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Global Nuclear Security

The Role of Uncertainty, Disputed Values and Non-state Actors

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Executive Summary

This policy brief discusses the uncertainties associated with the use of nuclear material for energy production, but attempts to move beyond the mainstream definitions on nuclear terrorism and nuclear safety issues. The policy brief argues that stakeholders involved in the nuclear decision-making process do not sufficiently acknowledge the uncertainties inherent in this complex subject. The limited attention reduces the 'societal legitimacy' of nuclear policy-making and even increases risks to potential nuclear accidents.

The information on the use of nuclear materials used in decision-making processes is contested, as facts are often uncertain and causal relationships are not entirely known. Uncertainty can also originate from diverging beliefs alongside personal and organizational strategic interests unknown to others. These beliefs and interests in turn steer the selection and interpretation of facts.

Appropriate management of the 'wicked problem' of nuclear security governance requires the involvement of non-traditional stakeholders in the decision-making process and the recognition of a plurality of perspectives and the pursuit of a shared discourse. It also requires that experts are able and willing to reflect on their work and communicate with a wider audience regarding uncertainties.

1. Introduction

Due to its changing relationship with Russia, the European Union (EU) will reconsider its current energy-combination (coal, gas, oil, nuclear and renewable sources, i.e., hydro, wind and solar power) with an increased emphasis on the implications of the current dependence on Russian gas through the Nord Stream pipeline. New energy sources need to be identified or further developed, in order to keep up with projected demand. In meeting concerns about the security of electricity supply and carbon emissions, a role for nuclear energy is, therefore, an option that is being explored. However, while few people would object in principle to a sustainable source of energy that does not have structural limitations, opinions differ as to whether the greater use of nuclear energy is consistent with enhanced safety and security. In light of public concern, some EU countries have decided to reduce the number of nuclear power plants within their territories (Germany, Switzerland, and Italy), while other countries are still highly dependent on this source (France for 75%). Providing societies with a safe and secure energy supply raises the following question: which uncertainties should decision-makers take into account and how do these uncertainties enter decision-making arenas?

> New energy sources need to be identified or further developed, in order to keep up with projected demand.

Since 2001, thinking about nuclear security[1] has increasingly focused on reducing the risk of mass impact terrorism using technical means, i.e., enhancing nuclear material physical protection[2]; reducing stocks of highly enriched uranium and plutonium; and strengthening the international legal instruments,[3] that govern these matters (see textbox). However, agreeing upon international binding instruments has been complicated and slow, and the majority of agreed measures are voluntary.

In this policy brief, the importance of a broader perspective on nuclear security is underlined. Broader in the sense that it does not exclusively focus on states as the primary actors and the protection of nuclear facilities (as defined through the *Advisory Group on Nuclear Security* definition on nuclear security). This broader perspective encompasses the risks emanating from the use of nuclear materials, not only for those directly working with nuclear materials (as defined by nuclear safety) but also for society as a whole. It thereby focuses on the influence of assumptions and the uncertainties within these assumptions that makes decision-making on nuclear issues a complex societal problem.

Important regulations regarding nuclear security are:

- IAEA Incident and trafficking database (1995)
- EC Regulation No. 2580/ 2001, No. 881/ 2002
- EU Security Strategy (2003)
- UN-SC resolution 1540 (2004)
- IAEA Code of Conduct of Radioactive sources (2004)
- EU Counter Terrorism Strategy (2005)
- International Convention for the Suppression of Acts of Nuclear Terrorism (2005)
- Convention on Physical Protection of Nuclear
- Material (2007)
- Various EU Council Directives
- EU Instrument for Stability
- EU Instrument for Nuclear Cooperation (2007)
- CBRN Action Plan (2009)

1.1 The Nuclear Security Summits

The topic of nuclear security was brought to the current level of political prominence in 2009 at Hradcany Square in Prague, where the President of the United States (US), Barack Obama, addressed an enthusiastic crowd, reminding them of the dark past and future dangers. President Obama's speech sparked a new phase in international cooperation on nuclear matters, with negotiations between Russia and the United States on a new Strategic Arms Reduction Treaty, a special meeting of the United Nations Security Council, and the first global Nuclear Security Summit (NSS) in Washington DC, which was followed by a second summit, in Seoul in 2012 and a third summit in The Hague in 2014.

The impact of the NSS summits should not be underestimated. The NSS summits are high-level processes where countries can demonstrate their progress and their commitment to nuclear security by gathering at the highest political levels and exerting diplomatic pressure. Previous summits took steps towards: (a) reducing the quantity of high-enriched nuclear material for non-military use, (b) improving the security of this nuclear material, and (c) improving international co-operation on this topic. At this juncture, it is important to reflect on progress and to identify some of the challenges to improving nuclear security before the final summit in 2016.

