
Achim Brunnengräber ·
Maria Rosaria Di Nucci
Editors

Conflicts, Participation and Acceptability in Nuclear Waste Governance

An International Comparison
Volume III

 Springer VS

Editors

Achim Brunnengräber
Forschungszentrum für Umweltpolitik
(FFU)
Freie Universität Berlin
Berlin, Germany

Maria Rosaria Di Nucci
Forschungszentrum für Umweltpolitik
(FFU)
Freie Universität Berlin
Berlin, Germany

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Preface

This book – Volume III – is part of a trilogy and concludes a long-term project. It deals with core themes of the disposal of high level radioactive waste (HLW), e.g. the wicked problem of housing nuclear waste disposal facilities, public participation and public discourse, voluntarism and compensation in siting as well as the role of advisory bodies and commissions. This book was completed within the research project “Methods and measures to deal with socio-technical challenges in storage and disposal of radioactive waste management” (SOTEC-radio) commenced in 2017 at the FU Berlin, Environmental Policy Research Centre (Forschungszentrum für Umweltpolitik, FFU). We understand it as a complement to Volume I (Nuclear Waste Governance, 2015) and II (Challenges of Nuclear Waste Governance, 2018) edited in the same row of books by Springer. These volumes compare the nuclear waste governance of 26 countries, e.g. the Euratom countries as well as Russia, China, USA, Japan, South Korea, Brazil and the Ukraine. Both books examine the modes of governance that these countries are developing to address the storage and disposal of HLW. The progress the countries have made and the obstacles they face are discussed by looking at the actors, stakeholders, regulations, technology choices, safety criteria, monitoring systems, compensation schemes, institutional structures and approaches to public involvement.

Volume III has a long history. Some of the contributors in this volume took part in the workshop organised by the FFU in Berlin on September 2016 in the framework of the interdisciplinary research initiative ENTRIA (“Disposal Options for Radioactive Residues: Interdisciplinary Analyses and Development of Evaluation Principles”, 2013-2019). This workshop focused on social issues concerning nuclear waste disposal and discussed different lines of conflict as well as various ways of participation and acceptance issues with a number of internationally recognised experts that provided in-depth insight into the issues the search for a repository site is facing. Other issues were discussed over the years in the Salzburg meetings of the energy research initiative known as the REFORM Group, short for Restructuring Energy Systems For Optimal Resource Management. The REFORM Group is an international network of energy experts from research organisations, universities, companies and decision makers. Special thanks go to Lutz Mez, the initiator of the REFORM Group for having provided a congenial arena for discussing diverse policy issues with peers in a fruitful international environment.

We gratefully acknowledge the support of the Federal Ministry for Economic Affairs and Energy (BMWi) that provides the core funding for SOTEC-radio and thus for part III of the trilogy. Special thanks go to Camée Ptak, whose engagement has been key to the success of this book project. The texts were skillfully proofread by Clio Forman and Jessica Wallach. Finally, we would like to thank Britta Göhrisch-Radmacher at Springer VS for her support. Any mistakes are the solely responsibility of the authors and editors.

Berlin, March 2019

Achim Brunnengräber, Maria Rosaria Di Nucci

Table of Contents

I. Introduction	1
Making Nuclear Waste Problems Governable Conflicts, Participation and Acceptability	3
<i>Maria Rosaria Di Nucci and Achim Brunnengraber</i>	
Why Technical Solutions are Insufficient The Abiding Conundrum of Nuclear Waste	21
<i>M. V. Ramana</i>	
II. Historical Paths and Legacies.....	39
The Future is Still Unwritten – History Too Overcoming the Conflicts of the Past in Germany.....	41
<i>Daniel Häfner</i>	
The Legacy of Nuclear Power and What Should Be Done About It Peripheral Communities and the Management of the Nuclear Legacy	55
<i>Andrew Blowers</i>	
The Elephant in the Room The Role of Gorleben and its Site Selection in the German Nuclear Waste Debate.....	69
<i>Anselm Tiggemann</i>	
III. Participation, Stakeholder Dialogue and Mediation	89
Chances, Challenges and Choices of Participation in Siting a Nuclear Waste Repository The German Case.....	91
<i>Jan-Hendrik Kamlage, Jan Warode, Anna Mengede</i>	
Consensus-Oriented Dialogue Experiences from “HZG in Dialogue” in Geesthacht	111
<i>Silke Freitag</i>	

Effective Dialogue and Broad Societal Support Stakeholder Dialogues on Radioactive Waste Management in the Czech Republic and Spain: A Review.....	121
--	-----

Merixell Martell

IV. Trust, Voluntarism and Compensation.....145

Voluntarism in Siting Nuclear Waste Disposal Facilities Just a Matter of Trust?.....	147
---	-----

