



# Do You Care About High-Level Radioactive Waste and Spent Nuclear Fuel? Opportunities for Co-Constructing an Appropriate Governance-Ecosystem in Belgium

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## 4.1 Introduction

On April 2, 2022 the Belgian radioactive waste management agency, ONDRAF-NIRAS, and the federal minister of Energy announced a “major national dialogue” to be launched in the near future on what should happen to the high-level and long-lived radioactive waste from the country’s nuclear power plants (NPPs) (Winckelmans, 2020). This would be the second consultation around this matter. In 2009–2010, ONDRAF-NIRAS conducted a Strategic Environmental Assessment (SEA), flanked by a societal consultation involving expert and stakeholder

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M. Arentsen and R. van Est (eds.), *The Future of Radioactive Waste Governance*,  
Energiepolitik und Klimaschutz. Energy Policy and Climate Protection,  
[https://doi.org/10.1007/978-3-658-40496-3\\_4](https://doi.org/10.1007/978-3-658-40496-3_4)

dialogues and a citizen forum, before issuing its Waste Plan in 2011 (ONDRAF-NIRAS, 2011) calling for a decision in principle on geological disposal (ONDRAF-NIRAS, 2012). A subsequent political decision did not materialise until a decade later (see Section I), opening the floor for a public debate on how to organise a “step-by-step plan to further the R&D activities for deep disposal” (Council of Ministers, 2022a).

This chapter discusses key dimensions for the future of high-level radioactive waste governance (HLW) in Belgium. It highlights elements that a diverse set of stakeholders considered to be of importance for a national public debate, and puts them in the context of the theoretical notion of ‘caring’, as developed by Maria Puig De La Bellacassa. Drawing on the work of feminist thinkers exploring the concept of care in various scientific disciplines, Puig de la Bellacassa focuses on care as a relational concept between humans and non-humans: “Care is a force distributed across a multiplicity of agencies and materials and supports our worlds as a thick mesh of relational obligation.” (Puig de la Bellacassa, 2017, p. 20). Facts can be established, but they can also be unclear or disputed. Concerns and interests that feed knowledge production can differ and possibly clash. Even though caring can be enacted in a variety of ways, introducing a care perspective holds a stronger promise of common ground, of a basis to start from. Based on empirical data from the Belgian case, this chapter explores the added value of a caring approach for the long-term governance of materials such as radioactive waste.

What follows is not an attempt to update previous works describing Belgian radioactive waste management from the 1920s (see e.g., Schröder & Bergmans, 2012; Lits, 2015; Parotte & Delvenne, 2015; Schröder et al., 2015), or to identify nuclear events that sustain the (dis)continuities in the HLW programme (Parotte, 2019). This contribution is a foresight chapter that gives voices to actors who compose the current governance ecosystem of HLW (and spent nuclear fuel—SNF)—from concerned citizens, scientists, policymakers, civil society representatives, and public administrators to environmental associations. These ‘voices’ were collected during a research project between June 2018 and December 2019, the largest part of which was dedicated to a two round enquiry into the problem definitions of those concerned actors, including their expectations regarding a future multi-stakeholder governance process.

This chapter is structured in three sections. Section 4.1 introduces the past and current situation of Belgian radioactive waste. Section 4.2 presents the key (future) dimensions identified by Belgian stakeholders for the HLW long-term governance process. It offers insights regarding planning, policy development and implementation these stakeholders desire. However, the aim is not to highlight

what perspective every type of actor develops, often resulting an emphasis on points of disagreement and conflict. Rather, the perspectives are considered as an interrelated collective in which each has its own merits and reasons for existence. It can be argued that these perspectives keep each other in balance. From that position, Sect. 4.3 develops recommendations to consider a future HLW governance process by introducing the notion of ‘matter of care’ as a conceptual framework. This offers the context for focusing on the commonality of the problem rather than divisiveness over the solution, as well as on the interrelations beyond those between human actors. Concrete elements are suggested to recognize potential joined pathways when considering possible futures of HLW long-term governance, and to organize collective action by allowing for multiple ways of ‘caring’. In the conclusion, we link back to the governance ecosystem framework presented in the introductory chapter of this volume.

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## 4.2 Radioactive Waste and Nuclear Activity

Radioactive waste in Belgium comes from various sources, but the bulk is related to nuclear energy production, resulting from seven pressurized water reactors (PWR) on two different sites, four in Doel (municipality of Beveren, Flanders region) and three in Tihange (municipality of Huy, Walloon region). In 2021, together both NPPs provided 21.3% of net energy generation and 49.7% of electricity production in Belgium (FEBEG, 2022).

### 4.2.1 From Past to Present

Belgium’s nuclear history has its roots in the 1920s, with the exploitation of uranium mines in Katanga, at that time a province in the colony of Congo. In return for supplying the US and UK with uranium for the Manhattan project, an agreement was signed in 1944 enabling Belgium to start its own nuclear research programme. Experimentations with nuclear reactors for civil energy production began in the 1950s with the support of a national nuclear research centre, now the Belgian Nuclear Research Centre (SCK CEN), situated in the Flanders region. In the following decades, the area around the nuclear research centre attracted nuclear companies, such as an experimental reprocessing plant (the Eurochemic plant was operational from 1966 to 1974), MOX-fuel production plants, and a waste treatment facility.

Since January 2003, Belgium has a “gradual nuclear phase out” policy (Phase Out Law, 2003). The maximum life span of a number of reactors has meanwhile been extended. Current regulations (various amendments to the Phase Out Law) still stipulate 2025 as the year all nuclear power production in Belgium will end (AFCN-FANC, 2022). However in 2022, Belgium still has no clear plan to secure energy supply after the nuclear phase out, and lacks a long-term vision regarding a national energy policy. In response to the current energy crisis, the federal government decided on March 18, 2022 to “take the necessary steps” to extend the lifetime of two reactors (Doel 4 and Tihange 3) by ten years (Prime Minister of Belgium, 2022). Whether this will prove to be more than a decision in principle will depend on ongoing negotiations with the owner of the NPPs, Engie Electrabel.