On 24 and 25 March 2014, the Netherlands hosted the 3rd Nuclear Security Summit (NSS), which again brought States together to address shared security concerns. The main outcomes of the 2014 NSS in The Hague include:

- All participating countries have agreed to implement the International Atomic Energy Agency (IAEA) guidelines on strengthening nuclear security implementation, with 35 out of the 58 countries committing to make the guidelines national legislation.[4]
- Several countries agreed upon the removal of highly enriched uranium within their borders.[5]

At the same time, several challenges have emerged with the content and organization of the NSS. First, only the non-military use of nuclear material (high-enriched uranium and plutonium for energy, industrial use and medical isotope production) is on the agenda even though it constitutes only about 15 per cent of the total nuclear material used. The United States argues that real progress can be made within a relatively short period of time by focusing on non-military nuclear material, and by excluding nuclear weapons, which are discussed in other fora. However, support is divided, with 15 countries[6] at the 2014 NSS expressing their discontent with the narrow focus, arguing that only the complete elimination "of all nuclear weapons could offer the international community a long-standing and sustainable solution for the provision of larger security in the nuclear field".

Building a nuclear security culture will require engagement with a wide variety of actors.

As a second challenge, the final communiqué called for a "strong nuclear security culture" to be established. However, this goal may prove difficult given the progressive narrowing of the scope of the discussion at the NSS and the fact that non-state actors[7] have found it difficult to make their views known in the three summits so far[8]. There is a varied understanding of who actually constitute non-state actors and to what extent they are to be involved.

Building a nuclear security culture will require engagement with a wide variety of actors, including civil society organizations, industry and academia that are becoming necessary elements of building trust at the societal level on nuclear security issues, and who are responsible for educating or even comprise, the future nuclear workforce.

1.2 The 2014 NKS and The Hague Institute-SIPRI Roundtable

Prior to a NSS, Nuclear Knowledge Summits (NKS) are organized to provide a platform for the exchange of knowledge and to inform policy-makers on the state of affairs between scientists. In a comparable way, a Nuclear Industry Summit (NIS) is organized as a forum for the industry. Under the umbrella of the NKS, The Hague Institute - in close coordination with Stockholm International Peace Research Institute (SIPRI) - organized a roundtable convening key experts on the topic of the role of non-state actors in nuclear security governance.

This roundtable addressed how stakeholders dealt with uncertain facts and disputed values and asked how uncertainty influenced their decision-making and policy formulation. What lessons can we learn, as industry, as civil society, and as policy makers from each other? By identifying and addressing such questions, The Hague Institute aims to advance ideas and policy recommendations to improve public campaigns and encourage more effective Track II diplomatic efforts. Our hope is to reach a mutual understanding of how best to develop evidence-informed practices and elaborate collective priorities with a view to improving public decision making and strengthening legitimacy.

This roundtable addressed how stakeholders dealt with uncertain facts and disputed values.

Issues and challenges that were addressed in the roundtable include:

1. Is nuclear security framed as a top-down/bottom-up process: how do these interrelate?
2. How should stakeholders' perspectives on global nuclear security be incorporated?
3. Which indicators best measure progress towards nuclear security?
4. What knowledge gaps exist on nuclear security activities of non-state actors?
5. What are the main sources of uncertainty *vis-à-vis* the role of non-state actors and nuclear security?
6. Which robust messages can be derived from available knowledge on the role of non-state actors and nuclear security?

The original policy recommendations in this document are a collection of the findings from the roundtable; they do not represent the consensus of participants. A limited set of recommendations was presented to the Dutch Sherpa as input for the Nuclear Security Summit 2014 in The Hague, specifically addressing the national delegations of participating states. This policy brief is a contribution by The Hague Institute to the policy debate on nuclear security, helping policy-makers to define priorities in the preparations for the final Nuclear Security Summit in Washington in 2016.

2. The Uncertainties in Nuclear Security

Reports that say that something hasn't happened are always interesting to me, because as we know, there are known knowns; there are things that we know that we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns, the ones we don't know we don't know.

Donald Rumsfeld, United States

2.1 The Known Risks of Radiation and Nuclear Technology

Radiation is used in electricity generation (i.e., nuclear power plants), in the medical field (including diagnosis and treatment), in industry (e.g., measuring the thickness of materials), in agriculture (e.g., food irradiation), and in consumer products (e.g., smoke detectors).

However, the man-made use of radiation introduced the possibility that things could go wrong, that workers or the general public could be accidentally or deliberately exposed to nuclear radiation. Official investigations have revealed that this has happened on numerous occasions[9]. Some cases are very recent. In 2013, in Mexico,[10] thieves dismantled a tele-therapy unit that was once used for cancer treatment, which still contained a small capsule of highly radioactive material. Exposure through isolated incidents to these natural and man-made sources is (to some extent) an *unknown known risk.*[11]

In everyday life we are constantly exposed to radiation. Non-ionizing radiation, such as visible light and radio waves, is unable to change the chemical structure of living tissue. The decay of atoms is called radioactivity and radiation is the energy and sub-atomic particles produced by this decay. Ionizing radiation or nuclear radiation emits alpha- beta particles, neutrons or gamma rays. This radiation carries enough energy to remove electrons from atoms in the materials the radiation penetrates and damage cells.

