

## Short Commentary

# A Comment on Nuclear Safety and Radiation Protection from a Historian of Science

Maria Rentetzi\*

Chair in Science, Technology and Gender Studies, ERC Consolidator Grantee, Friedrich-Alexander University Erlangen-Nuremberg, Faculty of Humanities, Social Sciences and Theology, Bismarckstrasse Erlangen, Germany

\*Corresponding author: Professor Dr. Maria Rentetzi, Chair in Science, Technology and Gender Studies, ERC Consolidator Grantee, Friedrich-Alexander University Erlangen-Nuremberg, Faculty of Humanities, Social Sciences and Theology, Bismarckstrasse 6, D-91054 Erlangen, Germany; Email: maria.rentetzi@fau.de

Received: March 19, 2021; Accepted: March 25, 2021; Published: March 31, 2021

In 1985 Hans Blix, the then IAEA Director General, called for the creation of an advisory committee in the area of nuclear safety. As a result, IAEA's International Nuclear Safety Advisory Group (INSAG) was formed with the main objective to offer advice on matters of nuclear safety, produce safety standards, and identify nuclear safety issues of international significance [1]. Only a year later the newly created Advisory Group was faced with one of the most terrifying nuclear accidents in history: Chernobyl. The concept of 'safety culture' was first introduced in the report that the Advisory Group issued a few months after the accident. Product of a crisis in the nuclear industry, the concept of safety culture was defined and analyzed as "assembly of characteristics and attitudes in organizations and individuals, which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance." Obviously, the emphasis was on organizational policies and managerial actions while individuals were seen as having "personal attitudes and habits of thought" linked to safety [2]. The aim was to strengthen the safety of nuclear power plants and avoid Chernobyl-type accidents in the future. Nevertheless, in a IAEA 2007 updated definition of culture, "nuclear power plant safety issues" (1986 definition) has been simply replaced by "protection and safety issues" [3] to mark a wider concern about safety culture in other "safety conscious industries" [4]. Evidently, since 1986 nuclear safety culture has been closely and primarily connected to organizational and technical issues within nuclear industrial settings leaving the medical sector largely unaffected. In this sense, culture is identified with learned behavior, a whole body of attitudes, habits, and practices passed on from one generation of nuclear operators to the next and related to the style of organizations and their culture. This understanding of safety culture is linked to earlier conceptualizations of culture—as static, shared, and uniform—that have prevailed in anthropology in the early part of the 20<sup>th</sup> century. The culture concept in use comes actually to mean the cultivation of people—in this case nuclear operators—through special technical education. Based on this perspective, individuals have been seen as complacent or in a position that is opposed to and thus outside culture [5-7].

Given the significant disengagement that exists between humanities and nuclear sciences and engineering, regulatory agencies' recent attempts to reconceptualize safety culture have not been adequately informed by disciplinary developments in the humanities

and social sciences. In contemporary anthropology and social history, culture is not considered any more as a package of knowledge shared by bounded individuals. A number of scholars have argued that anthropological and sociological analyses would be more productive if culture were to be broken into elements understood on their own terms rather than as unified corpus [5,7,8]. In addition, given that culture is closely intertwined with power, scholars of safety science in general, have only recently touched on issues of power and conflict in order to give an account of the dynamics of organizational life [9]. The time is ripe to rework the concept of nuclear safety culture based on insights from the social sciences and humanities while the world is becoming increasingly aware that human activities ranging from nuclear power production to the use of radiation in medicine could be very harmful and that protective actions should be taken.

Usually, the overall perception is that if workers are trained, operators are certified, and programs accredited then safety will ensue. But despite all this, incidents in both nuclear industrial and medical sectors continue to arise. Cited causes emphasize failures in techno-scientific issues, insufficient training, poor organizational and managerial structures, and inadequate safety culture. They neglect, however, to focus on the human and social aspects of the stakeholders involved, especially when dealing with liabilities that could spread beyond the originally conceived, or in accounting for human responsiveness and responses to safeguards and post-disaster mitigation [10]. In addition, although there is an international consensus on what safety culture means and consists of—a term widely used by regulators and corporate professionals in nuclear industry—its social dimensions are inadequately understood. Moreover, communities at the receiving end of nuclear are concerned with technological lockout, the fact that nuclear technology recipients are barred from accessing certain technologies due to lack of established frameworks within their societies for dealing with the safety hazards of such technologies. As recent as February 2016 the IAEA organized an international conference on the "Human and Organizational Aspects of Assuring Nuclear Safety" targeting mainly the nuclear power plants (NPPs). It was the first time that the Agency placed such an emphasis on the human and organizational factors affecting the safety culture of the nuclear industry and called for a reconceptualization of the term. In his introductory remarks, the then Director General (DG) Yukiya Amano, urged participants to reflect upon the lessons we learnt over the last

30 years since the Chernobyl disaster. The 2015 IAEA DG's Report on the Fukushima Accident left no doubts that human and organizational factors played a big role in the management of the nuclear disaster following the earthquake and the subsequent tsunami in Japan [11].

