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Taming uncertainty: towards a new governance approach for nuclear waste management in Belgium

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Taming uncertainty: towards a new governance approach for nuclear waste management in Belgium

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We focus on the new governance practices in Belgian nuclear waste management (NWM) from its 'participatory turn' in the late 1990s. Rather than praising (or rejecting) participation *versus* expert analysis, we make use of a theoretical and analytical framework in which the relevant dynamics for the analysis are 'opening up' and 'closing down' technological appraisals and commitments. Even though NWM agencies often plead for an integrative approach between expert analysis and stakeholder participation, in practice both exercises are often kept separate. We address this separation and its consequences and we find that societal concerns remain subsumed in the technical options that have long been favoured by the Belgian agency. This article encourages scholars, waste managers, and decision-makers to scrutinise the moments and situations in which opening up would be desirable, and when, by contrast, it would be better to close down options in NWM.

Keywords: nuclear waste management; participatory/expert analysis; strategic management; opening up/closing down

1. Introduction

In the aftermath of failed attempts in the 1980s and 1990s to deal with nuclear waste management (NWM) in a purely technical way – solely relying on experts' knowledge to select radioactive waste disposal repositories – most agencies in charge of NWM have initiated a 'participatory turn' and started to actively engage stakeholders[1] and the public in addressing ethical, political, and societal issues of radioactive waste management (Bergmans et al. 2004; Krütli et al. 2010a, 2010b; Lehtonen 2010a, 2010b).

As Bergmans et al. (2004, 28) put it, however, 'it would be too simplistic to argue that a new participative style of governance, based on stakeholder networks, has supplanted the established top-down government approach'. Rather, what the current evolutions in national programmes

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for NWM illustrate is that 'there rather seems to be a hybrid governance system emerging in the NWM policy sector, which uses both traditional and innovative practices and rationales in order to try to find a solution to the problem of legacy wastes' (Bergmans et al. 2004, 28). With a central focus on these new governance practices in Belgium, the objective of this article is twofold. First, it aims to describe those new governance practices as they occurred in Belgium from 2006 onwards, when the federal Government mandated the Federal Agency for Radioactive Waste and Enriched Fissile Materials (ONDRAF) to elaborate a strategic environmental assessment (SEA) and a waste plan for high-level/long-lived radioactive waste (HLRW). Describing this process represents a contribution in and of itself because the Belgian case, compared with other European countries such as France, Germany, or Sweden (Strandberg and Andrén 2011) remains largely understudied, with the notable exception of Schröder and Bergmans (2012). Thus, our work also contributes to filling in this gap while providing findings that can be helpful for (re)thinking and analysing nuclear governance in other European countries. Second, we make use of an innovative theoretical and analytical framework for the governance of technology in which the relevant dynamics for the analysis are 'opening up' and 'closing down' technological appraisals and commitments. This framework has been developed by Andrew Stirling and colleagues at the Science Policy Research Unit of the University of Sussex. We suggest that the use of this framework may help decision-makers acting under uncertainty (understood here in the sense of Callon, Lascoumes, and Barthe 2009), in this case for nuclear waste governance. Even though ONDRAF-like agencies often plea for an integrative approach between experts analysis and stakeholder participation, in practice such an approach often proves challenging, and both exercises are often kept separate in NWM activities. To address this separation and its consequences in current NWM, much work remains to be done at the interface between experts, politicians, and citizens. Furthermore, as Stirling (2006b, 245) and Smith and Stirling (2007, 368) earlier stressed, more detailed and empirically grounded case studies, elaborating on sketched examples, are needed to test and develop this framework for (re)thinking democratic technology governance and assessment practices. In the same vein as Ely, Van Zwanenberg, and Stirling (2014), this article is a concrete attempt to do so for nuclear waste governance and management.

Therefore, to address the case study of this paper, we rely on a combination of the aforementioned theoretical framework and detailed empirical materials. The latter consist of eight semi-structured interviews with key informants of ONDRAF and a representative of a technical consultancy company, Resource Analysis.[2] Some of the key informants were interviewed up to three times and the interviews were systematically analysed, categorised, and tagged with the qualitative software Mosaiqs. Secondary sources such as regulatory and legal documents of Belgian agencies and political documents issued by the federal government and the European Union were also analysed. Finally, we also rely on the first author's participatory observation in the process of societal consultations for HLRW management beginning in 2009. In what follows in Section 2, we detail the conceptual tools that will be used in our analysis. Section 3 focuses on the case study of the management of HLRW. We analyse the successive appraisals of technological options for HLRW management after ONDRAF decided to organise broad 'societal consultations' in order to integrate civil society organisations and citizens in the process of NWM in Belgium. In the discussion, Section 4, we find that the final version of the waste plan seems to have been mostly a consolidation (though under new conditions) of what had been technically and analytically favoured for 40 years by the NWM agency. We conclude that ONDRAF is under pressure, stuck in between the double imperative of ensuring technical and societal robustness.