Maria Rosaria Di Nucci

The Role and Functions of Community Benefit Schemes A Comparison of the Finnish and French Nuclear Waste Disposal Projects.....	175
---	-----

Markku Lehtonen and Matti Kojo

The Use of the Added Value Approach in Siting Radioactive Waste Facilities Stakeholder Opinions in the Czech Republic, Poland and Slovenia	207
---	-----

Matti Kojo and Phil Richardson

V. Between Science and Society: The Role of Experts and Commissions229

Experts and Politics in the German Nuclear Waste Governance Advisory Bodies between Ambition and Reality	231
---	-----

Ana María Isidoro Losada, Dörte Themann and Maria Rosaria Di Nucci

A “Deliberative Turn” in German Nuclear Waste Governance? The Participation Process of the Commission on the Storage of High-Level Radioactive Waste	261
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Julia Olliges

Bringing Transparency and Voice into the Search for a Deep Geological Repository Nuclear Waste Governance in Germany and the Role of the National Civil Society Board - Nationales Begleitgremium (NBG).....	293
---	-----

Miranda A. Schreurs and Jorina Suckow

The ENTRIA Project (2013-2018) First Steps towards Sociotechnical Radioactive Waste Management Research in Germany.....	311
<i>Klaus-Jürgen Röhlig</i>	
Stakeholder Experience The Example of the UK's CoRWM.....	323
<i>Gordon MacKerron</i>	
VI.Planning and Socio-Technical Challenges	333
The <i>Wicked Problem</i> of Long Term Radioactive Waste Governance Ten Characteristics of a Complex Technical and Societal Challenge	335
<i>Achim Brunnengräber</i>	
The Experience of the Swiss Negotiated Approach Borders as a Challenge.....	357
<i>Martin Steinebrunner</i>	
Multi-Level Governance of Nuclear Waste Disposal Conflicts and Contradictions in the German Decision Making System.....	383
<i>Peter Hocke and Achim Brunnengräber</i>	
Contributors	403

I. Introduction



Making Nuclear Waste Problems Governable

Conflicts, Participation and Acceptability

Maria Rosaria Di Nucci and Achim Brunnengraber¹

Abstract

Disposing of nuclear waste remains one of the most complicated problems to solve; it is a wicked problem. Finding and gaining public acceptance solutions for a high level radioactive waste (HLW) repository is cumbersome even in the case of the most resilient democratic political system. Handling radioactive waste is a permanent reminder of the historical paths and legacies connected with the civilian and military development of nuclear power. Despite the many attempts made in the last forty years, there is no civilian permanent repository for spent fuel and HLW in operation in any nation state. Long-lasting and thorny social conflicts and distrust continue to play an inhibiting role in actual siting procedures of nuclear waste repositories. However, in the last decade, these issues have stopped being regarded as a mere technical problem. Against the background of conflicts and deadlocks, the nuclear waste issue has broadened in scope to consider societal, political, psychological and ethical factors. This has led to the use of deliberative procedures enhancing the integration of community and stakeholder values into decision-making. The chapter briefly introduces the major issues dealt with in this volume and discusses the role of inclusive participatory procedures and stakeholder involvement, as well as of consent-based siting and compensation to enhance acceptability of contested socio-technical solutions.

1 Maria Rosaria Di Nucci | Forschungszentrum für Umweltpolitik, Freie Universität Berlin | dinucci@zedat.fu-berlin.de
Achim Brunnengraber | Forschungszentrum für Umweltpolitik, Freie Universität Berlin | achim.brunnengraeber@fu-berlin.de

1 Introduction

Despite the many attempts made over the last forty years, globally there is no civilian permanent repository for spent fuel and high level radioactive waste (HLW) in operation. For all countries that use nuclear energy – regardless of military or civilian origin – the same applies: the search for suitable repositories is imperative because the current interim storage facilities often are only emergency solutions and do not meet the technical requirements for the long-term storage of HLW. At the same time, the volume of waste continues to grow steadily with every nuclear power plant (NPP) that is still in operation or will be in the future. The International Atomic Energy Agency (IAEA) estimates that 370,000 tons of heavy metal (thm) in the form of used fuel have been discharged since the first NPP commenced operation (IAEA 2018: 1). Meanwhile the management and storage of HLW and the processes leading to a site selection for a repository remain highly complex issues and a conflict-driven socio-technical challenge. Concerns about risks and safety dominate the debate worldwide.