Natural sources of ionizing radiation are the earth itself (radon gas in the air and uranium, thorium and radium existing naturally in the soils and water) and the cosmos (increased exposure through high-altitude flights).

2.2 Complex Systems are Resulting in Unexpected and Inevitable Accidents

There are also the *unknown unknown risks.* They are unknown because the complexity of the interaction between people and technology is making it extremely difficult to predict outcomes. Perrow labels these events as 'Normal accidents' because they are "unexpected, incomprehensible, uncontrollable and unavoidable".[12] He argues that the use of complex systems, such as nuclear technology in power plants and nuclear weapons, creates environments in which failures are inevitable.[13] However, the insertion of safety measures in these complex systems creates new opportunities for disasters as they alter existing configurations and introduce new uncertainties.

The list of small and large failures with nuclear power plants, submarines, nuclear weapons, and radiological devices is long. Known accidents, described amongst others by Perrow (*ibid*) and Schlosser (2013),[14] include the Three Miles Island melt-down, the Damascus accident, the 1961 Goldsboro bomb, the 1958 Tybee bomb, the 1968 Thule crash, the 1966 Palomares accident, and the Chernobyl disaster, which occurred as the safety system was tested, eventually leading to a nuclear meltdown. In this paper, we will analyze a more recent event in greater detail, showing that different stakeholder groups inadequately or insufficiently recognize the uncertainties.

2.3 Case: The Fukushima Accident: A Man-made Disaster

More recently, the Fukushima accident (on 11 March 2011) occurred as the result of a series of errors. During construction, it was assumed that the risk of tsunami's passing the sea-defense wall, protecting the Fukushima power plant, was extremely small. However, a 14m high wave washed over the 10m high wall. After the earthquake, the operation of the plant was directly stopped according to protocol. However, the control rods with neutron-absorbing properties, which were inserted among the fuel rods, did not fully stop the heat generation. The excess heat could not be taken away as the tsunami damaged the power generators (which were placed on the ground floor instead of on the roof of the building). Moreover, as the heat rose, the water evaporated, further decreasing the cooling capacity and thus leading to the melting of the core. As the zirconium alloy of the fuel rods came into contact with the hot steam, highly explosive hydrogen gas was generated. To prevent an explosion of the core, the plant operators vented the gas into the maintenance halls, where it mixed with oxygen resulting in an explosive mixture that detonated, damaging the buildings.[15] As a result, radioactive material was released to the outside world.

According to the 'Fukushima Nuclear Accident Independent Investigation Commission', the Fukushima event is 'a man-made disaster'. Prior to the event, the plant operator (TEPCO) was warned about the risk of extreme tsunamis. The operator (TEPCO), the regulatory bodies (NISA and NSC) and the government body promoting the nuclear power industry (METI), failed to implement basic safety requirements. According to the commission, this is the result of the opposition of TEPCO to new safety regulations and the belief of the regulatory bodies that nuclear power was safe and the reluctance to question the behavior of TEPCO. At the same time, the regulatory body NISA was created as part of METI, which is the strongest supporter of nuclear power. The Investigation Commission concluded that the fundamental causes of the negligence and the event are to be found in the "ingrained conventions of Japanese culture: our reflexive obedience; our reluctance to question authority; our devotion to 'sticking with the program'; our groupism; and our insularity"

As a result of the disaster, radiation entered the air, seawater and groundwater, and a few people received a lethal dose of radiation; the longer-term impact of the disaster on humans and animals, such as fish, is unknown. However, the impact on economically important activities was immediate and important. For example, some key markets for Japanese fish were closed, and consumer confidence in the safety of Japanese fish was undermined. What damaged the fisheries in Japan is, therefore, not just the radiation, but also the *fear for radiation*. Radiation levels in the air, groundwater and seawater were not measured. Instead, they remained secret, which only increased the fear of the population in Japan and worldwide. On the other hand, the government had little information to guide its actions, but found it difficult to acknowledge this uncertainty.

The Fukushima case (and other cases) demonstrates that there are several issues which can be isolated that impact nuclear security. These issues show that nuclear security is more than a technical problem, which can be addressed with technical and legal instruments: it shows that nuclear security is a complex societal problem.

Plant operators, the regulators and several ministries thought that nuclear energy production was safe. However, their assumptions about the risks and uncertainties proved to be wrong. Faced with uncertainties, people made assumptions to fill the gaps in their knowledge. The plant operators assumed certain facts with respect to the functioning of the nuclear power plant and the possible cause of events. However, when technology becomes extremely complex, as is the case with a nuclear power plant, the likelihood of errors in operation and maintenance of this technology increases[16] and assumptions are more difficult to make.