#### 4.2.2 Radioactive Waste Management Today

Belgium deals with a relatively large amount of radioactive waste, given the size of the country, as it has depended on nuclear energy for a long time. ONDRAF-NIRAS, the national agency for radioactive waste management, founded by law in 1980–1981 as a government agency and implemented by Royal Decree, distinguishes three categories of radioactive waste, classified according to the half-life and level of activity (ONDRAF-NIRAS, 2021; National Programme Committee, 2015):

- category A for low- and medium-level, short-lived conditioned waste (equivalent LLW—IAEA 2009);
- category B for low- and medium-level, long-lived conditioned waste (equivalent ILW—IAEA 2009);
- category C for high-level, short- and long-lived conditioned waste (equivalent HLW—IAEA 2009).

In addition, the waste manager also identified five types of waste labelled as “other” given their specific properties, which are managed differently.

Both category B and C waste, (further referred to as HLW), demand a different long-term management strategy than LLW or category A (National Programme Committee, 2015, p. 28). For category A waste, a long-term management strategy, namely surface disposal in the municipality of Dessel, has been developed through a participatory governance process launched in 1998. In 2006, this strategy was confirmed by the Federal government, after which the project’s

blueprints were refined. Meanwhile, various technical and societal subprojects have materialized, such as a long-term health study (2011), a quay for transporting building materials over water (2013), a local fund (2016), a visitor center and exhibition space (2021), and an encapsulation and caissons plant (2022). However, the licence application for the disposal facility itself has been under review since 2013 by the regulator, the Federal Agency for Nuclear Control (AFCN-FANC).

While the program for category A waste is quite advanced, the management of HLW remains the key challenge in Belgium. As indicated before, the radioactive waste management agency, ONDRAF-NIRAS, issued a Waste Plan for HLW in 2011 (ONDRAF-NIRAS 2011), preceded by a SEA and a social consultation. Based on this plan, ONDRAF-NIRAS suggested the Federal government take a decision in principle regarding geological disposal in poorly indurated clay as the long-term management option for HLW, including non-reprocessed SNF. ONDRAF-NIRAS considered the SEA to have determined geological disposal as the way forward. Reference was made to international consensus on this long-term management solution. Also a citizen forum, organised by the independent Roi Baudouin Foundation, had judged the ONDRAF-NIRAS' solution to be acceptable under a number of conditions, such as the establishment of an appropriate decision-making process guaranteeing 'more transparency, and more interaction with society', or the technical reversibility of the facility for at least 100 years (KBS, 2010, pp. 7–8). The emphasis on poorly indurated clay stemmed from the fact that research for the last 50 years had focussed on this particular type of host rock and that review processes (e.g., by the OECD's Nuclear Energy Agency, NEA) of this research programme had so far been positive. However, in its advice to the Federal government, AFCN-FANC acknowledged geological disposal as the reference solution to manage the HLW waste safely, but considers it premature to take a decision regarding the geological host formation (FANC, 2011).

The European Waste Directive (2014) was transposed into Belgian legislation (Transposition Law, 2014), stipulating (in Art. 4) that any national policy regarding a long-term radioactive waste management strategy should be based on disposal by means of a concept of passive safety. It holds ONDRAF-NIRAS responsible for proposing a location for such a facility, and suggests the possibility for installing an "independent, multi-disciplinary body" to follow-up the national policy. A National Programme, was subsequently adopted in 2015 describing the situation with regard to the legal and regulatory framework, concerned actors and their respective responsibilities, the state of the waste inventory, existing management practices, plans for the long-term, and financial provisions (National Programme Committee, 2015).

In 2018, the Federal Minister of Energy asked ONDRAF-NIRAS to update its SEA from 2009. A public enquiry on this updated SEA was organized from April–June 2020 during the first COVID-19 lockdown. This led to a new request to the Federal Government to take a decision in principle on geological disposal, leaving the issue of the geological host formation open. In April 2022, the Federal Government agreed on a draft Royal Decree and Draft Law regarding the national policy for the long-term management of HLW, requiring ONDRAF-NIRAS to “draw up a step-by-step plan for the R&D activities for deep disposal in Belgium of high-level and/or long-lived waste”, to “sound out neighbouring and other interested countries about the possibility of developing shared disposal facilities”, and “to organise a participatory process and public debate” (Council of Ministers 2022a, April 1). Another Draft Law regarding the provisions for the decommissioning of the NPPs and the management of SNF was also agreed. This law aims to tighten the existing rules regarding the management of the nuclear provisions, including the establishment of an independent oversight body (Council of Ministers 2022b, April 1).

Much will depend on further implementation, but both Federal Government decisions have the potential to be a next step in closing the gap between research, policy and practice (Schröder et al., 2015). Under pressure from the regulator, the issue of the geological host formation is most likely to feature prominently in ONDRAF-NIRAS’s future R&D plans. What the topics of the “major national dialogue” will be, and how this process, announced as “deliberative” by an ONDRAF-NIRAS spokesperson (Winckelmans, 2020) will influence the course of events remains to be seen.

