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# IAEA's 3/11 Communiqués

Understanding the Communication Activities of IAEA in the Case of the Fukushima Nuclear Crisis.


verfasst von / submitted by

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Dedicated to my
Late Grandparents

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My journey from the tranquil Himalayan countryside to the thriving city of Vienna has been quite fulfilling. When I think of it today, especially of the last two years revolving around this research, I have found moments of emptiness. The never-ending saga of returning to the same page day-after-day when writing this piece of work alongside keeping up my professional life has been a challenging one.

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Saransh Sehgal,

Vienna, 2016

# Table of Contents

# List of Abbreviations

3/11 or 3.11: March 11 (Triple Disaster in Japan)

STS: Science, Technology and Society

S&T: Science and Technology

IAEA: International Atomic Energy Agency

UN: United Nations

TEPCO: Tokyo Electric Power Company

IEC: Incident and Emergency Centre

EPR: Emergency Preparedness and Response

DPI: Division of Public Information

TMI: Three Miles Island

4S: Society for Social Studies of Science Conference

RANET: Response Assistance Network

ICT: Information and Communication Technology

SSK: Sociology of Scientific Knowledge

IPCC: Intergovernmental Panel on Climate Change

STI: Sociotechnical Imaginaries

NTP: Non-Proliferation of Nuclear Weapons

APA: Austria Press Agency

AR: Atomic Reporters

ORF: Österreichischer Rundfunk

DG: Director General

CM: Christian Müller

PR: Peter Rickwood

VIC: Vienna International Centre

UN: United Nations

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# 1 Introduction

The March 2011 Fukushima nuclear accident was one of the most overwhelming technological disasters in the nuclear energy industry, and it is not surprising that the Fukushima Daiichi Nuclear Power Plant accident received much more attention from the media than the 9.0 magnitude earthquake and subsequent tsunami that hit the coast of Honshu (Guardian UK March 11, 2011).

In an age where sophisticated nuclear monitoring is more precise and information technology enables the swift assessment and dissemination of information, not only did it send waves of fear regarding a potential nuclear catastrophe in the region, but it also alerted the world to a major environmental crisis (Schmid, 2011).

Together, emergency agencies and the media tried to communicate the news around the world in real time (Findlay, 2012), which made clear the public's desire for constant information concerning such a harmful event.

Until today, rumors of global radiation risks spread, as the impact of the accident stretched far beyond the Japanese borders and altered the public's risk perception towards nuclear energy plants across the globe. In the wake of the disaster, numerous countries, such as Germany, Italy and Switzerland, have decided to re-think their nuclear power policies, indicating that 'business as usual' is not possible (Fairley, 2011).

It is known that the Japanese officials downplayed the immediate risks, by blocking key information flows and leaving the concerned public in Japan and across the world oblivious of the true situation. The British national daily The Guardian, reported that WikiLeaks released a diplomatic cable in which "*a high profile Japanese policymaker told US diplomats that the Japanese government's ministry which is responsible for nuclear power has been covering up nuclear accidents and obscuring the problems associated with the nuclear industry*" (The Guardian UK March 14, 2011).

Even experts had a hard time understanding what exactly was happening at the accident site, coming up with different accounts of facts and conflicting viewpoints (Findlay, 2012). Hence, at the broader societal level, questions were and still are, being raised in the pursuit of better crisis and risk communication systems, and for dealing with the uncertainty that generates public concern.

Agneta Rising, Director General of the World Nuclear Association in a statement stressed, "*In Japan we have seen a nuclear incident turn into a communication disaster. Mistakes in applying and interpreting the INES scale have given it an exaggerated central role in coverage of nuclear safety*" (World Nuclear Association, 2013).

Peter Sandman, one of the preeminent risk communication speakers and consultants in the United States noted that the Fukushima crisis communication failure is, in his consideration, the most

serious in regards "[…] *to the Japanese government's failure to speculate publicly about what-if scenarios, which were certainly being considered privately"* (Sandman, 2011). Sandman suggests that the information needs to be communicated to the public clearly and openly, noting that Japan failed to guide people's fears about worst case scenarios.

This has consequently revived the debate as to whether the existing practices of risk and technical communication (Sato, 2016) can actually satisfy the numerous players who are involved whenever such a nuclear catastrophe happens. Moreover, the debate also raises questions as to who participate in the decision-making processes during a nuclear disaster and what kind of risks are worth taking.

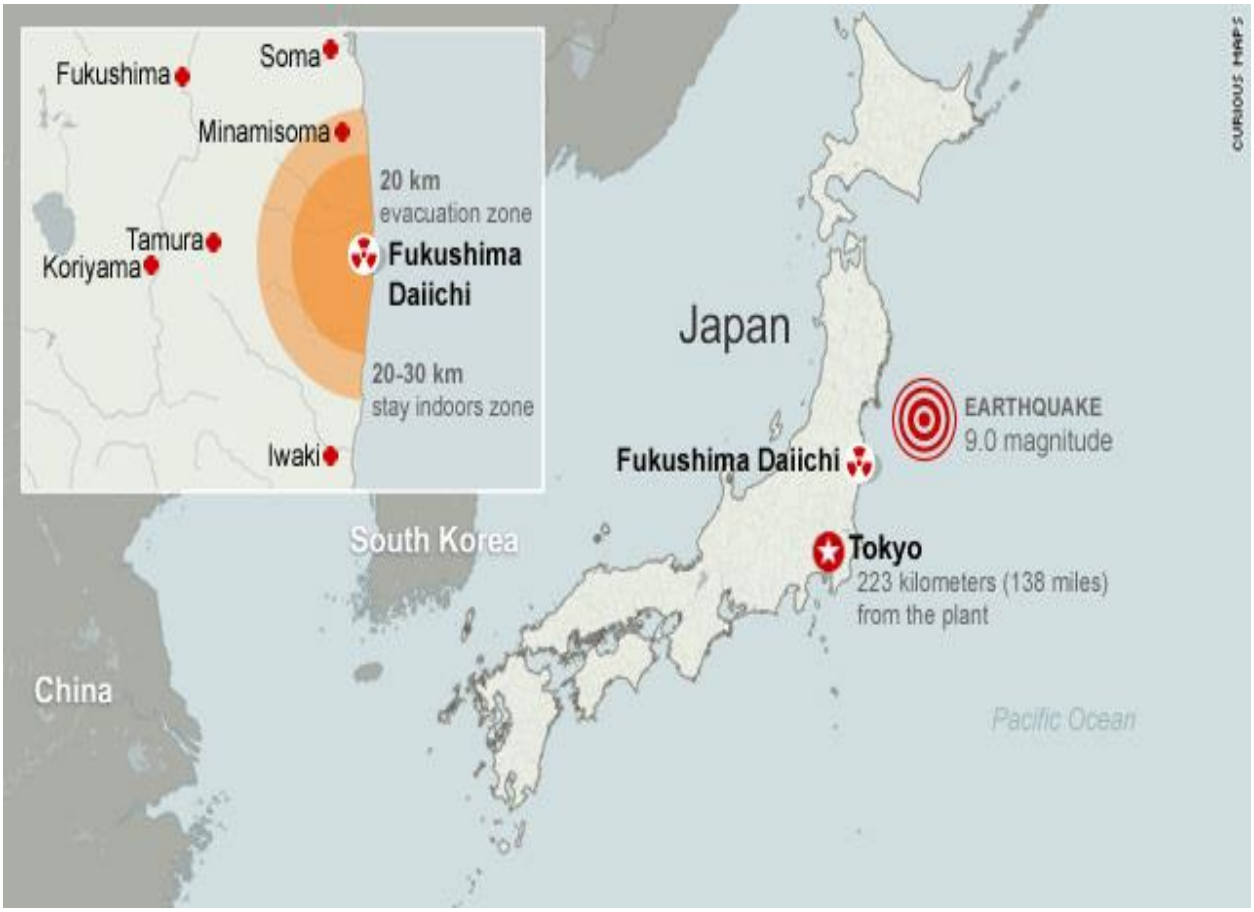



Figure 1: A map showing Japan and the epicenter of the nuclear disaster at Fukushima Daiichi plant. Source: (CNN, 2011)

One of the most interesting and surprising dimensions of this trifecta disaster from an STS perspective, is that apparently never before had a disaster involved so many different elements, and never before had it been so well captured. We can learn from such factors after having watched the events unfold and having them properly contextualized[1].

[1] As there have been other disasters but not of that size and complexity.

The social science research on the Fukushima disaster comes from socio-technological fields such as nuclear disaster studies, risk communication studies, organization studies, environmental studies, media studies and trans-boundaries studies.

To address issues, in the wake of the trifecta disaster in Japan, a global STS forum has also been constructed (Fukushima Forum, 2013). In its 2013 forum, it mainly discussed the practices for improving communication and nuclear safety. The field of Science and Technology studies is enormously rich in literature regarding the topic. Various STS scholars have debated the Fukushima nuclear crisis and have reflected upon the numerous facets of the trifecta disaster: from environmental consequences to health hazards, and from dealing with nuclear power to disaster communication policy (Pfotenhauer et al., 2012; Kimura, 2016; Felt, 2016).

Seen from a social science perspective, a disaster of this kind, with its combined natural and technological elements goes beyond just the impact of or need to prevent disasters and the related negative notion surrounding it; "*the sudden and large scale changes that disasters trigger in ecosystems societies and knowledge practices offer scholars unique opportunities to study social dynamics of techno-science under highly atypical situations*" (Fortun & Frickle, 2013, p.4). The emphasis is consequently on numerous themes of thinking that use such a trifecta catastrophe as a window into social occurrences that would otherwise not be noticeable or available.

In Science Technology Society (STS) terms, Pfotenhauer explains, "*nuclear power is best understood as a thoroughly hybrid entity in which the social and technological cannot be separated from one another for analytical or policy purposes. Technologies such as reactors, risk models, and safety mechanisms are embedded in social values and practices; similarly, national identity, risk regulation, and corporate culture are materialized in the production and operation of nuclear power plants"* (Pfotenhauer et al., 2012*).*

Bowker likens these natural and technological disasters to scientific controversies that are a useful theme for STS studies "*as they open up for examination networks of social and material relations that appear settled"* (Bowker, 1994, p. 10). These technological disasters are embroiled across diverse lines that offer a productive ground to perform what Bowker calls 'infrastructural inversion': bringing to the forefront the vital meaning of technologies, practices and the people engaged with it, which normally exist in the backdrop of such events and remain invisible for lay people.

STS scholars (Pfotenhauer et al., 2012; Jones et al., 2013; Fujigaki, 2015) focusing on the Fukushima disaster share that disasters of this kind are "*complex events with multiple and overlapping meanings*", where expert opinions are shaped by cultural and epistemological assumptions, giving a sense that there are no clear divides between what is caused by the environment and what is caused by human beings. Therefore, Fukushima (3/11) requires it to be seen from many narratives (Jones et al., 2013). Focusing on the notion that a single dominant narrative on the disaster shows "the acute danger of reductionism" (Jones et al., 2013).

A case in point shared by the same authors is the aftermath of the 1986 *Challenger* explosion, where experts pointed to flaws in NASA's safety culture and only prioritized technological solutions to overcome the failure, while leaving aside the organizational issues. Less than two decades later their decision had calamitous consequences when similar patterns of decision making contributed to the *Columbia* disaster in 2003 (Vaughan, 1996; Columbia Accident Investigation Board, 2003; Jones et al., 2013). Therefore, the Fukushima trifecta disaster (earthquake, tsunami and nuclear meltdown) should not be zeroed to a single narrative, otherwise it poses the risk of future calamity. In the wake of the Fukushima disaster, new accounts (Hindmarsh, 2013) have emerged that offer alternate links between nuclear power, government institutions, organizations and the public.

While many scholars have debated intensively on the subject from a nuclear catastrophe and the human impact (medical) perspective (Fujigaki, 2015), I would rather put my focus on the other prominent debates which tend more towards crisis and risk communication, uncertainty and public policy (Tabusa, 1992) in the context of such a disaster.

In my research, I will focus on the debates on risk communication and the disaster emergency response by looking into the International Atomic Energy Agency (IAEA), a global organization under the framework of the United Nations (UN), in particular, the ways in which the IAEA communication activities are performed. Taking the case of the Fukushima nuclear crisis, I will uncover various aspects of the overall debate and observe how the Agency (IAEA) delivered an emergency response. It is important to do so because the IAEA is the epicenter of the world on nuclear-information related topics. The IAEA also serves as the central intergovernmental forum for technical and scientific co-operation in the field of nuclear science and technology.

Therefore, through looking into the IAEA's communications (in the case of Fukushima) we can further learn about the complexities of risk communication and emergency response practices during disasters on the side of international institutional actors. Moreover, the kind of lessons that can be learned from the past and how communication and disaster management can be more efficient especially when a situation like that of Fukushima occurs again. This research will more dominantly reflect on the communication practices of the IAEA during the Fukushima nuclear crisis. Further details the information on the structure of this thesis.

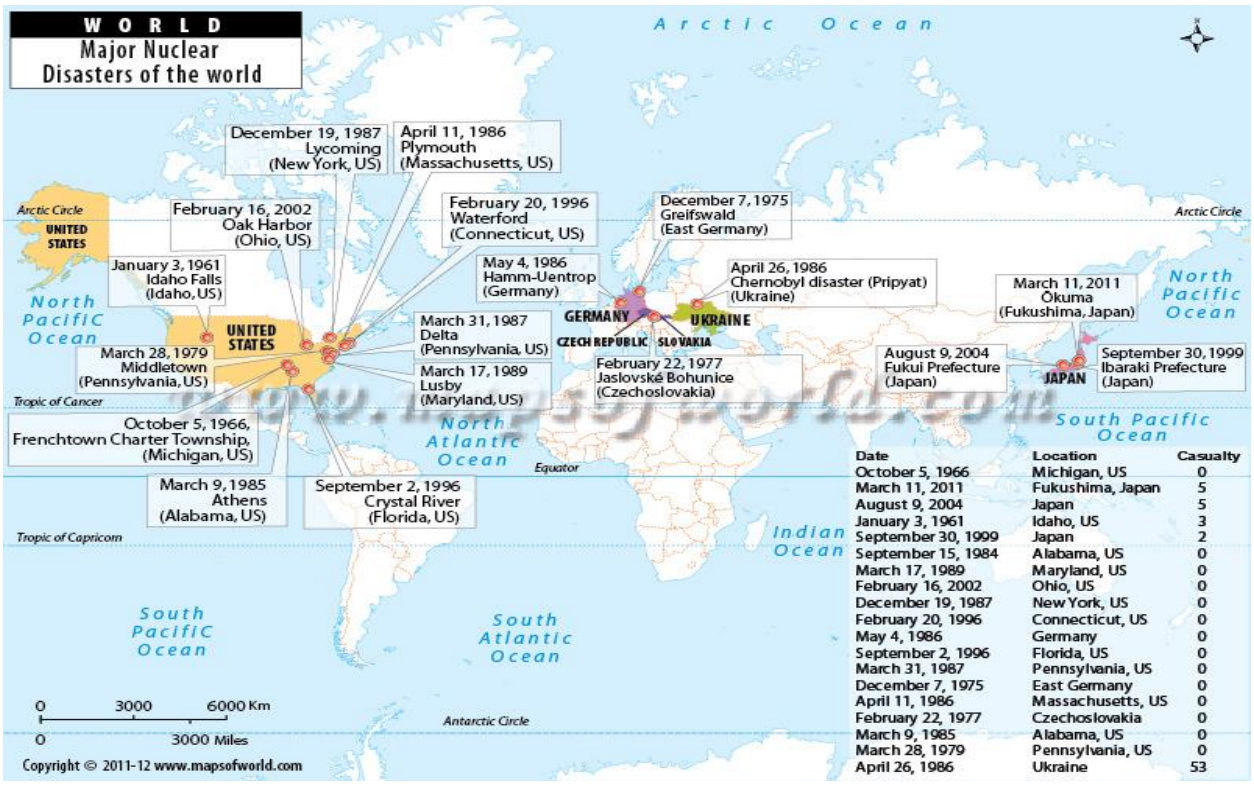



Figure 2: A map of the nuclear disasters of the world to date. The worst being Chernobyl in Ukraine in 1986, Three Mile Island in Pennsylvania in 1979, U.S. and Fukushima Daiichi in Japan on March 11, 2011 (World Map - Major Nuclear Disasters of the World n.d.)

## 1.1 Thesis Structure

This unit provides a short summary of the remaining sections of this thesis in order to explain the direction taken from my prior explorations to concluding remarks.

To begin, Chapter 2 will draw on the insightful literature concerning the issues that surround the IAEA's communication within the context of the Fukushima nuclear crisis. Looking at relevant themes through an STS lens, the chapter describes some of the inherent debates and current research on issues intersecting the IAEA, disaster communication and nuclear technology and accordingly, I have pinned down three key aspects, namely, risk communication, uncertainty and disasters as a concept as well as STS contributions to disasters studies. The classification of disasters is very significant as it is used in accounting for various factors, mostly blaming (Fortun & Frickle, 2013).

Finally, this chapter concludes with an assessment of how, in finding silver linings amongst the clouds, disasters could be viewed as windows of opportunity for STS researchers. They could allow society to be viewed from many other perspectives that otherwise might not be possible.

To supplement the aspects discussed in the previous chapter, in Chapter 3 I have broadened the theoretical framework upon which this thesis rests and alongside, brought in four concepts, namely, - "*co-production*", "*socio-technical imaginaries*", "*boundary work*", and "*media framing*". These notions will serve as theoretical leitmotifs underpinning the analysis of the IAEA's communication activities in the Fukushima nuclear crisis case.

Chapter 4 and 5 will lay out the background of my case, where I introduce the main "actor" - the IAEA as an organization - and present the timeline of the events that connected the IAEA and the Fukushima nuclear crisis. These chapters present how the IAEA takes center stage for all nuclear-related activities around the world. Specifically, the Agency's role in communicating during a nuclear emergency. A glance at this case will introduce the IAEA's communication activities, in particular a focus on its Public Information Unit and how they communicated during the Fukushima nuclear crisis and the difficulties faced in dealing with an emergency response.

In doing so, I intend not only to provide relevant information regarding the IAEA as a United Nations (UN) special organization and how it represents itself to the world, but also to connect its communication activities in the case of the Fukushima nuclear crisis through a timeline. Underlying the timeline will keep the reader focused on my case and realize the boundaries of this research.

Furthermore, in order to allow myself to answer the main research question in a constructive manner, the following chapter (6) will break this overarching research question into three, namely, the coproduction of various orders and practices at the IAEA, how the IAEA as an organization is observed through its boundary work and lastly, the public understanding of science which underlines the IAEA-media link. These three clusters open up a series of sub-questions, which in turn will also keep the research in focus. The sub-questions will also comprise hypotheses of likely results which were developed before the empirical investigation took place.

Subsequently, Chapter 7 will introduce the material and methods that were used in the empirical analysis of the research work. A comprehensive account is given to the methods employed in this research, thereafter, readers are well acquainted about the three interviewees. Mainly, the empirical deliberations will draw on accounts interwoven by data generated via two qualitative methods, namely, document analysis and semi-structured interviews, and analyzed by the discourse analysis approach.

Based on the methods described in the previous chapter, Chapter 8 will continue to follow the empirical investigation of this specific research by analyzing the relevant documents and interviewing the experts, namely, a prominent source from the IAEA, a nuclear information expert from Atomic Reporters and a science editor at the Austria Press Agency (APA). The analysis of data is broken down first by the analysis of the documents released by the IAEA and then into smaller segments where each sub-research question is reflected according to the data.

Further, the various accounts of the interviewers relevant to the communication activities of the IAEA in the case of the Fukushima nuclear crisis are shared. This chapter also entails a discussion of the results from the empirical research and how they reflect the hypothesis outlined earlier.

Successively, the literature from the state of the art is also reintroduced here in order to see if the results from the analysis are in line with preceding research outcomes or in fact highlight new possibilities.

