

Risk communication surrounding the Fukushima nuclear disaster: an anthropological approach

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Abstract The Fukushima nuclear disaster highlighted the relevance of effective risk communication strategies for nuclear accidents. Poor risk communication was evidenced during the crisis and its aftermath. The government's mishandling of radiation issues generated concern in international nuclear agencies as well as widespread anxiety among Japanese citizens. Based on anthropological research, I will argue that among the negative consequences of the government's inability to deal with public fears are the citizens' uncertainty and ongoing distrust toward the government, the safety regulators, and the nuclear industry. I will also suggest that such harmful effects can be mitigated by enhancing transparency of the decision-making process and by implementing participative programs where policy makers, stakeholders, and representatives of the local communities can jointly discuss energy production schemes.

Introduction

In addition to a death toll of around 20,000, the March 11, 2011 Great East Japan Earthquake and ensuing tsunami triggered one of the worst nuclear catastrophes in history. Large ocean waves flooded the Fukushima Daiichi nuclear power plant, a facility run by Tokyo Electric Power Company (TEPCO), causing the loss of all power sources needed to cool down nuclear reactor cores. Unable to operate emergency generators, the facility was left severely crippled and vast amounts of radioactive materials were released into the environment. At the time of this writing

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(nearly a year after the accident), the Japanese government and TEPCO were still having serious difficulties in bringing the nuclear crisis to an end.

Japan's handling of the disaster troubled international nuclear agencies and generated widespread anxiety among Japanese citizens. Due to partial, delayed, and ambiguous information, people grew distrustful of the government's honesty in informing about nuclear risks. For many observers, the Japanese government downplayed the seriousness of the crisis. Such concerns have brought global attention to the importance of effective risk communication strategies for nuclear emergencies (Perko 2011, p. 388).

In this paper, I will argue that poor risk communication was evidenced during the Fukushima nuclear disaster and that among the negative effects of the government's inability to deal with the crisis is the ongoing public distrust toward the government, the safety regulators, and nuclear industry. In trying to provide insights into what went wrong, I will first interrogate the sociopolitical landscape of nuclear safety in Japan. Then, I shall discuss risk communication surrounding the disaster. Finally, I will provide suggestions for improving nuclear energy-related risk communication strategies, such as citizen participation programs where policy makers, common citizens, stakeholders, and representatives of the local communities can jointly discuss energy production schemes. The lessons that can be drawn from this unprecedented tragedy hold implications at a global level, especially for countries that currently rely on nuclear energy and countries planning to engage in its use.

Methodology

The research I will discuss in this paper is based on "multi-sited ethnography," a fieldwork and analytical method developed by cultural anthropologists in the 1990s. Marcus (1995) defined multi-sited ethnographies as a form of interdisciplinary study that constructs its objects by using several techniques such as tracing people, objects, and metaphors within different settings of a complex cultural phenomenon (Marcus 1995, p. 105–110). Since its emergence almost two decades ago, this perspective has proved enormously useful for ethnographers and other social scientists, because "it moves out of the single sites and local situations of conventional ethnographic research designs to examine the circulations of cultural meanings, objects and identities in diffuse time-space" (Marcus 1995, p.96). Multi-sited ethnography involves a spatially dispersed field through which the ethnographer moves, actually, via sojourns in two or more places, or conceptually, by means of techniques of juxtaposition of data (Falzon 2008, p.2).

Choosing multi-sited ethnography for the study of the Fukushima nuclear accident is relevant for several reasons: The significance of this unprecedented catastrophe is so broad that constructing the field around one single geographical or conceptual site may not be the best approach. The cascading events at the Fukushima plant were triggered by an earthquake and tsunami as much as they were a result of complacency, inadequate decision-making, and political paralysis. Moreover, nuclear politics at the local level in Japan are embedded into a skilfully crafted discourse of nuclear energy that equates national economic growth with energy security based on nuclear power. If one looks at the sphere of perceptions, the government's dissemination of

ideas, images, and information during the crisis took place in the context of massive use of cutting-edge digital technologies. This means that, far from being passive receivers of government instructions, citizens could contest official discourses on the disaster in real time through social media platforms such as Facebook and Twitter. Therefore, the complexities of the issue (multiple interconnected scenarios, secretive political practices, diffuse space settings, virtual technologies) demand for multiple loci of analysis.