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### 4.3 Imagining the Future for a Long-Term Governance Process in a Participatory Way

Our study consisted of three tiers: (a) extensive desktop research, consisting of 22 in-depth interviews with key Belgian and Dutch stakeholders, and two focus group discussions with local actors directly concerned with nuclear sites (Meyermans & Bergmans, 2019); (b) two rounds of a bilingual online Delphi survey consisting of 109 items, in which 242 Belgian stakeholders participated (Parotte & Fallon, 2020); (c) three scenario workshops with ONDRAF-NIRAS senior staff and management (Rijkens-Klomp & Cörvers, 2020).

The starting point was the deadlock situation in which the process of developing the Waste Plan of 2011 had ended, without a political decision being taken. Therefore, the questions regarding respondents’ expectations for a governance

process were focused on general principles and “What next?”; rather than how to govern the implementation of a specific long-term management option, in particular geological disposal. By continuously approving (either explicitly or implicitly) the direction of ONDRAF-NIRAS’ R&D program over the last 50 years, implicit steps towards disposal (with geological disposal clearly in the minds of the decision-makers) have been taken long before the 2022 decision by the Council of Ministers. This has framed future national policy, as well as the mindset of several of the respondents.

### **4.3.1 Framing the (Start of) the Debate(s) ... Again: What Are the Problems?**

Initially more than 580 persons were targeted. All had either been involved in extra public consultations organized by ONDRAF-NIRAS (2009–2010), participated in a legal public consultation (2010), made public statements in the media on the nuclear waste plan between 2009 and 2011, or shown an interest in HLW issues through participation in seminars, workshops, etc. over the previous decade. The 242 respondents presented themselves mainly as ‘citizens’ and ‘scientific experts’, though some were also members of environmental associations or trades unions, healthcare professionals, or federal/regional/local civil servants (Parotte & Fallon, 2020, p. 8).

What do Belgian stakeholders have in common regarding their views on the future of the country’s HLW? Those who responded to our interactive survey generally recognised that the radioactive waste is already out there; that the way it is stored today may be considered safe for now, but cannot go on for ever; and that the European Waste Directive requires Member States to put an appropriate long-term policy in place.

So far, the 2010 Citizen Forum’s request for ‘more transparency, and more interaction with society’ has not been met. Neither the Transposition Law (2014), nor the National Programme (2015) attracted much public or media attention. Both passed as low key, inner-circle events, to settle formal EU obligations, and no public connection was made to the Waste Plan debate initiated by ONDRAF-NIRAS in 2011 (Parotte & Delvenne, 2015; Schröder et al., 2015). Although the SEA public enquiry in Spring 2020 appears to have attracted record numbers of responses (ONDRAF-NIRAS, personal communication, September 29, 2021), one could question the appropriateness of such outreach in the unprecedented time of the full lockdown during the first wave of the COVID-19 pandemic (Parotte, 2020b).

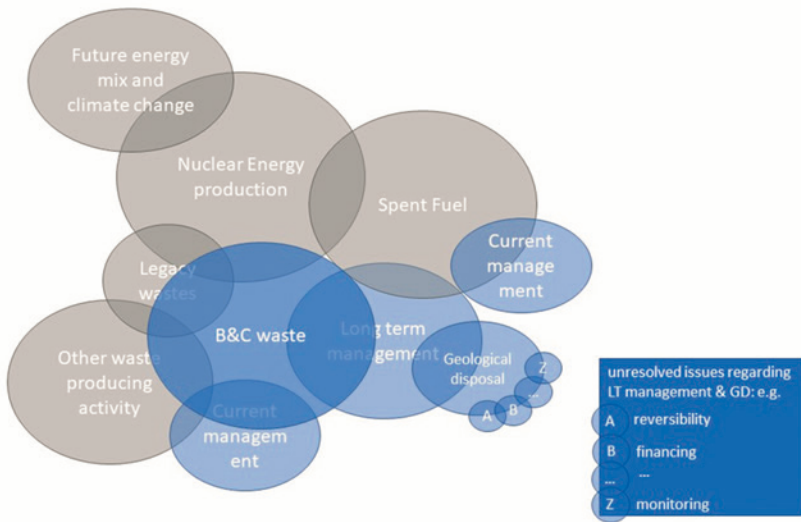
Our results show that in Belgium, awareness of the problem of radioactive waste in general and HLW in particular appears to be limited amongst actors who do not see themselves as directly linked to or particularly interested in the nuclear sector (regardless of whether they position themselves as supportive, critical or neutral). Such findings are in line with those of the most recent SCK-CEN Barometer, which demonstrates that people in general have little knowledge of how high-level (or other) radioactive waste is currently managed. About half of the respondents to that public survey reported believing that it is already stored underground (Turcanu et al., 2018).

Of the respondents to our more targeted survey, more than half regarded geological disposal as the ‘most realistic’ solution, and more than half were of the opinion that ‘doing nothing’ (i.e. delaying any steps towards implementation) was not a solution. Nevertheless, a large majority of the respondents insisted that the future of HLW management should not be discussed without addressing the entire nuclear production chain, the role of new nuclear technologies, and the status of SNF, in addition to exploring the possibility of multi-state joint management solutions. There were some similarities between the more informed respondents participating in our study and the sample of the public invited to respond to the SCK-CEN Barometer. In the Barometer, almost as many respondents (66%) reported believing that geological disposal should be implemented as soon as possible, and 57% did not think that geological disposal would solve the HLW problem (Turcanu et al., 2018, pp. 47–49). This indicates potential for discussing geological disposal without pretending that going down that path instantly solves the HLW problem.

Our respondents also considered that uncertainty remains regarding the radioactive waste inventory (related to the ambiguous status of SNF, and lack of clarity about the nuclear phase-out). While most insisted that a full overview of this inventory would be needed before deciding on a strategy for all waste types, many also acknowledged that shifts may occur in the future and that developments in technology and/or policy may call for changes.