Chapter 9 concludes the thesis by summarizing all of the findings presented in the previous chapter. It aims to explain how the IAEA's communication activities allow us to be familiar with how techno-scientific and societal orders are coproduced in a situation of techno-natural catastrophe such as the Fukushima nuclear disaster. In addition to this, further remarks on the findings, boundaries of the study and submissions for possible further research arising out of this research are discussed.

Note: Before proceeding to the following chapters I would like to clarify three issues, firstly, when doing this research, I am not looking into the issues as to who is precisely addressed and therefore the use of terms such as "the public", "general public", and "global community", throughout the thesis do not aim to be precise. From an STS perspective, these terms often differ as to who is being addressed. Different interpretations can be drawn by readers and therefore, during the course of my writing, these terms strictly indicate a collection of people who were/are concerned with the Fukushima nuclear crisis and the IAEA. Not only had "they" followed the news as it developed over time, but had also shown great interest in knowing about the issue and especially in finding the role of the IAEA in communicating the emergency response. Throughout the text, whenever these terms have been used interchangeably, they are merely meant to address a section of public across the world that include the concerned media, academics, NGOs, international organizations and world governments.

Secondly, the abbreviation "3/11" is used by the Japanese people to commemorate the anniversary of the event (by referring to the month and the year when it happened - March 2011). Following which, the abbreviation has made it way in the academic and media space when referring to the Fukushima nuclear disaster in Japan, and is used in this paper.

Lastly, throughout the text where reference to the communication activities of "the IAEA" is made, it is merely subject to the activities performed by the IAEA with context to the Fukushima nuclear crisis and not of the entire organization.

# 2 State of the Art

## Looking at the Issues through an STS Lens

Science and technology often engage with technical disasters like the one that unfolded at Japan's Fukushima nuclear site. Nuclear power plants, being complex man-made systems, are not only technically complex but also have a multifaceted organizational system where handling safety through guided communication is important, not only for the actual plant itself but for the global environment and entire nuclear industry. Therefore, the Fukushima trifecta disaster should not be zeroed to a single narrative, or it risks future calamity. In the wake of the Fukushima disaster, new accounts have emerged that offer alternative links between nuclear power, government institutions, organizations and "the public". In the past, major accidents like Three Mile Island and Chernobyl have influenced the public view of nuclear power and security as "*absolute safety*" concerning nuclear technology, which continues to be a key hindrance for the acceptance of nuclear technology. Even today, the "general public" is wary of the nuclear industry, believing it to be highly imbued with a culture of arrogance, secrecy, and complacency (Kinsella, 2012). This lack of confidence in nuclear power has developed over decades and is mostly intensified by dysfunction within and between world organizations, government agencies and nuclear authorities (Perrow, 2011).

The lessons from the past often tend to fall within one of two categories: a) Those that blame technology, such as the design of the nuclear reactor, b) Those that find fault with social factors, such as negligence towards high-risk technology, lack of response and failure to communicate; some might even blame corporate greed. My argument, however, is that one should see the problem and the lessons learned through from a broader perspective, observing and uncovering each aspect of the socio-technology system in detail (through one lens), thereby making the social and technical aspects, or the interrelatedness of both in modern technological projects (such as nuclear technology) inseparable from one another. This is in line with STS scholars like Pfotenhauer, Jasanoff, Jones and Saha, who suggest that "*recognizing that all aspects of sociotechnical systems are intertwined is essential to developing wiser technology policies*" (Pfotenhauer et al., 2012). This view invites understanding of disasters through a wide range of perspectives. Firstly, we need to acknowledge that in the design, production and implementation of technologies politics plays an important role. Secondly, nuclear power has global as well as national consequences which are subject to the various risks involved, even benefits and accountability. By unfolding these very aspects of nuclear technology, it would allow us to uncover a diverse set of lessons which would then point out fair responses that comprise recommendations from participatory technology policy and other major stakeholders, thereby pitching for strong global nuclear governance (Callon, 1991).

Social science research on the Fukushima disaster comes from socio-technological fields such as risk communication studies, nuclear disaster studies, organization studies, environmental studies as well as media studies.

To address various issues in the wake of the trifecta disaster in Japan, a global STS forum (Fukushima Forum, 2013) was constructed, allowing scholars to discuss practices for improving communication and nuclear safety (Fukushima Forum, 2013). The field of Science and Technology studies is enormously rich in literature regarding the topic. Various STS scholars have debated the Fukushima nuclear crisis and reflected upon the numerous sides of the trifecta disaster: from environmental consequences to health hazards and from dealing with nuclear power to disaster communication policy and public participation.

One of the most interesting and surprising dimensions of this trifecta disaster from an STS perspective is the assertion that, never before had a disaster involved so many different facets and never before had it been so well captured by the media, "the public" and the authorities themselves. This was the case particularly with social media highlighting every action and event of the trifecta disaster. Such facets of media were not present when disasters such as Chernobyl or Three Mile Island happened. While both these events had some differences in the flow of information and how the media reported them, the new media dimensions were essentially absent (Rubin, 1987). The question(s) remain(s), how to reflect upon such a situation after having watched it unfold and even after having several of its elements (of the disaster) placed in proper context.

Seen from a sociological perspective, a combination of natural and technological disasters of this (Fukushima 3/11) kind goes beyond the impact, where the need to control its intensity and the related negative notion around it becomes a major challenge. Hence, "*the sudden and large scale changes that disasters trigger in ecosystems societies and knowledge practices offer scholars unique opportunities to study social dynamics of techno-science under highly atypical situations*" (Fortun & Frickle, 2013, p.4). The emphasis, therefore, is on numerous themes that use such a trifecta catastrophe as a window into social occurrences that would otherwise not be noticeable.

In Science Technology Society (STS) terms, Pfotenhauer explains, "*Nuclear power is best understood as a thoroughly hybrid entity in which the social and technological cannot be separated from one another for analytical or policy purposes. Technologies such as reactors, risk models, and safety mechanisms are embedded in social values and practices; similarly, national identity, risk regulation, and corporate culture are materialized in the production and operation of nuclear power plants"* (Pfotenhauer et al., 2012, p.1).

Sims, in his piece, '*Things Fall Apart: Disaster, Infrastructure, and Risk,'* writing about Hurricane Katrina, quotes Bowker (1994), who calls these natural and technological disasters, *scientific controversies* that are a useful theme for STS studies "*as they open up for examination networks of social and material relations that appear settled"* (as cited in Sims, 2007). These technological disasters are embroiled across diverse lines that offer productive ground to perform what Bowker

calls '*infrastructural inversion'*: bringing to the forefront the vital meaning of technologies, practices and the people engaged in it, which normally exist in the backdrop of such events and remain invisible for lay people.

Some STS scholars focusing on the Fukushima disaster, share that disasters of this kind are "*complex events with multiple and overlapping meanings*" (Jones et al., 2013) where experts' opinions are shaped by cultural and epistemological assumptions, giving a sense that there are no clear divides between what is caused by environment and what is caused by human beings. Therefore, Fukushima (3/11) is required to be seen from many narratives (Felt, 2016; Jones et al., 2013). Signifying that a single dominant narrative of the disaster shows "*the acute danger of reductionism*," (Jones et al., 2013) multiple narratives therefore need to be looked at to address issues on a technological disaster. First however, I wish to make the reader aware of the way scholars located in institutions around the world have viewed this disaster.

## EAST/WEST Dichotomy

Studying the topic's relevant literature, it is worth noting how differences in focus emerges between scholars or researchers working in the region of the disaster to those based outside. This East/West divide is evidently a construct, though it is relevant to reflect where analysts speak from and what concerns they raise. Highlighting this difference at this stage is important as it will be a relevant element in the next chapters. Furthermore, this East/West language dichotomy (Hendry & Wong, 2006), which is strongly present in shaping sociological issues (that are often connected to each other such as: equality, development, environmental issues and healthcare, etc.), is perceived, and are the differences between the Eastern and Western world, mainly because of cultural differences rather than geographical division.

Both Eastern and Western-based STS scholars have examined and debated various STS subjects regarding such a disaster. From what I have examined, I learned that scholars based in the East have debated intensely the subject of a nuclear catastrophe and the human impact (medical and radiation) perspective while scholars based in the West have more frequently addressed crisis and risk communication, uncertainty and public policy.

The work of STS scholars based in the East, especially Japan, which is densely represented and where scholars have already shared their research on the underlying scientific and engineering disciplines, wasn't noticeable. Since the trifecta disaster, as both scholars located in the West and the East took a special focus on Japan, "*relevant insights about characteristic national differences in the interaction between scientists and engineers, remains*" (Traweek, 1988).

Japanese scholars such as Yuko Fujigaki, Shineha, Takuji Hara, Kimura and others have written on how the trifecta disaster has shaped Japanese policy and how various processes are embedded in different contexts relating to national history and government responses with regard to nuclear power plants in Japan (Fujigaki, 2011, 2015; Hara, 2013; Kimura, 2012, 2016; Shineha, 2011). Their focus has been on case studies on these subjects and moreover they have written from a human

perspective angle, mainly from a medical, environmental and radiation point of view, which is more obvious as Japanese scholars have seen the problem firsthand and are aware of the social, cultural contexts in Japan. In addition, it is arguable that their work concentrating on health, the aftermath of the disaster, radiation and the environment is shaped by their living and working in the region of disaster. Examples of their work could easily be seen at various STS forums on Fukushima – be it forums in the East or in the West. One of the latest books, '*Lesson from Fukushima*', edited by Yuko Fujigaki, has an interesting compilation of work examined by STS scholars in Japan and points to the argument offered here, on how scholars from the East see problems in different contexts (Fujigaki, 2011, 2015).

Meanwhile, STS scholars based in the West such as Charles Perrow, Scott Knowles, Kim Fortun, Sonja Schmid, Richard Hindmarsh among others, have written widely on STS and disasters, risk, risk communication, nuclear catastrophe, public policy, expert/layman communication, global environmental policy, and comparing Fukushima with nuclear disasters of the past and hence, have taken a more social and public policy route to dealing with the issues surrounding the Fukushima disaster (Fortun, 2012; Hindmarsh, 2013; Knowles, 2011, 2013; Perrow, 2011; Schmid 2011, 2015).

Richard Hindmarsh's work in '*Nuclear Disaster at Fukushima Daiichi: Social, Political and Environmental Issues'* shows a comparable example with that of the Japanese scholar Fujigaki. Essays written in the book (Hindmarsh, 2013) are among the first and most comprehensive social scientific analyses of the natural and human-made disaster that is Fukushima Daiichi.

Although it would be unfair to say that scholars based in the West have completely missed identifying and regarding cultural and national identity issues when writing about Fukushima, the depth of issues concentrating on health and environment among the scholars from the West has taken the shape of nuclear energy policy and dealing with disasters in general.

The most noteworthy highlight of the Fukushima studies has been a vibrant debate within Japan over whether or not to abolish or phase out nuclear power altogether, while in Western countries the Fukushima debate was taken into their own political cultures and some scholars shared that countries like Germany are dedicated to slowly ending the use of nuclear power in the name of safety (Fairley, 2011). The Fukushima case is complex by virtue of the fact that many supporters of green energy point to nuclear power as a key answer to cutting carbon emissions and the overall climate change debate. This too has been quite uniquely debated by scholars from institutions based in the East and the West. (Schmid, 2011; Fujigaki, 2011)

Scholars from institutions based in the West have also intensely debated the joining together of STS and disaster studies. This could be easily visible given the amount of literature that has been written on the topic, some of which I refer to in the chapter on State of the Art.

A common subject which was vastly written upon by both Eastern and Western-based scholars is the issue of experts and the media's response to the trifecta disaster. In Japan, STS scholars focused on the social media and emergency response relating to the blame game on the

government and Tokyo Electric Power Corporation (TEPCO), while scholars based in the West wrote on the swift response that social media and traditional media reported, though some questioned the experts and facts in its content and moreover concentrated on the world's response to the accident. It was also realized that the response of the IAEA was inadequate, and they should have been much more prepared. (Hindmarsh, 2013; Kimura, 2012; Shineha, 2011)

Therefore, from the above reading, it is clear that in the East and West, problems are viewed in different contexts and equally related to their own perception of various STS subjects. Even though the overall STS debate is tied up with these various issues crisscrossed at different levels, I will place greater focus upon crisis and risk communication, disaster studies and uncertainty on the trifecta disaster.

## 2.1 Risk Communication

At a time when potential dangers surround every action and choice (during disasters), the risks, its practices and outcome receive the most attention in the public domain as they are somehow linked to our culture, society and moral ideologies. One of the most important themes concerning Japan's triple disaster within the context of STS studies, is risk communication.

Poor risk communication was witnessed during the Fukushima nuclear disaster mainly due to the adverse effects of the Japanese government's failure to deal with the disaster (Figueroa, 2013), which has fed the unending public distrust towards the nuclear industry, the government and safety regulators.

In nuclear risk communication, the main objective lies in averting ineffective, fear-driven, and potential public over reaction to the crisis. As this is highly dependent on the situation, there is no general "recipe" for sound risk communication in situations of nuclear disasters (Perin, 2006). However, risk communication measures address various issues from handling an ongoing crisis to the uncertainty felt by the general public, by not just informing them about the situation but also building trust and working towards a wider solution involving all stakeholders.

Japan's triple disaster occurred under unique circumstances, including multiple infrastructure failures and competing public priorities, making the entire risk communication model neither reflective nor responsive to the specifics of the emergency and society (Figueroa, 2013). This places the debate concerning risk communication again at the forefront. Despite our past lessons on dealing with disasters, risk communication continues to be unproductive when dealing with such situations (Perko, 2011). Undoubtedly, the Fukushima nuclear disaster highlights the very relevance of effective risk communication strategies for nuclear accidents and a need for STS researchers to engage with the problem.

Since the post-Fukushima world, it has become evident that in order to guarantee the continued operation of nuclear services across the world, it is essential to intensify public trust through actions that lead to a generalized improvement in the situation and safety at nuclear facilities. This is at best possible when the issue of better risk communication with the public on the topic of nuclear lies is well addressed (Sato, 2016).

Therefore, in dealing with the problem, risk communication scholars highlight that the nuclear industry needs better preparation in response to such natural disasters which have the potential to trigger a technological disaster, and that further exploration is needed in order to understand the interaction between natural and technological catastrophes and the activities that governments and societies should take to respond to these events. Keeping this in mind, it is interesting and important to think about risk communication, as over the years, the topic of risk communication has gone far beyond its original conception of risk awareness. Today, the theme of risk communication provides a key link between experts and lay people for informational programs that are at risk by keeping the flow of information between the various systems and subsystems of society.

Moreover, the debate on risk communication has added a strong socio-technical element to disaster(s) and the controversies associated with it. The topic of risk communication has connected the dots between technological systems and social institutions (Benjamin, 2007), becoming a useful insight for Science and Technology studies to use in thinking upon these interdependencies.

In the case of the Fukushima nuclear crisis, a broad range of players had communicated through various channels. The multiplicity of the actors and the channels involved have also raised questions on how they responded during the nuclear emergency and what "risk" related communication they transmitted from experts (authorities/regulators) to the media and the public - not just in Japan but also across the world. While international cooperation in dealing with the Fukushima nuclear accident did become increasingly important to address nuclear issues in the post-accident phase, the overall communication network lacked public engagement and effective measures (Figueroa, 2013). Therefore, in the face of the crisis and in order to respond to growing societal pressure, risk communication authorities are urged to attempt to understand the public and the way it understands risks (Fischhoff, 1998) in certain subject arenas. That is precisely why risk and crisis communication on any nuclear emergency is already a key concern among world bodies and it has also been a subject of major debate in the scientific world for decades (Perin, 2006).

Here, it may be pertinent to press a point made by Italian sociologist Massimiano Bucchi, who notes that "*in order to understand risk communication under such events, the entire communication model calls for an investigation of multiple interactions of specialists*" (Bucchi, 2008) and the popular discourse generated around the subject.

From a Science and Technology studies outlook, such a combination of natural and techno-political disasters also presents a whole new set of difficulties which require swift responses to be taken by a multitude of organizations, national and international, as well as governmental institutions, all from various nations and cultures, and all with diverse world assessments and ways in which they describe the world around them.

For this reason, I wish to broadly highlight what risk communication is, the different approaches in which it can be seen in various events or disasters as well as showing patterns of risk communication by reflecting on disasters in the past.

To give readers a theoretical take on risk communication, consider for example a situation arises, where some data or information indicates that a hazard is not serious, yet the general public is near panic, risk communication can then be used to calm people down; in this circumstance its objective is to provide comfort and assurance. Still, it can be considered that there is a situation of urgency where information or data indicates that the hazard is serious, yet the reaction of the general public is one of apathy. Risk communication in that sense has been very effective in rousing people to the awareness such as evacuation from their homes during an emergency, provide sound communication and with that have a well-informed public (Renn, 2008).

Here, I would like to borrow Pratt and Yanada's words, whose work concentrates on risk communication around Japan's Fukushima Daiichi nuclear site, which states:

*From a conceptual standpoint, it is important to note that risk communication per se is not synonymous with the management of the communication process during the planning - prevention, crisis, and post crisis phases. And, from an analytical standpoint as a pedagogical approach, it is a method for integrating risk communication theory into a well - informed discussion of organizational communication during a major crisis.*

(Pratt & Yanada, 2014, p.4)

This definition very well echoes my understanding of risk communication, that it is a method that has to be very well integrated with the overall communication model during an emergency or a crisis. That a well-thought procedure is (should be) applied, which helps create an awareness and understanding of emergency response measures and improves the public response (Sato, 2016).

Having shared a conceptual definition of risk communication, I wish to acknowledge that there are other scholars who add a more social meaning to risk communication. This view of risk communication through a social spectrum fits well with my notion because technological disasters are very multifaceted and it is quite impossible to separate its social and technical features, i.e. its components, likelihood, and consequences are "*greatly influenced by personal, social and cultural factors*" (Pineda-Solano et al., 2013).

Researchers Tschurlovists, Taghizadegan and Engelbrecht at the Atominsitute of the Austrian Universities, share this definition of risk and risk communication that *""risk" is not only regarded as a scientific concept to measure a particular kind of information or lack thereof, but also as a*

*social code word. "Risk communication" is understood as a social stage where problems of decision making under uncertainty are revealed and debated. A scientific use of the term "risk" and efficient risk communication is made difficult by a variety of different definitions and approaches to the phenomenon of risk, largely due to the prevailing gap between natural and social sciences*" (Tschurlovits et al., 2004, p.1). According to the Austrian researchers, the reason for this gap is mainly how over time, natural scientists have been found as one-sided, focusing on the issue through a quantifiable approach, which has led them away from having a multifaceted view of the issue. Their definition echoes with Griffiths's work on dealing with risks, who notes that "*there must be only a very few real problem areas that can be adequately treated within the confines of a single discipline, and the subject of technological risk ... is certainly not one of them*" (Griffiths, 1981).

It is interesting to highlight here that "risk" in the studies of social sciences has a range of meanings and positions, which have been taken by sociologists over the years. Many approaches are found under "risk society" that has elaborated concepts of risk and modernization (Beck, 1991), some are focused on "risk culture" or socio-cultural approach by focusing on the issues of identity and the idea of risk in collective narratives (Lupton, 1999) and there are some who link risk to the notion of reflexive modernization with an eye on the uncertain future (Bauman, 1991) and lastly, those who term risk under power and governance (Foucault, 1991). As sociologist Deborah Lupton notes, some sociologists opt for a relativist approach while others tend to a more realist one and a few position themselves somewhere in the middle (Lupton, 2013). Therefore, it is worth noting how risk and risk practices are being played out and under which framework they are subjected, as Harry Otway and Brian Wynne share that the risk communication paradigm "*rests on unexamined and unarticulated assumptions about who is communicating what, to whom and in what context"* (Otway & Wynne, 1989, p.141).

These definitions of risk communication correlating to risk and risk communication through a social dimension is thought-provoking, especially when exploring technological disasters like the one which unfolded in Japan. It is, however, interesting to know that Austrian researchers note that there is the prevailing gap between natural and social sciences which limits the full use of risk communication in the overall communication model, mainly because of the limited view of natural scientists.

