Working Title:

Truth, Confidence, Action -

on the Emotions of Technical Rationality in Nuclear Waste Management

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Abstract

Actors who seek to implement repositories for high-level nuclear waste and spent nuclear fuel have traditionally sought to forward their project with reference to disinterested 'facts'. While publics have been represented as emotional and thus irrational, implementers have portrayed themselves as devoid of emotions, as simply guided by 'truth'. However, public opposition to repositories has forced implementers to realize that there can be no circumventing the 'irrationality' of publics if repositories are to be implemented; 'truth' in itself has proven insufficient. Hence, implementers now seek to *integrate* publics' emotions into their siting tactics, a stark contrast to 'old' tactics of circumventing emotions. In this paper, we analyse policy documents that specify how implementers foresee this quite novel emotional integration. Guided by the sociology of emotions, however, we invoke the insight that there is no such thing as rationality devoid of emotions. Rather than raising the issue of emotional publics, we discuss the nature of the emotions that underpin – and do not underpin - *implementers'* technical rationality. In doing so, we challenge the prevailing narrative that implementers are disinterestedly guided by 'truth', whereas publics are guided by 'irrational' emotions. By understanding the material as a case of 'discursive projection' – that is, not as a 'true' representation of emotions - we analyse the implementers' policy statements as an 'emotional regime' that establishes which feelings are compatible with 'truth', and which are compatible with 'falsehood'. In our discussion, we highlight the limitations of the understanding of the relationship between 'truth' and emotions that the empirical material establishes.

Key Words: nuclear waste management, truth, emotions, rationality

Introduction

> *Where is risk born? In the brain? In the stomach? Somewhere else? That feeling that a danger lurks or that something terrible can happen. Children know that there are monsters under the bed, they get nightmares or so much stomach ache that they cannot sleep. Grown-ups are afraid of other monsters. Spent nuclear fuel, for example.* (SKB 1998:10)

The quote above is derived from public information material produced by the Swedish Nuclear Fuel and Waste Management Company (SKB), a subsidiary to the nuclear industry. SKB is the actor in charge of finding a permanent solution to the problem of spent nuclear fuel in Sweden, that is, the waste that remains after nuclear power operations. Still, however, the waste is stored in interim facilities.

According to SKB, fear of spent nuclear fuel emerges from 'falsehood'; it is nothing but a monster under the bed. And as we all know; monsters are the stuff of fairy tales. Logically, this should mean that knowing 'truth' dispels the beast. What the quote does not elaborate on, however, is which emotions 'should' appear when truth has in fact dispelled the monstrosities of falsehood. Surely, the 'enlightened' must feel *something*?

If one holds true the sociological notion that there is no such thing as neither action nor rationality devoid of emotions (Barbalet 2001), then lack of fear is not an emotionless state but implies presence of other emotions. Then, how does it *feel* to know the 'truth' about spent nuclear fuel? How *should* it feel? Which emotions do those with 'true' knowledge convey, promote, inhabit, and display? And importantly, how do the 'truthful' foresee the dispelling of the monsters that still haunt the 'untrue'?

Why then, one might wonder, do repository implementers even bother addressing the emotions of publics? This is because despite having 'truth' on their side, implementers still need publics' permission to realize repositories. To be sure, siting processes are laden with power asymmetries, but implementers are not autocratic. Public resistance is a real obstacle to overcome, and most countries struggle to find sites where repositories can be realized (e.g. Bergmans et al. 2008).

From the perspective of implementers, diffusing 'truth' about nuclear waste by means of 'information' - which historically has been the prevailing tactic besides the more coercive dimensions of siting - has been largely unsuccessful because publics' 'risk perception' is still at the core of opposition (Flynn, Burns et al. 1992). To successfully turn reluctant publics to embracing publics, implementers have gradually transformed traditional information campaigns into more advanced emotion management tactics to change publics' 'perception of risk'. Hence, implementers now engage in developing methods for how the emotions of

'concerned stakeholders' can be addressed and assimilated into to siting endeavors to expediate implementation (NEA 2015). In turn, this is indication that implementers now understand publics' emotions as in need of addressing to finally reach the goal of implementation.