Besides the IAEA, other regulatory agencies and stakeholders have noticed that safety is not an issue that should be left to nuclear scientists and engineers alone. In 2012 the International Radiation Protection Association (IRPA) organized its annual meeting in Glasgow under the overarching theme "Living with Radiation-Engaging with Society" <http://www.irpa.net/page.asp?id=54516> In his report on the Fukushima accident, William Magwood, Director General of the Nuclear Energy Agency, a specialized agency within the Organization for Economic Co-operation and Development (OECD), argued that "we must address the human aspects of safety, such as ensuring effective safety cultures for both operators and regulators and continuing to learn from safety research, including through the NEA's international joint research projects." <http://www.oecdnea.org/news/2016/2016-01.html>

In the sector of nuclear medicine the "Bonn Call for Action," a joint position statement published by the IAEA and the World Health Organization in 2012, argued for a holistic approach to the problem of radiation protection including among others the civil society as well. One of the major proposed actions is to improve radiation safety culture in health care. [https://rpop.iaea.org/RPOP/RPoP/Content/AdditionalResources/Bonn\\_Call\\_for\\_Action\\_Platform/index.htm](https://rpop.iaea.org/RPOP/RPoP/Content/AdditionalResources/Bonn_Call_for_Action_Platform/index.htm)

Nuclear safety and radiation protection continue to be major challenges and the next frontier in nuclear science and technology. The two terms are closely intertwined. Since safety is primarily concerned with control over radioactive sources it contributes towards protection. But how could the humanities and social sciences contribute to the effort of a) managing the risk for patients to be overexposed to radiation during radiotherapy or intervention and of b) improving nuclear safety and radiation protection in industrial settings? The suggested way is to generate a cross-disciplinary, trans-geographical, and trans-national network involving scholars from social sciences, the humanities, the nuclear sciences and engineering, medical physics and practitioners in both the nuclear industry and medical sector in order to establish a common knowledge base on how to deal with safety and risk in use of radiation a) in medicine and b) in nuclear industrial installations. Also achieving analytical clarity of the key notions of radiation risk and safety culture based on the historical, socio-political, economic, and cross-national context in which these concepts have been embedded is key in this effort. The overall aim is to educate a new generation of what I call "nuclear safety mediators," that is all those individuals who could act as intermediaries among different social groups—i.e. workers in nuclear industry, CIOs in nuclear industry, nuclear engineers, patients, medical practitioners, radiotherapists and the public, to mention just a few—with direct interests to maintain nuclear safety and enforce radiation protection.

Safety mediators should be trained in a way that will allow them to integrate perspectives of social sciences in nuclear settings. To do so we need to develop major interdisciplinary resources such as a) a common data framework on the history of radiological and nuclear incidents making it readily available in the public domain, b) a research agenda to allow greater articulation to the relation between humans and the complex technological systems in both the industrial and the medical sectors, c) an understanding of the role that the standardization of human skills has historically played in the fields of radiation protection and nuclear safety and d) a framework of understanding the human and social aspects of safety culture in the workplace using as a methodological tool ethnographic studies in nuclear industrial and medical settings. No focused institutional study and no national group of researchers can capture the dispersal needs of radiation protection and nuclear safety. Given the diverse interests involved and the expertise that is required in order to bring a step change in achieving both radiation protection and nuclear safety, inter- and trans-disciplinary networking seems to be a viable solution.

## Funding

This publication is part of the "Living with Radiation: The Role of the International Atomic Energy Agency in the History of Radiation Protection" (HRP-IAEA) project that has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement No770548), <https://iaeahistory.weebly.com>.

## References

1. Meserve, Richard and Brockman Kenneth (2004) Safety for All, the New INSAG. *IAEA Bulletin* 46: 51-52.
2. IAEA Safety Series No.75-INSAG-4 (1991) *Safety Culture: A Report by the International Nuclear Safety Advisory Group*, IAEA, Vienna.
3. IAEA Safety Glossary (2007) *Terminology Used in Nuclear Safety and Radiation Protection*, IAEA, Vienna
4. IAEA Safety Report Series, no. 74 (2012) *Safety Culture in Pre-Operational Phases of Nuclear Power Plant Projects*. IAEA, Vienna.
5. Beldo Les (2010) Concept of Culture. In: James Bix (ed) *21st Century Anthropology* 1: 144-152. Thousand Oaks, CA: Sage.
6. Sewell, William (1999) The Concept(s) of Culture, in Victoria Bonnell and Lynn Hunt, (eds.). *Beyond the Cultural Turn* pg: 35-61, California: University of California Press.
7. Moore, Jerry D (2012) *Visions of Culture: An Introduction to Anthropological Theories and Theorists*. 4th Ed. Lanham, MD: Alta Mira Press.
8. Kuper, Adam (1999). *Culture: The Anthropologists' Account*. Harvard University Press.
9. Antonsen Stian, Kari Skarholt, Arne Jarl Ringstad (2012) "The Role of Standardization in Safety Management" *Safety Science* 50: 2001-2009.
10. Kyrtsis, Alexandros and Rentetzi, Maria (2021) From Lobbyists to Backstage Diplomats: How Insurers in the Field of Third Party Liability Shaped Nuclear Diplomacy. *History and Technology* 37.
11. IAEA Report by the Director General to the Board of Governors (2015) *The Fukushima Daiichi Accident*. IAEA, Vienna.

## Citation:

Rentetzi M (2021) A Comment on Nuclear Safety and Radiation Protection from a Historian of Science. *Cancer Stud Ther J* Volume 6(1): 1-2.