Over recent decades, deep geological disposal (DGD) has advanced as the preferred solution within the science and technology community. Nevertheless, to date there is no conclusive model to prevent radioactive substances from leaking out of a repository and long term safety has not been proven, as the many disputes over the adequacy of technical barriers (containers); geological barriers (salt, granite, clay), and the “social” barriers (to prevent human intrusion) demonstrate (see also Ramana 2019, in this volume). Compounding these long-term technical problems, there are (unsolvable) ethical concerns and challenges connected with the technical and social long-term safety requirements. Siting processes are affected and shaped by various factors, such as the nature of the political and legal systems, formal and informal rules and procedures, culture, political constraints, geographic conditions, technical skills, the stock of knowledge and public acceptance.

These challenges are faced by all nation states which have to dispose their HLW, regardless of political system and governance structure. As Rosa and Clark (1999) suggest, finding an acceptable solution for an HLW repository is arduous even for the most resilient democratic political system. In the case of nuclear waste interim storage and long-term disposal, problems and conflicts are multiplied by the various issues at stake within the wider debate on nuclear energy technology. Against the background of the discourse and the never-ending conflicts about a ‘final disposal’, which has been narrowly understood and framed by nuclear power advocates above all as a technical problem, disposing of nuclear waste remains one of the most complicated problems to ever solve.

Conflict and deadlocks exist in cases where countries continue producing new waste through expansion or retention of nuclear power plants (NPP), but also in cases where NPPs have been phased out and hence the production of waste is kept at a lower level. In this respect and on the basis of the general problem dimensions, it is not surprising that the search for a permanent disposal facility has remained unsuccessful all over the world largely; although the need for a successful search has been a given since the early deployment of nuclear energy and is high on nation states' energy policy agendas, at least at Euratom country level (see Brunnengräber et al. 2015; 2018). Thus, the political pressure to find solutions grows at the national, international and supranational level. The EU Directive 2011/70 /Euratom, which was adopted in September 2011, requires EU member states that deploy nuclear power to find a solution and draw up national nuclear waste management (NWM) plans with timeframes and measures and to update these plans every three years (Di Nucci and Isidoro Losada 2015). Thus, the EU member states are faced with the challenge of developing and implementing concrete plans and measures to manage nuclear waste and find solutions to finance them, while at the same time meeting the conditions of procedural and distributive justice to gain public acceptance at national and local levels. Programmes for managing HLW are progressing slowly in many nation states (IEA 2018). Most countries have different timeframes and have either not met this requirement or have done it much too late; there are a number of open infringement cases for failure to notify the national programmes.

2 Historical paths and legacies

Handling radioactive waste is a problem that permanently reminds us of the historical paths and legacies connected with the civilian and military development of nuclear power (see also Blowers 2019 and Häfner 2019, in this volume). Long-lasting and thorny social conflicts and distrust play a decisive role in actual siting procedures of nuclear waste repositories (Bickerstaff 2012). Therefore, learning from history, detecting the roots of the conflicts and acknowledging past mistakes is imperative. As Daniel Häfner (2019, in this volume) puts it, “it is vital that the core experiences and knowledge of the conflicts are kept relevant in the discussion”.

Furthermore, all the socio-technical problems connected with nuclear waste governance will continue to affect generations to come, so inter-generational aspects need to be considered. The Canadian Coalition for Nuclear Responsibility (Edwards and Del Tredici 2013) even doubts that mankind can contain knowledge

and security longer than decades and in response, developed the concept of ‘rolling stewardship’. The coalition purports that today there is no solution to the waste problem, but this may not be the case in the future. For this reason, they argue, nuclear waste should not only be stored in a repository but should be controlled every 20 years and handled if necessary. In this way information could be passed on to future generations.

Policy makers should be prepared to consider that the source of the problem is also rooted in the public mistrust accumulated over decades, because when people feel that technical decisions are made in a non-transparent way or introduced through the backdoor they may feel more at risk, even while expressing less apparent concern. The history of the German site in Gorleben epitomizes this. The analysis of past German decisions about nuclear waste disposal and the recent restart in the siting procedure are dominant elements of this volume.

In Germany, the current societal process for more engagement in site selection was made possible within the new frame of reference of the *Energiewende*. The energy transition to renewable energies and ‘cleaning up’ the fossil-nuclear legacies thus are closely interlinked. In Germany, a window of opportunity opened after the Fukushima catastrophe in 2011 and the decision to phase out nuclear power was followed by a new site selection process for a repository. In April 2013, the Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) announced the federal “Repository Site Selection Act” (Standortauswahlgesetz, StandAG). The Act, entered into force in 2013, and its amendment of 2017 regulate the siting process and represents a compromise between political parties about a stepwise approach for selecting a site for a DGD repository for HLW. It also sets principles for developing site selection criteria.