Despite this evolution, few studies - if any - have attempted to contemplate the implications of implementers' emergent emotion management programs. While there are plenty of studies that articulate the impacts of specific emotions on the prospects for repository siting 'success', these studies typically focus on the emotions of *publics* to understand their reasons for accepting - or resisting – implementation. In this article, we analyze currently unchartered implementer policy literature that elaborates more closely on how emotion management is envisioned, with the additional contribution that we elaborate on the emotions of those who describe themselves as *rational*, that is, those who conceive of themselves as the radical opposite of an 'emotional public'. Hence, we join the surprisingly few who have posed the critical question; is concern, anxiety and fear really 'irrational' emotions when faced with the properties of spent nuclear fuel (see REF!).

Theoretically, because rationality and emotions are inseparable, we understand our central task as being to consider the specific ways through which emotions and rationality are interwoven. When rationalities are blind to their doings and driving forces - when they cannot be grasped using their own concepts - sociology can contribute with concepts that better bring to light actions' dependence on emotions. By exploring which emotions are attributed stakeholders by implementers, we analyse which form of rationality and emotions are held as ideal, and what 'regimes of truth' emerge in the material. Thus, we do not only study the *explicit* emotion regimes that emerge in the empirical material, but also their *implicit* emotion prescriptions. We thereby do not consider the 'true' emotions of stakeholders, but the implementers' *representations* of these emotions with the core assumptions that these representations say something about the emotions of implementer rationality. Which emotions are granted importance in the siting actors' truth regime to expediate implementation? Which emotions are represented as 'rational', and indeed 'irrational'?

In what follows we first underline the historical contingency of the new emotion management tactics. Second, we review previous studies on the siting of controversial facilities. While most studies have been formulated in the field of risk analysis and risk governance, we propose a contribution that contemplates the role of emotions from a sociological point of view. Third, we discuss the sociological concepts that advances the understanding of the new emotion management tactics. Fourthly, we discuss the empirical

material and our methodological procedure. Fifthly, we proceed to analysing the empirical material. Lastly, we conclude our main results and discuss the implications of our findings.

From emotion circumvention to emotion management

In the dawn of nuclear power, the byproduct of nuclear power operations was defined as *asset.* The technology optimism that characterized the early to mid-1900s made clear that any unwanted side effect of existing technologies would be remedied as science and technology linearly progressed (Pfister 2015). What was foreseen was the utilization of spent nuclear fuel in technologies-to-be. As these technologies did not materialize, however, it became increasingly clear that the asset would indeed have to be redefined as *waste*. Hence, spent nuclear fuel would require safe management (Anshelm 2006).

This transformation from asset to waste brought with it a new technical problem to resolve, but also implied an impact beyond laboratories and power plants. Disposing of the waste required not just reliable technology, but also physical *site* for deployment. While responsible actors quite rapidly declared that a safe solution was found in so-called geological disposal (e.g. KBS 1978) – a technology where the waste is emplaced in canisters and buried deep in bedrock – it proved to be substantially harder to site the proposed technologies.

The task to site repositories has proven to be one of the most challenging for implementers to accomplish because publics have typically resisted (Shelley, Solomon et al. 1988). Evidently, few wanted to live next door to a repository. In the early days of waste management, siting actors initially sought to conduct their activities disconnected from the concerns of publics. The siting rationale was that scientific 'truth' would determine location. Sole technical criteria such as favorable bedrock conditions would be decisive, and publics were rarely involved in the site investigations. By turning up uninvited to conduct site investigations – as the Swedish case illustrates – implementers sought to circumvent any public concern. However, this strategy backfired as opposition quickly emerged in the face of the coercive tactics. Worldwide, pervasive public opposition typically forced implementers to withdraw.

However, implementers learned from these experiences. In what has been called 'the participatory turn' in the 1990s (e.g. Bergmans, Sundqvist et al. 2015), implementers launched new strategies. Instead of *circumventing* publics, implementers invited them to volunteer to site investigations. To be sure, this method of 'voluntarism' was still often associated with economic incentives and thus conditioned by local communities' economic dependence upon nuclear industries (Blowers 2003). Nonetheless, 'public participation', and 'stakeholder

involvement' have been keywords for any policy that attempts the realization of geological disposal.

The new arrangements following the initial failures, however, were still marked by technocracy. The enduring critique asserts that despite the new modes of participation, the arrangements have been laden with power asymmetry (Blowers and Sundqvist 2010). The predominant idea held by implementers has been that reluctant publics – when economic reimbursement proves insufficient - are to be scientifically and technically *educated* about issues of NWM. Knowing the 'truth' would facilitate acceptance. This is close to what Brian Wynne has called 'the deficit model'; by means of information, publics' knowledge deficit would be remedied and the enlightenment that followed would bring about public trust in technical experts' assurances about what is 'true' (Irwin and Wynne 1996).