Furthermore, the assumptions regarding the risks and uncertainties differed between those involved due to their particular knowledge and interests (i.e. those who operate and maintain the complex technology, the heads of the organizations, the controlling staff who are more remote from the actual practice and the difficulties faced, the policy makers and general public). Consequently, their actions will be different, e.g., the ability to exert control by the regulatory body NISA was negatively influenced as it was established as part of METI, which is the strongest supporter of nuclear power.

The case thus shows that it is not only the complexity of the technology itself which gives rise to accidents, but also the manner technology is embedded within an organization and culture, which influences how practices around technology are created and contested (figure 1). This means that, when trying to understand nuclear security, attention should be paid to the assumptions and the uncertainties underlying the practices that influence the course of action and not just focus on improving security through improving technology.

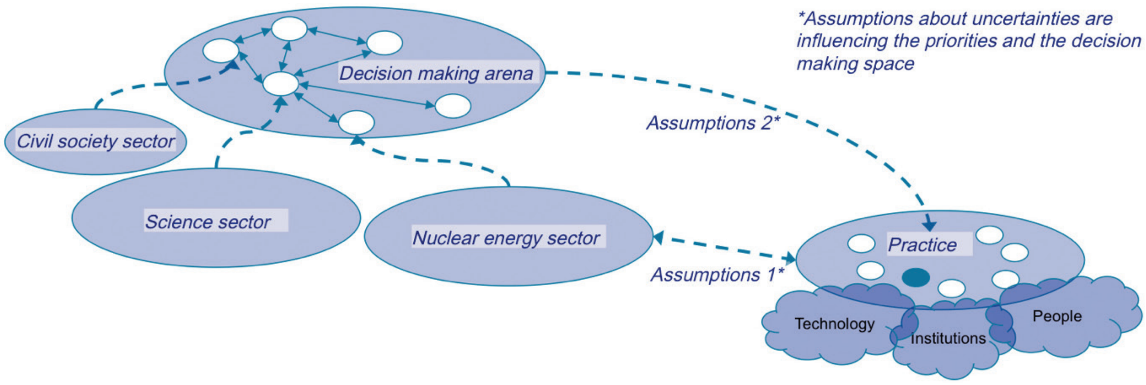

Figure 1: The role of assumptions and uncertainties in the current approach to nuclear security

3. Governance Based on Assumptions Versus Complexity

3.1 The Role of Uncertainty in Solving Societal Problems

The possibility of all stakeholders to reach a common understanding of a societal policy problem is primarily defined through the degree of uncertainty underlying the problem. This uncertainty hinders the definition of the policy problem and the identification of solutions.

The uncertainties influencing a single policy problem, such as nuclear security, stem from a range of sources (see also previous section), such as: physical and technical uncertainties (extreme weather events, actual risk to technical failures), economic uncertainties (cost effectiveness of different energy options), social uncertainties (acceptance of nuclear energy), institutional uncertainties (quality of inspections, good governance of nuclear sources), political uncertainties (relation between the West and Russia, availability of gas through North and South Stream pipeline), and uncertainties related to terrorism, etc.

The information that is brought to the fore in the immediate decision-making process is likely to be contested, as facts are often uncertain and causal relationships are not entirely known. Uncertain facts fall within two categories: uncertainties that can be reduced through measurements (e.g., measuring radiation with Geiger-counters) and facts that are intrinsically uncertain through their variable behavior (e.g., distribution of radio-active material through air and seawater, or the attitude of the general public towards nuclear energy production).[17] This variable behavior can be non-linear or even chaotic.[18]

Apart from this substantive dimension, uncertainty can also originate from diverging beliefs and personal and organizational strategic interests unknown to others. These beliefs and interests steer the selection and interpretation of facts. Yet, if these diverging voices are excluded from the decision-making process, it reduces the legitimacy of the decisions for societal problems.

3.2 Classification of Societal Policy Problems

Based on the abovementioned discussion, societal policy problems can be classified[19] according to the degree of complexity, which is of course an evaluation of the problem from the position of each individual actor. One useful categorization is the following:[20]

a. Simple,[21] technical problems for which there is no conflict (e.g., optimal design of a steam turbine in a nuclear power plant) are easily solvable;
b Untamed technical problems are problems 'where everyone agrees they must be solved, but for which there are no agreed upon technical solutions' (e.g., finding a cure for HIV/AIDS);
c Untamed political problems, 'where technical solutions are available, but where their application meets with societal conflict' (e.g., renewable energy production through windmills, but 'Not In My BackYard', (NIMBY));
d Wicked problems,[22] 'where there is neither agreement on the facts, nor the problem definition' (e.g., human contribution to climate change; carbon dioxide reduction measures; use of GMO to improve agricultural production etc.).