2.   A theoretical framework for NWM decision-making processes

2.1.   *Appraisals and commitments*

As the first step of characterising their theoretical framework, Andrew Stirling and colleagues distinguish two processes in technology governance understood as encompassing the diverse totality of actors, discourses, structures, and processes implicated in guiding and shaping technological configuration (Stirling 2008, 265). Those processes, namely 'appraisal' and 'commitment' are parallel, interlinked and mutually co-constituting (Smith, Stirling, and Berkhout 2005; Stirling 2006a, 2006b; Smith and Stirling 2007; Ely, Van Zwanenberg, and Stirling 2014).

The authors define 'appraisal' as 'an array of social processes through which knowledges are produced and gathered in order to inform decision-making and associated institutional commitments' (Ely, Van Zwanenberg, and Stirling 2014, 507). In short, appraising is about ways of knowing and informing (Stirling 2008). 'Commitment' is about forming concrete decisions for certain technological pathways and it encompasses a range of structures and processes for allocating resources, shaping political priorities or building up infrastructures (Stirling 2008, 265).

2.2.   *Opening-up and closing-down*

As the second step, Stirling and colleagues question participation as a one-size-fits-all solution to properly informing technology governance. Indeed, in the current environment of appraising science and technology, there is an increasing tendency to glorify participation and to create a false dichotomy with expert analysis (Stirling 2008). This is, as we stressed above, for instance, visible in the 'participatory turn' of most NWM agencies. Indeed, not limiting to nuclear governance, decision-makers and scholars alike encourage participatory methods (including reaching out to stakeholders and the general public) and strive for 'upstream' processes of knowledge production and participatory innovation management (Wilsdon and Willis 2004). Rather than normatively arguing for upstream engagement of stakeholders and the public, Stirling's work transcends the contrast between participation and expert input that, according to him, create an unnecessary dichotomy. Expert analysis and participation actually have a lot in common: they are both subject to framing conditions (Blok 2007; Jensen 2005), pervaded by power relations (Mouffe 1993, 2000), vulnerable to strategic behaviours, aiming at the reduction of diversity, being often consensus-oriented and likely to serve similar justificatory purposes (Stirling 2006a; Rossignol, Delvenne, and Turcanu 2015). For Stirling (2008) and Smith and Stirling (2007), the important dynamics for the analysis of technology governance are 'opening up' and 'closing down'. 'Closing down' is about defining the right questions, finding the priority issues, identifying salient knowledge, and recruiting appropriate protagonists to determine the 'best' options. 'Opening up', by contrast, entails a greater degree of reflexivity. It reveals the open-endedness, contingencies, and capacities for social agency in technology choice. Instead of focusing only on prescriptive recommendations, open appraisal poses alternative questions, focuses on neglected issues, includes marginalised perspectives, triangulates contending knowledge, tests sensitivities to different methods, considers ignored uncertainties, examines different possibilities, and highlights new options (Stirling 2008, 278–280).

2.3.   *Broadening out and narrowing in*

Ely, Van Zwanenberg, and Stirling (2014) go further into the characterisation of appraisal processes by paying greater attention to the *breadth* of the appraisal. Building on Stirling (2006b)

and Smith and Stirling (2007, 356), Ely, Van Zwanenberg, and Stirling (2014) differentiate an appraisal's inputs and outputs. Accordingly, appraisal inputs may be broad or narrow. 'Broadening out inputs' means including a greater variety of inputs in appraisal, such as problem definitions, technological options, policy alternatives, values and understandings, uncertainties and ambiguities, etc. The more even the attention to reasonable alternatives, they argue, the more 'broadened out' the particular appraisal is. Appraisal outputs may be open or closed. 'Opening up outputs' relates to the manner in which the eventual findings are externally communicated, which is more plural and conditional with respect to whatever are the most salient axes of sensitivity that emerge throughout the many dimensions of the appraisal. By contrast, 'closing down outputs' aims at favouring a single, definitive result.