Another approach I would like to add to our table of approaches on risk communication, which is from a sociologist's viewpoint, risk communication is the process of dialogue, a connection between the lay people and experts or as researcher Bennett describes "*rather the lack of dialogue*", borrowing one of the leading STS scholars Brain Wynne's famous work on lay decision-makers and experts (Wynne, 1996) that the boundary of experts is often grounded "*on a misconception of science – specifically of an objective scientific community in which subjective factors (social, cultural and psychological) either do not, or at least minimally, influence the decision making process*" (Bennett, 2012, p.10).

It is also appropriate to mention at this point that an impression gained during the course of reading appears to be that the magnitude of social science exploration on risk communication has increased dramatically over the last years, especially in response to the growing alertness among risk assessors, risk communicators, and even consumers that the general public should be better informed and more active concerning nuclear technology and the policy making surrounding it. During the Fukushima nuclear accident phase, social science researchers explored key determinants of considerations, misunderstandings, and outrage concerning risks connected with a wide variety of nuclear technologies.

A more constructed notion of crisis communication during such disasters can be best understood from Falkheimer and Heide who share that crisis communication can be understood as a sense-making process "*where reality is negotiated and constructed in cultural contexts and situations*" (Falkheimer & Heide, 2006, p.180). This means that the public's view is heavily affected by cultural contexts and the reality they are connected with.

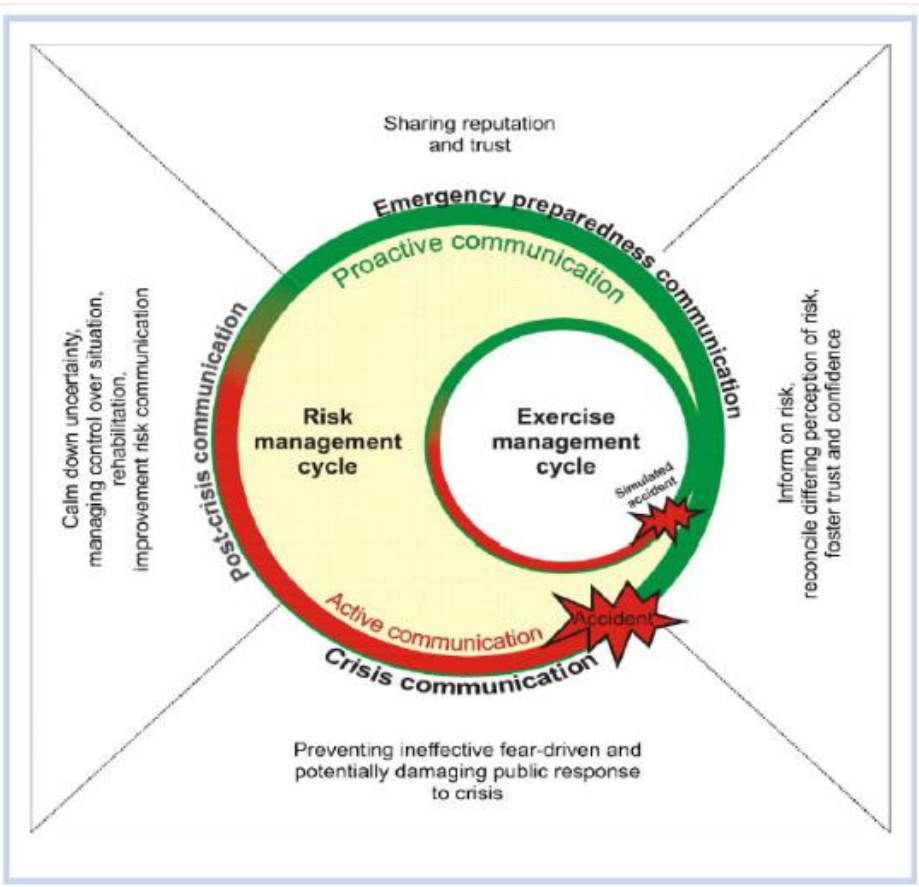



Figure 3: Risk communication in the nuclear emergency cycle. Source: (Perko, 2011)

The above figure shows the risk communication emergency cycle from the beginning of the crisis to its post-phase. Ideally, whenever a nuclear emergency strikes, there should be maximum prevention of damage by keeping risk communication channels active and an aim to inform the

concerned public in an organized manner. Through this process of active communication, a controlled impact of the emergency can be possible that not only lowers the levels of uncertainty and fear surrounding the nuclear emergency, but also paves the way for an improvement in the situation. Thereafter, the process of rebuilding trust and reviving emergency preparedness communication should be initiated that builds confidence and keeps the public better informed of the practices and risks involved in the process. According to Perko, government(s) or nuclear agencies should perform regular exercises or drills that allows them to be proactive and react immediately during an actual event (Perko, 2011). The cycle highlights the role of risk communication and how it can help make nuclear emergency management fully functional. (I will go into detail on the risk communication cycle in the chapter on case description, on how the IAEA performs its risk communication cycle.)

The Fukushima nuclear accident has undoubtedly provided a further opening on the growing importance of risk communication. From an STS perspective, it becomes our job to bridge gaps with the major elements surrounding the nuclear emergency actors worldwide and explore nuclear accidents which occurred in history, which will help various stakeholders highlight key issues in context.

Having discussed some of the approaches on how scholars interpret risk communication, (some of whom take a purely communicational angle, a few debating on the lack of dialogue while others bridge the "social" element with its meaning and how it is negotiated with reality) I would further like to show patterns of risk communication which highlight its importance.

It is worth mentioning a widely referenced article by David M. Rubin, previously the Co-Director of the Center for War, Peace, and the News Media at the Department of Journalism and Mass Communications at the New York University entitled, '*How the News Media Reported on Three Mile Island and Chernobyl*'. It is noteworthy at this point, as it accounts that there were many striking parallels in the flow of information during the Three Mile Island (TMI) and Chernoybl incidents relating from the lack of crisis communications strategies as to the careful withholding of data on radioactivity releases (Rubin, 1987).

In the same vein, it is equally important to look at and learn from past disasters that offer a great deal of exchange with regard to the use of information and communication. Dulek and Hale explain that "*the role of risk communication from the past events offer awareness and also allows analyzing and investigate crisis communication*" (Dulek & Hale, 2005) on how authorities and media reports add to the crisis events. The public's belief on this also plays a significant role.

To further add to the case of the Chernobyl accident, despite the fact that it happened over 25 years ago, to this day the public across the world remembers it. Various opinion polls, within Europe and beyond, concerning this nuclear catastrophe still exhibit large insecurity and anxiety in the population with regard to its consequences, mainly due to opaque communiqués, distrust toward the authorities and fear of its consequences. The Chernobyl accident is perhaps the most suitable reference prior to the Fukushima incident where the risk communication model failed.

The communication of the various aspects of the Chernobyl accident "*became increasingly politicized with regard to related policy agendas*" (Abbott et al., 2006, p.105). As an historical reference to our debate, the Chernobyl nuclear accident is a dramatic case of a technological disaster calling for better and more transparent risk communication with the affected public, either directly or indirectly, even long after the critical phase of the crisis (Rubin, 1987).

It is also relevant to point out Sonja Schmid's work on Chernobyl nuclear disaster and the entire soviet nuclear industry in her latest book '*Producing Power*'. She compares Chernobyl to Fukushima, and notes, "*The repercussions from Fukushima are thus no less dramatic than Chernobyl's: we are witnessing, yet again, a massive overhaul of technical safety protocols at nuclear power plants, a thorough reevaluation of operating procedures, especially in emergency situations, and a fundamental review of the safety oversight and regulatory apparatus*" (Schmid, 2015). Guiding to the point that this breakdown of complex sociotechnical systems has largely happened due to oversight technical safety measures and emergency procedures.

However, Pfotenhauer et al., in their briefing on '*Lesson from Fukushima'* point out that all three major nuclear disasters (Chernobyl, Three Mile Island (TMI) and Fukushima) had arisen because of different circumstances, noting that the "*events are too idiosyncratic to allow easy generalizations about where our model fails, though they seem to suggest that annual failure-risk estimates such as one in ten million or even one in ten thousand are a serious underestimation"* (Pfotenhauer et al., 2012, p.7).

To leave behind the patterns of risk communication during a disaster and the reference to Chernobyl, I would like to further ponder some key players or actors that play a significant role in risk communication during technological disasters. They are prominently the media (including social media), the public, organizations and various other framings and voices that add to the multicity of actors involved in technological disasters. As Breakwell, a policy advisor and researcher in risk communication and risk management, explains, "*the development of various technologies with their associated risks and hazards leads to the growing significance of risk communication*" (Breakwell, 2000) with stakeholders and the public at large demanding more clearness and accountability from emergency services and risk-managing establishments. The public indeed remains a major stakeholder on the subject because not only are they at the receiving end but they are also in the primary place to become part of the policy-making through a consensus whether nuclear technology or the communication model benefits them or not.

Even though the understanding of the public is a crucial element of how the public perceive and interpret crisis and risk related information, these practices are in fact more embedded into a socio-political culture which many scholars describe as "*opaque and secretive*" (Bowen, 2006, p.21). Under a certain framework, nuclear risk communication seems to be more a one-way process from the source to its target group.

Another interesting actor in the overall debate of risk communication is the media, which was a significant player in the 3/11 disaster. As Nelkin notes, in circumstances which demand the

communication of risks from authorities to the public that the media represents "*both a source of information and an indicator of public opinion*" (Nelkin, 1989). The media is a prominent information channel for the lay public, often being used for communication by different stakeholders and even acts as the watchdog of and for society. The media helps monitor the nuclear emergency management, forming a link between the emergency actors and the risk perception among the population.

Scholars like Shineha highlight that unlike reporting in the traditional media, information on the disaster unfolded more on social media websites with a combination of major American, Japanese and British newspapers (Shineha, 2011). Shineha studied the different dialogues and representations about the accident and the technical information that was used to construct them in major social media networks such as Twitter and Facebook. He points to problems related to public understanding of science, science/media relations (Shineha, 2011) and crisis and risk communication models and how they are enacted in a different way by types of media across various countries.

A similar tone is shared by Mikihito and Kakubayashi, who point out differences in how the media and science communicators do not share the same umbrella during disasters. Their work deals with what they refer to as the problem between science and the media, which Austrian STS scholar Ulrike Felt calls the "*relationship between Science & technology and Science & Society"* (Felt et al., 2013). They studied the conflicting information coming from the scientific community and social media and tracked how the disaster shifted from being a natural disaster to a human disaster (Mikihito & Kakubayashi, 2011). During the early phase of the Fukushima disaster various scientific explanations given by given experts differed (mainly with context to risk and the scale of the meltdown), which created more confusion.

The mass media played a key role in their increasing judgments of trust in regulatory agencies and risk management organizations based on sound science and effective risk communication practices (Hindmarsh, 2013; Sato, 2016). This could be seen as a media-centric debate, which is often canned as a sort of "technological determinism", which is fundamentally unhistorical. The uses of social media over time need to be understood in both cultural and historical contexts and examined in what relation it has formed a connection to mass media, policy-making and other agents involved. It is one of the areas which has so far not been explored in sufficient depth in the STS domain and which I wish to debate in the later stage of my work.

To settle the various actors involved in this complex sociotechnical system, organizations need to have a larger role to fix issues at the site and also at a policy level. As one must know, all crises, regardless of their intensity and impact, require an organizational response. Organizations become morally accountable to stakeholders to aid in attaining effective sense-making which can only be accomplished by providing messages of instructing, adjusting and through distributing "messages" by having strong public policies.

At the crux of this debate on risk communication is the organizational setup and preparedness, which plays a vital role in an effective response to such disasters. In dealing with the Fukushima nuclear crisis, various institutions and organizations communicated to address various issues around-the-clock yet lacked collaboration and uniformity in not taking decisions, disrupting the overall communication model (Figueroa, 2013).

An organizations' move to work around risk communication, as Coombs explains, is the practice of collecting and reacting to evidence and information internally in order to make better-informed decisions. These inferences and chosen actions must then be passed along to external stakeholders by addressing issues in the way of form and content. The form of a crisis message response embodies practices like responding quickly through relevant channels, consistently (Coombs, 2012) and openly while the content of messages focuses on the type of information that should be included.

Finally, it is important to describe why Fukushima is a special case when dealing with risk communication. Sociocultural anthropologist Pablo Figueroa notes in his piece '*Risk Communication surrounding the Fukushima nuclear disaster: an Anthropological approach'* that "*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" (*Figueroa Pablo, 2013, *p.56).*

This asymmetry between unequal parties, as shared by Figueroa, I believe is very challenging on a broader societal level. The risk communication mechanism did not perform the way it should have, and posed further problems that hint to a degree of geo-politics surrounding the nuclear technology. Yet, with the Japanese government's failure to deal with the disaster, poor risk communication was one of the evident reasons to be blamed as it has put the entire sociopolitical landscape of nuclear safety under one umbrella (Kimura, 2016) and as public distrust continues towards the government and nuclear industry as a whole since the event, it has questioned the uniformity of policy makers, stakeholders and common citizens towards the subject (Hindmarsh, 2013). These issues have brought worldwide attention to the significance of effective risk communication strategies for nuclear emergencies.

Therefore, in order to understand the Fukushima nuclear disaster, there requires an international perspective given to the multichannel communication that was in place. There were numerous communication breakdowns or failures, different values emerging, different settings, and different underlying meanings, all leading to different interpretations and varied meanings and most of all, it was unclear in the way in which the communication and other emergency activities were described.

In finishing the points concerning risk communication, the subject of risk communication has always been at the forefront of various disaster debates, albeit the 'communication' can embody different forms and Fukushima underlines yet again that there are no good risk communication models in place without strong societal instruments to deal with their unavoidable limitations and

failures. Therefore, on a broader societal level, questions were and still are being raised for better crisis and risk communication that generates public discourse. It also questions how the existing practices of risk and technical communication can actually satisfy numerous observers – and what risks are worth taking, and who should participate in these decision-making processes.

From the above reading, it is clear that in such technological disasters the role of risk communicators is not entirely fixed. Following the argument that public policy needs to be strengthened, further STS exploration is required so that the government, the nuclear industry and related watchdogs develop effective risk communication techniques. This would allow for a transparent flow of information and give the public a base for making a well-informed decision around how much risk they are prepared to tolerate, by taking into account the benefits received from technology and the way they identify risk.

## 2.2 Uncertainty

Another significant characteristic of any nuclear emergency is the uncertainty that is often combined with the notion of risk and the various meanings and emphasis across various fields (such as speculation), has grown into a major concern since the nuclear disaster. Since the Fukushima accident, a sense of confusion has arisen, along with the sense that knowledge is withheld and uncertainty is amplified.

Over the decades, 'uncertainty' has become an increasingly important concept in STS studies, that has helped explore and analyze various meanings of several issues in scientific debate, especially in technological disasters. Various scholars dealing with uncertainty consider it as part and parcel of scientific debate which in cases can be reduced, but not removed. Scholars can incorporate uncertainty into calculations or work around it which helps explore issues more clearly parallel to how scholars like Ulrich Beck see 'risk' as a significant character of our contemporary age (Beck, 1991).

One of the most well-known STS explanations that reflects on uncertainty comes from Brian Wynne, whose thoughts on science and everyday life are based upon his studies of Welsh and Cumbrian farms affected by the Chernobyl fallout, in which he makes an important distinction between 'risk', 'uncertainty' and 'ignorance'. He posits that 'risk' subsists where an episode may or may not occur, but the chances of it happening are somewhat known; 'uncertainty' on the other hand is the state where the wide parameters of a risk are assumed, but science is not (or not yet) proficient in precisely measuring the odds. However, 'ignorance' takes the problem one step deeper. In a situation of uncertainty, we are mindful that there are variables we cannot foresee; but in a situation of ignorance, we do not know what it is that we don't know (Wynne, 1992, pp.114).

The Fukushima nuclear accident was poised with a high degree of uncertainty that existed by virtue of the withholding of crucial information, as the agencies were insufficient for evaluating the possible consequences of the accident. STS scholar Michel Callon calls these uncertainties "*most striking in the domains of the environment and health, undoubtedly the most fertile terrains for socio-technical controversies*" (Callon, 2001).

Tessa Morris-Suzuki from the Australian National University intensively researched the Fukushima nuclear accident in both social and historical contexts, and concluded that uncertainty lies at the very core of the nuclear dilemma. Noting from her experiences from Fukushima that it shows a wide gap in how the meaning of 'uncertainty' is understood "*in the realm of contemporary scientific discourse, and the lived experience of indeterminacy confronted by those whose everyday lives are affected by nuclear disaster"* (Morris-Suzuki, 2014).

Scholars Shackley and Wynne (1996) argue that "*uncertainty claims function as boundary-ordering devices which can stabilize and uphold the borderline between scientists and policymakers"* (Shackley & Wynne, 1996) at the same time as permitting exchanges across the boundary.

In researching key developments of the post-Fukushima period, Schmid, focusing on the history and the organization of nuclear industries, notes: "*Since March 11 we have heard, seen, and read analyses from countless experts on what is going on at the crippled Fukushima Daiichi plant. That these accounts have often been contradictory is hardly surprising, given the volatile state of affairs, and the different perspectives from which experts view the situation. In a rapidly developing emergency, we expect to see assessments that diverge and evolve quickly*" (Schmid, 2011, p.174).

Thus, "[...] *far from being a neutral statement about the unknown, uncertainty about the environment increasingly appears as the product of a very special form of social activity*" (Jasanoff 1998). Furthermore, it also sheds light on the uncertainty with regard to policy. Both "*policy-makers and scientists are mindful of the propensity for public panic-buying and pseudoscientific claims in response to these emergencies"* (Misreporting Fukushima?, 2012).

Hence in a complex world of uncertainty, choices are apt to be more effective, accepted and sustainable if they methodically consider scientific facts and the genuine engagement of the public (Renn, 2008). In the case of Fukushima both the government and the nuclear industry failed to communicate the open risks from nuclear energy and their scientific assessment.

Concerning the environmental uncertainty, Jasanoff in her paper "Contested Boundaries in Policy-Relevant Science", shares "[…] *in areas of high uncertainty, political interest frequently shapes the presentation of scientific facts and hypothesis to fit different models of 'reality'. The language in which scientists represent and legitimate their claims varies in accordance with the audience to which the representations are made. Accordingly, one's impression of the reliability of scientific knowledge can differ depending on whether one looks at the public language of science or at the private language in which scientists communicate their assessments of certainty to each other"* (Jasanoff, 1987, p.103).

Their arguments make clear that conflicting information and a lack of transparency only generates a climate of controversy among scientists, policymakers and the lay public. Schmid reminds us that "[…] *a situation involving multiple, simultaneous core meltdowns is unprecedented and almost by definition unpredictable. In addition to technical explanations and effective management, Fukushima calls for broad social engagement, not expert demarcation"* (Schmid 2011).

Sociologists of science often debate how uncertainties within scientific knowledge are negotiated. A constructivist analysis of scientific uncertainty argued by Mellor in '*Negotiating Uncertainty: Asteroids, Risk and the Media'* note that uncertainty is not merely an absenteeism of information, facts or even a phase of underlying authenticity, but something that is dynamically constructed and achieved. To explain she uses the term "*"ignorance" to cover uncertainties, errors, absences of knowledge and other forms of non-knowing, argues that ignorance, like knowledge, is "a construction embedded in diverse social interests and commitments*" (Mellor, 2010).

This construction of various notions of uncertainty at play brings us back again to Callon's argument that disasters or major controversies that unfold in hybrid forums are not only fostered by technical and scientific uncertainties but also by social uncertainties and can be grouped into two big families: *those concerning our knowledge of the world and those affecting the composition of the collective* (Callon, 2001).

In policy contexts (Nelkin, 1979), the Fukushima accident was surrounded by uncertainty, especially with the imprecise nature of nuclear radiation, which compounds the complications of risk valuation and has left substantial room for subjective aspects to enter both scientific explanations and public insights.

