of arranging such repository (siting, etc.) provides certain elements of fuzziness – the factor closely related to chaos and facilitating fine tuning of a human beings towards mutual understanding. In particular, it would be desirable to develop one hidden intrinsic property in our language, namely – its intrinsic fuzziness which when being properly applied, could help us reduce misunderstandings [23,25].

Furthermore, the most important feature of the fuzziness – the fuzzy logic – seems to be a highly efficient factor in situations where misunderstandings and contradictions might arise. In such conditions just the fuzzy logic, by supplementing the classical „Yes” and „No” logic with a probabilistic component [26] - would help to generate different combinations among contradicting opinions and proposals, via combining them in some common, possibly qualitative novel inference.

Thus, fuzziness, especially in the siting strategy of multinational facilities with a complex hierarchy of stakeholders, as well as generally in our thinking and language patterns, could foster to impose favourable conditions for facilitating efficient societal SO, in particular, the complementarity feature, thereby helping in the decision-making process to reduce mutual misunderstanding. Besides, it could be just the fuzziness approach which would be capable to develop and foster an optimal favourable balance between cooperation and competitions of controversial options thereby optimizing SO processes of stakeholder community and promoting stakeholder consensus seeking.

Furthermore, taking into account L. Zadeh's proposal that elements of thinking are elements of fuzzy sets [27], one can deduce that chaos and fuzziness being considered as essential components of creativity, could acquire a primary role in conditions of elevated complexity

and environmental uncertainty when there is no unique answer and solution. Therefore, it seems that there exist certain grounds which substantiate to make an assumption that just such a fuzzy environment where one could be recommend to seek consensus among the involved all-level stakeholders, especially in the key strategic problems of arrangement of multinational repositories

Creativity and Systems Thinking

A likely way to acquire the capability to develop a novel, complementary state of thinking patterns and sensible perception to the hierarchy of multiple sets of individual as well as global values seems to be the following one – to develop, namely, a creative approach to world phenomena, problems and values. And it is especially important just nowadays – in the period of mutually controversial realities and values [28] – that creative flexible thinking, as a manifestation of the systems thinking, could promote the SO process in the direction of facilitating an integral perception of the world and its values.

First of all, an elementary creative act of generation of a novelty, being a SO process in the corresponding material environment (for example, the brain neuronal network, etc) [29], is essentially based on quantum concepts as well as on fuzziness, taking into account the L.Zadeh's proposal that elements of thinking are the elements of fuzzy sets [27].

Furthermore, from the Zadeh's incompatibility principle [27] which actualizes the fuzziness feature when dealing with solutions of complex problems, one can deduce: fuzziness as essential component of the creative process will acquire primary role in conditions of aggravated social complexity, environmental uncertainty and controversies, taking into account that „the search for mutual understanding under conditions of fuzziness knowing that there is no ultimate answer and solution, becomes creative learning process” [23].

Thus, by emphasizing the key role of development of our creative spirit in knowledge acquisition and learning, as well as in perception and analysis of complex multiscale problems, mental flexibility, creativity and knowledge are considered as basic prerogatives for gaining a higher level of mutual understanding, for advancing the preparedness to act together, to seek a consensus for seeking further consensus in forthcoming stages, and ultimately, for achieving desired acceptance by all stakeholders of the shared facility. And finally, the international scale of such consensus seeking issue would require us to take into account also possible differences in mentalities of nations and countries, thereby highlighting the necessity to develop cross-cultural thinking capabilities.

INTERNAL VARIETY, SOCIAL LEARNING AND RISK MANAGEMENT

Corresponding to the previously (in [18,28]) considered Ashby principle of requisite variety - about the desired predominance of internal variety over the external one - and the possibility of the its use in optimization of stakeholder interactions [28], one should anticipate that the process case of arrangement of multinational nuclear facilities - in conditions of highly complexified and extended external environment – will be accompanied by a marked increase of external variety. Just these circumstances are calling forth an actual present-day task, namely - to enhance the internal variety the whole hierarchical set of the relevant stakeholders community.

First of all, the role of social learning would to a significant degree facilitate risk management measures, taking into account that in the case of multinational repository siting the disputes between host and partner countries could be especially highlighted in the area of possible risks (economic, ecological, societal), their compensations and benefits and the possible

balancing of these factors. Also those neighbouring countries not being among the directly involved third parties, should be considered as participants in consensus seeking activities concerning risk perception and management, owing to such international nuclear industry affairs as possible trans-boundary impacts or RW transportation through third countries

The role of social learning as an essential facilitator of internal variety drastically increases also in the risk communication area, in particular, by highlighting the uncertainty factor as well as providing some uncertainty management mechanisms. First of all, via the uncertainties management in confidence building in safety assessments; secondly, via the decisive role of the unknown factors [30] in determining risk perception by the public; and thirdly, owing to the capability via the uncertainty handling [31] to replenish deficiency in the necessary information.