In addition, as some scholars (see Voss, Kemp, and Bauknecht 2006, 431) have noted, strategies of governance agents must not only be based on further 'opening up' and 'broadening out'. At some point, 'narrowing in' and 'closing down' are also necessary in full realisation of the reduction of complexity that is involved (Kemp, Parto, and Gibson 2005, 438). In this respect, it is important to keep in mind that a necessary balance between 'opening up' and 'closing down' moments has to be found for institutional and political commitments to be made and decisions to be taken (Stirling 2014). The key analytical question then concerns the moments and situations in which opening up would be desirable, and when, by contrast, it would be better to close down.

Such recent theoretical conceptualisations of governance of science and technology encourage actors to scrutinise and reconsider their underlying assumptions, institutional arrangements, and practices. These approaches call into question the foundations of governance itself, as they point at a shift towards modulation rather than control of ongoing socio-technical developments (Hendriks and Grin 2007, 333–335; Voss, Kemp, and Bauknecht 2006, 4; Rip 2006). Equipped with these new conceptual tools to analyse nuclear governance, we suggest focusing on NWM, where both technical (what is the technically best management option?) and societal (what is socially acceptable or legitimate?) uncertainties are deeply involved and interlinked.

3.   Case study: forming appraisals for HLRW

In 2001, ONDRAF underlined that for high-level and/or long-lived nuclear waste, societal, and economic aspects should be taken into account – this was never the case before as only technically aspects were considered (ONDRAF/NIRAS 2001a, 2001b). To address this issue, in 2004, the Energy Minister asked ONDRAF to explore and compare all possible alternatives for NWM with the double purpose of suggesting the best management option *and* initiating a societal process for debating HLRW (Lalieux 2013). In 2006, ONDRAF was commissioned for undertaking an SEA combined with a waste plan. Both documents aimed at presenting the general programme for the long-term management with the intent that it would later be approved by the government (Aerts et al. 2010, 2). The SEA aimed at objectively describing and comparing, on a general level, all national and international available options to manage HLRW, which almost naturally fits with a requirement for openness in appraising technological options for NWM. The waste plan was more closed down in framing, as it aimed at a more committed overview in which ONDRAF would suggest its preferred management solution(s) for HLRW.

3.1.   *Broadening out of the inputs to appraisal*

ONDRAF decided to do more than what was required by the law in order to integrate civil society organisations and citizens early in the process of technological appraisal (ONDRAF/NIRAS

2001b). The successive and sometimes overlapping appraisals likely to feed the elaboration of the waste plan to be transferred to the federal government included (a) the SEA, (b) societal consultations (eight participatory citizens dialogues and one interdisciplinary stakeholder conference), (c) one citizens' consensus conference, and (d) legal public consultations.

(a) In search of greater framing openness, ONDRAF decided to submit the waste plan structure to the SEA advisory committee.[3] The NWM agency stressed the need for an integrated approach throughout the appraising process (ONDRAF 2009; De Preter 2013), addressing not only technical, but also ethical, economic, and social aspects. The underlying argument was that the waste plan should reflect the four dimensions (science/technology, ethics/society, economy/finance, and ecology/safety) of a 'sustainable solution' (Lalieux 2013). To write the SEA, ONDRAF also mandated the involvement of a technical consultancy company, Resource Analysis.[4] The report was a substantial achievement in broadening out of the inputs and opening up technology options for NWM by taking ignored, uncertain, or marginal options into account; it highlighted all possible and even unlikely alternative options before it described in further detail six options and assessed their short- and long-term impacts. The options were eternal storage, geological disposal, deep borehole disposal, extended interim storage with a view to subsequently choosing a management option that can become definitive, storage pending the industrial implementation of advanced nuclear technologies, and the status quo option.