## 2.3 Disaster: As Concept and Disaster STS studies

One of the other significant characteristics found among the vast literature surrounding the overall Fukushima nuclear crisis is disaster or disaster STS studies. The literature has two distinct approaches. One focuses on the practical order in which disasters are thought to be a way to resolve the real-world issues and hence are defined in a certain order and effect in an overt reaction due to their destructive impact. The other approach offers a more theoretical approach, which studies the epistemological approach to disasters and the way organizations and the workings of society before and after disasters offer new insights about the functioning of society.

A historical take on how sociologists defined disasters, is worth sharing as they are entirely differentiated between disasters and other daily social problems. Quarantelli, an American sociologist, pioneering the sociology of disaster, shares:

*They saw disasters as different from chronic and everyday social problems. Disastrous crises are marked by a sense of urgency, a need for prompt reaction, and for quick action to prevent further*

*immediate, often instant, deterioration of the situation. They stand in contrast to more diffuse and continuous social pathologies such as poverty, unemployment, crime, drug use and other similar negatively viewed phenomenon that sociologists treat as part of the social problems of society.*

(Quarantelli, 2000, p.6)

Disasters are not only described as natural but also manmade, technological and even combined with social factors. As a concept, Lonergan in his paper *Natural disasters and Man-Made Catastrophes* describes that "*disasters are seen as matters of opinion and not of simple fact*" (Lonergan, 2011, pp.3) meaning that their characteristics are not measured on a universal scale, but rather opinionated by a certain class of people or actors.

According to Lonergan, everything is determined by one's perspective. What may look like a disaster for some might not be for the others; especially events of the past where no human intelligence on such matters existed. This points exactly to what Carr notes in his piece '*Disaster and the Sequence-Pattern Concept of Social Change'* that "*not every windstorm, earth-tremor, or rush of water is a catastrophe*" (Carr, 1932, p.211).

Emphasizing Lonergan's argument which gives instances of asteroids striking planets with natural life and planets that are devoid of life, and in particular how one would regard that as a major disaster while the other as just a crash of space rocks. Sharing a more practical example allows him to advance his argument that one's opinion or thought is subjective on disasters:

*A tidal wave (tsunami) hits a far off, inhabited coast. Under normal conditions this would be a sad loss of life and destruction of property. If that coast is uninhabited, and home to no beloved animal colony, perhaps nobody much cares. When such an occurrence takes place during time of war, and befalls a feared enemy, it might occasion celebrating in the streets, and even cause religious leaders to give thanks. Everything is determined by one's perspective.*

(Lonergan, 2011, p.132)

Time has also been a crucial element in how disasters were and are thought of. In the past, while many projected unnatural events as "Acts of God", as Furedi shares "in the middle ages, solar eclipses and comets were seen as catastrophes because they were interpreted as signs of divine anger against human sins, as were earthquakes and volcanic eruptions" (Furedi, 2007, p.483). However, since the social, cultural and technological changes, we have evolved in the way we interpret disasters – giving them a whole different meaning (McCormack, 2014) and perhaps a more social angle.

It is also suggested that disasters happen on an invisible level of scale. A tsunami, an earthquake or a nuclear power plant explosion are events where the intensity of the impact is beyond borders and the scale can never be truly imagined. The bigger the scale, the more it gathers social interest and hence deemed as a societal problem that involves human suffering, economic loss and a long-term impact on society and environment (McCormack, 2014; Fortun, 2012; Fujigaki, 2011).

In the case of the events at Fukushima, it could be considered to be one of the rarest of its kind, in which even no modern life intelligence could assess its real intensity and impact at the beginning. Until today, experts are not finding it simple to address exactly what happened at the nuclear accident site, coming up with different accounts of facts and conflicting viewpoints.

Having shared the first approach which tends more towards how disasters are thought of and opinions upon them formed, I wish now to share how the disaster has actually been phrased from a social science approach. Social science researchers often engage in the term "disaster" with the society as well as in the social system. Drabek states that "*disasters are non-routine social problems, non-routine problems distinguishes disasters as unusual and dramatic social happenings from the reservoir of everyday routines and concerns, largely originating within identifiable historical and social conditions*" (Drabek, 2006, p. 47).

This definition actually allows for exploring the various components of disaster which are placed in the society. It allows further, the assessment of how, and with what kind of impact it changes the society and the social system surrounding it. Seen as "acts of society," it tries to discover how societies contrast in handling responses to disasters and what kind of social orders they make in a local as well as global context (Strauss, 1978).

The second approach looks at the effect the social system had on the extent of the disaster. In a way, it classifies the disaster and even looks for disparities in the society, thereby making the human and social element inseparable.

This also bends towards the socio-technical disaster which highlights the interconnectedness of disasters that were not viewed as natural, as seen in the case of Fukushima, where the occurring of a natural disaster also took the shape of both technological and social disaster. So "*unlike natural disasters man made or socio-technical disasters involve a loss of control over processes perceived to be controllable and they involve identifiable parties to blame and hold accountable*" (Aini & Fakhrul- Razi, 2010, p.1288).

In the same vein, scholars Gill and Picou explain that "*Socio-technical disasters take place when there is a breakdown in technological and bureaucratic organisation system which leads to a destruction or contamination of the natural and built system*" (Gill & Picou, 1998, p.796). This directs us to the information on how disasters of today are seen across various sections of society and among various fields of academics, science and technology and even in the media.

A thorough explanation comes from Quarantelli who explains that socio-technical disasters involve a multitude of elements. It is not simply the suffering of the human, but also the environmental conditions, the socio-cultural system and the technologies framed in different settings, which contribute to the understanding of disasters with the interconnectedness of relationships.

Quarantelli, who uses Pelenda and Bates' terminology to explain about disasters with a strong human element and where the environment is involved:

*In a very real sense, socio cultural systems arise to prevent or control disasters and crises that threaten the survival and well-being of human population (. . .) disasters occur when one or more of the socio cultural systems that a population depends on fail to provide an adaptation to the environmental conditions which surround it, or when one of these systems produces, from within its own technological order, an event that threatens the population. The problem of understanding disasters then amounts to understanding the relationships between particular types of human systems and the environmental conditions to which they are related as adaptive devices.*

(Quarantelli, 2000, p.4)

Scholars also shape these as disasters originating in urbanization and industrialization since the 20th century and recognize them as a disaster constituting huge damage not only to nature but also impacting the social system.

*The 20th century has witnessed the emergence of a unique form of disaster that is disasters originating from technological and social agents. Examples include events at Buffalo Creek, United States (1972), Bhopal, India (1986), Chernobyl, Ukraine (1986), Three Mile Island, United States (1979) and Love Canal, United States (1979). Compared with natural disasters, these events were unique in that technology, organisations, and human culpability caused disastrous consequences for human communities. Erickson calls such events a "new species of trouble". Others have described them as man-made or technological*.

(Gill & Picou, 1998, p.796)

The very account puts the focus of disasters on society or the perception previously shared as an "act of society." The inability to separate manmade and natural disasters in today's scenario has questioned the way social systems function or, to put it directly — as the failure of social systems.

Recent examples such as the initial earthquake and subsequent tsunami in Japan, later followed by a nuclear accident or the case of Hurricane Katharina in the United States, where the damage goes beyond any economic and human suffering, has made it hard for scientists and academics to decode and to connect the dots (Olson, 2011).

With time, disasters are occurring and growing at an alarming rate. So has the enormous interest from academics and researchers in exploring the various epistemic events in a new way of thinking and breaking the social, technical and political features (Kimura, 2012). Without any doubt, disasters have become an interesting topic of departure for educational exploration that otherwise wouldn't have been easily possible (Fortun & Fickle, 2013). The ground of experts and the production of scientific knowledge and technological viewpoints that emerge by studying disasters, has given a new meaning to the field of social sciences to expose and solve the practical problems associated with disasters (Knowles, 2011).

Although disasters could be seen as non- routine social problems in which its scale of intensity is totally invisible, they "*highlight the multidirectional pathways that exist in society, which can enhance the flows of research findings and theoretical frameworks*" (Drabek, 2007, p.92). On the

other hand, disasters have harmful or negative effects on human society as well as on our environment, thereby exposing that disasters uncover our social constructions and culture more sharply than other significant events (Jasanoff & Kim, 2009).

For this reason, the overall research from a sociological perspective, surrounding the disasters has been focused on the social system involved, as well as on the efforts to reduce risk in order to minimize the intensity of the impact. This has been one of the core lines for STS researchers focusing on disasters, who alongside the local and global context of the issue, also draw parallel lines with the environment, politics, economics and media (Petucci, 2013). In the same light, organizational preparedness, disaster management or risk communication (emergency responses) are areas where scholars see investigation and solutions after disasters.

Disaster studies make themselves interesting for various reasons. The kind of scientific knowledge and technological production is in abundance for academics and scientists to work together with various industries. Particularly when a cloud of uncertainty makes no room for judgment, it gives way for future possibilities and institutions to collaborate. Equally, it sets the atmosphere for a valid interaction between lay and expert knowledge (Wynne, 1992) that brings the social system into the core of the debate and the role of various organizations on how they are operated and with what knowledge and experience they perform.

As O'Leary and Pidgeon describe, "*social system failures such as technological and organisational failures are at the heart of many disasters, and their normal operating procedures which can remain somewhat obscure in normal societal conditions are opened up for scrutiny and so analysis as a result of disasters*" ( O'Leary & Pidgeon, 2000, p.1). Finally, the importance of disaster studies also pitches social science scholars to understand how society associates itself with disasters and the kind of impact it has on society from previous disasters and the fear allied with it shared with how legal and media framework in our society adds to the entire picture of viewing and exploring disasters. All of this brings new light to bear on how disasters can be studied across various dimensions.

Having shared the debate on what a disaster actually is, and the two approaches on how disasters are thought of and opinions upon them formed from a sociological perspective, I now wish to put forward the further debate on a more STS-centric focus and highlight literature that connects STS and disasters, and with it connects the case of Japan's trifecta disaster.

It is noteworthy that disaster studies are relatively young compared to other subjects such as the public understanding of science, techno-scientific knowledge, technological policy and science communication, etc. Earlier, STS researchers had researched more on the linkage of STS and technology, including how it is shaped in our society. They further researched different aspects of science communication, exploring the bridge between lay and expert knowledge and the public, and how information is disseminated (Wynne, 1992; McCormack, 2014). However, studies concerning disasters remain buried or perhaps overlooked by leading philosophers and historians

of science and technology. Literature from major scholars like Latour, and Wajcman has not included any works that contribute to the field of science and technology in disaster studies.

In fact, in the past the focus had merely been on technology – its development, the actors and non-actors involved and how it inherits its space in society both temporally and globally.

Though understanding the gravity of disasters, Dutch STS scholar Bijker placed STS at the center of addressing such problems in the 21st century that binds the science and technology with social, political and the environment. He outlines:

*Sociological and historical studies have developed a more constructivist analysis of technology in contrast to the standard image of technology that was "technology determinist." The resulting social shaping models stress that technology does not follow its own momentum or rational goal-oriented problem solving path, but is instead shaped by social factors.*

(Bijker, 2006, p.109)

Debates primarily started to surface when disasters such as the Bhopal gas tragedy in India in 1984 and the Chernobyl nuclear accident in Ukraine in 1986 were researched by STS scholars and termed as 'socio-technical disasters'. Yet the overall STS research on topics concerning disasters remains quite thin compared to other STS research areas. Fortun and Frickle, who push for STS disaster studies, note "*To date, however, a synergistic body of STS research on disaster has not emerged*" (Fortun & Frickle, 2013, p.4).

The focus on the fact that socio-technical disasters are a series of events that create a multitude of interesting STS dimensions opens up various research arenas for STS scholars:

*Disasters are not only techno-scientific in their origins, but also unleash torrents of techno-scientific activity, directly and indirectly. These activities have included basic and applied research, policy innovations, technology development, the creation of new funding mechanisms, expert-lay collaborations, and the reorganisation of scientific networks. These recent examples leave little doubt that large-scale disasters contain wide ranging techno-scientific practices, knowledge, and incorporate multiple institutions and communities. They also suggest that the social dynamics of science and technology are deeply implicated in how governments, industries, legal systems, affected communities, and other social institutions deal with disaster, risk management, emergency response, and long term rescue.*

(Fortun & Frickle, 2013, p.4)

Arguing their point, they note that it is alarming "[…] *because STS theory and empirical findings clearly have great relevance in efforts to better understand how techno scientific knowledge, experts, and institutions condition and respond to catastrophic events and impact disaster policy*" (Fortun & Frickle, 2013, p.4). Hence with the growing interest over the years in the recent disasters, STS disaster studies has come to take center stage.

Sheila Jasanoff, the Pforzheimer Professor of Science and Technology Studies at the Harvard Kennedy School, extensively researched the Bhopal gas tragedy, however, a wide gap remained since her work on disaster studies until the Fukushima disaster surfaced. Even though other topics in the past like the Challenger explosion, Hurricane Katrina, and the Piper Alpha and Deepwater Horizon disasters also brought back the pitch for disaster studies on the table of STS, as of yet no comprehensive body of work exists on socio-technological disasters in STS.

The disaster at Japan's Fukushima has led to an enormous growth of attention on to covering disaster research in a way in which it was not previously studied. The topic of disasters seems to remain center stage, as, even after four years of the Fukushima disaster, workshops, public debates, and news coverage both from the East and West and public attention is very much visible. An STS forum named "*An STS Forum on the East Japan Disaster*" was created solely to concentrate on the 2011 Fukushima disaster on various dimensions with its workshop held in Japan as well as at the University of Berkley in the US (Fukushima Forum, 2013).

Scholars from the East and West share extensive information on the subject, especially at the STS Principal conference, the society for social studies of science conference (4S) ("4S Society for Social Studies of Science," n.d.), where numerous contemporary STS scholars presented the Fukushima case from a different perspective.

Recently, a web platform (http://disaster-sts-network.org) was also created by STS scholars and researchers to collaborate STS-centric debate on disaster (Disaster STS Network, n.d.) for further collaboration and discovery. Its aim:

*The Disaster-STS Research Network was formed to bring together researchers from around the world, from many different disciplines, concerned to better coordinate efforts to understand, anticipate, prevent, and respond to disaster. A key aim of the network is to build an empirically rich, theoretically attuned, comparative body of research on disaster -- with practical relevance.*

(Disaster STS Network, n.d.)

Even various STS publications and quarterlies have shed light on the STS disaster studies, with papers writing on the Fukushima disaster from different viewpoints. These different directions in the STS research mostly tend towards risk communication in disasters which also inclines its debate towards media, public understanding of science and challenges to Information and Communications Technology (ICT), disasters and accountability and the repercussions, which mainly focuses on the reconstruction in the aftermath of the disaster and the role of institutions and their relationships.

Japanese scholars like Shineha, whose work mainly focuses on the various dimensions and the representations about the disaster, in particular found in the arena of social media, have questioned the science communication issues of the disaster (Shineha, 2011). Shineha's work looked into how the communication of the crisis in Japan was perceived in different countries from the beginning when Japan was hit by an earthquake followed by a tsunami. All this paved a way

for conflicting information and therefore made this transform across the world from a case of a natural disaster to a human disaster (Plantin, 2015).

In the same tone, another thought-provoking approach is the public imagination of disasters and technology that rests with the association of media (both traditional and social) and science communication in the overall process. The debate has repeatedly questioned if the media, in general, should reconsider its methods of covering disasters.

The latest disaster of a Germanwings Airbus A320 crash in the French Alps has made the media take time for self-reflection on how it functions. The British national newspaper The Guardian brought up the subject in its "Comment is Free" section sharing. "*Incredible new facts, information and analysis have emerged hourly as the authorities respond to the demand from media and public for transparency. Thanks to breaking news we can see this process as it happens, instead of waiting for journalists to bundle it up in packages when it suits them… Presenters and reporters are learning the language of the hyperfast news cycle. They are more prepared to admit what they don't know*" (Robert & Beckett, 2015).

As this study moves on from how media and communication channels associate themselves with disasters, another interesting concept of disaster STS is that of the studies that relate to the post-disaster technical investigations, which is of "responsibility". The field of disaster STS studies finds that enquiry into disasters is an extension of the "*very techno-scientific mode of thinking*" that brings these nuclear power plants that are high-risk technological systems into actuality (McCormack, 2014). Disasters are regarded as a breaking point in which social vulnerability also shows up, thereby allowing the exploration of the social structure and issues of accountabilities behind the disasters which are beyond the blame game and in which various entities of socio-technical components are at fault.

As Scott Knowles shared in his presentation "Investigating 3.11: Disaster and the Politics of Expert Inquiry" at the STS forum on East Japan Disaster in 2013, "*Disasters also bring risks and their managers back into public view and under scrutiny, at least for a time. The rapid and confusing flow of events in the midst of a disaster makes it a difficult moment for the review of a particular risk and its history. As such, formal disaster investigations have long stood as the venues through which chronology, causality, and blame are allocated after a disaster*" (Knowles, 2013).

In this sense, the word "manmade" for nuclear technology points to the consequence of the 3/11 accident which is strongly criticized in terms of social justice. Such focus caused actors such as the operating company Tokyo Electric Power Company (TEPCO) and governmental institutions to face strong criticism and blame not only from the Japanese people, but also through a global outcry.

Yuko Fujigaki, one of the leading Japanese STS scholars for her research on the Fukushima disaster, focuses on the social responsibility of various experts, individuals or social institutions as a whole. By examining the idea and what the term "unexpectedness" means, she examines how it can be measured with the notion of responsibility in disasters (Fujigaki, 2011). She addresses gaps in opinions between various scientific professionals and how it led to a broad failure in the public's

understanding of the situation and risk at large, hence, the issue of social responsibility seems to be evident.

Jasanoff's collection of edited papers published in a book entitled '*Learning from Disasters: Risk Management after Bhopal 1994'*, address the repercussion of disasters and how reconstruction plays out across various scientific arenas (Jasanoff, 1998). She notes that, despite the complex relationship between society and technology, disasters are points of learning for power institutions in the social sphere in order to learn from failures. This implies that in socio-technical disasters, the role of change of power and learning within the society could change the way in which high-risk technologies are operated and hence this role could minimize the chances of disasters.

In the aftermath of disasters, the legal proceedings and the corresponding global and local settings also serve as a touchstone for dealing with numerous issues during the investigation and help construct an explanation of the disaster. A case for instance, which Fortun points out is the Union Carbide chemical plant disaster in Bhopal, India (Fortun, 2002) concentrating on the global supply of industrial dangers as a consequence of various legal measures.

In the case of the Fukushima nuclear disaster, the International Atomic Energy Agency (IAEA), an organization that serves as the world's central intergovernmental forum for scientific and technical co-operation in the nuclear field, was at the center of the debate as the "general public" across the world looked for factual information as to who was responsible. The IAEA as an agency is a crucial element in this work as it focuses upon the institution and how it produces knowledge, social and technological orders which will be discussed in further chapters. Since the disaster, the Agency has been faced with numerous weighted questions on how it collected information and data from its counterparts in Japan to overall responsibilities in handling the disaster.

While STS exploration focused strongly on the East Japan trifecta disaster, exploration on the IAEA front remained quite absent, which is the main reason I will focus on this institution which ties itself in the middle of the nuclear disaster and hence needs examination on how the social and policy implication of its actions were analyzed during and in the aftermath of the Fukushima disaster.

This also connects to the relationship between disasters and experts. Scott Gabriel Knowles' book '*The Disaster Experts: Mastering Risk in Modern America'* (Knowles, 2011) provides a great deal of information on the relationship between disasters and expertise. Knowles claims that numerous experts from public officials to scientists and engineers to world body institutions have repeatedly failed to find a solution or to recognize their failure in making society prepare for disasters. He debates who the experts are, how they influence decisions and despite the frequency of disasters increasing over time, nothing has changed and yet the experts' voice has become far more powerful.