I will examine the Fukushima disaster from an anthropological perspective that aims to integrate risk communication knowledge with multi-sited ethnography. The arguments I discuss here draw upon scholarly literature of risk communication, information selected from Japanese and international newspapers, and the tracing of the nuclear risk issue through a wide array of digital sources such as websites and blogs. They also draw upon the perceptions of key informants (e.g., NGO/NPO leaders and residents of the Fukushima region). I conducted on-site fieldwork in the cities of Tokyo, Sendai, Ishinomaki, Soma, Minamisoma, and Fukushima between June and October 2011. Rather than presenting a traditional ethnographic account, this research aims to achieve qualitative analysis by taking into consideration the affective components and the perceptions of risk of affected individuals, who have traditionally been separated from nuclear energy policy decision-making.

Sociopolitical background: perceptions of security and risk

Since its inception in 1954, when the first budget for nuclear research and development was proposed to the Diet (Tabusa 1992, p. 88), the Japanese government has had a strong commitment to nuclear energy policies (Tabusa 1992; Kondoh 2007). Based on the idea that the country must achieve energy security, the government created a national energy scheme heavily dependent on nuclear power. By 2010, about 30 % of Japan's electricity was provided by 54 nuclear reactors sited at 17 plants, with an ambitious goal of further generating more than half of total power capacity by 2030 with the construction of 14 new nuclear reactors. This was made possible due to the close ties between the government, the regulators, and the nuclear industry, despite frequent nuclear mishaps and a well-documented series of scandals related to inadequate safety (Kingston 2004). Even widespread public opposition to nuclear energy in the wake of the Fukushima accident has not resulted in an open reconsideration of Japan's long-term energy production strategies (Aldrich 2012, p.2).

The pursuit of nuclear energy in the Japanese archipelago gained momentum in the 1970s, when skyrocketing oil prices stimulated the government to aggressively implement "top-down" nuclear policies. However, such policies have led to friction with the public. Previous research conducted by Tabusa (1992) shows that, during the 1970s and the 1980s, construction plans for nuclear power plants met strong opposition from the local communities. Antinuclear groups filed administrative and civil lawsuits against the construction of the Ikata nuclear power plant in Ehime prefecture, the Tokai No. 2 nuclear power plant in Ibaragi, the Fukushima No. 2 nuclear power plant in Fukushima, the Kazhiwazaki/Kariwa nuclear power plant in Niigata, and the Onagawa nuclear power plant in Miyagi. Local communities contested the

construction license validity on the grounds that safety related to the construction and the operation of nuclear power plants was inadequate. Despite citizens' concerns about having nuclear plants in their vicinities, all suits were ruled in favor of the nuclear power companies (Tabusa 1992, p. 273–297).

Although for decades the government had been claiming that Japan's nuclear plants were absolutely safe, the Fukushima disaster proved that official assumptions were not taking into consideration the probability of catastrophic accidents. Banri Kaieda (the Economy, Trade, and Industry Minister at the time of the accident) stated he could not deny that there was a myth of safety surrounding nuclear power plants. "Probably somewhere in our minds we always thought that measures against emergency situations are unnecessary because such situations would never occur" (NHK 2011).

Attributing the accident to the myth of safety, however, would be an oversimplification of a much more intricate reality: The actual practices of risk management and risk communication are embedded into a political culture that some scholars describe as opaque and secretive (Bowen 2006, p. 21). In order to draw lessons from Fukushima, it is imperative to understand how decisions were made. The government's failure to keep any records of the 23 meetings held during 2011 to deal with the crisis (The Daily Yomiuri, 1 Feb 2012) exemplifies the sort of opacity that pervades political culture in Japan.

It may be argued that, in appearance, Japanese people have always looked satisfied with their nuclear program. However, studies show a stark contrast between official discourses and the citizens' standpoint (Kingston 2004, p.17, Kondoh 2009 p.64). Public polls conducted by Asahi Newspaper show a steady decrease in the support for nuclear power after the 1986 Chernobyl accident and the 1999 Tokaimura accident (Kondoh 2009, p.64; Kotler and Hillman 2000, p. 23). Recent surveys of public opinion indicate that support for nuclear energy plummeted in 2011 after the Fukushima disaster, with as much as 74 % of respondents agreeing with the replacement of nuclear energy with alternative sources (Mainichi Daily News Poll, 2011/08/22).