Opposition did not, however, vanish neither in the face of the new modes of participation nor through economic systems for compensation. From the implementers' viewpoint, the insufficiency of the existing tactics lies in that there are still few sites that have been secured. With the exceptions of Finland and Sweden (Flores 2015, Johansson 2021), implementers still struggle – worldwide - to site repositories. The recurrent failures imply the continued importance of fostering deliberation between implementers and publics, but also *new* modes of participation that can better bridge the gap between implementers and reluctant publics, that is, producing public 'acceptance' of implementation.

Because of the limited success, implementers have increasingly turned to the rare 'successful' cases. Sweden - which experienced great disputes over nuclear power in the 1970s and 80s and repository siting attempts in the 1980s – is a case that represents the prospects of turning seemingly hopeless siting into success. The Swedish experience, nonetheless, testifies to the need to expand and deepen relationships with local publics, that is, repository candidate sites. In essence, it is the nuclear industry's tenacious fostering of a relationship with the local community that has finally facilitated compliance. The Nuclear Energy Agency (NEA) and the International Atomic Energy Agency (IAEA) - devoted to aiding organizations worldwide that struggle to site repositories - have deepened their commitment to siting. The guiding principle to legitimize siting is now 'consent-based' strategies; communities must actively embrace facility construction, just as has been the case in Sweden.

With the Swedish success story in mind, NEA has taken interest in nurturing local culture to facilitate consenting publics. By borrowing The United Nations Educational, Scientific and Cultural Organization's definition of 'culture', it now seeks to engage in the 'the set of distinctive spiritual, material, intellectual and emotional features' of the candidate sites (NEA,

2015: 24). With the explicit ambition to 'foster a durable relationship' with publics, NEA and IAEA have produced considerable amounts of policy that serves to guide implementers in addressing and managing the emotions of 'concerned' publics.

It is in this new set of policy that we take our empirical starting point. We do so while keeping in mind that implementers' journey from coercion, to participation, to production of consent by means of relationship-building is not innocent, but rather marks the emergence of new forms of wielding power (Lagerlöf, 2022). In what follows, we account for how the implementer tactics have been addressed by previous research.

Emotions as public 'risk perception'

Studies of the siting of controversial facilities has explored a range of problematics relating to the localization of contentious facilities. While siting actors often legitimize their actions with reference to technical criteria (such as geographic suitability, bedrock conditions, etc.) scholars have shown that siting is a distinctively social project (e.g. Aldrich 2016, Berndt and Aldrich 2016). Highlighting the power asymmetries between industries and publics, (Blowers 2003, Blowers 2010), understanding what predicts 'successful' and 'unsuccessful' facility siting (Aldrich 2008), attempts to facilitate 'fair' siting procedures (e.g. Kelleher 2017, Bell 2021), and the study of conflicts relating to controversial facilities (Shelley, Solomon et al. 1988) are examples of social aspects that have received scholarly attention.

While displaying a broad range of theoretical assertions and ambitions, the enduring critique that unites most studies is that of technocracy; siting processes have been shown to be marked by undemocratic tendencies (Blowers and Sundqvist 2010). As modes of participation have evolved, however, it has become increasingly clear that contemporary research has de-emphasized critique in favor of either more hands-on engagement in siting processes, or the ambition to inform siting processes.

How to address and understand the implications of this development, however, is not a straightforward task. This can be illustrated by proposing a dividing line between scholars who on the one hand still seek to formulate critique 'outside' of the siting processes, and those who seek to make their scholarly findings relevant for the improvement of the practices they study, that is, for the 'inside' of the procedures. It now appears to be the case that researchers predominantly, as in the following example, 'aim to inform future efforts … to overcome failed technocratic histories and instead steward participatory, equitable, and democratic processes to manage high-level nuclear waste' (Richter, Bernstein et al. 2022)(1).

One dominant line of scholarly inquiry that is relevant to mention because it partly engages in emotions relevant to siting, we find in the latter category of research. With the many failed siting attempts as their backdrop, such research has engaged in primarily quantitative research that typically has been conducted to make clear publics' 'risk perceptions', and what predicts publics' 'attitudes' to repositories (e.g. Sjöberg 2009).