Currently researching the Fukushima disaster, Knowles discusses how different experts - especially at the early phase of the disaster - came up with different narratives of the disaster and thereby

allowing the "general public" to receive different information, subjective to the narrative that suited them well and accounted (Knowles, 2011).

From the Chernobyl accident to Three Mile Island (TMI) and now with Fukushima, experts have held numerous narratives and yet as a collective they failed to meet solutions that deal with all dimensions of disasters, implying that nothing has changed in the way experts could provide more value in dealing with disasters.

The IAEA, too, comes into the picture as it not only acts as an inter-governmental institution but also provides expert knowledge on the nuclear industry. It came under massive scrutiny, especially from the media in the West and the public at large, for how it accounted expert knowledge, as with time, the disaster took different shapes across various dimensions affecting society and the environment in general.

A different approach was examined by Kimura (2012) who assessed how citizens became local experts through sharing knowledge on mass media and in this way created their own knowledge and expertise on the basis of different accounts shared by the public. This created confusion for some, but also helped many in the area of the episode to understand the situation. In a different light, Allen (2007) also examined how experts are being viewed studying expert knowledge and environmental justice in the repercussion of disasters. She draws light on how various groups compete for science from the community. She draws her parallels from Hurricane Katrina in her piece *Environmental Justice and Expert Knowledge in the Wake of a Disaster* on how different outside groups form as an entity, thereby allowing us to draw lines that become misinterpreted by individual experts.

# 3 Theoretical Framework

Having shared some of the most significant pieces of referential literature upon which this thesis is based, the following chapter will introduce the theoretical framework for thesis. In addition, I will also shed light on some of the main sensitizing concepts that will be used throughout the empirical analysis. In instituting a theoretical concept, STS researchers in general use various methodological tools, thereby, incorporating multiple empirical cases that allows a clearer understanding of the associations between science, technology, and society.

In the present case, the multidimensional and contextual nature of the case study calls for a theoretical understanding of the subject. Even though the case of understanding the communication activities of the IAEA in regard to the Fukushima nuclear crisis could have been examined from a number of different perspectives, I will use the theory of co-production as my central framework. This approach rests on the belief that scientific knowledge and technology are produced and shaped by people and institutions who may (or may not) have inbuilt biases, political intentions, and even a general lack of understanding on the subject (Jasanoff, 2014). With the goal to "*possess explanatory power about how new objects and phenomenon come into existence*" (Jasanoff, 2014), in particular, how science and technology can be made understandable across time, space and culture. It focuses further upon the ways in which controversies and disasters are shaped and fixed, and finally addresses how science and technology are given validity and significance especially in terms of the way we view the world.

Co-production, as will be explained in greater detail in the first section of this chapter, will not only build the case for investigation but also offer the reader a justification for this work in exploring the research question(s). It will help me to untangle relationships I seek to understand and to unpick complexities that have multiple meanings.

With regard to the sensitizing concepts, socio-technical imaginaries, boundary work and media framing will be used. Both boundary work and media framing will uncover the broader concept of public understanding of science, public policy and governance. These concepts will not solely be presented and explained, but will also be contextualized with regard to their use in the analysis of the empirical material.

## 3.1 Co-production

A key theoretical framework for this thesis is co-production, as defined in the book '*States of Knowledge. The Coproduction of Science and Social Order'*, edited and partly written by Sheila Jasanoff, a key figure most associated with the idiom of the co-production of knowledge (Jasanoff, 2004). In this thesis, a co-productionist approach will be used to explain the complex system in

which a policy institution is seen as an arena in which co-production itself takes place between knowledge orders, technology orders and social orders.

Co-production as an approach will explore how policy institutions contribute in different ways to the co-production of science and technology, how its forms have changed over time and how the very elements of the world are inseparable, pointing to the core of co-production theory, "*the proposition that the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it*" (Jasanoff, 2004, p.2).

The idiom of co-production has the purpose of getting away from both the deterministic view of science as separated from its social context, and also from social determinism itself. As an alternative, scientific knowledge is seen to be formed as an essential practice that involves both the scientific method and the social context. Clearly, guiding to the importance that scientific knowledge and technology are shaped by people and institutions, with inherent preferences, political reasons, and commonly imperfect understanding (Jasnoff, 2004).

At the same time, science and technology can validate and transform the power of the state and other institutions in critical ways. For instance, to present science as a purely social artefact with no link to external reality, or explaining the economy as the simply mechanical working of technology, does harm to the topic. Hence, the idea of co-production engages with questions that are both *metaphysical and epistemological* – how the world is, and how we find out about it – blurring the boundaries between the two, and providing interesting insight into the issue at hand.

This approach differs somewhat from the previous theories such as those promoted by the Edinburgh group, on the sociology of scientific knowledge (SSK) (Shapin, 1995). A key difference is that co-production does not propose that social context 'wins over' the scientific method. However, co-production sees both as integral to scientific knowledge, and this helps to understand the dynamics involved in it.

A more 'attention-grabbing' co-productionist account comes from Clark Miller, who examined the climate science and global political order through his approach. In his essay he sheds light upon the foremost climate science policy body, which is the Intergovernmental Panel on Climate Change (IPCC), noting that "*a co-productionist idiom attunes the analyst to ways in which micro- and macro-categories, actors and dynamics connect up, directing careful attention to how, in their day-to-day routines and practices, institutions like the IPCC simultaneously reconfigure their ideas, their institutional forms, and the cognitive and social landscapes they inhabit*" (Miller, 2004, p.48).

This understanding of the in-depth activity and dynamics of an institution where scientific knowledge plays a key role will help to analyze the history of the topic in its very context, as well as to understand the mechanisms of ongoing embedding of risk communication in this policy institute (IAEA). On a policy level, both of these aspects impact the formation and enacting of (soft) policies and regulations, as "*ways of knowing the world are inseparably linked to the ways in which people seek to organize and control it*" (Jasanoff, 2004, p.1).

In co-production theory, the developments through which knowledge of any orders, came to be acknowledged are of great interest, as: "*scientific knowledge, in particular, is not a transcendent mirror of reality",* but rather it *"(…) both embeds and is embedded in social identities, institutions, representations and discourses*" (Jasanoff, 2004, p.3).

The co-productionist approach will help discover how global narratives (in the case of this thesis, those that have become so persuasive to diverse, public and policy audiences, and those connecting up those global narratives under such institutional frameworks), have achieved social order. This overall exploration of the understanding of nature and society, in explicitly global terms, is very significant to the work of this thesis, and the lines drawn by co-production theory offer a more mature method of examining them.

As Clark Miller shares, "*co-productionist accounts emphasize the power of ideas in shaping world order. In this* [His use of the case of IPCC can be seen in parallel to that of the IAEA], *they build on recent neo-institutional approaches to international environmental politics, which highlight the role of scientific knowledge of transboundary environmental problems as a stimulus for the creation of new international institutions and regimes"* (Miller, 2004, p.50).

To explore those issues constantly at play in the case of the IAEA, another dimension, which is viewing the IAEA's role as an agent of co-production, could provide an interesting insight. Research in science and technology studies has established that global institutions (like the IAEA) play a significant role in enhancing the scientific integrity, especially in public contexts. As Clark uses Jasanoff's co-production approach whilst explaining the issues in force on the international environmental body, shares "*At a procedural level, legislative, executive and judicial bodies commonly participate in setting public standards for the conduct of policy-relevant scientific research, establishing criteria for scientific evidence in administrative and judicial proceedings, determining who counts as an expert in public forums, and demarcating boundaries between scientific and political authority*"(Miller, 2004; Jasnoff, 1990). Hence, this approach, placed in my research context will restore the various cultural norms and practices for securing trust and reliability to patch-up scientific and social uncertainty.

With the examination of various dimensions, as Jasanoff et al. have discussed, I will describe and use the four main objectives that shape the co-productionist theory, namely: description, explanation, normativity, and prediction. Each of these elements will be applied to a greater or lesser extent during the analysis of this thesis. (Jasanoff et al., 2004)

In "Learning from Fukushima", Pfotenhauer et al. claim that "*Efforts to explain what went wrong in Japan's nuclear disaster are doomed to fail if they seek to separate the social from the technological. Recognizing that all aspects of sociotechnical systems are intertwined is essential to developing wiser technology policies*" (Pfotenhauer et al., 2012). Therefore, focusing on the basis of co-production theory will assist this thesis in contributing to the aforementioned body of STS work, by keeping the very understanding of co-production intact, whilst providing an STS-informed

case study analysis towards understanding the communication behavior of the IAEA in the case of the Fukushima nuclear disaster.

It is also worth mentioning here that the analysis piloted for this research project cannot provide a full synopsis of all the impelling factors at play in the historical as well as the current and apparent co-production of various (knowledge, technological and social) orders in the IAEA (with regard to the Fukushima disaster).

Hereafter, this work merely intends to present a snapshot of the complex institutional co-production of various orders at play and thereby tries to bypass any kind of potential or possible cover-up which may have resulted from falsely supposing a deterministic passage of events. As well as this, it aims to comprise a wide range of actors involved and impacting factors, "organizational, material (and) embodied". The making and shaping of "identities, institutions, discourses, and representations" in a co-produced fashion will help gain "explanatory power" in portraying the IAEA, and the policies surrounding it (Jasanoff, 2004).

## 3.2 Sociotechnical Imaginaries

One of the most important sensitizing concepts used in this thesis is Jasanoff's theory of sociotechnical imaginaries, which is narrated with its relation to the research work and is thoroughly explained. It is recommended that this concept could help understand how nuclear technology and the IAEA as an agency (that works in close cooperation with nations worldwide to promote the safe, secure and peaceful use of nuclear technologies) have been positioned by various actors throughout their development and practice; and that these imaginaries have played a vital role in the social negotiation of this technology.

In her work, Jasanoff contributed to the development of this concept, in explaining that the theory could help to better analyze how various non-scientific actors and institutions (in this case, the IAEA) receive and encourage certain scientific and technological developments and agendas. As an analytical approach it will benefit the achievement of better understanding the relationship between the notions of power, and scientific and technological development. In the paper 'Containing the Atom', Jasanoff and Kim (2009) label sociotechnical imaginaries as "*collectively imagined forms of social life and social order reflected in the design and fulfilment of nation-specific scientific and/or technological projects*" (Jasanoff & Kim, 2009, p.2).

Research in the STS studies has focused on how these imaginaries intermingle with research and development practices, thereby impacting technological and scientific discourse, influencing expectations, and how they find themselves "*enacted in everyday practices*." (McGrail, 2010)

The concept of sociotechnical imaginaries allows us to explore issues from a broader perspective. It also opens up "time" as a dimension of exploration, as using "imaginaries" presents the option

of seeing how nuclear technology is taking itself from the past to the present, and how the IAEA has related itself to nuclear technology over the time. These imaginaries not only concern single individuals, but also take entire groups or even societies into consideration. Henceforth, sociotechnical imaginaries would guide us through a form of technological interpretation reflecting on the past, present; also considering how it could be seen in the future, making the concept an important part of my research work.

Furthermore, the concept of socio-technical imaginaries circles around the outset of technology and how technology and its other forms work together in the formation of national identities, which will be seen as an essential part of this work when researching the IAEA and focusing on Japan's triple disaster. The Japanese national identity and formation of nuclear technology in Japan is a visible element of this piece. This, as collective imaginaries, gives direct reference to policy-making as a whole, in the consideration of how nuclear imaginaries in techno-natural disasters, could be seen in Japan during the pre- and post-Fukushima world.

In her work focusing on policies of science and technology (S&T) Jasnoff and Kim notes that, "*S&T policies thus provide unique sites for exploring the role of political culture and practices in stabilizing particular imaginaries, as well as the resources that must be mobilized to represent technological trajectories as being in the 'national interest'*" (Jasanoff & Kim, 2009, p.3). Therefore, institutions play a huge role in defining what elements are 'for the public'. In other words, socio-technical imaginaries help to define which members of the public should know about the technology, who these S&T policies should serve as well as who should decide on such S&T policies, and how debates in this field are to be conducted and concluded.

This relation of imaginaries, as being part of witnessing social order, is perhaps the key explanation of such a theory, which Jasanoff refers to in the introduction of sociotechnical imaginaries:

*The concept of sociotechnical imaginaries builds in part on the growing recognition that the capacity to imagine futures is a crucial constitutive element in social and political life. Imagination is no longer seen as mere fantasy or illusion (Sarewitz, 1996), but as an important cultural resource that enables new forms of life by projecting positive goals and seeking to attain them. [...] imagination helps produce systems of meaning that enable collective interpretations of social reality (Castoriadis, 1987); it forms the basis for a shared sense of belonging and attachment to a political community (Anderson, 1991); [...] In short, imagination, viewed as ''an organized field of social practices,'' serves as a key ingredient in making social order (Appadurai, 1996; Taylor 2004).*

(As cited in Jasanoff & Kim, 2009, p.4)

In the same vein, Austrian STS scholar Ulrike Felt, in examining the case of nanotechnologies in Austria found sociotechnical imaginaries as relating to national techno-political cultures, thereby noting how social order is established with the development of technology. Felt explains "*Socio-technical imaginaries" (Jasanoff/Kim, 2009) seems an excellent sensitizing concept for studying how technologies relate to national techno-political cultures (Felt et al., 2010)–in this case Austria–*

*and how the (non)development or (non)implementation of specific technoscientific projects and imagined preferred ways of living and social order are mutually constitutive*" (Felt, 2015, p.106).

Similarly, the context of social imaginaries is of particular significance and is rationally linked with my research work on the IAEA and the Fukushima disaster. Social imaginaries are significantly substantial in *social resilience,* as Lamont and Hall argue that they "*are constitutive of the collective capabilities of a community or society*". They bind their members with accounts of past actions and also note how they comprehend what they are proficient in performing together. This leads to outlining *social resilience* as "*the capacity of groups of people bound together in organizations, classes, racial groups, communities, or nations to sustain and advance their well-being in the face of challenges*" (Lamont & Hall, 2013, p.6), they debate that such imaginaries can offer important resources for such research work.

Imaginaries play an important role in the way a society addresses issues relating to science and technology. It will help unpick how Japan's nuclear imaginaries have tirelessly encompassed certain ideals of science and technology, as the concept of sociotechnical imaginaries is defined as "*collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology"* (Jasanoff & Kim, 2009). Sociotechnical imaginaries assist in this approach, both as the ends of policy and as mechanisms of legitimation.

According to Jasanoff's Sociotechnical Imaginaries Project, these imaginaries can be observed in a number of policy contexts over the past decades (The Sociotechnical Imaginaries Project, 2013), which is one of the major reasons to use this theory, because of its close links to the STS concept of co-production.

As the Sociotechnical Imaginaries (STI) Project points out, these "(sociotechnical*) imaginaries help explain why, out of the universe of possibilities, some envisionings of scientific and social order tend to win support over others—in other words, why some orderings are co-produced at the expense of others*" (The Sociotechnical Imaginaries Project, 2013). Examples offered in the Harvard STI Project include nuclear power as a vision and source of peace (Eisenhower, 1953), an imagined democratic engagement between 'science' and the 'public' (UK House of Lords, 2000), and a conception of science and state, in which science must be politically separate (Bush, 1945), etc.

Sociotechnical imaginaries are therefore not largely distinct from the discourse, but are also commonly associated with movements of state power and the supervision of political dissension. Through the case study analysis, this thesis uses the theory to understand the interplay between the outlooks of nuclear imaginaries as a whole, within the IAEA and its communication strategy, with other diverse interests entangled within the organization.

Taking everything into account, the way in which these imaginaries have played out in various contexts become essential, to see how they unfold. As Sociotechnical Imaginaries Project notes: "*Case and controversy studies offer a potentially rich entry-point to sociotechnical imaginaries because they afford opportunities for documenting interactivity among diverse types of actors*

*deploying varying strategies in struggles to imagine and control the future*" (Harvard 2013). Through a contextual understanding and analysis of the interrelated practices that are involved, this thesis uses the concept of sociotechnical imaginaries to recognize what has unfolded over time, as well as seeking to gather essentials of the case study as an expression of these sociotechnical imaginaries.

In this context, the theoretical prism of socio-technical imaginaries allows for a more critical exploration of the communication channel units in the IAEA, with regard to Japan's triple disaster. This is achieved by not separating the social from the technological and thereby analyzing all aspects of the sociotechnical system (nuclear power technology) and national identity involved.

## 3.3 Boundary Work

A key concept underlined during the empirical work undertaken in this study, is the concept of boundary-work, used not only to describe policies but also to describe negotiation processes used by social entities active in shaping, endorsing and implementing guidelines regarding communication practices during the crisis in the IAEA. As detailed by Sociologist Thomas Gieryn, known for developing the concept of "boundary-work," in "*Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists*", *"Boundary-work" describes an ideological style found in scientists' attempts to create a public image for science by contrasting it favorably to non-scientific intellectual or technical activities*" (Gieryn, 1983, p.1).

The Gieryn paper allows researchers to emphasize that the very deliberations of the demarcation between science and non-science are "ideological" and that there are enough factors for scientists (or the scientific community) to erect over such boundaries both at variance for their own objectivity and the need for sovereignty. Even though the communication units of the IAEA, which is the arena of this research, are not necessarily defined as scientists (or part of the scientific community) by any explanation of the word, the empirical analysis will show that the interviewed role of such communication units is consistent with being representatives of the science constituting "scientific" practice, through a long-lasting segregation practice.

In the field of social sciences and in particular of STS, boundary work is theorized as an approach that primarily concentrates on the social functions of an organizations' words and discourses, how such organizations shape symbolic boundaries, and how an invisible flow of communication works along those blurred lines within the organization.

Using boundary work, which builds and upholds specific orders and to define who holds authority, in my case will particularly help to understand the very characteristics of the IAEA as an organization. The IAEA will be seen as an institution of science and policy, where construction of a social boundary that distinguishes certain intellectual activities, as well as those activities outside

that boundary, are very much visible. The way scientific and non-scientific practitioners work in one organization, the methods they apply, the stock of knowledge that is kept and generated, and the work management in which it places itself, drives the use of boundary-work in untangling these assemblies.

Understanding the most captivating accounts of an organizational apparatus behind its successful relation between environmental policy and science, is the *Report of the Workshop on Boundary Organizations in Environmental Policy and Science* from The Belfer Center for Science & International Affairs in 2000, which noted that "*Boundary organizations are institutions that straddle the shifting divide between politics and science. They draw their incentives from and produce outputs for principals in both domains and thus, it is hypothesized, facilitate the transfer of useful knowledge between science and policy*" (Guston et al., 2000, p.1).

In this context, boundary work has been found to be very useful with regard to policy-relevant applications in studying the strategic demarcation between political and scientific tasks in the arena of science policy. Sheila Jasanoff's work on the relationship between scientists and regulatory agencies is a good example of boundary work, as it finds the *blurring of boundaries between science and politics, rather than the intentional separation often advocated and practiced* (Guston et al., 2000). This can help to mark the way for a more productive policy making.

In the same manner, witnessing the role of the IAEA as a nuclear sciences authority is interesting to explore, as the organization speaks about the nuclear sciences and sets procedures as well as enjoying greater public support for being a United Nations agency, thus falling within the remit of the Charter. Thus, it constructs itself in a special space, expanding its own authority.

Another dimension where boundary work allows for the illumination of various roles and characteristics is that of the nuclear technology itself, as in how accepted it is, how safe it is, as well as whether it is in regulatory compliance or not. Such discourses give insight into how the nuclear technology processes are carried out. As STS scholar Kinsella notes:

*Such categorizations exemplify the active construction, enforcement, challenging, and reconfiguration of rhetorical boundaries (Kinsella, Kelly, & Kittle Autry, 2013). Sociological and rhetorical concepts of "boundary work" (Fisher, 1990; Gieryn, 1995; Kinsella, 2001; Taylor, 1994) help illuminate this negotiative process.*

(As cited in Kinsella, 2013, p.3)

In boundary work as a sensitizing concept, the outlining practices are not only used to draw a line between science and non-science, but also within what is reflected as being "science", by the actors involved (Gieryn, 1983). In this research, which concentrates more on boundary organizations, the concept provides an opening for the formation and use of boundary objects and the uniform assemblies and packages within. It also involves the participation of actors from both sides of the boundary, as well as specialists or experts who often function in a facilitating role and exist at the frontline of somewhat diverse social worlds of policymaking and science. However,

regardless of this they have distinct shapes of responsibility. Therefore, in conclusion, Gieryn describes that "Boundary-work" defines a conceptual style found in scientists' (or scientific communities') efforts to create a public image for science by making it favorable to non-scientific intellectuals or other technical activities. This thereby displays the construction and reconstruction of the very edges of social divisions.