(b) Concerning societal consultations, in the opinion of the different ONDRAF Directors, the legal public consultations were organised too late and the public input had to be collected sooner. Hence, a small internal project group[5] was created to think about broader consultation activities. Looking for external support and input for the design of such consultation activities, in February 2009 ONDRAF organised a workshop entitled 'Key Actors Meeting', with representatives of universities, research centres, administrations, Greenpeace,[6] and trade-unions. This interdisciplinary group of 53 experts engaged in intensive debates about how to formulate questions, themes, and reflexions, how to frame the participatory processes and how to work on an improved nuclear decision-making process (Albertijn et al. 2009). After the meeting, ONDRAF decided that two phases of 'societal consultations' would be planned and organised in 2009, consisting of eight participatory citizen dialogues (April–May 2009) and one interdisciplinary conference (April 2009). The participatory dialogues voluntarily engaged Belgian citizens while the target group for the interdisciplinary conference was stakeholders.[7] Both consultations had the same purpose: identifying societal issues, concerns, and questions regarding HLRW management, finding out the guiding values and principles of those concerns and highlighting the main relevant criteria and conditions to assess the options at hand to manage the nuclear waste.[8] An external audit committee primarily composed of social scientists was constituted for the participatory event follow-up and their independent assessment.

(c) Disappointed by the small number of engaged citizens in the participatory dialogue, and fully aware of its ambiguous and criticised (Goorden, Weyns, and Zwetkoff 2009) position of judge and jury in the societal consultation process (Lalieux 2013), ONDRAF decided to organise one 'extra' public consultation and delegate its entire organisation to the King Baudouin Foundation (KBF), an independent public charity. KBF organised a consensus conference with 31 citizens selected according to several criteria of representativeness. To ONDRAF's relief, results revealed that citizens supported its position on geological disposal, although under several conditions (Aimeth et al. 2010). In particular, citizens pointed at the reversibility, defined as the technical or financial possibility to choose other options later on, which they urged should be guaranteed during 100 years after the closure of the repository (Aimeth et al. 2010). In addition, they considered that an independent and permanent commission (in addition to the ONDRAF)

should be created 'to assess, reassess, [and] revise choices made previously' (Aimeth et al. 2010, 17).

(d) Finally, according to the law's requirements, legal public consultations were organised, in which civil society organisations and interested citizens could have access to both the SEA and the waste plan's drafts, voice their concerns, and share their opinions. A website 'Waste Plan' was created and gathered all the information available to the wider public. The report that followed the legal public consultation phase revealed that 8000 arguments from 2000 opinions[9] were collected and divided into thematic areas. Most arguments were intended to open up the scope of the appraisal. However, many arguments were beyond the scope of ONDRAF's competencies and, therefore, were excluded from the waste plan's considerations. Nevertheless, the comments expressed on the Internet brought up major issues, some of which overlapped with the consensus conference results: the reversibility concept, the retrievability of wastes, the controllability, and the memory and knowledge transmission to future generations.

3.2. *Towards a (temporary?) closing down of outputs of the appraisals*

In spite of the numerous inputs provided by these successive appraisals, when elaborating the waste plan, ONDRAF solely considered the geological disposal in poorly indurated clay (Boom Clay or Ypresian Clays). They argued that it was the 'best option', which should be concretised 'as soon as possible' in one single facility on the Belgian territory (ONDRAF/NIRAS 2011b, 198). We advance two reasons for this early closing down of options for NWM, one opportunistic and one strategic.

First, the SEA final report contributed to the strengthening of the available technical information about geological disposal compared with other possible options. Even though the SEA was much broader in scope than a mere environmental assessment, its construction remained a purely expert analysis process on which societal concerns and values were grafted with the trajectory of the technical solution left unchanged (ONDRAF/NIRAS 2011a; Lalieux 2013). Relying on SEA and its almost 40 years of experience, ONDRAF was then able to technically 'demonstrate' (De Preter 2013) – at least to even better justify – its long-chosen option. SEA is then a 'transparent' reminder of how closed the available technical options are.

Second, the waste plan selectively integrated the main societal concerns that specifically applied to geological disposal. Indeed, even if the concepts of retrievability, reversibility, knowledge transfer, and permanent control could have concerned any technical solution, ONDRAF used them to reinforce the focus on its chosen option. Nevertheless, even when the waste management agency did not have control over the appraising process, such as during the consensus conference, geological disposal was identified (under certain conditions, including retrievability) as the solution.

Throughout the elaboration of the waste plan, ONDRAF committed to relying on societal requests but under narrow technical, financial, and safety conditions. For example, they considered that reversibility and retrievability should not be achieved at the expense of safety. In addition, they stressed that the permanent control of any waste disposal system should not 'be performed in a way that might disturb the system and its proper functioning' (ONDRAF/NIRAS 2011b). In others words, if societal consultations allowed a real enrichment of the waste plan on many new dimensions (Depaus 2013; De Preter 2013; Lalieux 2013), societal aspects remained subsumed to technical ones.[10] Thus, the final version of the waste plan seems to have been mostly a consolidation of what had been technically and analytically favoured for 40 years by the NWM agency.