In combination with the reasons that a number of stakeholders provided for refusing to take part in our research project, the results point to a general feeling that the focus of geological disposal is excessively restricted as the definitive solution to the problem of HLW in Belgium. Respondents regarded the problem as multi-dimensional and argued that the governance process should aim to incorporate these dimensions as much as possible, rather than screening out some from the start. Therefore, re-framing the issue of radioactive waste would seem recommended: starting from the problem, rather than from an envisioned solution, inviting societal actors and stakeholders to participate in a debate on the question of





**Fig. 4.1** The multiple dimensions of the HLW problem. (Source: Bergmans et al., 2020, p. 11)

high-level and long-lived radioactive materials present in society—some declared as waste, others not (yet). This debate should not be restricted to technical management features or the financial cost of the disposal project, but should also consider related environmental, ethical, socio-political, financial and legal issues regarding the entire production chain.

Figure 4.1 provides an overview of the themes associated by the respondents to the issue of HLW (or category B&C waste). The themes in blue directly relate to ONDRAF-NIRAS’ realm of competence, for the themes in grey, other actors have a leading role.

### 4.3.2 How to Organize the (Future) HLW Governance Process?

We also asked respondents what core principles and main organisational features they considered important for HLW governance. Their answers could be clustered around the following five governance principles: (1) a “flexible and stepwise” approach, (2) “practising transparency”, (3) providing “clarity about the link

between participation and decision-making”, (4) ensuring “monitoring and control” and (5) “robust financing”.

### **Flexible and Stepwise**

Given the long-term nature of the HLW problem, a reflexive, flexible and stepwise governance process is called for. For our respondents, this meant that an overall framework should be prepared, identifying key steps and general principles to ensure participation on a continuous basis. Many indicated a preference for this to be laid down in law to provide some guarantee. However, a clear demand for continuous participation does not mean respondents expect this to take the same form throughout the process. On the contrary, they insist it should be regularly reassessed and adapted according to the phases of the process and audiences targeted. These insights are not new, but resonate with the general principles and specific actions identified by the NEA in 2004 regarding decision-making for long-term radioactive waste, inspired, among others, by the partnership approach taken in Belgium for the long-term management of category A waste (NEA, 2004; Pescatore & Vari, 2006). Our respondents considered the federal level to be the most appropriate for organising such a debate on criteria regarding location, technical options, (economic) incentives, public and stakeholder involvement, etc., with an important role for the regulator, AFCN-FANC.

### **Practising Transparency**

More clarity and transparency is expected from ONDRAF-NIRAS and other responsible actors on the management of HLW. Regarding our respondents’ request for transparency, three clear expectations could be summarized from the interviews and the survey: (1) active sharing of information on the issues, (2) traceability of the (decision-making) process, and (3) a varied information system. Our respondents explicitly pointed out that making information accessible is one thing; actively sharing it, is something else. During the interviews in particular, more effort was requested regarding outreach and making people aware and knowledgeable. Outreach activity by ONDRAF-NIRAS was seen as too fragmented, both in time and vis-à-vis stakeholder groups. From the Delphi survey the suggestion came to set up a high-quality and varied information system, bringing together contributions from multiple sources, including what respondents referred to as “contradictory expertise”. Making explicit who the concerned actors are and what they stand for with regard to the question of HLW waste was also seen as important.

Regarding the traceability of the process, respondents’ expectations not only concerned the process ahead. How the current situation was reached is important to know for people who consider becoming engaged in HLW governance.

However, the related legislative history appears to be characterised by a relatively high level of obscurity. Starting with the creation of ONDRAF-NIRAS in 1980, the framework for a national waste management policy and its institutional organisation were ‘buried’ in one dedicated article (Art. 179) of a law on budget proposals (Budget Law, 1980).

Finally, the survey respondents connected the need for a varied information system with their demand to organize the traceability of decisions. They suggested putting into place a “Pluralist Documentation Centre” (Parotte & Fallon, 2020, pp. 50–55), to collect and preserve relevant information from a variety of sources (public agencies, NGOs and the research community), and to distribute this to diverse audiences: politicians and civil society, but also the scientific community and professionals in the field. Independence from the nuclear sector was considered important almost unanimously, but opinion was divided on how to realise this in practice. Some argued for joint management by a broad range of stakeholders. Others considered this a role for a public body.

### **Being Clear about the Link Between Participation and Decision-making**

Our respondents asked for more clarity on the role of participation in the decision-making process. In general, they expect politicians at the appropriate levels of government to decide about the management of radioactive waste. But they also insist that a broad range of actors should be (more) actively involved in preparing those decisions. A feeling that “backroom politics” dominated the decision-making process on radioactive waste was often recorded, which can be linked to the perceived lack of transparency.

The participatory approach to local partnerships for category A waste was referred to by several interviewees as an example of how things can be done differently (without saying a future process for HLW should be designed identically) and is seen as an exemption to the rule. This can also be deduced from the section on “transparency and participation” in the National Programme for the Management of Spent Fuel and Radioactive Waste (National Programme Committee, 2015, pp. 16–17). So far, the Belgian legislator has not invested in providing a legislative framework for public participation, other than the general obligations regarding public access to government, and access to information and public participation in decision-making on environmental matters (often imposed through transposition into Belgian law of international laws and conventions).