Since the perceived risk of repository could be regarded as a function of knowledge of repository issues [30], the role of social learning in the solving the risk perception issues displays also in the following way: namely, in line of assumption that the unknown factor of perceived risk can be diminished via that mode of social learning where affected communities become familiar with nuclear issues, we also stress another side of social learning, namely, the ability to understand how the community perceives all possible and imaginary risks.

As an efficient approach to reach such understanding one could propose a comprehensive identifying of public and other stakeholder concerns, in particular, by increasing, via versatile communication and stakeholder involvement, the levels of such trust components [32] as openness, caring and competence. Such ability will allow to incorporate these concerns in the decision-making mechanism, thereby raising the decision-making capacity of a stakeholder community and succeeding the public acceptance.

CONSENSUS BUILDING BETWEEN LATVIAN AND LITHUANIAN STAKEHOLDERS

Finally, the elements of the proposed approach could also be applied also to siting problems of such national RW disposal facilities which supposedly could have non-negligible trans-boundary impact. In particular, during the two last years some disputes have emerged concerning the site selection for the planned near-surface RW repository in the vicinity (~ 10 km, depending on the final choice of the site) of the Lithuanian-Latvian border (as well as Lithuanian-Belorussia border) foreseen for disposal of short lived low- and intermediate level waste arising from the decommissioning of the Ignalina NPP.

Taking into the close vicinity of the planned repository to these neighbouring countries and according to requirements of the Espoo Convention [33] related to trans-boundary impacts, in these countries comprehensive siting study and discussion activities with close and permanent involvement of international stakeholders have been developed. The basic steps of stakeholder involvement and participation in siting of this Ignalina repository are the following ones:

1) Interaction with international stakeholders:

a) Evaluation of the Siting investigation report [34] prepared by the Lithuanian institutions jointly with Swedish International Project Nuclear Safety (SIP) and SKB International Consultants, in the international seminar organized jointly by IAEA, SIP and RATA (the Lithuanian RW Management Agency), with participation of all key institutional stakeholders (Vilnius, 2004);

b) The International Peer Review Meeting of the IAEA Peer Review team and the RATA experts on assessment of candidate sites of the repository, with participation of Latvian observers, and additional meeting for Latvian-Lithuanian experts (Vilnius, December 2005).

2) Intergovernmental (national and intra-national stakeholder) interactions:

- a) Information for the Latvian part (the Ministry of Environment) about the proposed activity under the Espoo Convention, and the feed-back of the Latvian part,
- b) Information for the Lithuanian part about the planned public hearings in the Daugavpils district (the corresponding part in Latvia being on the border of Lithuania) of the EIA of the near-surface repository, by asking participation of the Lithuanian part,
- c) A meeting with the Latvian public was held in Daugavpils municipality for introduction repository's project and the EIA report, with participation of the Minister of Environment and experts from the Latvian side, and RATA and the particular authors of EIA from Lithuania,
- d) Information for Lithuania on the results of evaluation of EIA and the Latvian position regarding construction of the near-surface repository in the proposed region, with the request to involve Latvian experts in further discussions and developments,
- e) Conclusion of the Latvian part on the supplemented EIA for construction of a near-surface repository for RW.

In the intergovernmental communications where Latvia is basically represented by the national stakeholder - the Ministry of Environment – the governmental position has been formed via multilateral communications and discussions among the all-level stakeholder groups, i.e., - *local communities and municipalities* (mainly – of Daugavpils district) – *Non-governmental organizations (NGOs)*– *the State authorities* (the Radiation Safety Centre, the Environmental State Bureau) - *the Ministry of Environment*, and even close involvement of the *Prime Minister* and the *State President*).

So, the NGO “Daugavas Savienība” has applied to the State President with a request to carry out comprehensive polling of Latvian residents; besides, also the Daugavpils district Council applied to the State President with the issues of the aforementioned repository, with the attached minutes of the general meeting of the head of Daugavpils city municipality and of the district local municipalities. In turn, as the result of these applications, the State President has asked the national stakeholder as well as the institutional stakeholders (Radiation Safety Centre, etc.) to submit information on the possible trans-boundary impact of this planned object, as well as asked the Prime Minister to assess the necessity to assign financial compensation for the Daugavpils district.

CONCLUSION

Guided by recent international trends towards development of multinational RW repositories and based on contemporary non-linear science concepts, in the paper has been proposed a possible interdisciplinary approach towards stakeholder communication and building their consensus on the international scale. In line with the emphasized significance to increase internal variety of stakeholders via their social learning, tolerant communication and creative flexibility in the decision-making process, the whole hierarchical set of stakeholders community in their consensus building efforts might be called to develop and follow “the same creative multilateral engagement and active international cooperation” [35].

The proposed approach purposively should be extended also to solving similar societal-technical problems for arrangement of other multinational nuclear facilities (NPPs, research

units) as well as national facilities supposedly having trans-boundary impact. On the basis of present analysis one can recommend to develop, in the frame of international cooperation projects, further systemic interdisciplinary studies preferably having goal-oriented status.

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