All knowledge that is produced, for instance on nuclear security, is conditioned on (the unknown validity of) assumptions. Hence, uncertainty is unavoidably co-produced.

Arthur Petersen, 2014

In addition, Funtowicz and Ravetz[23] point to the high stakes, urgency of decisions and far-reaching impact of a complex policy problem as additional characteristics of wicked problems:

- Several issues within the nuclear policy debate require urgent decisions (e.g., should we invest in nuclear energy as the possible transmission of Russian gas to Europe is not yet ascertained; should decision-makers continue to license nuclear power plants facing possible operation and maintenance failures, etc.).
- The impact of these decisions is far-reaching (e.g., wider relationship with Russia, impact on both the Russian and European economy following a drop in gas sales; possible accidents with nuclear power plants and nuclear waste; will there still be a guaranteed supply of medical isotopes when there is no support to maintain production facilities? etc.).
- The knowledge regarding the issues and their solutions is subject to uncertainty. Nuclear issues in particular are surrounded by uncertainty, as much information is secret in order to protect data and power installations from espionage and terrorist attacks (e.g. how are the risks factored in policy decisions? does and will it have an impact on the actual practice? how certain are claims that nuclear energy production is safe? how effective are current security measures?).
- The values are in dispute as state and non-state actors perceive risks -related to the use nuclear materials- differently. The contradicting arguments of these actors are based on the environmental consequences of uranium mining and the production costs of nuclear energy, or on the other hand, on the society energy needs, and the need for low-carbon dioxide emitting power plants.

Each party thus brings particular facts and values to the policy debate, thereby not recognizing the intrinsic uncertainties in their arguments. As such, there are 'deep uncertainties' due to human reflexivity.

3.3 Reduction of Complexity

Although many societal policy problems are wicked according to the above definitions, decision-makers often proceed as if they were simple problems with technical solutions, instead of recognizing the full complexity of the problem. Implicit assumptions[24] are made about the process: Boundaries are drawn around the problem ('which actors are relevant to the problem, which are not?'), the full heterogeneity of the problem is reduced to a limited set of sub-problems ('let's restrict our focus to the real problems'), individuals are thought to act in predictable and often rational ways ('to solve the problem we changed the protocol'), and processes are assumed to run without friction ('nothing unexpected will happen').

Nuclear security is usually treated as a technical issue managed under the responsibility of individual states. Although increasingly attention is given to the role of differing cultural practices in understanding and limiting the risk of accidents and possible terrorist attacks, the reflex of policy makers is to securitize the response (secrecy, fences, regulations, etc.) through science, technology and policy. The complexity of the problem is, therefore, reduced to a simple problem, which can be dealt with by technical solutions.

3.4 Selective Decision-making Arenas: the Tole of Assumptions and Legitimacy

A selective group of national and international decision-makers is structuring the governance of nuclear resources. As only a selective group of state and international organizations is in charge, the *legitimacy* of the use of nuclear materials is limited in the eyes of groups excluded from decision-making.

Scientist:

We are actually often uncertain about risks.

Roundtable participant, 2014

For example, there is a belief amongst some non-nuclear States that only a few countries are truly impacted by the risk of nuclear terrorism, and these countries are pushing the international community to strengthen nuclear security for essentially selfish reasons. Many countries are more concerned that it is the weapons themselves (that only a few countries have) that present the biggest threat. The tension between those differing perceptions is difficult to overcome in a compartmentalized debate.

Assumptions steer the focus on which risks are to be addressed and which measures are therefore needed. These assumptions enter the policy debate through the selective group of stakeholders, whose arguments are often supported by policy supporting models and tools, which also depend on assumptions.

Either deliberately or through ignorance the intrinsic uncertainty within these assumptions are ignored or insufficiently recognized. As not all uncertainties can be quantified, this might result in situations where, in complex issues, unquantifiable uncertainties are more relevant than other, quantifiable uncertainties.

Consequently, an illusion of certainty is created as assumptions can lead to the 'Swiss cheese' model or to the normal accidents described by Perrow and Schlosser, in which assumptions about natural, technical, social, psychological and institutional conditions coincide and contribute to a catastrophe with far reaching consequences—such as a major nuclear incident.

Assumptions are constantly challenged by actual incidents; before 9/11, the risk of a terrorist attack using airplanes was not given high priority; before Fukushima, the risk posed by an extreme tsunami was considered limited. Which uncertainties will be exposed by the next disaster?

4. Fundamental Uncertainty: A Role for Non-state Actors

[The] scientific and technical discourse is no longer restricted to expert communities but needs to be inclusive of non-specialist participants (stakeholders and citizens). [...] Since no particular expertise can deliver certainty for policy issues in the post-normal domain, no expertise can claim a monopoly of wisdom and competence.