Nearly at the same time as the finalisation of the waste plan, a new European Directive (2011/70/EURATOM, European Union 2011) establishing a 'community framework for the responsible and safe management of spent fuel and radioactive waste' was adopted. According to this directive, each member state should establish a national framework with national programmes for its radioactive waste (Article 5). At the Belgian federal parliament, the waste plan was presented in anticipation of this European Directive (Chambre des Représentants de Belgique 2011), which ONDRAF considered would give additional support to the geological disposal option.

It was against this backdrop that ONDRAF's Board of Directors unanimously approved the waste plan on 23 September 2011, thereby officially advising the government to concentrate on geological disposal. This commitment was sent to both the Energy and the Economic Affairs Ministers on 26 September 2011. Both tutelage Ministers replied back a month later and gave six recommendations to ONDRAF, tentatively reopening possible options for nuclear waste governance and management. Among these recommendations, the Ministers stressed that research and development (R&D) should be continued to study geological disposal in poorly indurated clay – meaning that the closing down towards geological disposal should be accompanied by continued knowledge generation to appraise this option – but, at the same time, the government also mentioned that R&D should be pursued in order to investigate alternatives that were not further analysed in the waste plan. With this political reaction, the process is at crossroads: this
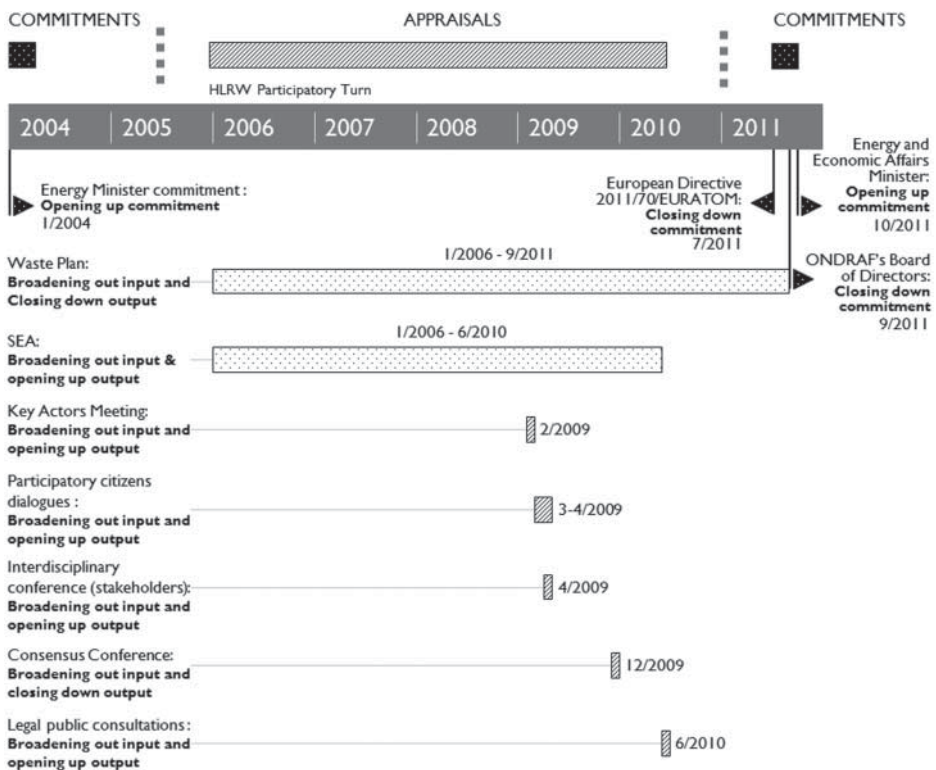

Figure 1. Processes of appraisals and commitments in the Belgian governance of HLRW from its 'participatory turn'.

may lead to temporary reopening of the outputs of the earlier appraisals, the government may either ask for a series of new appraisals or it may finally approve the way that has been paved by ONDRAF it its waste plan.

Figure 1 summarises what was opened up/closed down, at various stages of the history of the process from 2006 onwards.