Resulting from the Act, the “Commission for the Disposal of High-Level-Waste” (EK - Endlager-Kommission) was established to define a new site selection procedure and to propose criteria, processes and decision frameworks to evaluate the “Repository Site Selection Act” and to make proposals for public participation. The EK brought together 32 representatives of the political, social and scientific communities. It was set up in April 2014 and concluded its work in 2016 (see Isidoro Losada et al. 2019 as well as Olliges 2019, in this volume). Consequently, German governance changed significantly and new institutions were established, such as the independent regulator, the Federal Office for the Safety of Nuclear Waste Management (Bundesamt für kerntechnische Entsorgungssicherheit, BfE) and the operator, the Federal Company for Radioactive Waste Disposal (Bundesgesellschaft für Endlagerung, BGE) (see Schreurs and Sukow 2019).

Germany's new institutional architecture should guarantee that the new site selection process follows the law prescribing a participatory, science-based, transparent, self-questioning and learning process, through which the best possible location for a repository is to be determined. The "Repository Site Selection Act" indicates exclusion criteria and minimum requirements to be met for a site to be considered suitable. All potential geological formations (salt, clay, and crystalline) are to be considered and the principle of a 'blank map' is to be applied. The nuclear operator BGE will then propose areas based on geological exclusion criteria and minimum requirements for possible site selection.

Thus far, the selection of a site for radioactive waste has either been top-down (for the case of Gorleben, see Tiggemann 2019, in this volume) or municipalities have been motivated by monetary or non-monetary compensations (often declared as structural regional fund), as in the case of the repository for medium- and low level radioactive waste in Pit Konrad, a former iron ore mine. The recommendations for action of the Working Group on the Selection of Repository Sites (AkEnd) combining the search for a repository with participatory conception and implementation of a long-term regional development (AkEnd 2002) have not been applied so far. Thus, voluntarism in Germany is not a criterion for site selection and is not anchored in the "Repository Site Selection Act" (Di Nucci and Brunnengräber 2017; Di Nucci 2019, in this volume).

3 Participation, stakeholder dialogue and mediation

The search for a nuclear waste site cannot be grasped through predefined technical concepts and planning approaches in which problems are defined, analysed, and solved in consecutive steps and in a top-down approach. Although the debate is still dominated by technocratic decision-making and structures, the nuclear waste issue has broadened to consider societal, political, psychological and ethical factors. Over the years, there has been a 'socio-technical reframing' as Cotton (2017) puts it. This meant the use of 'analytic-deliberative' decision-support techniques designed to facilitate the integration of community and stakeholder values into governmental decision-making processes through an implicit political commitment to sustained and inclusive engagement of stakeholders (see Kamlage et al. 2019, in this volume). This reframing is reflected by a growing body of literature that encompasses socio-technical works on risk, acceptance, transparency, inclusive communication, acceptability and participation in the siting process that complement technical issues concerning nuclear waste repositories.

Greater attention has been devoted especially to questions of transparency and participation in the siting procedures (Bergmans et al. 2015). A broad social dialogue and greater public involvement are regarded as a prerequisite for a promising approach by international nuclear organisations (see *inter alia* the publications of the Nuclear Energy Agency, NEA 2009; 2015). The dialogue about suitable sites engages civil society, social organisations, social movements and affected communities. Moreover, participation is now embedded into laws and regulatory texts in many countries. However, it is essential to define which specific possibilities for participation are offered to the affected communities, as country-specific factors (including political culture) do not allow for a one-size-fits-all solution.

Over the years it has become apparent that a ‘final repository’ cannot be realised without political regulations and participation. Therefore, the issue of involving the public has gained central importance in NWM. Citizens’ demands range from the ‘right to know’ to the ‘right to object’ and the ‘right to shape’ decisions (Di Nucci et al. 2017). Participation forms include stakeholder dialogues, as an exchange of views and opinions to explore different perspectives, needs and alternatives, with a view to fostering mutual understanding, trust and cooperation on strategies and initiatives (see also Freitag 2019, in this volume). There have been attempts to start processes based on early information and transparency, but these have been hardly successful (see Martell 2019, in this volume). Martell argues that the results of such dialogues have not been taken up in the decision making; rather, that the initiatives undertaken have arisen for instrumental reasons and to guarantee a certain degree of legitimacy to decision making.

Moreover, new approaches for solving problems in different countries are begetting completely new problems (Brunnengraber et al. 2015; 2018), but they have one thing in common: they look at a much broader field of actors and understand the ‘repository siting procedure’ – more or less as a deliberative pursuit – as a process of social participation (see Kamlage et al. 2019, in this volume). It has become common sense that public participation helps to improve siting decisions by solving or smoothing significant conflicts, and enhancing trust and social acceptance. Participation contributes to legitimacy and public acceptance via “harnessing of local knowledge for substantive improvement of decisions and plans [and] resolution of political and societal conflicts by means of alternative mechanisms” (Wesselink et al. 2011: 2690).