Critics have pointed out that the frame adopted for assessing and communicating nuclear risk in Japan may be inadequate. Since the initial construction of nuclear power plants in the 1960s, operators and the Nuclear and Industrial Safety Agency (NISA) have relied on a method known as probabilistic risk assessment or PRA. This theoretical model has proved poor in terms of its accuracy for predicting severe nuclear accidents. In recent years, researchers have contested it both on theoretical and empirical levels. According to nuclear energy experts, although the World Nuclear Organization, reactor makers, power plant operators, and nuclear safety regulatory agencies claim that the possibility of severe accidents is extremely small, the actual frequency is much higher than the figures expected by PRA-based calculations. In addition, critics argue that a chain-of-event conception of accidents cannot account for the indirect, non-linear, and feedback relationships that characterize many accidents in complex systems (Ramana 2011).

In tandem with this framework, nuclear risk communication has usually taken the form of a one-way source to target process. As pointed out by Hayenhjelm (2006), risk communication is in most cases a fundamentally asymmetrical relationship between unequal parties. In Japan, information of the nuclear risk has tended to have the purpose of manipulating the perceptions of the public.

Lack of transparency is perhaps the most serious failure among nuclear safety regulators. As of March 2011, the NISA was under the jurisdiction of the Ministry of

Economy, Trade, and Industry (METI), which had the mission of promoting nuclear energy. Aware of this fact, the public perceived an inherent conflict of interests. The ministry promoting nuclear energy controlled the nuclear safety regulator; frequent personnel exchange between NISA and METI raised doubts about the transparency of nuclear power-promoting officials working within a nuclear safety regulatory body.

Along with the abovementioned, TEPCO has built itself a reputation for dark business practices. The electric utility has a seemingly long history of cover-ups, widespread falsifications, and submission of fake technical data (Kingston 2004, p. 19; Government of Japan 2004, 6–2). Among the company's latest scandals is the discovery that, for over 20 years, TEPCO had been secretly handing out donations of about two billion yen per year (the equivalent of \$26 million) to local governments near nuclear facilities. According to the Asahi Newspaper, the payments were designated as “funds to deal with local communities” (Ichida et al. 2011).

As a result of lack of transparency of regulators and operators, previous signs of the vulnerability of the Fukushima Daiichi nuclear plant were ignored (Noggerath et al. 2011, p. 37). Regulators' experiments argued that tsunami waves could easily overcome Fukushima Daiichi seawall, which was designed to withstand only 5.7 m compared to the 15-m-high waves that flooded the facility. Seismologists had warned lawmakers for years that power plants in Japan were not prepared to endure worst-case scenarios. Despite successive opportunities for revising safety measures, lawmakers did not reassess earthquake and tsunami risk surrounding nuclear power plants.

Poor risk communication surrounding the Fukushima disaster

As there are multiple definitions of risk, and the concept itself has developed considerably since its emergence in the sixteenth century (Denney 2005, p. 9), it will be useful here to specify what the term means in this paper. Renn (2008) defines risk as the “possibility that human actions or natural events lead to consequences that affect aspects of what humans value” (Renn 2008, p. 1). For the sake of conceptual simplicity, this is the definition that will be followed here. Regarding risk communication, the International Atomic Energy Agency (IAEA) website incorporates a definition formulated by Ropeik (2008) as “actions, words, and other interactions that incorporate and respect the perceptions of the information recipients, intended to help people make more informed decisions about threats to their health and safety” (IAEA Website). This frame is useful because it emphasizes three important aspects: that risk communication is a matter of what an organization does, not just what it says, that risk communication must respect people's perceptions of risk, and that risk communication will be more effective if it is conceived as dialogue, as opposed to old schools in which its main function was instruction.

Bearing these definitions in mind, I will discuss their relevance for the disaster. For Japanese society, not knowing clearly about the risks involved in the nuclear crisis was one of the most damaging aspects of the catastrophe. Risk communicators have known for years that the most severe consequences of radiological emergencies are not only economic but also the adverse physical and psychological effects (Ropeik 2008, p.58). In regard to the Fukushima disaster, environmental activists, residents of the local communities, and citizens alike agreed that official sources provided

confusing, inaccurate, and partial information. As a result, the government's credibility was badly damaged and anxiety widespread. Roughly two thirds of the population in Japan today agree with the replacement of nuclear power by alternative energy sources (Penney 2012, p.1).