4.   Discussion

With its recent decisions to organise wide societal consultations about NWM, to delegate the care of one participatory event to an external organisation, to mandate a private company to write the SEA, or to invite independent social scientists to observe and assess participatory processes, ONDRAF was heavily involved in opening up to society and improving the accountability of its own decisions. Nonetheless, we find that although much more information was collected on societal interests and concerns than ever before, these views have been systematically sidelined because ONDRAF remained preoccupied with conditions under which the incumbent trajectory of geological disposal could be maintained (see Stirling 2014). Even when broadening out appraisals could lead to (re)opening up possible solutions to nuclear waste disposal, waste managers project onto society the consequences of potentially irrational and out of control fears, and they adapt accordingly. Waste managers spend enormous amounts of time and energy in making sure that, being the agency in charge of NWM, they appear quite confident in what needs to be done to ensure a sustainable solution to nuclear waste. Consequently, ONDRAF prefers early closing down to maintain the illusion of control over radically uncertain processes, even when the federal government explicitly calls for the avoidance of too early locking in the geological disposal option. This taming of uncertainty may come at a high price if it systematically reduces the scope of alternative options for governance intervention or if societal consultations ultimately appear as an instrument of legitimisation of already-taken decisions. This raises the questions relating to the appropriate time for closing down the process and the legitimate actors for doing so. ONDRAF's managers unanimously consider that the government must and will have the last word. The role of ONDRAF, in their view, is to suggest some options and orientate political conclusions (Vanhove 2013).

Our findings also attest that ONDRAF is under pressure, in between the 'participatory turn' that almost forces it to open up to wider interaction, and its responsibility to produce technically sound reports likely to inform decision-makers. In other words, ONDRAF has to deal with the double imperative of ensuring social *and* technical robustness. Today, the agency is held accountable by both the citizens and its sister agencies with which it shares results and exchanges 'good practices'. While citizens strive for including concerns like the retrievability of wastes, the controllability of the waste manager and the waste disposal, and the memory and knowledge transmission to future generations, other NWM agencies and regulatory bodies assess ONDRAF's results in terms of technically robust solutions, strong evidence, and concrete figures, which often have very little to do with social perceptions and 'soft' values.

To put it in Foucaldian terms, ONDRAF has long located itself in a technical 'truth regime', which today finds itself pressured to engage in opening up to society. A truth regime is constituted through discourses and practices that distinguish what is considered as true or wrong. A truth regime encompasses the set of rules – implicit or explicit – allowing certain discourses and practices to determine the conditions under which matters of fact or matters of concern are considered as 'truth' or 'misguided' (Foucault 2004, 21–22). With its focus on innovative appraising practices engaging stakeholders and citizens, the Belgian agency shows a greater involvement

in building socially constructed and accepted solutions for NWM, thus taking societal voices more seriously in determining relevant matters of concern. However, even though cracks are appearing in the purely technical truth regime and associated management techniques typical of the 1990s and early 2000s, societal concerns remain subsumed in the technical options that have been favoured by the agency for decades. This is for instance the case when societal consultations lead ONDRAF to address important issues important for citizens, such as retrievability or reversibility, but only in a narrow framing limited to the geological disposal option. To put it differently, societal adaptation occurs but at the margins of the technical side and it happens as though the multiple boundary crossings between scientific facts and social values were not taken seriously (or even rejected) in the new appraising techniques of ONDRAF. Therefore, even though pressures for participation and opening up instil new conceptions of governance practices in the mind of ONDRAF's Body of Directors (Minon 2010; De Preter 2013; Lalieux 2013; Vanhove 2013), the technical truth regime resists and remains predominant.

In piloting the interactions between experts and citizens, and in translating their outcomes to policy-makers, ONDRAF has continuously relied on a 'work of purification' (Latour 1991), separating scientific facts and social values. This shows that the participatory and deliberative exercises actually allow both waste managers and decision-makers to open up the prospects for technology governance choices, by subjecting them to public debate and discussion. However, the authoritative, disciplinary, and functional boundaries derived from the usual distribution of work between science and society do not fade away at the stroke of a pen.