However, the lack of legal obligation does not mean one cannot set up a participatory process with stakeholders. In Belgium, both the partnership approach (Bergmans, 2008) and ONDRAF-NIRAS activities in 2009 and 2010 for elaborating the 2011 Waste Plan (Parotte & Delvenne, 2015) highlight how it is pos-

sible to envision supplementary participatory initiatives aimed at specific stakeholder groups, experts, and citizens, beyond what the law prescribes. However, policy practice thus far provides an inconsistent pattern when it comes to public and stakeholder participation. A closer look at the information provided in the National Programme as ‘transparency and participatory practices’ (National Programme Committee, 2015, pp. 20–21, 25, 41–44, 46–49) makes this clear. The partnership approach for category A waste, and the societal consultation for the 2011 Waste Plan notwithstanding, the current practices listed are passive ways of making information available, and the related communication is almost solely directed at official bodies. Our respondents clearly expect more. They insisted that public and stakeholder participation as a key feature of long-term governance of HLW is only valid if a genuine connection is ensured with the institutional decision-making process. Therefore, at the start of the decision-making process, it should be clear what the purpose of participation is, when participation is possible, what is open for discussion, and how the input by stakeholders will be taken up in the decision-making process.

### **Ensuring Monitoring and Control**

The survey respondents expressed a number of expectations that can be categorised under the heading of ‘monitoring and control’. It is important to stress that they see a combined need for monitoring and follow-up of both the long-term management strategy and the related governance process, which they consider as intrinsically linked.

A majority of respondents insisted on monitoring of the governance process, which stems from their requirement for such a process to be flexible and adaptive. They expect both technical and societal aspects to be jointly addressed in the governance process, and therefore also by any control mechanisms. In line with expectations regarding the role of the regulator, respondents suggest making this more active in terms of providing information, adopting regulations, and organising debates on safety aspects. In support, many respondents consider it useful to establish an independent mixed pluralist body at the federal level. The possibility for setting up such an entity is foreseen in the Transposition Law (1980). Our respondents did not express clear views or expectations regarding the composition of such a body, but expect it to work closely with the public authorities to assess the HLW management process at strategic level. To a lesser extent, respondents thought it could also be responsible for evaluating the operational process and public consultations. The possibility for enrolling counter-expertise, particularly for affected communities (present or future) at the local level, was also put forward as an important feature of a system of monitoring and control.

### **Robust Financing**

The respondents insisted on ensuring the principles of reliable financial management for HLW. For them, in the case of insolvency, the State is ultimate responsibility and should be clearly organised, by considering the evolving nature of the costs, presenting a risk analysis about producers' insolvency scenarios, and ensuring strict control of the sufficiency of funds at the national and European level. At the national level, respondents suggested organising financial control attached to the parliament (in the spirit of the Court of Auditors).

Regarding these suggestions, how to envision the long-term governance process of radioactive waste in Belgium? Combining the views collected from the stakeholders with the authors' past research in a European and international setting, and putting this in a perspective of considering radioactive waste as 'matter of care', Sect. 4.3 identifies three overall principles for building a long-term governance process HLW (and SNF) in Belgium.

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## **4.4 Building a Long-Term Governance Process Based on the Notion of 'Caring'**

From the field of science and technology studies we have learned that no technology is value-free and that science and technology development does not deal solely with facts, but also with interpretations, with cognitive, practical and financial boundaries, etc. These values and interpretations impact relations between human actors, but also interactions with non-human actors, in this case most particularly the waste, and any technology developed to manage it. How to manage these materials is not only a matter of established techno-scientific facts, but also a matter of interests, a "matter of concern(s)", as Bruno Latour would put it. Facts and concerns are intimately interrelated, as concerns "add reality" to facts (Latour 2004, p. 232). Therefore, concerns tie and hold together matters of fact. They contribute to "enrich and affirm their reality by adding further articulations" (Puig de la Bellacasa, 2011, p. 89). ONDRAF-NIRAS, like all other actors involved in the radioactive waste management program, produces matters of concern or appreciations, strongly entangled with, and sometimes also presented as, facts. The exclusive research focus on poorly indurated clay, for example, mainly stems from the availability of that host rock in SCK-CEN's backyard. That in itself is not necessarily problematic, as long as it is recognised as such.

As Puig de la Bellacasa (2011, 2017) points out, often we are dealing with more than interrelated matters of facts and concerns; a situation she refers to as "matters of care". Caring in this sense takes being concerned (or having an inter-

est) in a particular issue or fact to another level. Our practices, discourses and engagement regarding a particular issue or situation differ, depending on whether we ask ourselves: “Is it a fact?”, “Am I concerned?”, “Do I care?”. Applied to radioactive waste, an answer to each of these questions could be “The waste is already here and it must be managed”, “I’m concerned about what will happen with these radioactive materials”, and “I care about the way they are handled”.

Caring is about projection onto another (even where that other is the self or a non-human entity); it is an outbound activity, whereas concerns and interests are directed inward. One will undoubtedly find acts and considerations of care in the current radioactive waste management approach by the responsible agency or other actors concerned when analysing discourses and practices. But the emphasis has so far remained on providing facts (based on the persisting idea that facts are neutral) and on weighing, and at best balancing, interests.

This is not unique to radioactive waste management. It is symptomatic of the way we deal with various complex societal questions, in particular in the field of urban planning, and regarding environmental and technological risk. Many participatory practices remain instrumental, and limited to what is legally required. But many of the more voluntaristic initiatives continue to be guided by Fischhoff’s (1995) famous plea for inclusive risk management, which he represented as consecutive stages of development (see Fig. 4.2).