Arthur Petersen, 2014

4.1 Uncertainty, Trust and Non-state Actors

Accidents and attacks with nuclear material have a tremendous impact on a particular society, and are, therefore, a legitimate cause of public concern. This concern creates mistrust regarding both political decision-makers and the nuclear energy sector, and decreases the legitimacy of the policies intended to safeguard the public. What is, therefore, required is the involvement and positive engagement[25] of non-state actors.

Leading scholars[26] argue that the fundamental uncertainty in science and policy must be recognized and accepted. When dealing with complex policy problems, normal science (discovering true facts) is insufficient, meaning that new tools are needed to guarantee the quality of the decisions made. Therefore, appropriate management of uncertainty requires the recognition of plurality of perspectives and the extension of peer community. The consequence of this acceptance is that there is no such thing as only one legitimate problem perspective and only one solution for wicked problems.

4.2 Involvement of Non-state Actors

Non-state actors play a key role in the formation of the existing nuclear governance regime, although not explicitly recognized as such. They already shape policy decisions on nuclear issues through lobbying, but also through second-track diplomacy. However, non-state actors have only limited access to the formal decision-making arena, as the issues around nuclear security are often classified: The legitimacy of the use of nuclear material (whether it is for weaponry, energy production, industrial or for clinical use) is constantly challenged or supported by a broad range of (non-state) actors with a variety of different perspectives. Through contestation, assumptions are challenged and uncertainties reduced. In a more positive way, non-state actors can also contribute to creative thinking for solutions.

Non-state actors challenge assumptions thereby reducing uncertainties.

5. Discussion and Recommendations

The issues identified in this policy brief have significant implications for the governance of the current nuclear security regime. As uncertainty is fundamental to wicked societal problems, its recognition requires substantial changes in the attitudes towards nuclear security. Roughly, the arenas (figure 1) that play a role in nuclear security practice are the knowledge production, the nuclear industry, the civil society, the decision-making arena, and the practice arena where people work directly with nuclear materials. In these arenas the use of facts, their interpretation and communication are directly affected by uncertainty. Therefore, the challenge concerns knowledge production, secrecy of information, the lack of trust, public communication, and the current international nuclear policy regime and agreements.

5.1 Knowledge Production

Challenge 1: Acknowledging uncertainties

- Scientists in the Roundtable expressed their concern that they do not actually know where the current knowledge gaps lie. In response to uncertainties, they felt that the response of all stakeholders is too often to flee (pass the problem to somebody else) or to freeze (fall back on precedent to conduct "business as usual"). Interdisciplinary collaboration is essential, notwithstanding the existence of various actors with diverging values.

Recommendation:

- The first step in reaching a more robust production of knowledge is the acknowledgement of uncertainties by the scientists who are currently contributing to the debate on nuclear security. Acknowledging uncertainties and fostering an understanding of different discourses can open the policy-making process.

Challenge 2: Mitigating fear and public communication of uncertainty

- There is much value in public communicating and acknowledging uncertainties, as this adds to security. However, there is a devaluation of the role of expertise within the current politicized debates. Sensational voices receive more media attention, which results in a messy debate fed by fear by ignoring or deliberately downplaying the contextual nuance.
- A scientific risk approach will not itself eliminate this fear, which prompts compartmentalized thinking (e.g., regarding energy and security) and policy inertia. However, deliberate communication between the traditional and non-traditional actors in nuclear security is needed to establish trust. Trust is essential in creating legitimacy and compliance for any policy measure.
- Mitigating public fear relies on open communication and especially more institutionalized spaces for consultation and deliberation with non-state stakeholders, including about risk mitigation mechanisms, rather than dealing in euphemisms about risk.
- Civil society organizations play an essential role in educating the public, bringing new ideas to the table, challenging traditional thinking and reaffirming aspirational goals.

Recommendations:

- When scientists are engaging with the general public – including through the media – it is essential that expertise itself is not devalued and that complex (and often technical) issues are not reduced to binary arguments.
- Decision-makers have the responsibility to communicate their messages clearly to the general public, but should not overlook possible uncertainties.

An example in a more nuanced field is export controls. At least in Europe, policymakers regularly reach out to European stakeholders, such as NGOs, industry and academia, and invite their views on how the EU regulation affects them, their concerns, how it could be improved, etc. Furthermore, this dialogue works even though many actors keep certain information secret. This dialogue takes place, because without it the policy could not be effectively implemented-compliance would be weak.

5.2 Secrecy, Trust and Legitimacy

Challenge 3: Secrecy of data

- The engagement of non-state actors, including academia and the intelligence community is hindered by data secrecy. Nuclear security issues are secret in order to effectively deal with threats. One of the unfortunate and unintended implications is that people are able to cover up for their failures.