The reason why one can speak of 'emotion' in these studies is because they identify primarily the two emotions of 'trust' and 'confidence' as (potential) determinants of publics' 'acceptance' of siting processes and their outcome. High levels of public *trust* are now often viewed as the crucial condition for the prospects of 'successful' siting (e.g. Flynn, Burns et al. 1992, Di Nucci, Isidoro Losada et al. 2021), as has been shown to be the case also with *confidence* (Siegrist, Gutscher et al. 2005, West and McKinley 2011).

Although trust is conceptualized as a somewhat divergent emotion in the literature – trust can be 'epistemic', 'social', 'institutional', and 'general' – it has been shown that it correlates with publics' 'negative' risk perceptions. The great interest in trust, in turn, has emerged because of its association with siting 'success': 'the aim of politics is to gain trust, hoping that it amplifies the acceptability of a proposed technological option. Thus, theoretically, trust should increase acceptance by attenuating the perception of risk.' (Seidl, Drögemüller et al. 2022)(2). This means that it is not the nature of the disposal technologies that are scrutinized, but rather the focus is on how publics can be influenced to *accept* those pre-existing technologies. As we have seen, building 'trust' and 'confidence' is one way of doing so.

Although scarcely noted in the literature, some scholars have indeed made valuable critical observations that are worth preserving and advancing. For instance, it has been argued that emotions such as *trust* and *confidence* are neither unequivocally 'positive' nor 'negative'. While most scholars and implementers alike have conceptualized *trust* as a wholly positive feature of siting, others have made the crucial observation that there is such a thing as a downside to trust because in excess it may breed uncritical thinking, and *mistrust* in fact encourages vigilance (Lehtonen, Kojo et al. 2022). Both these examples are arguably potentially virtuous in moments of uncertainty, and the benefits of trust partly lies in the eyes of the beholder. As further examples of critical insights that are typically not reiterated in most research, it has been argued that dismissing publics' resistance as the product of 'irrationality' or 'egoism' is a fundamental mistake because publics often report perfectly reasonable motives for their concerns (Wolsink 1994); anxiety and fear do not simply emerge from 'falsehood'. From these perspectives, the dominant strand of research devoted to investigating the emotions of publics could indeed be accused of supporting – in both a deliberate and undeliberate fashion

- the project of ‘minimizing the impacts of opposition and/or changing [public] perceptions’ (Schively 2007)(263).

In sum, while a few studies successfully have contributed to more clarity about the reasonability of public resistance – thus granting ‘rationality’ also for those who do not align with implementers – they do not shed light on the rationality and the emotions of the implementers. Moreover, the research concerned with emotions and feelings of nuclear waste management (NWM) has predominantly reduced emotions to ’risk perception’, often with the goal to aid siting processes. In what follows, we seek to move toward an understanding of siting processes that focus on the emotions of *implementer’s* rationality, thus expanding the concept of emotions beyond ‘risk perception’.

The Discursive Projection of Technical Rationality (Theory)

Rationality and emotions are intertwined. Even science – the crown jewel of rationality in modern society – is emotional (Barbalet 2002). This contradicts the core idea of the enlightenment, that is, that truth emerges only where emotion is circumvented. The sociological project is thus to show how emotions underpin truth claims. To be sure, this can be done in a variety of ways and should prompt scholars to be specific as to how they interpret the emotional content of, for instance, texts. In what follows, we discuss our theoretical framework.

First, the emotion management project of implementers is, as we have shown, historically contingent. This means that one must understand NWM emotion management as having emerged *relationally* (Bandelj and Society 2009), that is, neither as a disinterested quest for diffusing ‘truth’, nor as stemming from enthusiasm for technical work. Truth claims and references to unemotional Reason are indeed intimately coupled with the ambition to implement.

In this sense, emotion management emerges as a form of exercise of power, which in turn speaks to the literature that has critically engaged in how powerful actors strive to forestall opposition, or to pre-empt critique (Lagerlöf, 2022) (e.g. Longest, Shriver et al. 2021). As such, emotion management is a form of consent-based tactic used to produce public consent, that is, the dismantling of opposition. Crucially, and as previous research in adjacent fields has argued, the production of consent can, in turn, simultaneously be a means to increase the legitimacy of inherently exploitative endeavours, which sometimes explains why reluctant publics are invited and contemplated in pre-determined contemporary policies (Eimer and Bartels 2019).