Risk communication during the Fukushima disaster failed to achieve a crucial function discussed above, namely, to help people make more informed decisions about threats to their health and safety. The following sections will discuss three aspects in which risk communication was poor or failed: the denial of risk, the downplaying of the seriousness of the crisis, and the failure to openly speculate about probable events and worst-case scenarios.

Denial of risk

Risks that are not acknowledged cannot be communicated effectively. The cascading events at Fukushima Daiichi indicate that neither the government nor the electric utility had acknowledged the possibility of a serious accident. There had been several previous signs of the vulnerability of Fukushima Daiichi nuclear plant (Noggerath et al. 2011, p. 37), especially in regard to a clearly unsubstantial seawall and the high risk of being hit by a severe earthquake. Seismologists and members of a government advisory committee had been warning about the imminent threats for years. Despite repeated opportunities for revising safety measures, lawmakers did not reassess earthquake and tsunami risk surrounding nuclear power plants.

Risk denial and the communication failures that ensued can be illustrated through a brief discussion of “venting” (the release of highly radioactive steam into the environment). The operators thought venting would never be necessary because a serious emergency would not happen. Venting the reactors, however, was crucial to alleviate the growing pressure inside the containment vessels and prevent a dangerous blast that would spread massive amounts of radioactive debris far beyond the plant. Advised by the Nuclear Safety Commission, then prime minister Naoto Kan ordered TEPCO to vent the ailing reactors immediately. However, risk communication to the local residents related to venting and evacuation was poor. Residents were confused because they had never been told a serious accident was a possibility. They had never drilled for evacuation in case of a nuclear emergency and had never received counselling about radiation exposure-related health consequences.

As a result, venting took many hours; workers did not know how to execute the actual procedure, which under the critical circumstances had to be done manually and in the dark (NHK, Special Documentary 2011). Denial of risk can be identified as a factor directly related to poor risk communication among government officials and local residents during the disaster.

Downplaying the extent of the crisis

Risk communication specialists agree that it is far better to tell people “it’s not as bad as we thought” than having to inform the public “things are worse than we first thought” (Sandman 2011). During the crisis and beyond, the government insisted that there were

no serious problems with the reactors. As the world watched successive hydrogen explosions (which most nuclear analysts outside Japan interpreted as possible nuclear cores meltdown), many citizens felt the Japanese government was downplaying the seriousness of the crisis. This perception was reinforced weeks later when the government upgraded the initial rating of the accident from Level 4—an accident with local consequences—to Level 7—an accident with widespread health and environmental consequences. (The International Nuclear Event Scale rates accidents from 1 to 7 according to their severity; the only accident rated 7 before Fukushima was Chernobyl).

Delayed disclosure of critical information nailed people's perceptions of downplaying and mistrust. It took more than 2 months for TEPCO to announce that the Unit 1 reactor went into meltdown on the first day, something many Japanese think the company knew or suspected from the very beginning but had not wanted to openly state.

Failure to warn about likely events and to openly speculate about the “ifs”

This section is based on, and follows closely, ideas and reasoning formulated by crisis communication expert P. Sandman. Along with Sandman (2011), I will argue that perhaps the government's biggest failure in terms of risk communication was its standpoint of willingly not warning people about probable events and the avoidance to openly speculate about the worst-case scenarios. Sandman (2004, 2011) points out that every crisis raises three fundamental questions. There are three things that people always want to know in a critical situation:

- What happened—and how are you (the government/organization) responding to it, and what should we (the public) do?
- What is likely to happen next—and what are you doing to prepare for it, and what should we do?
- What is your credible worst-case scenario—and what are you doing to prevent it, and what should we do?

With regard to the March 11 nuclear crisis, the first question remains perhaps unanswered; what exactly happened is something that still needs further clarification. However, as Sandman (2011) points out, the second and third questions (what is likely to happen next and what are you worried might happen), those were the crucial ones, and the Japanese government failed to provide any satisfactory answers.

The authorities could have predicted some of the events that were likely to happen next. One example is the forecast of the path the radioactive plume would take. The government had a computer system called SPEEDI (System for Prediction of Environmental Emergency Dose Information) that projects the dispersal of radioactive substances and pinpoints which areas should be evacuated after a nuclear accident. However, it appears that bureaucrats in Tokyo withheld SPEEDI's projections claiming that releasing the data “would cause unnecessary panic” (The Daily Yomiuri, December 30, 2011). As a result, people living in villages nearby the power plant evacuated to areas where, due to the radioactive precipitation, the levels of radiation ended up being much higher than those of the places they had just left.