Recommendations:

- Strengthening the international exchange of information and mitigating secrecy is of importance.
- Peer reviews and trusted experts can help to bridge the insistence on secrecy.
- Next, governments should clearly explain which aspects are to remain classified.

Challenge 4: Transcending the divides

- The divergence between regulatory, industry and non-state actors is exacerbated by limited attention for possible uncertain facts, lack of trust, openness (and therefore effective communication) and especially deliberation. Supporters of nuclear energy prefer clear messages that either suggest minimal risk, or communicate a robust capability to manage risk, while groups contesting nuclear energy tend to focus on the risks and their disadvantages. Governments have the specific obligation to strike a careful balance between preventing unnecessary unrest and openness.

Recommendations:

- Transcending these divides requires openness from all sides.
- Actively convincing the technical community that civil society organizations and educators have expertise to bring to the table is a task that requires active engagement.
- Uncertainties surrounding the use of nuclear materials are often insufficiently addressed, in part because policy actors fear that acknowledging uncertainty will lead to paralysis. Nevertheless, identifying uncertainties is essential to the effectiveness and legitimacy of decision-making.

Challenge 5: Involving non-traditional stakeholders in decision-making

- Policymakers may construct the policy, but its effective implementation relies on stakeholders (e.g., such as industry who run power plants, the authorities that are first responders, etc.) buying into it,. The range of organizations with key experts on issues that are relevant to the discussion of nuclear security, but that are excluded from the nuclear security process, includes respected organizations such as the Red Cross, UNDP, WHO, and IOM.

Recommendation:

- Governments have an interest in involving non-traditional actors in decision-making. Doing so, will create a broad support and legitimacy for their policies.
- It is very important when communication takes place to explain why all stakeholders are important-this also makes everyone involved understand that they are working towards a common, shared vision.

Challenge 6: The role of the NSS-fora

- One ‘divergent value’ is the role of the NSS process itself: whereas leading states explicitly see it as a forum to narrow the focus of the nuclear governance debate to concrete action on a narrow spectrum of nuclear security contingencies, others stress the relevance of a wider basket of nuclear risks. It is doubtful whether only broadening the debate within existing nuclear fora (e.g., through broadening the definition of nuclear security or including more topics on the agenda) will reduce the uncertainties and create wider legitimacy as it will likely result in a *dialogue of the deaf*. This can lead both to 'forum shopping' and confusion when fora are mixed inappropriately.

Recommendation:
- With the assistance of all relevant stakeholders, explore the need for combined or specialized fora, based on the shared understanding to make progress on specific subjects.

5.3 Global Coordination Versus Local Action

Challenge 7: Global impact gives rise to local concerns
- The importance of achieving sustainable solutions is high and while the risk of incidents may be low, the effects of one incident can be disastrous, with transnational and even global impact.

Recommendation:
- States should not only focus on global decision-making, but instead broaden their perspective. There are many relevant processes both regionally and locally that deserve greater attention. This also relates to the fact that security concerns are first and foremost local concerns, i.e., the effects of nuclear accidents and incidents on a local community.

Challenge 8: Governing a global industry
- The nuclear industry is increasingly a global industry, which requires universal codes of conduct and standards. There is, moreover, no global decision making authority. The IAEA already plays an important role in the global coordination of issues related to nuclear security, but is depending on the support of the individual countries. Although multilateralism is difficult, it is important to involve more countries in the nuclear security process as they are all affected by global accidents.

Recommendation:
- New governance mechanisms need to be developed, as the fragmentation of nuclear security is not sustainable.

- One common proposal is to ensure universal participation in codes and practices as a tool to standardize the existing frameworks, especially those frameworks that already exist but are not yet put into practice. However it is not realistic to expect every country regardless of their circumstances to immediately implement all nuclear security policies nationally. Implementation is a tricky, costly issue. Context must shape priorities, so that the end result is not agreed policies that are not implemented effectively.

Recommendation:
- Universal good practices should be tailored to local contexts without losing their primary purpose, goal or functionality.

List of Participants

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Endnotes

1 | Within the policy debate, a distinction is made between nuclear security is, which is the security against deliberate attacks and nuclear safety, which is the protection against nuclear accidents. Weapons, and the stockpiles, are excluded from these definitions. The mainstream definition of nuclear security is by the Advisory Group on Nuclear Security (AdSec): '*the prevention and detection of, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities.*'

2 | Security programs initiated through the US helped to secure unprotected sources of radiation in abandoned facilities, hospitals, and disposal sites in Eastern Europa, Central Asia, the Middle East, Africa and Latin America.

3 | See for example: Anthony, 2013. The role of the European Union in strengthening nuclear security. Non-Proliferation Papers No. 32, EU Non-Proliferation Consortium.

4 | The IAEA is given the substantive role of further supporting the sharing of good practices and lessons learned, providing guidance to countries and of carrying out peer-reviewed missions to increase trust building.