As a first theoretical point, we thus consider emotion management to be one 'tool' in the 'toolbox' of consent-based siting tactics.

From a sociology of emotions perspective and the assertions above, the implementer texts that we engage in are the product of implementers' *interpretations* of their *experiences* of oppositional publics. The historic encounters between oppositional publics and implementers we understand as a prime - relational - reason for the emergence of the new emotion management tactics. Thus, the words of implementers do not represent the 'true' emotional experiences of publics, they are the product of *implementers'* rationality and the 'rational' understanding of the opposition between emotions and Reason and of how implementers choose to understand critical publics and opposition to siting. More precisely, the texts constitute the 'discursive projection' (Billig 1997) of NWM technical rationality's reductionist understanding of emotions *onto* publics. Hence, we argue that implementers' assertions about the emotions of publics say something about the emotions of implementer rationality itself. Hence, we understand the analysis of the discursive projection of emotions as resulting in the identification of NWM's 'emotion regime' (Reddy, 2001). In the analysis we highlight key emotions and feeling rules that promote the implementers "rationality", that is, the set of 'rules' that indicate what one *should* and *should not* feel in NWM.

Emotions are, simultaneously, intimately connected with the prospects for *action;* different emotions imply divergent room for manoeuvre. In our case, the implementers' sense of confidence in its disposal technology solutions promote action and a desire to proceed in the realization of the own disposal project. Perhaps this sense of confidence and trust also feeds a feeling of frustration at critical opposition as standing in the way of action. The implementers' own emotions of trust and confidence is then, by implementers themselves interpreted as reasonable and rational since this is how it *feels*. Criticism is on the other hand understood as emotional and thus as irrational..However, are of course potential virtues with these 'negative' emotions overlooked by NWM rationality (it is "rational" to be anxious, for instance). Our point is, however, that not even implementers can rid themselves of the emotions underpinning the feelings of trust and confidence in their own technical solutions andquantitative calculation .

With the above concepts, we can proceed with a better understanding of the rationality (now coupled with sociological concepts of emotions) that guide the implementation project. We are not focused on publics but focus on the emotional aspect of the implementers' policy. In turn, this provides an opportunity to critique the "irrational" parts of NWM rationality, that is, show that the certainty conveyed by NWM rationality is quite reductionist.

Data and methods

We chose the material for this article mainly because it accounts for the contemporary concern of implementers to address publics' emotions. The material has been scarcely considered in previous research. Focusing on this material constitutes an empirical contribution both to studies of NWM, as well as to the sociology of emotions which – to the best of our knowledge - is yet to engage in NWM.

To find relevant material, we identified two actors that influences policy globally: NEA and IAEA. The organizations provide aid and advice to a range of NWM programs worldwide and are influential reference points for waste managers internationally. By searching the organizations' data bases for key phrases such as 'stakeholder involvement', 'communication' and 'nuclear waste management', we identified a set of documents that describe how emotion management is envisioned in NWM. The search resulted in us identifying 17 policy documents, ranging from 40 to 200 pages. We limited our search from the year 2000 to 2022. We did so because the early 2000 marks a time when the more advanced participatory technologies of NWM were still in their infancy. Consequently, the selected period ensures that the data reflects the development of NWM communication strategies, that is, the temporality of implementer tactics. It is worth noting that lion's share of the documents has been produced in the last 5-10 years, suggesting that policy makers increasingly emphasize the crucial importance of interactions with 'concerned publics' and emotion management.

We coded the documents using a form of thematic coding. This procedure is largely aligned with that of Foucauldian policy analysis (Bacchi 2009). First, we developed codes that *descriptively* recaptured the rationale of the material. Our reason for doing so was to concisely capture the implementers' narratives. Second, we proceeded to a second step of coding which entailed identifying the ideas and presuppositions that underpinned the implementers' narratives. This is because policy 'necessarily contain implicit problem representations that demand scrutiny' (Bacchi 2009)(xviii). Compared to the first stage of coding, the second step thus constituted a more critical approach to the implementers' assertions. Third, we sought to 'disrupt' the dominant problem representations, and the prevailing narratives of the material (Bacchi 2009: 96). At this stage of the analysis, we proceeded to juxtaposing a sociological understanding of emotions with the understanding of emotions as conveyed in the material. Finally, this analytic work resulted in a set of core themes and categories that we are soon to account for in greater detail.