The government could have also warned about some of the things that most likely would happen, such as spikes in the level of radiation in water, food, soil, etc.

In terms of risk communication, the government's biggest mistake was its adopted stance to not openly speculate about the worst-case scenarios it was considering privately. A report delivered to then Prime Minister Naoto Kan on March 25 warned that, if the situation at the plant went completely out of control, authorities would have to issue mandatory or voluntary evacuation orders for all people living within 250 km of the plant (155 miles)—a zone including greater Tokyo (population 35 million) and the major cities of Sendai and Fukushima (Quintana 2012, p.1).

There are several hypothetical reasons why organizations are usually reluctant to speculate in public. One of them is “people don't need to know”. According to Sandman (2011), this reason makes sense only if a) there are no precautions you want them to take, b) they do not need any psychological preparation either, (c) you do not need their cooperation, (d) if the worst case materializes, when they look back, they will agree there were no precautions to take. None of these reasons holds true for the Fukushima disaster.

A second reason is “people might panic.” This is indeed the explanation the Japanese government gave about not informing the public. However, most risk communication experts (Fischhoff 2011; Sandman 2011) agree that panic is rare. Panic is an “emotion so ungovernable that it leads to behavior damaging to oneself and perhaps to others” (Sandman 2011). Experience shows that people tend to react sensibly to the prospect of a serious crisis. More often than not, telling people about a possible worst-case scenario is more likely to reassure them than to fret them.

A third reason is guided by the misconception that it is wrong to speculate. However, talking about risk and communicating it is necessarily speculative. Weather forecasters, financial analysts, and many political and business leaders do routinely speculate. It is crucial, however, to speculate responsibly, in other words, all likely scenarios should be transmitted with the maximum level of clarity possible (Sandman 2011). It does not make sense to refrain from speculation in a risk situation.

Ironically, the Japanese government avoided manifesting what it saw as alarming speculation but, on the other hand, it did speculatively reassure its people that the situation was or would soon be under control. But then, day after day, the public would learn that the crisis was far from being contained. This attitude, the official speculative reassurance to “maintain control” created the opposite to the desired effect. Most people in Japan today are distrustful of the government's capability to deal with the disaster and its aftermath.

Widespread distrust

The negative effects of poor risk communication can be clearly observed in Fukushima. Local residents said they were confused with a flood of unclear information that prevented them from making sound decisions. Hundreds of people, especially mothers of young children, argued that the health standards set by the government were inadequate to protect children from the harmful effects of radiation. Anger towards the authorities led local residents to create the Fukushima Network for Protecting Children from Radiation, a group that denounced, “reckless radiation limits and protect hundreds of thousands of Japanese children from a lifetime of possible increased cancer risk” (Green Action Japan 2011).

Moreover, Fukushima residents did not trust the official readings of radiation. Distrustful of the government, Japanese and international volunteers decided to take independent action by creating a citizen association called Safecast, which they defined as “a global project working to empower people with data” (Safecast 2011). Safecast produced its own radiation maps and made them easily accessible online, for free use. Many other citizens’ groups distrustful of the government and the regulators emerged. Among them, Fukuro-no-Kai and the Fukushima Conference for Recovery from the Nuclear-Earthquake Disaster held regular meetings to discuss radiation issues. This unusual surge of associations can be seen as a consequence of the inability of the central and local governments to cope with risk communication.

Although the need to improve risk communication with the local communities had been discussed as part of the framework utilized by regulators and the nuclear industry, no concrete actions to improve communication with the populations at risk were taken. Post 3/11 fieldwork in Fukushima shows that residents had never heard about radiation measure units such as Sievert before the nuclear accident, nor were they counselled about the potential health risks of exposure to radiation. Astonishingly, they had never received any instruction and had never drilled for evacuation in case of a nuclear emergency. When faced with making crucial decisions such as recommended, voluntary self-evacuation (as opposed to mandatory, enforced evacuation inside the 20 km no-go zone around Fukushima), local residents felt they were not prepared to make sound judgements, because neither the government nor the regulators had told them that a serious nuclear accident was a possibility.