By using Arnstein’s participation ladder (1969), Di Nucci et al. (2017) provide a comparative analysis of the participation process in four countries: Finland, Sweden, France and Germany. They argue that the German participatory process is to be placed on the lower rungs of the ladder. This means that the initiatives carried out are characterised by efforts to achieve public support through “public

relations approaches”, and while this approach includes participation, it provides information in a unidirectional way. As far as consultation is concerned, this step can be considered “window dressing”. In other countries, such as Sweden and Finland, Di Nucci et al. (ibid.) recognise patterns of participation reaching the stage of placation (corresponding to rung 5 in Arnstein’s ladder); citizens can advise or plan, but decision-makers ultimately decide whether or not to accept their input. It is only in the next stage, characterised by partnership, where negotiations are possible and decision-making responsibilities are shared.

Several contributions (Martell 2019; Kamlage 2019; Isidoro Losada et al. 2019; Olliges 2019, in this volume) also discuss cases in which consultation was carried out in which stakeholders formulated propositions and recommendations, but were barely empowered to take part in decision-making. This attitude shows that little attention is paid to the fact that through participation, citizens’ innovative ideas can be integrated into infrastructure development. Recognizing this is a first step to prevent citizen participation from being used under false pretences or as an alibi. This mistake becomes obvious when, for example, consultation is only used to provide information despite participant desire for more co-determination, influence and policy shaping options. As a result, there may be conflicts that were not actually voiced. Taking in concerns of the affected population and stakeholders and giving voices to them increases the chance for evidence-based conflict resolution and for acceptable outcomes. As can be concluded from previous decades of DGD siting efforts, continuing to use top-down approaches would end up enhancing opposition and public protest.

4 Acceptability, voluntarism, compensation and trust

Acceptance and Acceptability

Over the decades, it has proved hard to find sites that are both scientifically and socially acceptable. As Andrew Blowers (2019, in this volume) puts it, it is “a matter of place and time”. According to him, the siting of nuclear waste facilities is concentrated in ‘nuclear oases’. These are peripheral, remote locations that suffer from economic marginality and lack of political power. By a process of ‘peripheralisation’, these places are reproduced and reinforced as landscapes of risk extending over space and time.

Therefore, ‘acceptance’ and ‘acceptability’ have become key concepts in the quest for a solution to the nuclear waste siting process – while at the same time, the question what ‘acceptance’ actually is and, even more importantly, how it could or should (or rather could not and should not) be achieved remains highly

debated. Science and Technology Studies have been analysing various forms of acceptance. However, there is a great heterogeneity in the conceptualisation of this idea. It is not just the wording; often there is a fundamental difference in the various definitions and processes and assumptions related to social, political and local acceptance and varying responses and attitudes. In many cases, ignoring these claims resulted in the further hardening of attitudes and has led to deadlock situations (see Blowers 2019; Lehtonen and Kojo 2019, in this volume).

The term ‘acceptance’ implies a passive local community resigned to be imposed a certain project in their area. ‘Acceptance’ of a nuclear waste disposal facility is not a good enough concept if the goal is to build and maintain a positive, durable relationship between the local community and the nuclear waste repository, which needs to extend across generations. Martell (2019, in this volume) posits that ownership is a higher form of acceptance. Creating ownership of the societal project in the community implies that citizens feel comfortable about safety and the value that the facility continuously brings to the community. It is natural that ownership becomes a legacy and creates new ownership in the next generations. One cannot put the cart before the horse - the issues concerning participation, engagement and ownership come before acceptance. Acceptance is the last thing that might occur, not the first. If people and regions are to accept processes as foreseen in the law, or accept the designation of a site, an inclusive and fair participation is necessary.

The scholarly literature distinguishes between ‘acceptability’, ‘acceptance’ and ‘support’. However, there is a conceptual ambiguity with which the terms ‘acceptance’ and ‘support’ are used interchangeably, which especially in the case of contested technologies poses empirical and theoretical problems. Huijts et al. (2012: 526), distinguish between attitude as ‘acceptability’ and behaviour as ‘acceptance’. There is furthermore a fundamental difference between concepts of acceptance (research methods and questions regarding acceptance models) and on procedures to achieve acceptance. This implies a working assumption that even if something is not ideal, it is probably the best compromise available. We maintain that that “acceptability” is related to the process of making a “project” acceptable to the greatest number of affected people, whereas “acceptance” refers to a response to the issue after it has been concluded (Cowell et al. 2011). However, acceptability of technological solutions is also determined by values. These are procedural justice/fairness, distributive justice/ fairness, perceived costs and benefits, perceived risks, perceived, negative affect and positive affect. All these values or factors are strongly influenced by trust (Huijts et al. 2012; Di Nucci 2019, in this volume).