## 3.4 Media Framing

One other concept that knits with my empirical work is media framing: examining how socio-technical disasters are perceived across different moments in time and which dominant subjects arise in the way that such disasters were covered. The subsequent result of the analysis could help reflect on the relationship between the IAEA and the media. Even though concentrating on the media in its entirety is not the sole purpose here, it is very helpful, given that the media is somewhat of a principal basis of information for the world community as a whole, especially as a source that has the biggest influences on public perception. This approach will allow for a better understanding of the various notions of the primary debate that merge with it, in this thesis.

In my empirical work, the interview of a prominent science editor of the Austria Press Agency (APA) will be used. The editor not only followed the IAEA closely, but also paid keen attention to the Fukushima disaster and the IAEA's communication response to the media and the public. The media frames theory traces its roots back to Goffman, as West notes: "*Goffman proposed the frame as a construct, for how people organise experience, suggesting that people practice frame analysis as a way of determining what is going on here. He referred to frame analysis as a 'slogan to refer to the organisation of experience*" (West, 2001, p. 62).

Goffman's theory of media frames permits one to recognize what is judged as relevant in the complexities of the debate and what is central in a given situation. This in turn permits the formation of a reality or proximity to the actual events. As Goffman himself notes, "*definitions of a situation are built up in accordance with principles of organisation which govern events (…) and our subjective involvement in them; frame is the word I use to refer to such of these basic elements as I am able to identify*" (Goffman, 1974, p. 10).

In the case of this thesis, not only does this concept help construct independently how various factors are interpreted in the social world we reside in, but also goes beyond. It helps to organize and structure reality, especially in terms of organizational communication and the process they are involved in. In the words of Gandy and Resse, "*framing is concerned with the way interests, communicators, sources, and culture combine to yield coherent ways of understanding the world…frames are organizing principles that are socially shared and persistent over time, that work symbolically to meaningfully structure the social world*" (Gandy et al., 2001, p. 11). This definition very much connects with the main theoretical framework of co-production which is being used for

the analysis in this paper. Here, it will help to reflect a media perspective into the overall debate. As such it will assist an understanding of what dominated the media and which subjects remained absent; drawing interesting lines on how the media saw the issues and thereby influenced public perception.

In their book '*Framing Public Life: Perspectives on Media and our Understanding of the Social World',* Reese, Grant and Gandy share their basis on how this concept can provide outstanding analysis. The key points that they share are:

• *Organizing: Framing varies in how successfully, comprehensively, or completely it organizes information.*

• *Principles: The frame is based on an abstract principle and is not the same as the texts through which it manifests itself.*

• *Shared: The frame must be shared on some level for it to be significant and communicable.*

• *Persistent: The significance of frames lies in their durability; their persistent and routine use over time.*

• *Symbolically: The frame is revealed in symbolic forms of expression.*

• *Structure: Frames are organized by providing identifiable patterns or structures, which can vary in complexity.*

(In Gandy et al., 2001, p.11)

These points open a new window to analyze the public information unit of the IAEA that largely associates its role with public and media relations. This ties in with the interview of the science editor of APA, which will illuminate the various notions of frames that exist in tandem with the media analysis.

In short, the concept of framing unlocks a significant field of exploration concerning how specifically the media builds subjects, discourses and sense of the overall Fukushima disaster. On the other side, it will also help to reveal what subjects the media missed in their coverage and to what extent the media regards the IAEA as an organization or an authority on nuclear power. Entman describes this respectively as an "*information-processing schemata of individuals and attributes of the news itself*" (Entman, 1991, p. 7).

Despite the fact that this thesis will not analyze any news articles from media organizations (besides the media centric interview of the science editor at APA), it is worth noting how frames in media organizations are constructed. This necessarily includes studying the kind of language being used, selection of their sources/resources, how balanced their reporting is and what is missing from media coverage, all of which is equally as interesting as what they have written about. All of the aforementioned affect the public understanding of the subject as media constructs a specific reality.

As Entman, who combines communication and journalism for his work, notes, "*frames call attention to some aspects of reality while obscuring other elements, which might lead audiences to have different reactions*" (Entman, 1993, p.55).

Similarly, other scholars share a like conception of how media shapes actors (in the case in discussion here, it shapes the organization - the IAEA) and ties reality through their construction of particular frames. As Bauer et al. share:

*Like a picture frame, media framing allows for the inclusion and exclusion of certain content which changes how one views the picture. A picture's frame defines its boundaries, and at the same time influences the appearance of the content by managing the inclusion and exclusion of information and thus defining its bias. Changing the frame changes the contextual environment and the meaning of the picture.*

(Bauer et al., 2006, pp.129)

Media frames theory, used particularly in cases of sociotechnical disasters, has allowed a great deal of analysis, especially as the public connects itself to the news and as "*mainstream news is a vital conduct of information to the lay public and to policymakers (…) news story frames highlight certain factors and thereby define problems and promote particular interpretations*" (Antilla, 2010, p.241).

These additional characteristics of the theory have been further developed by other scholars such as Nisbet, whose extraordinary work on analyzing the public perception of stem cells established that media framing of an issue is not just some theoretical act but can actually influence public understanding of a topic and henceforth the future policies associated with the subject.

The parallel to this, within this thesis, is the press advisory written by the public information unit of the IAEA for the media. The language of the document needs to be studied in its entirety and analyzed accordingly through media frames theory. As stated by Antilla, "*how news organisations translate facts and frame their articles builds meaning and significance - or socially constructs the issue in the public sphere. The selection of stories by journalists can help shape public policy as well as influence public support for or against measures*" (Antilla, 2010, p. 241).

To conclude, media frames theory, exclusively in the case of understanding the communication activities of the IAEA with regard to the case of the Fukushima nuclear disaster as a socio-technical disaster, will expose the connection between the IAEA and the media, not just as two separate units but will also highlight their interrelation with each other.

# 4 Introduction to the IAEA and its communication activities on Fukushima Nuclear Crisis

At the core of my research work is the United Nations (UN) agency the International Atomic Energy Agency (IAEA) that "*serves as the world's central intergovernmental forum for scientific and technical co-operation in the nuclear field, and as the international inspectorate for the application of nuclear safeguards and verification measures covering civilian nuclear programs"* (IAEA n.d.).

For the reader it is important to get acquainted with the IAEA as an organization, as it is crucial to understand how the inter-governmental organization communicated during the various stages of Fukushima triple disaster through the Agency's emergency preparedness mechanism. In order to better grasp IAEA's communication strategies throughout the different phases of the Fukushima triple disaster, it is essential to understand IAEA as an intergovernmental organization in the nuclear field.

The IAEA defines its role: "*to work for the safe, secure and peaceful uses of nuclear science and technology",* maintaining that its roles contribute to "*global peace and security*" ("IAEA Our Work," n.d.). On its official website, the organization shares its mission statement:

*The IAEA is an independent intergovernmental, science and technology-based organization, in the United Nations family, that serves as the global focal point for nuclear cooperation, assists its Member States, in the context of social and economic goals, in planning for and using nuclear science and technology for various peaceful purposes, including the generation of electricity, and facilitates the transfer of such technology and knowledge in a sustainable manner to developing Member States; and also develops nuclear safety standards and, based on these standards, promotes the achievement and maintenance of high levels of safety in applications of nuclear energy, as well as the protection of human health and the environment against ionizing radiation.*

(IAEA Mission Statement n.d.)

The IAEA communicates as part of its professional service during nuclear emergencies on a regular basis with the aim to keep the world up-to-date with information on the risks and impacts of disasters. It serves as the world's hub for cooperation in the nuclear field; the IAEA is the nucleus around which all other parts of the global nuclear governance system revolve, aiming at promoting safe, secure and peaceful nuclear technologies (Findlay, 2012).

The International Agency's genesis started on 8th December 1953, when United States' President Eisenhower in his "Atoms for Peace" speech, addressed the United Nations General Assembly and proposed its establishment, under the aegis of the United Nations. It was in July 1957 that the Agency was formally established, though independently of the United Nations through its own international treaty, the IAEA Statute. It reports to both the United Nations General Assembly as well as the Security Council (Trevor, 2012). Without doubt, the history of the IAEA as an

organization is inevitably linked with the evolution of nuclear technology. As David Fisher, who compiled one of the most noted books on the IAEA as an organization, 'History of the International Atomic Energy Agency: the first forty years,' explains that "*The IAEA was created in response to the deep fears and great expectations resulting from the discovery of nuclear energy, fears and expectations that have changed profoundly since 1945 and continue to fluctuate. As a result, what the IAEA is asked to do about nuclear energy, and indeed, what it can do and does, are much affected by the vicissitudes of national moods, international politics and technological change.*" (Fisher, 1997, p.1)

The IAEA's assets are distinctively connected to those of a single, yet controversial technology that could be used either as one of the most environmentally friendly source of energy or in the making of the destructive force formed from nuclear reactions. Nuclear technology has nearly endless capability to cause harm but at the same time has practically inestimable potential to produce the energy upon which the world will progressively hinge in future centuries to better the state of affairs concerning quality of life and overall growth of its rising populace.

Figure 4: UN Vienna International Centre in Vienna, the headquarters of the IAEA. (UN Photo by Mark Garten)
Source: UN Vienna International Centre

Over the decades, the IAEA has placed itself at center stage through its various programs like the development of the peaceful applications of nuclear technology, providing international safeguards against misuse of nuclear technology and nuclear materials, and promoting nuclear safety (together with radiation protection) and nuclear security standards and their implementation (Fisher, 1997). The Agency was awarded with the Nobel Peace Prize in the year of 2005 jointly with its former Director General, Mohamed ElBaradei (The Nobel Peace Prize 2005 n.d.).

Tasked by the United Nations (UN) to independently monitor nuclear technology related matters, the IAEA has the ability to make independent assessments of nuclear safety and its outside role on the nuclear industry allows it to be an unbiased marketer of nuclear energy for countries where it is fitting, reasonable and subject to the success of essential milestones.

The IAEA, as a professional agency regulated by a special agreement with the UN, has a strong science and technology orientation. Its activities on nuclear safeguards and related verification actions seem unparalleled.

With various technological disasters that have taken place, it has become a wider known fact that ever since its response to the nuclear reactor explosion and disaster near Chernobyl, Ukraine in 1986, the Agency intensified its efforts in the field of nuclear safety. The same happened after Japan's Fukushima nuclear disaster in 2011, after which the intergovernmental forum for scientific and technical cooperation in the peaceful use of nuclear technology and nuclear power worldwide redoubled its efforts under the current Director General Yukiya Amano.

## Activities of the IAEA

It would be pertinent to briefly introduce the main areas where the IAEA performs its activities, which are: Technical Cooperation, Research and Development, Nuclear Power (Energy & Electricity), Nuclear Safety and Security, Safeguards and Governance and Management.

Technical Cooperation: The IAEA supports nuclear-related cooperative projects, achieving tangible social and economic benefits for people mainly in developing countries. In its website it notes, "*Many channels and partnerships provide expert services, specialized equipment, fellowship training as well as specialized training courses, meetings or workshops and other types of technical assistance support when requested by Member States.*" ("IAEA Our Work," n.d.)

Research & Development: The IAEA works on various research and development projects on serious problems facing developing countries together with institutions and laboratories across the world. The IAEA website shares that its work "*targets food and agriculture, human health, water resources, marine and terrestrial environmental concerns, physical and chemical applications, Programme of Action for Cancer Therapy (PACT) and where nuclear and radiation technologies can make a difference. In 1961 the IAEA opened its Laboratory in Seibersdorf, Austria, creating a channel for cooperative global nuclear research"* ("IAEA Our Work," n.d.).

Nuclear Power (Energy & Electricity): This has been the IAEA's major activity in making resources available for various nations in need of energy, which includes nuclear generation of electricity. With its research and development team, it uses advanced technologies dynamics to help meet the world's rising energy needs. With regard to this, the IAEA claims that "*Enlarging the benefits of the peaceful uses of nuclear science and technology is a fundamental mandate for the Agency by improving Member States national nuclear power infrastructures and programmes and evaluating the need for possible replacement technology within countries and/or possible decommissioning and other uses such as desalination and hydrogen production. The Agency will*

*coordinate cooperative research, promote information exchange and analyse technical data and results for various reactor lines (such as advanced water cooled reactors, high temperature gas cooled reactors, liquid metal cooled reactors and accelerator driven systems), and for innovative nuclear energy systems (INS) including small and medium sized reactors"* ("IAEA Our Work," n.d.).

Nuclear Safety and Security: One of the major tasks for the IAEA is setting and encouraging the application of international safety standards for the supervision and regulation of activities involving nuclear and radioactive materials.

*"The IAEA's work has set the framework for cooperative efforts to build and strengthen an international safety and security regime and includes advisory international standards, codes, and guides; binding international conventions; international peer reviews to evaluate national operations, capabilities, and infrastructures; and an international system of emergency preparedness and response… The focus is on helping States prevent, detect, and respond to terrorist or other malicious acts - such as illegal possession, use, transfer, and trafficking - and to protect nuclear installations and transport against sabotage*" ("IAEA Our Work," n.d.). Past nuclear accidents have made the organization revisit its nuclear safety parameters involving member states.

Safeguards: Safeguards has been a very key area which the IAEA has been working. The IAEA is the world's nuclear inspectorate, inspecting nuclear and related facilities under safeguard agreements with 164 States. As such these States have internationally committed themselves not to possess nuclear weapons.

According to the IAEA, "*They* (Member States) *are concluded pursuant to the global Treaty on the Non-Proliferation of Nuclear Weapons (NPT), for which the IAEA is the verification authority. The strengthened safeguards system, based on "comprehensive" safeguards agreements and "Additional protocols" to those agreements, has established a new and higher standard for effective, co-operative verification of States' nuclear undertakings and comprises measures by which the IAEA independently verifies the declarations made by States about their nuclear material and activities."* ("IAEA Our Work," n.d.; "IAEA Archives in detail," n.d.)

Governance & Management: This activity of the IAEA forms the most significant part of the research conducted here, even though the IAEA has widened its scope to focus upon policy making, budget and finance, conference services, personnel, public information and information management. The focus of this research is on the public information and information management unit, which also contains the news center department, including media advisories, communication and press releases. More detailed information on this will be shared at a later stage of this chapter. For now, focus will briefly shift to the structure of the IAEA as an organization.

## 4.1 Structure of the IAEA

The three main organs of the Agency are the General Conference, the Board of Governors and the Secretariat. The information below on these three organs of the Agency mainly comes from their website (iaea.org).

The General Conference contains the 164 Member States as of July 2016. A general conference happens once a year among the member states, which not only reviews the work of the agency, but also gives guidance on future programs, approves applications for membership, approves reports to United Nations organs and elects members to the Board of Governors. The agency's budget is submitted to the Conference for approval (iaea.org n.d.).

The Board of Governors: This organ of the agency is mostly comprised of the executives, concerning the issues related to membership and the Agency's work program. In a nutshell, it is a policymaking body which includes the 35-member Board of Governors and the General Conference comprising all Member States.

It is under the policymaking body that the Board of the IAEA approves all safeguards agreements, safety standards and other important projects during its five meetings that take place at its headquarters at the Vienna International Centre (VIC) in Austria.

The Secretariat: The Secretariat, which is under the leadership of the Director General (DG) of the IAEA, is responsible for the administration and implementation of the Agency's program. The DG is assisted by six Deputy Directors General, each head of a department (Management, Nuclear Applications, Technical Cooperation, Safeguards, Nuclear Energy and Nuclear Safety).

This organ of the IAEA mostly concentrates the entire professional workgroup of the IAEA and its headquarters and regional offices in various locations across the globe. It also includes the IAEA's research and development team and its centers and scientific laboratories in Vienna and Seibersdorf, Austria; Monaco; and Trieste, Italy. "*The Secretariat also makes great use of the advice of experts in the various fields of nuclear technology. About 15 conferences, symposia and seminars, about 170 advisory groups, technical committees and specialists' meetings and about 100 research coordination meetings on specific problems meet each year*" ("IAEA Our Work," n.d.; "IAEA Archives in detail," n.d.).

In the future, the IAEA further proposes to modernize its management and administrative methods and techniques to carry out the 'IAEA mandate', and the acceptance of specific changes in its internal administrative structure and working measures. The purpose of this is to ensure that the IAEA will be ready to assume the new duties and directives to be assigned by its Member States and will implement them with greater competence. According to the IAEA report "20/20 Vision for the Future," the Secretariat "*will continue to vigorously pursue opportunities to improve its efficiency, both in its program activities, as well as in its management practices. In the timeframe to 2020, it will redouble its efforts through an institutionalized "quest for efficiency", adopting*

*proven practices while keeping its focus on its core activities and those which it can bring a high added value*" (IAEA, 2008).

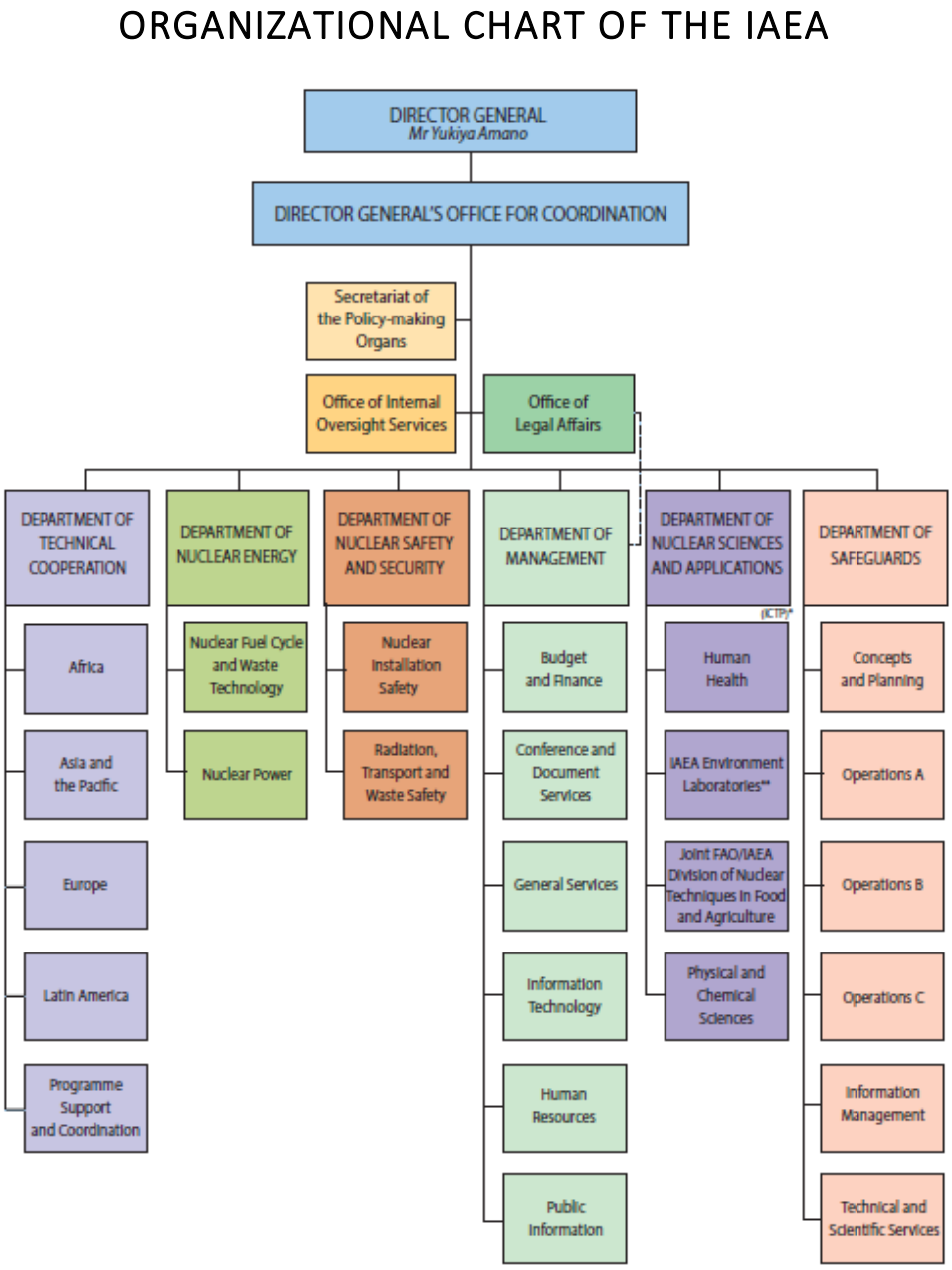



Figure 5: The organizational structure of the IAEA with the names of the various units under each department. The Public Information unit under the Department of Management and the IEC unit under the Department of Nuclear Safety and Security together are of key interest. Source: IAEA Organizational Structure

Moreover, there are two units of the IAEA which are of particular research interest in this thesis: The Incident and Emergency Centre (IEC), (which comes under the Department of Nuclear Safety and Security and the Division of Public Information) and the Office of Public Information and Communication (which comes under the Office of Management in the organizational structure of

the IAEA). In an event of a nuclear accident the IEC and Public Information Unit work closely and intensely together. First the IEC gives information to the Public Information Unit and later the Public Information Unit passes that information on in a formulated way to the media and to the public at large.