We contribute by filling in the " missing link" that is that the industry overlooks the fact that it is the industry itself who outlines the public's feelings! A methodological assumption we make is that rather than the industry's description of emotions being "hegemonic" (which it also is), it rather tells us something about what *implementers* can and cannot feel. So, it is a form of projection, in that sense.

Analysis – Empirical Review

In what follows, we provide empirical examples and our interpretation of the examples.

Why should the implementers care about public emotions?

To overcome opposition, the implementers now acknowledge that 'societal acceptance probably cannot be acquired without meaningful involvement.' (NEA 2017)(39). From this realization, the implementers tell a story of a new set of insights that have emerged following the failures of past tactics:

> It is now recognized that behavioural factors such as openness, transparency and fairness (as discussed earlier) are essential components of any siting and implementation process that aims to achieve public acceptability through engagement with other relevant participants such as local governments and host communities as well as non-governmental organizations (NGOs) and civil groups. (IAEA 2022)(16)

This means that implementers now seek to facilitate interaction between industries and publics. This new project, in turn, is not guaranteed to succeed. However, it is the very least the industry can, and should, do to increase the chances of implementation:

> Effective stakeholder involvement will not guarantee that new nuclear efforts will be successfully implemented; however, increased public participation is a necessary condition for public acceptance. Inviting diverse stakeholders to contribute to risk analysis and management is repeatedly shown to improve the likelihood that decisions will be commonly accepted. (IAEA 2021)

The documents tell a narrative of a self-critical implementers that seriously have underappreciated the pervasiveness of the emotions of a general public. Indeed, it is the implementers' stance that they have been too coercive, and too reliant on conveying technical messages without explanation to less-knowing publics:

> A widely accepted philosophy in the early years of nuclear technology was, generally, that the less the public knew, the better, or that the issues were too complicated for the general public to understand. Simple often bland reassurances were all that were employed to allay fears regarding nuclear facilities. A number of high profile events, such as the Three Mile Island accident in 1979 and the Chernobyl accident in 1986, demonstrated the flaws in this way of thinking (IAEA 2011)(3)

Irrational publics, thus rational implementers

Typically, implementers do not describe themselves *explicitly* as adhering to an objective understanding of risk. However, as the quote below illustrates, the *projection* of irrationality upon the emotions of publics suggests that implementers are the very opposite of publics. Implementer rationality is, in other words, based on scientific data and facts:

> Public opinion is often based on perception rather than on scientific data or facts, and simply introducing scientific messages will rarely eliminate the influence of risk perception on public opinion (REF!)

The divide between the two, in turn, is represented as deep. Once again, implementers appear to conceive of themselves as being representatives of 'scientific assessment of risk', whereas publics understand risk 'subjectively':

> The public perception of risks from nuclear energy differs markedly from the scientific assessment of those risks and even from the actual experience reflected in statistical data on damages, morbidity or mortality resulting from nuclear energy activities. Studies have shown that the general public evaluates risks not by the standard scientific computation of probability times consequence, but through a series of subjective criteria (NEA 2002)(55)

This should mean that it is an 'irrational' and 'emotional' feature of publics to understand, for example, morbidity and mortality in terms other than 'the standard scientific computation of probability times consequence'. In terms of discursive projection, it is clear that what emerges from the material is a form of 'emotion regime' that not just tells publics what (not) to feel, but it simultaneously tells what *implementers* can and cannot feel. From the example above, feeling anxiety and fear in the face of radiation risk is by no means a wanted feature of implementers. Yet, one must ask the critical question whether it is really 'irrational' to attach 'subjective criteria' to calculation of – for example - morbidity.

> The current debate on risk refers to a certain extent on the objective assessment of risk. Often, however, such assessments are rejected by society. Therefore, risk measurement methods should be proposed that take subjective and perceptual values into account (NEA 2002)(45)

Taken together, these assertions of the implementers represent their understanding of the relationship between rationality, irrationality, and risk. But how does one make 'irrational'

actors ‘rational’, that is, *transform* public emotions? Below, we elaborate on how implementers foresee this transformation.