Although ‘treating people nice’ (Fischhoff’s sixth developmental stage) is a way of caring, it is not a matter of care, as put forward above. Analysing 20 years of evolution in risk management, Fischhoff argued that this practice should, ideally, be guided by the facts. However, what is recognised as facts is often limited to the “sizes of the risks and benefits involved”, while “changes in political and social status that arise from the risk-management process” should also be taken

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- All we have to do is get the numbers right
  - All we have to do is tell them the numbers
  - All we have to do is explain what we mean by the numbers
  - All we have to do is show them that they’ve accepted similar risks in the past
  - All we have to do is show them that it’s a good deal for them
  - All we have to do is treat them nice
  - All we have to do is make them partners
  - All of the above
- 

**Fig. 4.2** Developmental Stages in Risk Management (Fischhoff, 1995, p. 138)

into account as facts. In that way, Fischhoff saw the social contract between those who create and those who have to bear risks (at least partly) fulfilled. Not through eliminating conflict, but as a way of “having fewer, but better conflicts” (Fischhoff, 1995, p. 144). Twenty-five years on, it may be time to reflect on whether adding concerns as another layer onto facts (still too often interpreted as either technical facts, or social and political concerns) and creating spaces in which these could be discussed, is enough to tackle complex questions of environmental and technological risk.

Before returning more explicitly to what it could mean in practice to approach radioactive waste as matter of care, we consider three features of a related long-term governance process that have been given attention by social sciences, and that were put forward by our respondents. For each we will indicate how we see it linked to a perspective of care.

#### **4.4.1 Long-Term Radioactive Waste Management is and will Remain a Socio-Technical Challenge**

Many of the Belgian stakeholders we questioned stressed the interconnectedness of social and technical aspects and the need to integrate the socio-technical challenge into one approach. This is also the ‘Leitmotiv’ of ONDRAF-NIRAS’ official communication. However, when it comes to public and stakeholder participation, this is often mainly directed at what is considered the social aspects (Bergmans et al., 2015; Hietela & Geysmans, 2020). Therefore, it is worthwhile to consider four observations on the interconnections between those dimensions that directly relate to our respondents’ expectations (Kallenbach-Herbert et al., 2014, pp. 27–31).

First, the process of radioactive waste management is composed of a broad variety of interactions between humans and non-humans (the environment and other living entities, but also created artefacts), in various constellations, spread over space as well as over time. However robust or stable such a process may seem at a certain point in space or time, reconfigurations of these interactions and players will inevitably occur due to changes in the socio-political or economic context, the accumulated knowledge base, technical development, etc.

Second, wider societal involvement means more than offering citizens a way to express democratic values or getting approval for an already elaborated technical fix. It means that new inputs could feed the technical project and vice versa.

Third, if taken seriously, opening up to wider societal involvement has the potential to bring in alternative perspectives that could contribute to the creation

of new knowledge and the identification of new solutions which could influence technical choices.

Fourth, concerned societal actors could and should be invited to participate more explicitly in the technical debate, and be encouraged to contribute to this debate beyond discussing the local impact of implementing a specific technology at a specific location.

The technical and social, but also ecological, ethical, financial, dimensions of radioactive waste management are not mutually exclusive. They are seldom the exclusive competence of one particular stakeholder, and every stakeholder should have the possibility to take part in the debate on each dimension. However, in practice people who genuinely care and have a legitimate interest (e.g. those living close to existing waste infrastructure or NPPs), often refrain from entering such a debate (particularly when this is framed as about ‘technical choices’). This is largely because it tends to be centred around facts, and many do not feel competent enough or are reluctant to start an engagement process by studying large files with graphs and technical information. With respect to interests or concerns, when aiming for early and “upstream” engagement (Stirling, 2008), people may not yet fully comprehend the extent to which they are concerned. But they may care nevertheless. A perspective of care means one does not start from a proposed technical solution, but from the perceived problem, and how that matters to various stakeholders. In that way, it could lower the threshold for participation and serve as leverage to emphasise the social in the technical, and the entanglement of all relevant dimensions.

#### **4.4.2 The Long-Term Management Solution is and will Remain Experimental by Nature**

The term “experimental” was not one the respondents offered. Still, several interviewees pointed out that long-term radioactive waste management is a first of its kind endeavour, which cannot yet rely on past experience. This calls for a particular type of governance to deal with uncertainty over a long period of time. However, interviewees also indicated that even with regard to a specific technical solution such as geological disposal, different interpretations exist of what this implies as a practice (e.g. regarding notions of reversibility and retrievability, the need for monitoring). They expect these differences in interpretation to continue, which could be seen as positive, because it creates room for dialogue.

Various authors have labelled this as “experimental” or as “an on-going process of technological innovation” (see e.g., Barthe & Lindhart, 2009; Felt et al.,



2007; Kallenbach-Herbert et al., 2014; Landström and Bergmans, 2015; Parotte, 2018, 2020a). Considering the associated time-scales clearly acknowledged by most respondents, it is unlikely that at present we are able to envisage all changes or potential problems that could arise over time.

This calls for a governance approach to deal with uncertainties and give room for (social) learning. The respondents' comments are thus in line with observations from previous research, proposing to understand the implementation of a long-term management programme as "a (scientifically) controlled, open-ended exploration towards a possible solution" (Kallenbach-Herbert et al., 2014, p. 29).

This implies maintaining the capacity for technical innovation and scientific knowledge, and the continuation of the research programmes as part of the implementation process, as explicitly indicated by the respondents. It also means letting go of a classical project-based approach with a clear beginning and endpoint (Fallon et al., 2013, Kallenbach-Herbert et al., 2014; Parotte, 2018). Lastly, it implies identifying regular or milestone 'meeting points' rather than a rigid roadmap (Barthe et al., 2010; Kallenbach-Herbert et al., 2014; Parotte, 2018). Those milestones could also be understood as a momentum to assess the ongoing process and to steer a process of progressive participation, as called for by our respondents.

Approaching radioactive waste as matter of care and striving for 'communities of care' rather than 'host communities' could be meaningful. It allows the debate to unfold over the thing all care for, namely the waste and its safe future, not a particular waste management solution. A care perspective offers more opportunity for those who may not agree with, or have reservations about, the path taken to participate in the governance process. Furthermore, it holds a promise of allowing such governance processes to be truly adaptable or reversible, as new care perspectives will inevitably develop over time and generations.