Social acceptance also requires ethical acceptability (see Taebi 2017). A better participatory process and democratic decision-making also means avoiding technological lock-in to geological disposal as the only option. There is thus also an urgent need for exploring new methods for communicating the technical and social uncertainties, but also to understand and address the fundamental justice issues, including intergenerational justice.

Voluntarism and Trust

In countries that are in an advanced stage of implementing a repository, such as Finland and Sweden, voluntary search processes have played an important role. Other countries, such as Canada, the United Kingdom, Belgium and the USA have tried, albeit without success, voluntary procedures. Voluntary approaches depend on a large number of factors, not least the role played by trust in institutions, experts and in the nuclear industry (on the role of trust, see Di Nucci 2019, in this volume). A whole section in this volume outlines the salient characteristics of siting experiences of European countries in an advanced stage of planning or even constructing a nuclear DGD facility. The authors discuss various modes of governance as well as voluntary siting approaches. The characteristics of the hosting communities in Sweden, Finland, France and the United Kingdom help to explain the propensity of certain communities to offer their candidature as a nuclear waste site (see also Blowers 2016; Di Nucci and Brunnengräber 2017). The ‘willingness to accept’ and voluntarism has often been correlated with the role played by community benefits in form of compensation packages rewarding volunteering communities for their assent to the construction of a waste disposal facility, framed as an activity in the public interest (see in this volume Di Nucci 2019; Kojo and Richardson 2019; Lehtonen and Kojo 2019).

The framework conditions that may lead to a decision to volunteer are: strong identification with the nuclear industry, economic marginalisation and geographical seclusion of the region (nuclear oases) (see Blowers 2016) as well as economic interests and dependencies that have arisen from the nuclear industry and the resulting value chain (Di Nucci 2016). An in-depth discussion of whether there can be ‘pure’ voluntarism or voluntarism should be considered as ‘bought’ and of distributive justice in combination with compensation is provided in Di Nucci and Brunnengräber (2017) and Di Nucci (2019, in this volume). Voluntarism and partnership strategies can provide “an element of community control over the technology strategy for radioactive waste management” (Cotton 2018: 138) and help smooth opposition, especially in cases where the affected population feels involved in the project.

This viewpoint is substantiated by the experience in Finland, where cooperation took place between the operator Posiva and the local councils with whom the negotiations were carried out. The need to ensure local acceptance was a major motive for the operator Posiva's adoption of a more dialogue-oriented strategy (Lehtonen 2010; Kojo et al. 2012). Posiva's procedures are said to have been characterised by two modes of action: continued general public communication and informed closed-doors negotiations with the municipality (Lehtonen and Kojo 2019, in this volume).

Compensation

Nuclear waste facility siting programmes have often made use of social and economic benefits for the potential host community, offering packages such as financial compensation and local empowerment. This is frequently referred to as an 'added value approach'. Compensation packages often accompany voluntary approaches to site selection. These are a form of 'mitigation' to neutralise perceived fears and possible negative financial effects. However, the option of compensation does not necessarily have to be financial, and there are different types of compensation for designated locations, including monetary or fiscal incentives (or the supply of public good, improvement of local infrastructure, cultural centres, swimming pools, etc. Richardson (2010: 4) classified the use of compensation for a repository as 'community benefits' and categorised them into: 'cash incentives', 'social performance measures' and 'community empowerment' measures. Kojo and Richardson (2019, in this volume) describe stakeholders' opinions of the use of compensation in siting a nuclear waste facility in the Czech Republic, Poland and Slovenia and argue that an added value approach should be adapted to the interests and needs of stakeholders during different stages of a siting process. Moreover, negotiations on the overall approach is needed, and not be limited to community benefits.

Markku Lehtonen and Matti Kojo (2019, in this volume) discuss the role and functions of community benefit schemes in the case of the Finnish and French nuclear waste disposal projects. They raise awareness regarding the 'bribe effect' and understanding of how the type of benefit measures and the order in which they are presented will make a difference in local acceptance for the repository projects. In France, the benefit schemes have occupied more space in public debate, and have arguably played a greater role in winning local support for the project than in Finland. In addition to compensation, there are also cases where mechanisms for negotiation (for example in Switzerland) have been established to compensate the affected communities and have played an important role. A

study on site selection in Switzerland suggests that a fair procedure is more essential than a fair distribution to find consensus (Krütli et al. 2010).