5 | Belgium and Italy completed the removal of their excess supplies of highly enriched uranium and plutonium so that those supplies can be eliminated. Japan announced that it will eliminate 300kg of plutonium in cooperation with the United States (but will retain a stock of 9.3 tons of plutonium). Twelve other countries (Chile, Czech Republic, Denmark, Georgia, Hungary, Mexico, Republic of Korea, Romania, Sweden, Turkey, Ukraine, and Vietnam) have announced the elimination of the costly highly enriched uranium from within their borders by *inter alia* making their research reactors suitable for low-enriched uranium.

6 | Algeria, Argentina, Brazil, Chile, Egypt, Indonesia, Kazakhstan, Malaysia, Mexico, New Zealand, Philippines, Singapore, South Africa, Ukraine and Vietnam.

7 | Non-state actors include civil society organizations, academia, lobby groups, businesses, etc.

8 | The only reference -in the final communiqué of the 2014 Summit- to non-state actors concerns the following sentence: "*This responsibility [of States] includes taking appropriate measures to prevent non-state actors from obtaining such materials – or related sensitive information or technology – which could be used for malicious purposes, and to prevent acts of terrorism and sabotage*."

9 | http://thebulletin.org/2014/may/treasure-island-cleanup-exposes-navys-mishandling-its-nuclear-past7137

10 | http://thebulletin.org/mexico's-stolen-radiation-source-it-could-happen-here

11 | This is a classification of risk made popular through the speech of Rumsfeld. Other scholars suggest a slightly differently, more formal typology. For the purpose of this policy brief, we will not go into these.

12 | Perrow, C. (1982), "The President's Commission and the Normal Accident", in Sils, D., Wolf, C. and Shelanski, V. (Eds), Accident at Three Mile Island: The Human Dimensions, Westview, Boulder, pp.173–184.

13 | Perrow, Charles, 1999. Normal Accidents: Living with High-Risk Technologies. Princeton University Press.

14 | Schlosser, Eric, 2013. Command and Control: Nuclear Weapons, the Damascus Accident, and the Illusion of Safety.

15 | Kurokawa, 2012. The Fukushima Nuclear Accident Independent Investigation Commission. The National Diet of Japan.

16 | See for example Perrow

17 | Mathijssen, J., Petersen, A., et al. Dealing with uncertainty in policy making. CPB/MNP/ RAND Europe, The Hague.

18 | The concepts of complexity and chaos first emerged in the 1980s when mathematicians discovered that a system with a limited number of variables could quickly become unpredictable ('chaotic') through amongst others, an increased number of connections with other processes. The concept was quickly taken over by different academic disciplines, with different degree of success.

19 | Liu *et al.*, 2007. Complexity of coupled human and natural systems. Science, 317: 1513-1516.

20 | Hisschemöller, M., en R. Hoppe (2001). "Coping with intractable controversies." In M.

Hisschemöller, R. Hoppe, W.N. Dunn and J.R. Ravetz, eds., Knowledge, Power and Participation in Environmental Policy Analysis. Policy Studies Annual Review, dl. 12. New Brunswick: Transaction Publishers.

21 | Islam and Susskind, 2013. Water diplomacy: A negotiated approach to managing complex water problems. RFF Press/ Routledge

22 | Rittel and Webber, 1973. Rittel and Webber oppose Wicked to Tame problems. According to their definition wicked social problems cannot be definitively described because in pluralistic society there are no objective definitions of public good or equity with consequently no optimal solutions. Wicked problems are therefore ill-defined, ambiguous and associated with strong values.

23 | Sylvio O. Funtowicz and Jerome R. Ravetz. 1993. "Science for the Post-Normal Age." Futures 24: 739–755.

24 | Allen, 2001. What is complexity science? Knowledge of the limits of knowledge. Emergence, 3(1), 24-42.Allen, 2001. What is complexity science? Knowledge of the limits of knowledge. Emergence, 3(1), 24-42.

25 | While the Fukushima disaster, for example, opened a window of opportunity to incorporate the societal unrest (and political gain), the engagement of the non-state actors was limited and decisions to make enormous investments in the transition/ *Wende* in Germany were based on limited information.

26 | (a) Sylvio O. Funtowicz and Jerome R. Ravetz. 1993. "Science for the Post-Normal Age." Futures 24: 739–755. (b) Arthur C. Petersen, Peter H.M. Janssen, Jeroen P. van der Sluijs, James S. Risbey, Jerome R. Ravetz, J. Arjan Wardekker, and Hannah Martinson Hughes. [2003] 2013. *Guidance for Uncertainty Assessment and Communication*, Second Edition. The Hague: PBL Netherlands Environmental Assessment Agency (http://www.pbl.nl/en/publications/guidance-for-uncertainty-assessment-and-communication).

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