#### **4.4.3 A Transparent and Democratic Way of Addressing This Challenge**

Our research results show there is a tendency to see the (Belgian) HLW governance process as participatory technology assessment to be applied in various phases of decision-making, and at various levels of government. According to the respondents, such a process could be piloted by an interdisciplinary committee of scientists and representatives from different stakeholder groups, including directly concerned local communities. Around particular aspects (or dimensions, as presented in Fig. 4.1), specific consultations could be held at specific points, targeted at a diverse range of stakeholders or existing advisory bodies.

The Transposition Law (1980, Art. 4) provides for an “independent multidisciplinary body” to follow-up the National Policy on radioactive waste and SNF. Our findings indicate that engaging such a committee in co-constructing the National Policy would be in line with stakeholder expectations. Building on suggestions from the respondents to the Delphi survey, one option could be to install a long-standing committee with rotating membership linked to parliament with an advisory role (at the Federal level and potentially also the Regional Government), reporting back on its activity at distinctive moments throughout the process.

Such a multi-level approach could be embedded in a broader ambition to strive for multiple debates in multiple interconnected arenas. This is not a task for ONDRAF-NIRAS alone. It would be extremely challenging, if not impossible, to address the multiple dimensions of HLW in one process or arena. Therefore, rather than incorporating all dimensions into a single debate on a governance process for the long-term management of HLW, one could envisage a different framework, within which different actors are mandated to organise a broad stakeholder debate on one (or more) aspect(s). These would not need to keep the same pace, nor engage the same actors at the same levels of government. But it could put the question of the long-term governance of HLW in a broader perspective and help to meet the range of related expectations from various actors.

In an ideal scenario, such a governance process is either preceded or accompanied by a public debate on national energy policy, as in Germany where the (re) launch of the radioactive waste debate came a few years after “a collective project for the future” for the country’s energy transition was discussed and presented by a transdisciplinary Ethics Commission for a safe energy supply (BMU, 2011). Our respondents acknowledge it is not ONDRAF-NIRAS’s role to organise such a public debate, and that the radioactive waste debate cannot be postponed indefinitely. Nuclear energy and radioactive waste are undeniably interconnected, as claimed by the respondents and other observers (e.g., Laes, 2015). In this respect, the decision of the Belgian Constitutional Court in March 2020 (Cour Constitutionnelle, 2020) to quash the decision to extend the lifetime of reactors Doel 1 and 2 could be seen as an opportunity for public consultations which couple nuclear energy and radioactive waste policy.

A recognition of the interconnectedness between nuclear energy and radioactive waste should be made more explicit by paying (more) attention in the HLW debate to the impact of various future scenarios for nuclear energy production, other nuclear technologies, and the management of SNF on the HLW inventory and related strategies. This would meet a primary concern expressed by our respondents of the need to raise awareness among a variety of stakeholders and engage them in (joint) problem definition and the analyses of potential solutions.

Our respondents had a clear focus on well-defined processes for participation with a clear purpose. However, despite inclusive principles that may lie behind a formal participatory process, some stakeholders may remain (purposely or not) outside such a structure. Therefore, a flexible and adaptive governance process should not only look inside (invited participation), but should be aware of what goes on outside (uninvited participation). It should continuously monitor its environment in order to be responsive to opinions raised, new issues arising, or new stakeholders emerging, or when new stages in the process are reached (see e.g., Chilvers, Pallet & Hargreaves, 2018; Cuppen, 2018).

An opportunity could lie in making the waste the object of care. Caring is not about providing one pre-fixed initial programme, but ensuring the waste is being taken care of by means of a collective and open decision-making and governance process. Since caring is an outward activity, it enables engagement with all who care, and in particular those directly affected, such as local (site) communities and citizens. This process of caring will inevitably span decades and generations of stakeholders. Intergenerational engagement should be aimed for, but this can only be reached by starting with the present generation.

#### **4.4.4 Considering Belgian HLW and SNF as Matters of Care**

Considering HLW and SNF as matters of care changes the way concerned actors are engaged in the programme and the way they frame it. According to Puig de la Bellacassa (2011, 2017), ‘caring’ has three concrete consequences. First, and related to concern, care has strong affective ethical connotations. Concern denotes worry and thoughtfulness about an issue, while care adds a strong sense of attachment. Second, the more you care, the more you are actually engaged in the process: arguably, the individual or organisational commitment to the object thus becomes stronger, also potentially criticism. And third, one could assume that those who ‘care’ develop a stronger sense of responsibility and a particular vision of the current state and future of things, enabling going beyond “past responsibilities” to create continuity in such a responsibility.

Each of these consequences cuts across the three features of a long-term HLW governance process described above, and makes caring substantially different from managing. A perspective of caring does not require a legal mandate, related position, nor expertise. Caring can be highlighted by actions (what people do), promoted by ethics (how people justify actions) or the labour of maintenance

(invisible daily practices) (Puig de la Bellacasa, 2017). There are multiple ways of caring as well as different ‘carers’, people who care. The notion of ‘caring’ requires regular re-assessment: “Who cares and what are their concerns?”, “What are the critical standpoints?”, but also “Who will do the work of care, as well as how to do it and for whom?” (Puig de la Bellacasa, 2011). From the perspective of a waste management agency, ‘caring’ about what happens to the waste does not mean ‘controlling’ an entire process. It means being in charge, and ‘taking care’ in spite of all the unexpected things that might change.