Managing public emotion

As should be clear by now, implementers do not engage in the emotions of publics for therapeutic reasons. As the quote below shows, the emotion management tactics are primarily aimed at forestalling opposition:

> Effective communication strategies include resources that help to address high emotions and, potentially, opposition. Local construction and industrial operations can inspire strong reactions from many sides. Feelings like happiness, sadness, anger, fear, disgust and surprise become relevant to communicators who must respond to these reactions constructively. (IAEA 2021)

As we see in the next quote, the good communicator (who acts as representative of industries and implementers) is thus encouraged to have an approach to public emotions that acknowledges safety as socially and emotionally constructed (although implementers have the objective understanding of risk). The communicators need to be particularly receptive when addressing publics who do not share implementers rational, that is unemotional, understanding of risk:

> Communicators who know their audiences develop empathy. They watch for body language, listen for subtle indicators and take note of different opinions. Strong knowledge of audience priorities helps build greater understanding. It shows that nuclear professionals care about what is important to others. (IAEA 2021)

For implementers, this means that a world of emotions can only be explored when communicating with publics. As the example below illustrates, the Swedish implementer SKB speaks of its own emotions only in relation to its *communication* programs. In relation to this program, the company can allow itself to feel ‘pride’:

> In the view of SKB, the Swedish approach is so far positive with clear roles and financing for RWM, voluntary participation, openness and transparency, trust and confidence and the final decision making upcoming in a relatively near future. SKB puts pride in promoting everyone to come forward, offering different ways to do it, listening carefully and answering every question or comment. If not directly, SKB returned later with the answer to the person or organisation who had formulated a question or a comment. Openness, transparency and the process of building trust and confidence between SKB, the

> municipalities and other local stakeholders over time has contributed to the stability of the process in such a way that political changes, the Fukushima Daiichi accident or other issues have had a minor influence or none at all. (NEA 2020)(89)

What should publics feel?

The lion's share of the material concentrates upon issues of communication and participation processes. Through these processes, the implementers envision that the emotions of *trust* and *confidence* should appear among publics once they have been subjected to the truth of waste management, while simultaneously having been met with respect by deliberation facilitators (that is, communicators). The relationship-building between industries, implementers and publics will yield trust:

> As stakeholder involvement becomes more widespread, confidence in the process and trust in the participants tends to increase. It is particularly important to be clear from the very beginning about why a particular facility is required, and what the roles and responsibilities of the various parties involved are. However, this trust can quickly be destroyed by unexpected events or changes to agreed programme steps. Trust can be strengthened by demonstrating technical competence and adherence to high standards both in performance and reporting. It can also be developed by demonstrating respect for people's concerns, and not dismissing them as irrelevant or emotional. (IAEA 2022)(8).

However, the implementers contemplate also aspects beyond mere participation. These aspects also reveal that emotions beyond trust and confidence are to be welcomed. From the material, it becomes evident that the implementers do not want to put a ban on *all* emotions except trust and confidence. On the contrary, implementers hold that publics should be encouraged to feel joy and pride when hosting a repository. Clearly, such emotions are not the emotions of implementers – implementers care about objective risk - but they pose no *threat* to implementation. Hence, implementers promote not just constructive deliberation and participation, but also seek to incorporate aesthetic qualities into repository constructions that may spark publics' inspiration and dismantle scepticism. Here, publics are indeed encouraged to feel 'irrational' emotions:

> The installation may become an icon, a well-known, emblematic and admired feature of the place. People may draw pride from the presence of the installation; it can become a positive part of local identity" (NEA 2007) (24).

Bridging the Irrationality-Rationality Divide

Taken together, the envisioned end goal for the implementers is the unity between publics' and implementers' confidence in the *safety* of geological disposal. However, publics' confidence must be socially and emotionally *constructed*, whereas implementers' confidence is represented as already firmly grounded in 'truth', that is, as deduced from rational calculation and existing 'true' knowledge:

> … safety is not only a physical criterion but also a social construct. As such, it has an emotional component as well. Technical safety and "peace of mind" safety are both goals. The "feeling" of safety inspired (or not) by a set of technical arrangements is a legitimate criterion, among many others, for judging those arrangements. (NEA 2022)(41)

This quote suggests that safety as a physical criteria is already in place. This is *true* in a scientific-technical sense. However, safety can have an emotional component and is thus social. As such, *publics* socially constructs safety. Hence, the goal, in relation to siting and publics, implementers must construct a feeling of safety (peace of mind).