The Incident and Emergency Centre (IEC), as the IAEA notes in its website, "*is the global focal point for emergency preparedness and response for nuclear and radiological safety or security related incidents, emergencies, threats or events of media interest. The IEC is also the world's centre for coordination of international assistance in emergency preparedness and response*" ("IAEA IEC," n.d.).

It was in 2005 that the IAEA announced the establishment of the IEC. The decision to craft an integrated Centre within the IAEA had become more pressing with the upsurge in the use of nuclear applications, as well as sensitive concern over the malicious use of nuclear or radioactive materials. Even though the Emergency preparedness and response (EPR) competences had existed within the IAEA since 1959, further enhancements were necessary after the accident at Ukraine's Chernobyl Nuclear Power Plant in 1986 and the accident at Japan's Fukushima Daiichi Nuclear Power Plant in 2011. The major functions of the IEC include the developing of the Emergency preparedness and response (EPR) related safety standards, thereby providing guidance and tools to support Member States as well as the international organizations ("IAEA IEC," n.d.). It also develops methodologies for crisis and consequence management, thereby providing assistance to Member States in their efforts to build capacity and ensuring that the Secretariat's staff members are adept to react efficiently. As a focal point for emergency response, including the provision of emergency assistance - regardless of the cause, the IEC prepares for and responds to nuclear or radiological incidents and emergencies which occur in relation to a facility or an activity.

It is the IEC's role within the IAEA that has come under scrutiny following the Fukushima tragedy. The IEC functions under several different levels of operation. During the time of the Fukushima crisis, "*the Early Notification and Assistance Conventions (ENAC) website and the Nuclear Events Web-based System were available for distributing information to member states"* (Trevor 2012) together with the Response Assistance Network (RANET), intended to be a global repository of information on national assistance accessible in case of a nuclear accident. It was in June 2011, during the Fukushima crisis, that the IEC launched its new Unified System for Information Exchange in Incidents and Emergencies (USIE), which was under development since 2009, replacing the two old systems which were present during the Fukushima period.

The role of the IEC is to determine the rating of a nuclear emergency, through which the IAEA confirms whether a particular nuclear event of given intensity, is indeed a nuclear incident or an

accident. In the case of the Fukushima nuclear disaster, the IEC notified, and classed it as level 7, terming as “Major Accident” in its International Nuclear and Radiological Event Scale.

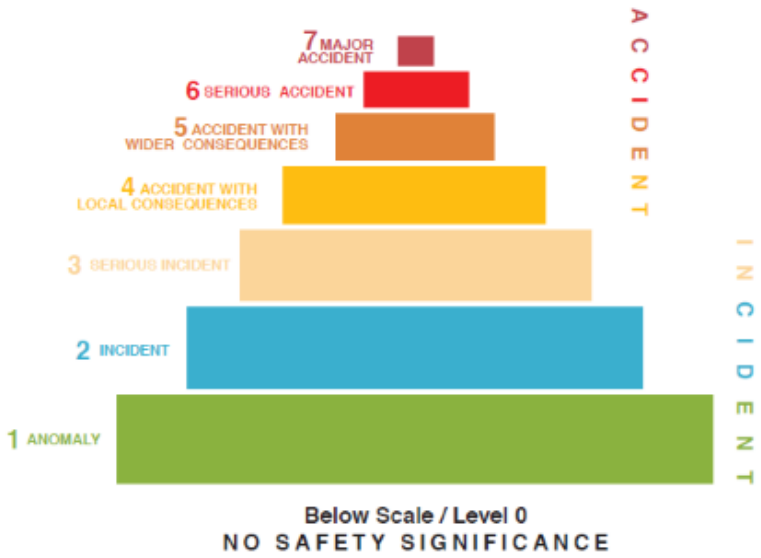



Figure 6: International Nuclear and Radiological Event Scale. Source: (Findlay, 2012, p.27)

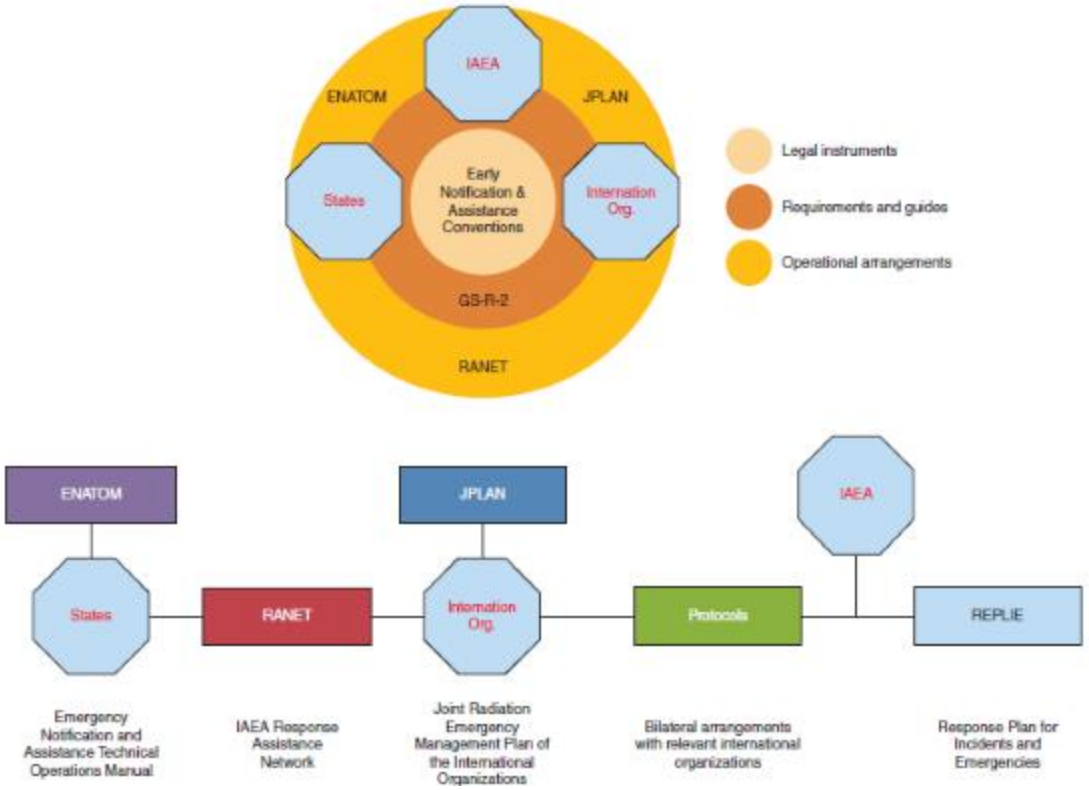



Figure 7: Elements of the IAEA Emergency Preparedness and Response Framework for Nuclear and Radiological Incidents and Emergencies. Source: (IAEA, 2011)

## 4.2 IAEA's Division of Public Information

Now we turn to the second area of the IAEA, which is of most interest to this study: **the Division of Public Information**, which is divided into two sections: The first is the Media and Outreach Section which generates news stories that *positively highlight IAEA's activities* and at the same time work towards the understanding of nuclear issues, including the various applications they publish. This operating environment is very dynamic, participative and interactive, dealing with longer-term promotional campaigns, as well as crisis communications on issues of global importance. The second is the Press and Public Information Officer, who actively supports the spokesperson and senior IAEA staff in generating news stories highlighting IAEA activities. This includes the media advisories, press releases, podcasts, videos, IAEA Bulletin and other news related sections.

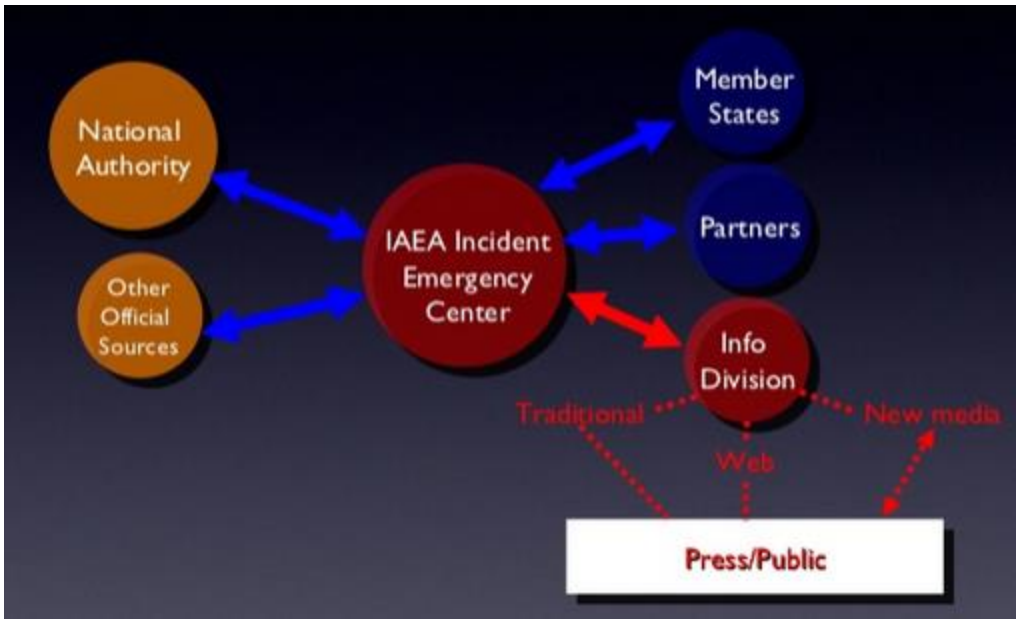



Figure 8: IEC and Info Division in direct link in the organizational structure of the IAEA. Source: (Rodolfo, 09:28:33 UTC)

As the website of the IAEA has been redesigned between 2011 and 2015, the current version shows a special section called 'Topics in Focus,' which highlights all information about Fukushima. It focuses on the current activity of the IAEA, and documentation is seen under the "Fukushima Nuclear Accident" section. The division of Public Information's main functions are media relations, outreach activities, management of the IAEA's public website and the production of periodicals, including the IAEA Bulletin featuring magazine and related information material designed for general readers.

The world's eyes were focused on the only official global establishment that notified us of the time, location and the nature of the event, as well as acting credibly in providing crucial information on the activity involved, the general characteristics of radioactive release, monitoring

conditions, and protective actions while predicting behavior of radioactive release at Fukushima. The IAEA's team of experts dealt with strengthening the international response to nuclear accidents by providing a mechanism for rapid information exchange in order to minimize radiological consequences.

As the Fukushima triple disaster unfolded, the IAEA's public information division was under constant watch by the media and "the general public" who were eager for information; especially within the first few weeks of the accident. The world wanted swift information on a real-time basis on the latest occurrences in Fukushima. This was indeed understandable, given that the risks of radiation and nuclear failure pose massive consequences to human life and the environment.

Even though the Division of Public Information at the IAEA maintained in its activity report on Fukushima that continuous emergency communications with the media and general public took place from March 11 to April 22, the department even had a purpose-built emergency update website (called the Alert Log) also activated on March 11 (IAEA, 2011; Findlay 2012). However, with thousands of telephone calls, emails and netizens looking for information on the IAEA's website – the massive volume of traffic made for a very unusual event at the IAEA's headquarters. The IAEA's website was down due to massive load on its Webservers.

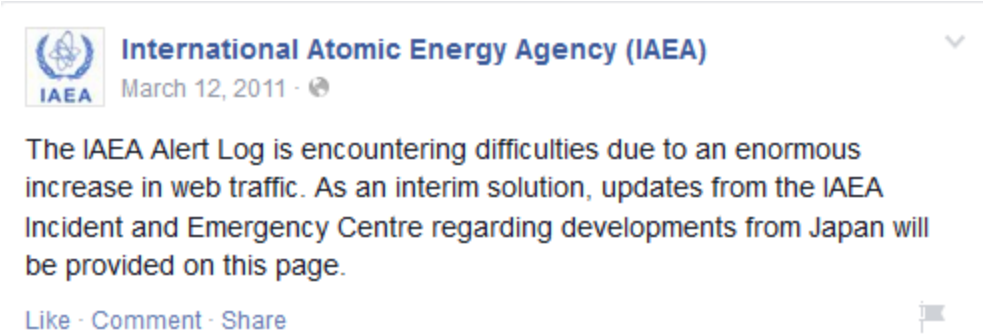



Figure 9: IAEA's Facebook Page shares the news that its online communication was hit with difficulties on March 12, 2011. Source: (IAEA Facebook, 2011)

The Nature magazine, in its hard-hitting piece 'Nuclear agency faces reform calls', (Brumfiel, 2011) noted a month later, after the Fukushima accident that, "*from the name, one might expect the International Atomic Energy Agency (IAEA) to have been a major force in the response to the Fukushima nuclear crisis in Japan. Instead, its performance was sluggish and sometimes confusing, drawing calls for the agency — an independent organization that advises the United Nations — to take a more proactive role in nuclear safety.*"

The deteriorating situation at the Fukushima nuclear power plant put the IAEA under pressure, with the media reporting different accounts around-the-clock, with some even criticizing the functioning of the IAEA with regard to the flow of information and complaining that the Agency did not rush to help Japan as soon as the crisis hit.

With citizens and world governments becoming immediately concerned with the news coming out of Japan, it was clearly imperative that Japanese bureaucrats become more transparent in their crisis communication. As Ionescu explains, "*news channels and newspapers invited dozens of experts in nuclear technology to provide public explanations of what was occurring at Fukushima. Seeking to provide accurate and reliable explanations of the events, the invited experts often had to assemble their own expert teams to elaborate a coherent story prior to their broadcasts… Unfortunately for public audiences, the multitude of explanations that emerged created more confusion than clarification*" (Ionescu, 2012, p.1).

Even though the IAEA, in accordance with its relationship with its member states, provided a defense of itself by stating that it has no power to either force member states to prepare for nuclear emergencies, or to impose itself upon them when emergencies do occur, this however, does put the handling of nuclear emergencies in a state of limbo.

The IAEA was in an imbroglio, faced with global criticism as an international regulatory body failing to communicate effectively with the world. Amidst the mounting international pressure, the IAEA did put Japan's nuclear regulatory authority TEPCO (Tokyo Electric Power Company, Incorporated) in the spotlight for further cooperation. The James Martin Center for Nonproliferation Studies (CNS) notes in a factsheet to the IAEA's conference, "*Some Western states as well as media within Japan called the IAEA's response too slow, confusing and dependent on information from Japan. Many experts, however, countered that the IAEA cannot accomplish a great deal without a mandate for enforcement of safety standards or receiving more resources to implement safety programs"* (CNS, 2012).

The IAEA, though, in the later days opened various communication channels and had near 24/7 support with the help of its temporary staff in its headquarters. In fact, the Fukushima crisis was the first time that the IAEA had used social media networks to expand its reach and intensify its monitoring efforts. As Trevor Findlay notes, "*Service was eventually restored, but in the meantime, the Agency expanded its use of social media such as Twitter and Facebook to bring updates to the public. From March 15, the department arranged 16 press conferences and drafted over 120 updates for the Agency's website (IAEA, 2011). The Agency did eventually begin to produce its own charts based on its own expertise and monitoring efforts, as well as satellite imagery purchased commercially"* (Findlay, 2012; IAEA, 2011).

In the days following the accident, the agency issued over 260 updates on its website (iaea.org) and had over 120 update reports with daily media briefings as well as issuing media advisories as part of their emergency response. Despite the fact that it has been almost five years since the accident, news of radiation risks and IAEA's public information notes on the current situation are constantly followed, in the post-Fukushima phase, by the media and "the public."

The Fukushima accident totally shook public confidence regarding the safety of nuclear power. The "global community" criticized the information dissemination methods of the nuclear power

infrastructure (Traer, 2016), asserting that they must learn how to resourcefully communicate to the public and advance better routes for public risk communication.

A journal of the IAEA explained the development of risk communication in nuclear technology, outlining that, "[…] *to this day, many still believe risk communication is just a matter of making information understandable. This is particularly true in fields like nuclear technology, strongly influenced by people with scientific and engineering backgrounds. For decades this approach has failed, and most risk communication experts say it is inadequate. The perception of risk, and the behaviors that result, are a matter of both the facts and our feelings and instincts and personal life circumstances. Communication that offers the facts but fails to account for the affective side of our risk perceptions is simply incomplete*" (IAEA Bulletin, 2006).

There is no doubt that that the global control of emergency preparedness and response has progressed since the Chernobyl catastrophe, from absence to a multifaceted web of treaties, provisions and measures, within which the IAEA is seen as a central actor. However, the system still seems divided and it is often unclear as to who is holding the most responsibility for informing the public (Findlay, 2012). Leave aside the inadequacies of the member states (in this case of Japan), the IAEA's own nuclear emergency preparedness and response system faced its greatest test so far with Fukushima and it seemed that it had utterly failed.

Trevor Findlay, in his book, '*Unleashing the Nuclear Watchdog: Strengthening and Reform of the IAEA*,' gives an account of Fukushima's role with regard to IAEA, explaining that:

*Criticism of the Agency's performance as the expected provider of information and analysis to member states, the media and general public during the Fukushima crisis — "the global focal point for nuclear cooperation" (UN, 2011c: 15) — has been widespread, some of it justified, some not. Deadly dull technical briefings and uninspired media performances did nothing to enhance the Agency's reputation. What the Agency really needed was a telegenic spokesperson to sell the Agency's message confidently, in the style of White House spokespersons. In this information-saturated age, the IAEA needs a more professional, media-savvy approach if it is to continue to credibly claim to be the "hub" of anything. Information provided by the Agency needs to be readily accessible by a general public whose level of understanding of nuclear matters is low and often ill-informed.*

(Findlay T, 2012, p.30)

Moreover, some observers like Olli Heinonen and Findlay have noticed that the IAEA was slower even in providing facts and figures that were already available to them (Harrell, 2011; Findlay 2012). Indeed, the IAEA could have prepared itself in advance and shared the information with the world. As former IAEA Deputy Director General Olli Heinonen notes, the Agency "*should give its own independent assessment using all the information that is available. If information isn't available the agency should seek it actively*" (Brumfiel, 2011). This would have helped to inform the world on various figures with regard to the dangers posed by natural events to nuclear reactors and the numerous safety methods that are in place.