The waste management agency does not care alone. As became clear from the survey responses, multiple committed people and organisations are willing to challenge or support the programme. They are as engaged in ‘caring’, as ONDRAF-NIRAS, even if ‘how to care’ and ‘what dimensions to focus on’ varies. Engaging other stakeholders in waste governance from a perspective of care allows entry to other forms of caring. A commitment to ‘caring’ means to “remain speculative” and not let “a situation or a position [...] define in advance what is or could be” (Puig de la Bellacasa, 2011, p. 96). This is in contrast to an instrumental approach to engagement with a strong focus on finding acceptance for a pre-defined solution. Introducing care “requires critical standpoints that are careful”, and that “... manifest visions that have become possible by learning to care for some issues more than others” (Puig de la Bellacasa, 2011, p. 96). It should not be decided up-front whether or not positions or standpoints are relevant to a programme. One must ‘care’ for the different standpoints, keeping in mind that it could have been otherwise. In the context of long-term radioactive waste governance, the objective is not only to expose or reveal care practices and matters of concern; it is also to generate them. This means there is no fixed future for these wastes, but there are multiple ways of caring about the future(s) of the programme. Our study clearly highlighted who are the stakeholders who care and what dimensions matter to them, including those who did not participate, who criticize the process from the outside and contribute to it in other ways.

Lastly, there is no monopoly of caring narratives. Beyond recognition of forms of care, the challenge is to allow forms of care to co-exist. Therefore, it would be recommended for a future HLW governance process not to be the reflection of one dominant narrative. We suggest the key question for ONDRAF-NIRAS should be: how to allow multiple care narratives to co-exist in one long-term governance programme for HLW (and SNF).

## 4.5 Conclusion: Time for a Paradigm Shift?

Expectations regarding the long-term governance of HLW depend on the concerned actors' framing of the radioactive waste problem, which may or may not include a pre-conceived idea about a solution. Our research made clear that some respondents seem to be willing to support ONDRAF-NIRAS to take further steps with regard to geological disposal of HLW as (part of) a long-term solution. However, others do not support this solution (and may never will), and those who do, do not necessarily share the same problem definition on which they base their conclusion. Therefore, it will be very difficult, if not impossible, to define a one-sided governance approach that covers virtually all dimensions and expectations from all stakeholders in a satisfactory way. Multiple efforts and a mix of initiatives and responsive actions towards new developments will be needed to ensure engagement and maximum transparency in the long-term governance process of Belgian HLW.

As described in the introductory chapter to this volume, planning a governance process for the long-term management of radioactive waste, and particularly HLW, is a long-haul process. The importance of a reflexive, flexible and stepwise collective governance approach cannot be emphasised enough. This means the governance ecosystem will be in constant flux. Its composition and institutional setting will evolve over time, potentially leading to a shift in structure, changes in culture and the adoption of new routines.

In this chapter we reflected on what constitutes a long-term governance approach. We have drawn on the opinion of actors as a sample of the Belgian HLW governance ecosystem and on the theoretical concept of 'care'. There appears little contestation (in academic literature, nor in the opinion of concerned actors) that long-term HLW management is and will remain a socio-technical challenge, that any solution will remain to some extent experimental in nature, and that it is our moral duty to ensure a transparent and democratic way of addressing this challenge. On how to ensure that, opinions and expectations tend to differ, and interests come into play.

We have argued for a perspective of care in order to lower the threshold for participation and to serve as leverage to emphasise the social in the technical. Such a governance approach requires an empathic attitude towards the needs and expectations of all current and future stakeholders in the nuclear energy and radioactive waste debate. In the framing and enacting of the announced public debate, ONDRAF-NIRAS and other stakeholders have the opportunity to show how they care. Caring means assuming that sociotechnical uncertainties will remain,

regardless of the preferred long-term option for radioactive waste. Caring is also about allowing real spaces for others who care to express what they care about and how they desire to do so. Caring is not about providing one pre-fixed initial programme, but is about ensuring the waste is being taken care of by means of a collective and open decision-making and governance process.

Putting forward a perspective of care does not mean disregarding facts and interests or concerns. However, the COVID-19 pandemic has shown that conflicts over facts are often not the ‘better’ type of conflicts Fischhoff wanted, and that balancing interests is in some cases an impossible mission. We clearly need more than “all of the above” (see Fig. 4.2 here).

Figure 4.2 Rather than adding ‘caring’ as an additional stage in Fischhoff’s list, we strongly recommend taking a care perspective first, before addressing facts and concerns. A practice of care as a more profoundly different approach to addressing environmental and technological risk could be a way forward. It is not our intention to claim that a perspective of care will prove to be the magic formula for dealing with ‘reluctant stakeholders’, or ‘inconsiderate project developers’ under all circumstances. However, we do consider this a worthwhile path to follow.

Addressing radioactive waste as matter of care means a paradigm shift at three levels. First, it means acknowledging there are multiple ways of caring that can co-exist. Rather than aiming to establish agreement on facts, and which facts matter first, establishing common ground from a perspective of care is better served by starting from identifying and acknowledging that uncertainties of various types will remain. Second, it appears recommended to talk about waste before talking about waste management solutions. This allows establishment of a community across the whole governance ecosystem of those who care about the waste, not only those who care about a particular endpoint for it. Third, since caring is an outward activity, it enables engagement with all who care, and in particular those directly affected, such as local (site) communities and citizens. This process of caring will inevitably span several decades and generations of stakeholders, and intergenerational engagement should be aimed for, but this can only be reached by starting with the present generation in a collective and open decision-making and governance process.

In support of such a paradigm shift in governance practice, further research into the consequences of addressing radioactive waste as matter of care would be helpful. The need for a closer understanding of the affective, ethical, and practical engagements of caring remains, both in terms of human interactions (the classical focus of governance studies) and of interactions between humans and non-human actors.

Another thing that remains is the waste and the need for it to be taken care of.

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