Ongoing uncertainty

The impact of the Fukushima disaster is likely to be felt for decades to come (Hall 2011, p. 408). Fieldwork shows that, several months after the accident, local residents’ fears were ongoing and include (a) radiation fears related to health, food, and the environment, (b) distrust toward the government and the nuclear industry, and (c) future work and housing worries. Although further research is needed to trace the development of these issues, they will most likely continue for a long time, as reconstruction budgets, plans for the creation of employment, check-ups for radiation health problems, and the remediation of the environment (disposal, treatment, and relocation of contaminated soil) are still in their very early phases. Especially for those whose former residential areas have become inhabitable as a result of the nuclear contamination, trust toward the government and the nuclear industry will be very difficult to gain.

Suggested policies

The Fukushima nuclear disaster provides an opportunity to renegotiate the roles of all interested parties and find common ground in the discussion of the nuclear issue. Kotler and Hillman (2000) pointed out that, during the 1990s, the Japanese social context regarding citizen participation in energy policies started to change as a consequence of serious nuclear accidents and that the public began to understand they could not hold the government responsible for everything in society (Kotler and

Hillman 2000, p.28). Similar observations have been made by Fujigaki (2009), who argued that Japan is making a transition from a technocratic model (in which the main obstacle for making better decisions is the technical incompetence of the bureaucracy) to a democratic model, which calls for citizen and stakeholder participation in the decision-making process (Fujigaki 2009, p. 515). Aldrich (2011) highlighted that the Fukushima disaster provides a “window of opportunity for both the government and the citizens of Japan to revisit issues such as a national commitment to nuclear power” (Aldrich, June 13, 2011, p. 2).

Moreover, the need to address risk management issues is not new to the Japanese government or the nuclear safety agencies. Regulatory bodies such as the Nuclear Safety Commission (NSC) and the NISA have previously discussed the utilization of risk information, and they have agreed that existing regulations could be improved by making nuclear safety norms more efficient and transparent. The NSC highlighted the relevance of a better safety and assurance regulatory along with some of the most prominent issues facing Japan’s nuclear industry, e.g., aging power plants and an earthquake-prone geology (Nuclear Safety Commission and Japan 2005). Additionally, the METI addressed the need to build trust between the government and local communities through detailed communication (Ministry of Economy and Industry 2006).

This paper argues that a participatory approach characterized by transparency, citizen participation, and joint decision-making is necessary to gain public trust and to carry out successful energy policies. For the implementation of participative programs, several multidimensional aspects must be taken into account. The Japanese government has traditionally separated antinuclear movements from the national nuclear energy decision-making process by imposing constraints on the movements (Tabusa 1992). Given this historical background, citizen participation in Japan should be facilitated by the government, as it is something that seldom takes place spontaneously. Moreover, for participatory methods to be efficient, in-depth research on the nature and extent of public perceptions of nuclear risk, including contextual factors, as well as historical and regional contexts has to be carried out, if the potential of risk communication for public and business policies is to be taken seriously (Cha 1997; Frewer 2004; Fischhoff 1995). So far, public participation (such as hearings before the construction of nuclear power plants) has been understood by the electric utilities and the regulators more as a mere formality that had to be completed as quickly as possible rather than a two-way dialogue.

After the Fukushima disaster, the involvement of the public has grown significantly, as evidenced by the emergence of multiple citizen groups across the Japanese nation. This context of citizen activism may provide an opportunity to renegotiate the roles of all relevant actors. Following Renn (2008), I will argue that for this, the following elements and actions would be necessary:

- a. Rethinking the nuclear program in accordance with people’s perceptions of risk. As for late February 2012, citizens’ groups in Osaka and Tokyo had gathered more than the required number of valid signatures to legally ask for a referendum, but city mayors in both Tokyo and Osaka denied their support.
- b. Involvement of representatives of all actor groups [stakeholders, directly affected public, observing public, policymakers] in each step of the decision-making process.

- c. Empowering of all actors to participate actively and constructively in the discourse.
- d. Co-designing the framing of the risk issue in a dialogue with these different groups (Renn 2008, p. 274).

Another key element for gaining the trust of the public and enhancing their participation would be the establishment of an independent nuclear safety regulatory body. As discussed above, it is very hard for the public to trust a regulatory body directed by a ministry in charge of promoting nuclear power.

Effective risk communication can only be carried out when all these aspects are taken into account. The implementation of citizen participation programs at local and national levels, joint decision-making between citizens, lawmakers, and stakeholders, and a comprehensive, in-depth study of people's perceptions of nuclear risk are essential for successful and fruitful discussions of energy policies. It is only through a democratic, participative approach that a society can make mature decisions about complex risks.

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