5 Between science and society: The role of experts and commissions

Policy makers should be prepared to consider that the source of the problem is not only to be found in the reaction of the public, but also in the behaviour of institutions responsible for creating (technical and institutional) innovations, managing risk and setting the scientific and technological policy agenda. This seems to us to be the most urgent imperative. In a realm still dominated by technical issues like nuclear waste governance, an evidence-based policy is conflicted. The level of evidence and what ‘good evidence’ means are disputable. Moreover, different policy stages need different bases of evidence, in particular because of growing societal pressure to deliver policy decisions backed by rigorous and ‘objective’ scientific evidence or criteria. In this context, expert knowledge and bodies advising politics and providing ‘neutral’ scientific input or advice to policy assume a key role. Experts and expert committees, as Lentsch and Weingart (2011: 7) suggest, represent a sort of ‘institutional layer’ between science and politics, which has its own rules and values. The more political decision-making processes are controversial and the more expert’s dissent is visible, the important role played by advisory bodies.

However, it would be naïve to assume that experts, even when mostly belonging to a scientific community, form a homogeneous group. This is especially clear in the case of broadening stakeholders in nuclear waste management (NWM). In the past, technical experts shared not only similar methods and even goals, but also a common technological paradigm, for example the preference for DGD. However, the more the commissions are opened to other knowledge and experts beside applied scientists, consider lay knowledge, and include perspectives from practitioners, industry and society, the more their positions and preferences will be conflicting. Ana Maria Isidoro Losada, Dörte Themann and Maria Rosaria Di Nucci (2019, in this volume) show the limited influence of these commissions on policy making by analysing the work of five advisory bodies appointed over the last 40 years to advise the German Parliament or ministries in matters concerning NWM. They underline how pure scientific and technical approaches are totally inadequate for proposing development trajectories for contested technologies. Policymakers remain badly informed not only because of information gaps and classified information, but also because they are not ready yet

for procedures in which science, politics and society cultivate together a new art of stronger discourse and are prepared to learn from each other.

Julia Olliges (2019, in this volume) asks whether the participation process conducted by the German Commission for the Disposal of High-Level-Waste in charge with providing recommendations on the siting selection process has reflected deliberative democratic ideals. She identifies a deliberative deficit regarding the inclusiveness, fairness, and transparency of the Commission's procedure as well as concerning feedback-mechanisms for how the results of deliberation have been integrated into policy making. The science-policy interfaces and the role of science in society and politics is apparent when the considering the composition of these committees with regard to distance, plurality and neutrality, and the evolution of disposal concepts and strategies within these advisory bodies. In that respect, and in an almost parallel timeframe with the EK, the research platform ENTRIA (2013-2018) in Germany has made an important additional contribution by enhancing a broad based interdisciplinary exchange. This has also had a certain impact in reframing the research-policy perception of science, technology, and risks and in fostering the interaction with policy and administration (see Röhlig 2019, in this volume).

The example of the Committee on Radioactive Waste Management (CoRWM) set up in late 2003 by the UK Government as an 'independent' committee offers interesting insights how an advisory body tried to shape the development of a new policy for the management of the UK's higher-activity radioactive wastes. Mackerron (2019, in this volume) shows how this body engaged with both the public and stakeholders and how this attempt, in spite of the failure to achieve an acceptable site in the UK, can still be considered as a relatively successful process. But also in Germany the mission of expert committees and the spectrum of the experts included in these has changed as a the so-called National Civil Society Board (Nationales Begleitgremium or NBG) undertook the task of mediating and independently monitoring the process of the site search in the public interest. In compliance with § 8 of the 'Repository Site Selection Act' (StandAG 2017) and following the recommendations of the EK, the NBG was established at the end of 2016 as an independent, pluralistic body to accompany the implementation of public participation in the site selection process (see Schreurs and Sukow 2019, in this volume).

6 Planning and the challenge of multi level waste governance

Cowell and Devine-Wright (2017: 500) point out that research on infrastructure siting processes and public responses “tends to focus on single cases and particular technologies and frames its goals in instrumental terms (e.g. ‘getting to yes’ or promoting ‘social acceptance’), rarely connecting siting decision-making with broader political and technological changes”. As Achim Brunnengraber (2019, in this volume) suggests, the disposal of HLW is more extensive and a wicked problem that is linked to political, economic and social challenges associated with siting and the disposal of nuclear waste. Ten characteristics of these wicked problem are embedded into three core dimensions; the material, the technical and the social. The complexity is aggravated by the fact that there is a multitude of actors involved with differing interests, values and preferences, which have hardened over time and formed lines of conflict.

The challenges to meet strict safety requirements are shaped by the definition of “affected regions” (see Steinbrunner 2019, in this volume) and by a complex interaction of international, European, national and country-specific or even local constraints. All these levels are touched upon in the search for a repository for nuclear waste in multi-level governance system (see Brunnengraber and Hocke 2019, in this volume). Steering mechanisms, such as those that shaped political-administrative systems in the 1980s, or market-based approaches are not suitable in the ‘projects’ of repository search, which are very different from one country to another. They are not sufficient to adequately account for different stakeholder interests and the socio-political dimensions of the problem. Even an international top-down approach, as has been established in environmental regimes (for example, the Kyoto Protocol), has failed. But the complexity of the problem, the cross-level processes and the divergent interests in shaping societal relationships to nature ultimately require reformed or even new social institutions and new forms of governance. To do this, the existing governance structures must be identified, understood and re-analysed, moving from the assumption that as the multiplicity of state, private and civil society actors increases, the structures and processes of politics, law and economics become more complex and the known levels and arenas of political negotiation need to be extended.