5.   Conclusion

In this article, we described and analysed the new governance practices in Belgian NWM from its 'participatory turn' onwards. Rather than focusing on the false dichotomy between participation and expert analysis, we made use of an innovative theoretical and analytical framework for the governance of technology in which the relevant dynamics for the analysis are 'opening up' and 'closing down' technological appraisals and commitments. This allowed us to argue that some facts (e.g. technical knowledge concerning geological disposal) or concerns (e.g. technical and safety conditions) were considered more legitimate than others (e.g. eternal storage of wastes, or ethical and societal dimensions) in the process of broadening out inputs and closing down outputs of the appraisals. Altogether, our results allowed us to highlight the conditions under which different types of knowledge (expert, lay, technical, ethical) interact in radically uncertain processes and how some of them are more naturally considered as deserving careful attention in current NWM in Belgium.

We stressed that ONDRAF's particular way of taming uncertainty by forcing a closing down of NWM options towards geological disposal could have damaging effects for both the nuclear waste governance and the societal accountability of institutional decisions. In other words, the unexpected re-wilding of uncertainty, in plausible cases of natural hazard, public backlash, better technical options for NWM, or economic and political tensions with the government, shall not be underestimated, or worse, ignored, if ONDRAF does not want to take the risk of undermining its important efforts in opening up to society and improving the accountability of its own decisions. This of course, raises the question: 'how long do we have keep things open?' In particular, many actors in radioactive waste management policy argue that now, after decades of exploration of different options, and at least 20 years since the participatory turn, the time has come to finally close things down. Even within the Belgian agency, there is no agreement on this issue:

the technical and communication experts of ONDRAF disagree on that point. One ONDRAF director illustrates the point as follows:

> [For the communication experts of the agency], a lack of governmental commitment on geological disposal could be seen as an opportunity, a chance for the societal debate to be continued, thereby increasing the legitimacy of the process. Meanwhile, for engineers and technicians, no governmental decision means 'we are stuck in uncertainty and maybe we will have to remake everything'. (Vanhove 2013, 18, own translation)

Our national case study attests to the culturally embedded character of both knowledge and policy in Belgium, with interferences from other levels such as the European Union and its 2011 directive. Further research is now needed under a comparative approach of NWM policies, the latter requiring a different justification today than simply the propagation of improved managerial techniques.

Acknowledgements

Disclosure statement

Notes

1. A stakeholder is defined as a person or a group who could affect or be affected by an issue (Welpa et al., 2006).
2. Whereas eight interviewees may not seem like much, we stress here that we have been nearly exhaustive in interviewing all informants who have been initiating and managing the process of preparation, elaboration and writing of the SEA and the waste plan. They are the (1) General Director, (2) the Director of general services in charge of communication, (3) the Director of long-term management and (4) the General Director of EURIDICE, adviser on safety aspects at ONDRAF, (5) one employee of the long-term management staff, (6) one employee of the communication staff, (7) one representative of Resource Analysis and (8) one member of the Board of Directors.
3. To address these new environmental requirements of the law of 13th February 2006, a specific Advisory Committee was created, composed of a body of public officials representative of the main federal ministries, which had the task to consult every actor whose formal advice is required by the law (for instance, the Federal Council of Sustainable Development).
4. Resource Analysis' is a consultancy company today known as the 'Technum' (division of Tractebel Engineering in Belgium) unit of Suez group. At the time of SEA's elaboration, it was an independent consultancy firm specialised in Environmental Impact Assessment.
5. This group was composed of the General Direction representatives, the Director of Long-Term Management, the Director of Communication, as well as several internal safety advisers and internal communication advisers. Depending on the actual needs, some advisers changed over time (De Preter 2013; Vanhove 2013).
6. Greenpeace refused to participate in the earlier societal consultations but the NGO participated as an expert in the consensus conference, and later it sent numerous arguments during the legal public consultation phase.
7. They were 84. Most of them were 'hard' scientists coming from regulatory bodies (AFCN/FANC), SCK/CEN or universities.
8. The only difference was that the interdisciplinary conference went one step further: participants had to prioritise, test and reformulate the different options (Zwetkoff and Parotte 2013).
9. Even if 80% of the expressed opinions primarily came from an NGO's cyber activism, ONDRAF considered each of them individually.
10. Nevertheless, it seems that societal consultations mostly provoked a cultural change for HLRW managers. They learned to vulgarise their research towards the general public and to get out of their usual technical framing:

The public is more interested in operational elements and the safety issues on two or three generations only. (...) It has been a real change for ONDRAF, which now asks its R&D Department to focus on additional operational aspects never explored before. (Lalieux 2013, 12, own translation).

Although crucial, this point is not the object of this article, as what we analyse here is how ONDRAF transferred all the collected inputs into the waste plan.

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