The goal is not, however, that publics are to become equally rational as the implementers. These two different forms of understandings of safety that emerges in the material – as socially constructed *and* as rationalist (emotional and *true*)– can coexist only if the former is built up by 'positive' emotions, that is, primarily trust and confidence. In turn, this means the construction of an ideal public that lacks 'negative' emotions such as fear and anxiety. A public that elicits constructed *faith* in the calculations of technical experts is still, however, irrational because its confidence does not flow from understanding quantitatively calculated risk. Crucially, however, this form of envisioned public irrationality does not contradict the goal of implementation, but rather encourages it.

Conclusions and Discussion

We have shown that implementers in the face of siting failures have moved closer and closer to 'concerned publics' and that it has developed increasingly elaborate methods of participation. In doing so, an important part of the story is that implementers have ventured into a world of emotions, that is, a world the implementers traditionally have sought to avoid. This is not primarily an attempt to facilitate democratic procedures for siting processes for the

sake of democratic values, but the engagement in the emotions of publics should be understood in the light of implementers' desire to implement. To succeed, public 'sentiment' cannot be circumvented.

In making these fundamental points that explain the emergence of emotion management, we have shown the more specific ways through which NWM policy addressed emotions. What emerges in the material, however, is not implementers contemplating the nature of what they themselves feel. On the contrary, the material conveys the image of an unemotional rational implementer speaking to an emotional, that is, 'irrational' public. While implementers present themselves as devoid of emotions, they nonetheless rely heavily on conveying *confidence* as *the* emotion that can be incorporated into their concept of 'truth'. While there are other emotions that publics are occasionally encouraged to occupy, these are only 'positive' emotions (such as joy and happiness) that will not contradict *truth* and *action*, that is, implementation. More notably, implementers heavily promote *trust* and *confidence* as key aspects of success. In turn, confidence is represented as *the* emotion that emerges, or should emerge, in the face of acquiring *true* knowledge about nuclear waste and spent nuclear fuel.

According to our analysis, the prevailing emotions in the material are associated with 'rationality' and as such are emotions that correspond to 'truth'. Implementers are confident and confidence breeds action. Relying heavily on confidence, however, is complicated by the sociological insight that the benefits of emotions (as means) are at least in part relative to their ends. It is sociologically *true* that there is such a thing as overconfidence, and overconfidence fosters uncritical thinking, the risk of hasty decisions, the neglection of danger, and represents the opposite of what Feenberg (2017) has called the 'wisdom of restraint'. This rationality appears - rather than 'true' and enlightened - as dismissive of the fact that NWM is *inherently* volatile, laden with risk and uncertainty, and that it implies consequences for virtually endless generations to come. Future generations will indeed have no influence over neither the NWM of today, nor the repositories that will likely be part of their surroundings. To conceive of critique and emotions of anxiety, fear, and concern as 'irrational' and 'untrue' in this context appears not just as presumptuous, but even as saturated with hubris. And as we have argued, hubris is indeed an *emotional* state characterized by 'excessive pride or self-confidence'. If one holds the sociological concepts of rationality and emotion as true, one can arguably claim that it is indeed the confident rationality of NWM policy that is truly irrational.

The inevitable uncertainty of NWM and our results imply for future siting an *unsolvable* problem. While much research has aimed to improve siting procedures – sometimes by aiding the manipulation of publics' emotions - our findings imply that the best one can hope for is

granting justified emotions of concern credibility, thus de-labelling them as ‘irrational’. Yet, this will not in any way magically render siting ‘fair’ and ‘democratic’. It will merely promote a more accurate representation of siting processes which explicates their inherent problematics and more realistically elucidates their limitations; a reasonable conception of siting grants perpetual concern rationality.

These results, however, come with some caveats. While we have provided an analysis of the reality of emotions in NWM *policy*, how policy is realized in practice is a different story. To be sure, reiterating the rationale of policy does not tell the story of *implementers’* potential doubts and fears or any other emotions that do not fit into truth regimes boasted in policy. Neither does this paper explain the ‘true’ emotions of publics, nor of their responses (assimilation or opposition) to the new emotion management tactics. The results of this paper thus imply that what is missing to our story advantageously can be considered by future research to render clearer also those aspects that we have refrained from elaborating on. Nonetheless, we hope to have demonstrated that emotions in NWM deserve scrutiny. Given the fact that implementers still struggle to site repositories worldwide, it appears justified to expect the continued advancement and refinement of implementers’ emotion management tactics.

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