The increase of levels and number of actors results in extended scope of action for the stakeholders and affected people; these interdependencies are not always obvious. In this context, categories such as private-public or local-global have low meaning. Public and private interests, as well as national, regional and local levels, can hardly be viewed independently of each other, as they interact so closely. However, this raises the question of which interests and with which goals

certain (institutional) levels are formed, and which questions and issues are negotiated at which levels. The framing of problems, the distribution of competences, resources, tasks and, ultimately, decision-making powers at different levels of action (local, national, sub-national or international) as well as the material side of the problem must therefore be seen in context and analysed accordingly. With reference to negotiating systems, Robert Putnam (1988) pointed out that politics – in his case the international ones – can be described and analysed as two-level games. Multi-level governance, however, points beyond the two-level structure and to such complex interactions between institutions, many levels of action and very different societal issues.

7 Conclusion

This volume reflects on various factors that characterise and even shape the debate on what is an ‘acceptable solution’ for a final repository for HLW and on various strategies adopted in order to discern “acceptable” solutions. In doing so, the book attempts to shed light on historical paths and even path dependencies, factors and actors that are or were decisive to elicit solutions or procedures that are fair and participatory and hence help restore trust or reducing conflicts and mistrust. At the same time, the contributions in this volume consider various mechanisms applied and issues touched upon in these strategies, such as economic interests at stake, compensation, ethics and governance as well as participation, looking at the root cause of successes and failures.

It quickly becomes clear why site selection is a difficult task worldwide: not only does the best-suited geological location need to be localised according to ‘accepted’ criteria and the best possible technologies selected, but also complex political conflicts must be resolved in order to gain social acceptance for a contested facility. The aggravating factor is that the exposure to ionizing radiation persists for hundreds, thousands and even millions of years, something that cannot be grasped in human time dimensions. The scientific and technical uncertainties and the very different social problem-solving challenges are enormous. Each repository not only has geological uniqueness but also has to consider cultural, historical, political and socio-economic aspects in the region. That is why it is generally so hard to identify ‘universal’ guidelines in the repository site selection process. In all cases, a learning process and questioning of chosen approaches are the rule, rather than the exception, and can only be handled and even understood through a deep analysis of conflicts and interests on multi-governance levels.

The disposal of HLW is not only a question of local and social acceptance, although the risk perception of nuclear waste repositories and corresponding opposition increases strongly the closer it gets to people's living environment. Given the multitude of actors involved with different values and preferences, the technical and scientific uncertainties surrounding the emplacement of radioactive waste, and the economic interests at stake, new conflict constellations readily result in this process, which can end up becoming long-drawn-out political disputes. The contributions in this volume highlight a range of socio-technical issues and national peculiarities.

The differences across countries are not just technical and geological, but especially concern factors that influence decision-making procedures and how deliberation and participation are/were stimulated or discouraged. The spectrum of cases highlighted shows different modes of governance and different perceptions and understanding of the role that the social control of technology and participation in procedural matters should play.

The complexity of the issues at stake and multi-level governance structures suggest that the political process of regulating the search for repositories can by no means be based on a common understanding of the problem. Already the problem definition, the social and political perception of the various stakeholders, affected communities, and also the various narratives and their 'packaging' are highly divergent. Understanding how governments organise public engagement and participation in decisions concerning energy infrastructures has significant implications for the relationship between energy transitions, democracy and justice (Cowell and Devine-Wright 2018). Against this background, this book also makes clear how important it is to consider the way decision-making functions are distributed between the various private and public actors, society, experts and politics, and what opportunities are given for working towards a solution in an open dialogue, whereby questions concerning the distributions of risk and benefit should be approached from the perspective of justice and fairness.

There are, however, reasons to fear that defining the process, the central areas of action and political regulation may strengthen the established political actors, whose preferences, interests and logics of action can be (but not necessarily) opposed to those of the civil society. The room for manoeuvring is determined above all by those who work in the key institutions (such as regulators, operators and ministries in charge) and who have the necessary resources. And yet, in order to achieve an 'acceptable' solution, all these aspects must be brought together in the political process. In that respect, Germany has a chance to learn from the mistakes of the past, take inspiration from other national experiences and start devel-

oping a genuinely and ambitious participatory governance approach. In this process, Germany can draw its own lessons to improve prospects for deliberative, transparent procedures.

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