The IAEA worked out several meetings and conferences since the Fukushima crisis and in many such sessions, they shared that various lessons were learned and that the security of nuclear plants and public communication is now a priority more than ever.

It was also the first time that the IAEA's Incident and Emergency Centre (IEC) launched a new secure web-based communications platform to unify and simplify information exchange during nuclear or radiological emergencies. "*The Unified System for Information Exchange on Incidents and Emergencies (USIE) has been in development since 2009 but was actually launched in June 2011 during the emergency response to the accident at the Fukushima Daiichi nuclear power plant. It replaces two existing communication systems: the Emergency Notification and Assistance Convention (ENAC) website, and the Nuclear Event Web-based System (NEWS)"* ("New IAEA system," 2011).

In the post-Fukushima period, the IAEA communicated the following key message: "*The IAEA secretariat is to provide Member States, international organizations and the general public with timely, clear, factually correct, objective and easily understandable information during a nuclear emergency on its potential consequences, including analysis of available information and prognosis of possible scenario based on evidence, scientific knowledge and the capabilities of Member States"* (Flory, 2012).

Accepting its challenges, the IAEA from its communication of the Fukushima disaster noted that their "*INES as a communication tool did not play its role: it should be reviewed and improved to make it more effective"* (Flory, 2012).

The IAEA has undergone significant reforms since the Fukushima accident, in the belief that by communicating the remediation and rebuilding programs, it could lessen some uncertainties, and offer greater confidence in the decisions being made. Without any doubt, the IAEA now seems to identify this need. As it confessed in one of its annual report for 2010 (although only released in 2011) "*The main lesson learned is that the general public considers that the work of the Agency is highly sensitive and that its impact is significant for the safety and security of the international community. It is thus important to provide accurate and timely information on major developments in the nuclear field. This is why the Agency has to continue to improve its outreach capacity*" (IAEA, 2011).

The "general public" is a challenging stockholder because citizens are deeply split regarding the acceptability and value of nuclear power generation and tends to express its feelings. A bulletin of the IAEA notes "*In this context, however, one important stakeholder has been under-appreciated, under-utilized and somewhat misunderstood: the general public. The nuclear power infrastructure must learn how to efficiently communicate to the public and develop better options for public risk communication that relate to deliberate attacks or accidents"* (IAEA 48/1Bulletin 2006).

Since its outset, the IAEA has organized numerous '*IAEA Action Plan on Nuclear Safety*' meetings where participants like the Member States' parliaments, emergency response agencies, nuclear regulatory, safety and technical support organizations, as well as nuclear power plant operators,

international organizations, non-governmental organizations and the media participated from over 60 countries, with the objective of the meeting *"to identify and analyze lessons learned from that accident and discuss best practices for improving the dissemination of information"* ("Experts discuss better nuclear disaster communication," n.d.).

At the time of writing, the IAEA's comprehensive report on the Fukushima nuclear accident was not made public. Therefore, even in the post-Fukushima Action Plan we have not seen who holds responsibility for handling issues related to the correct and timely information under such a nuclear emergency and nor do we know the players or treaties involved. Given the situation, there is an important need for the IAEA's Secretariat to review its unclear illustration on communication activities that act as a stimulus to its emergency response framework (Brumfiel, 2011). The international public and media are likely to be confused and skeptical if a situation like Fukushima happens again.

In accordance with the new developments, "*these organizations should implement programs that raise awareness among the public about the risk and benefits of nuclear energy and provide technical information that is understandable to the general public"* (Alba L. Pineda-Solano et al., 2013). In this way, an informed society will be less impacted by the potential flaws in the information communicated through the media when an accident occurs. However, if the policy makers do not diagnose further actions to recover public trust, any attempt to globally cooperate on a nuclear crisis will be much more difficult, putting the entire nuclear industry in a state of limbo.

# 5 Timeline[2]: Fukushima Nuclear Crisis from IAEA's perspective and other related events

In order to correctly understand the event and storyline narrated above, the case in question, and for a good understanding of how the Fukushima nuclear crisis developed over time with IAEA's role, certain key moments have been extracted below for the sake of clarity. They predominantly include significant events that will guide the reader through all the phases of Fukushima with regard to IAEA's involvement.

March 11, 2011: Japan was confronted with a triple disaster (Earthquake, Tsunami and triggering of a meltdown at the Fukushima Daiichi nuclear power plant). The Fukushima Daiichi nuclear accident occurred after a 9.0 magnitude Tōhoku earthquake and subsequent tsunami on 11 March 2011, only 14 days before the reactor was to be shut down. The Fukushima Daiichi was a multi-reactor nuclear power site in the Fukushima Prefecture of Japan. This offshore earthquake, near the island of Honshu, produced a large tsunami in Japan, and a tsunami warning for over 20 countries within and around the Pacific Rim.

As the Fukushima Daiichi nuclear power station is located in the Pacific Ocean coast, following the earthquake and tsunami, the plant received huge damage. Mainly, the piping facility in the building, the facilities for the external power supply and backup power were destroyed in the plant. By the next day (12 March), the leakage of radioactive materials had been found in front of the main gate of the Fukushima Daiichi nuclear power plant. This led to a series of unfortunate events and caused the nuclear accident. According to data from TEPCO, the amount of radioactive materials released into the air were 770,000 tera Becquerel (in short Bq, which is the SI derived unit of radioactivity) until the beginning of the next month of the accident. The rating of the accident level increased from 5 to 7, which is the same level as the Chernobyl nuclear accident.

Japanese authorities did inform the IAEA's Incident and Emergency Centre of an emergency situation at its Fukushima Daiichi nuclear power plant.

March 11, 2011 – April 5, 2011:

The situation at the Fukushima Daiichi nuclear power plant was very serious with the Japanese government declaring an emergency, alerting the world to major consequences affecting human life and the environment.

Right from the first day (March 11) of the emergency, the IAEA started to get itself involved.

[2] This timeline is based on the significant events that occurred during the Fukushima nuclear crisis and how the IAEA was involved with context to its emergency preparedness response. Events are listed keeping in view of the research work that carried forward.

During the crisis period, IAEA gave multiple technical briefings to the media and constant alert logs from its website as well as using social media to raise awareness among "the public." The IAEA received information from various official sources (such as TEPCO) in Japan through the Japanese national competent authority, the Nuclear and Industrial Safety Agency (NISA).

Radiation levels were climbing during this period, with technical briefings from the IAEA on an almost daily basis. It was during this period that the IAEA was criticized by the international community for its weak communication and for being seemingly incapable of taking any significant action much to alleviate the crisis.

IAEA moved to Twitter and Facebook as well as other new media channels for more effective communication - updating every source, after failing to satisfy the public's initial thirst for communication.

## April 5, 2011

The disaster inspired change in China and Germany within the context of their policy on nuclear power plants. Beijing rethought its nuclear safety strategy, while Berlin remained in favor of using nuclear energy.

## May 17, 2011

The IAEA announced that it was sending an international expert fact-finding mission to Japan, tasked with carrying out a preliminary assessment of the safety issues linked with the Fukushima Daiichi plant and the overall triple disaster. It was decided that the international experts from the IAEA would share their experience and expertise in their fields of competence with the Japanese authorities.

## June 20, 2011 – June 24, 2011

The IAEA hosted a five-day Ministerial Conference on Nuclear Safety to discuss issues related to improving nuclear safety around the world following the Fukushima accident. The conference acted as an international follow-up to the accident and included lessons learned to strengthen nuclear safety worldwide.

## September 11, 2011

The IAEA's Director General gave a statement on behalf of IAEA's Member States endorsing the Agency's Action Plan on Nuclear Safety for achievable actions post-Fukushima and stressed the need for further transparency. He noted that, "*We must not lose our sense of urgency. Public expectations are very high.*"

## September 22, 2011

The IAEA projects slower nuclear growth after Fukushima. Noting that the Fukushima Daiichi nuclear accident "*caused deep public anxiety throughout the world and damaged confidence in*

*nuclear power.*" Various countries publicized reviews of their programs. Some took steps to phase out nuclear power totally while others re-emphasized their extension policies.

## November 4, 2011

Nuclear experts discussed IAEA's operational safety reviews and lessons learned post-Fukushima.

## November 15, 2011

The IAEA issued a final report on its first assessment of the strategy and outlined plans under consideration by Japanese authorities to remediate the areas off-site from the Fukushima Daiichi nuclear power plant.

## January 31, 2012

The IAEA expert team completed its mission to review Japan's nuclear power plant safety assessment process.

## March 11, 2012

This date marked one year since the accident and the IAEA stressed the need for further cooperation and the strengthening of efforts for nuclear safety.

## May 2012

The IAEA published a book on Communication with the Public in a Nuclear or Radiological Emergency for Emergency Preparedness and Response. The book forms part of the research material which will be analyzed in the following chapter.

## June 18, 2012 – June 21, 2012

The IAEA hosted a three-day International Experts' Meeting on Enhancing Transparency and Communication Effectiveness in the Event of a Nuclear or Radiological Emergency. Experts shared views and experiences on public communication during major emergencies such as the Fukushima Daiichi, Chernobyl and Three Mile Island accidents, as well as radiological incidents and natural catastrophes.

## August 2, 2012

Nuclear information went mobile as the IAEA nuclear information system launched its mobile version of the website, thereby helping it to target a new audience for further engagement. It is the main source of nuclear information and contains over 3.4 million bibliographic records with 440 000 full-text documents available online. The material shared on this platform is important to governments, academic and research institutes and private firms.

## December 15, 2012

The Fukushima Ministerial Conference on Nuclear Safety closed with calls for continuous improvement and vigilance to further strengthen nuclear safety worldwide. IAEA noted that the conference provided a tremendous opportunity to share knowledge and lessons learned from Fukushima, to promote and enhance transparency and to discuss the progress of international efforts in strengthening nuclear safety.

## May 23, 2013

The IAEA delivered a final report to Japan after the initial review of plans to decommission Fukushima Daiichi.

## July 26, 2013

The IAEA undertook its expert mission to Japan, for further cooperation in radiation monitoring and remediation at Fukushima.

## January 24, 2014

The IAEA handed Japan the final report from an expert mission that reviewed remediation efforts in areas affected by the Fukushima Daiichi accident.

## September 23, 2014

The IAEA's Incident and Emergency Centre held a conference on boosting preparedness and response through emergency drills at its Vienna headquarters.

## May 14, 2015

The IAEA delivered a major report on the Fukushima accident to the Member States. The 240-page report assessed the causes and consequences of the accident triggered by a huge tsunami that followed a massive earthquake on 11 March 2011. It was the worst emergency at a nuclear plant since the Chernobyl disaster a quarter of a century earlier.

## June 8, 2015

The IAEA announced its preparation of the comprehensive report on the Fukushima Daiichi accident scheduled to be made public at the IAEA General Conference in September 2015, involving some 180 experts from 42 IAEA Member States and several other organizations. "*The report represents an authoritative, factual and balanced assessment of what happened at Fukushima Daiichi that should also be accessible for a non-technical audience*," the IAEA Director General Yukiya Amano stated.

(Faireley, 2012; Felt, 2016; "Fukushima: What Happened?," n.d.; "IAEA News Center," n.d.; Fukushima: A Timeline of Significant Events n.d.; Findlay, 2012)


Figure 10: IAEA'S Fukushima in Focus News Center. Source: (IAEA website, 2015)

The IAEA devoted a special web portal on its website focusing on the Fukushima nuclear accident. One can see from the image, the IAEA's site includes news, press releases, media advisories, reports, updates and emergency preparedness activities performed since the event unfolded.

# 6 Research Questions

Having expounded an overview of the relevant theoretical literature, the theoretical framework and the main concepts used for this research project as well as providing a detailed introduction to the IAEA and its communication activities on the Fukushima nuclear crisis, I would now like to continue with the introduction of the research question(s) underlying the empirical analysis.

## Research Questions

The main aim of this research project is to study crisis communication especially as new media channels are shaping new dimensions and integrating into the crisis management and communication process. Moments when there is a breakdown of crisis communication and organizational level support to deal with emergencies is not effective, such moments of crisis communication are also moments in which one can observe the co-production of knowledge orders and societal orders. In the situation of a techno-natural disaster, observing the communication activities (particularly crisis communication) of an organization that situates itself in a global setting is a vital aspect of this research. Using the example of the Fukushima nuclear disaster as a case study, the work of this paper is to examine how the Fukushima nuclear disaster was communicated by the IAEA to the wider world; and with that, the relationship between public policy, social knowledge and societal orders that situate themselves within the Agency.

An important element - time - also needs to be studied, with regard to how different notions and methods of storytelling have changed over time within the IAEA. The research will observe what steps the IAEA has taken post-Fukushima. Have things changed over time with regard to its communication operations? This includes examining the measures that they have taken to build in, and to bring nuclear risk communication to the forefront of their strategy among member states, as well as highlighting what the IAEA seems to have missed with regards to its engagement with the media and the "general public" within the context of Fukushima.

With this, the research undertaken here will be able to witness co-production in the making. From an STS perspective, the communication units in the IAEA should be seen as an arena in which co-production occurs between knowledge orders, technology orders and social orders. Hence, it is important to project the ways in which these different venues contribute in different methods of co-production of science and technology.

Deriving from the fact that scientific knowledge and technological artifacts are defined in a certain social order that is influenced by both cultural and political institutions, it is important to know what is co-produced by the IAEA (as a global organization under the framework of the United Nations) within the nuclear context.

This clearly will explain the very components of co-production:

*Description: a view of science in society and society in science*

*Explanation: how co-production mitigates*

*Normativity: the analysis of various emerging orders*

*Prediction: prediction and action*

(Miller, 2004; Jasanoff, 2004)

When looking at the IAEA, another dimension also becomes crucial to study. As to how the IAEA as a policy institute constructs or imagines the public and the logic behind its communication. The Fukushima nuclear disaster placed the world in a state of major environmental crisis, yet the public's thirst for constant information regarding such a harmful event seemed unending. Furthermore, the work undertaken here will also consist of observing and understanding the role of the IAEA, through which it performs its actions, especially in conducting risk communication during a nuclear crisis. By narrowing down my research on the different communication channels which they have in place, I will be approaching the organization as a global player. This research project will also aspire to examine how the IAEA constructs its image and solidifies its risk communication position.

The principal research question for this project comes to the fore naturally: How do IAEA's communication activities allow to see how techno scientific and societal orders are co-produced in a situation of a techno-natural disaster?

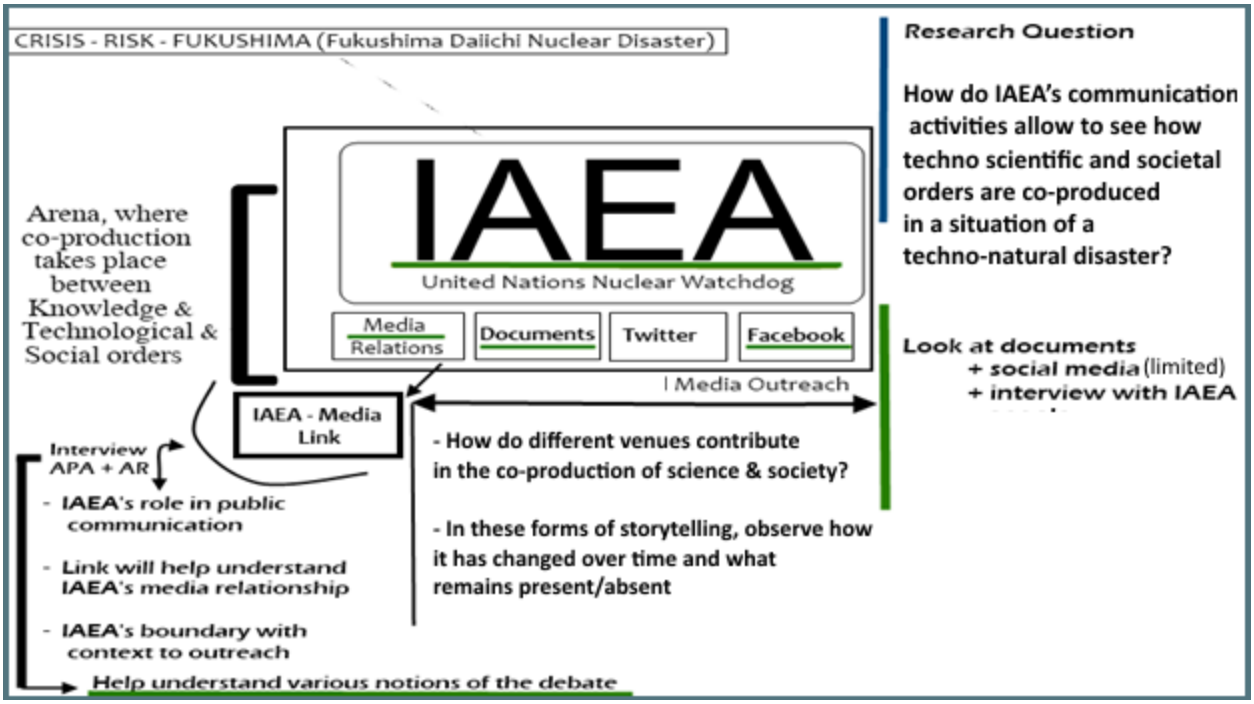



Figure 11: The above image shows the description of the research work

Relating now the main theoretical framework and the various dimensions of the sensitizing concepts that are used, it is possible to define more specific sub-questions, which I have clustered

into three main groups: co-production of various orders and practices, organization and global setting seen through time as an element and finally, decoding IAEA/media links that relate to the public understanding of science.

## Coproduction of various orders and practices

Harboring an interest in the co-production of knowledge, technological and social orders, the immediate focus dwells mostly on the practices and forms of negotiations which take place in the IAEA. This will help to view 'Mode 2' in the making, which is the production of knowledge through the dynamics of science and research in modern societies — a move from *extreme technological determinism and social constructivism* to a more general understanding of how society and technology 'co-produce' each other (Jasnoff, 2004). This dynamic interaction between technology and society is highly significant to observe and understand, as it relates to how technical experts and other groups in society generate new knowledge and technologies together within the IAEA.

Here, it would be pertinent also to refer to the work on "lab studies" carried out (Latour & Woolgar, 1986 [1979]; Knorr, 1981) in order to understand knowledge production, which notes that it is important to examine practices and how they are related to the local and global context. Therefore, viewing the IAEA as a laboratory, where knowledge is created through its various scientific programs, allows one to view the Agency as an established scientific setting. The IAEA has its own laboratories close to its Vienna headquarters which focus on Nuclear Sciences and Applications (NA) and Safeguards (SG), while the other located in Monaco focuses on the environment, mainly marine environment and radioecology.

The laboratories of the IAEA can rightly be called sites where the production of knowledge takes place regularly. The IAEA produces a variety of scientific documents that highlight the interaction between knowledge and instruments, making the case, as Marianne de Laet describes, "*That instruments have substantial impact on the knowledge that their researchers and experts generate. Or they look at the resonances between lab and popular imagery, arguing that the borders between these spheres are leaky and that influences go both ways*" ("STS: An Insider's Perspective," n.d.). This allows us to study and ask what kind of practices are being described. It subsequently permits attempting to connect them to research and knowledge production as well as establishing how the member states involve themselves with the IAEA is presented during the interview. With this, I hope to achieve a fine-tuned understanding of what it means to conduct research and to produce knowledge as well as how the IAEA positions itself, and how the activities that they undertake are related in a global context.

Similarly, focusing on the kind of practices that shape the working of the IAEA allows the possibility of gaining an impression as to how far various orders are negotiated in the setting and reflect upon the entire machinery of knowledge production. Additionally, it is then interesting to observe if they draw boundaries (Gieryn, 1983) to other forms of practicing, and what, in turn, that opens up and closes down within the context of knowledge production. Hence, the sub-questions about co-production of various orders and practices are formulated as such:

- *How do different venues contribute in different ways to the co-production of Science & Technology?*
- *In forms of storytelling (IAEA's documents and media relations), what is present or absent?*
- *How do the communication channels in the IAEA participate in the co-production of science and technology and science in society?*

## Boundary work in the organization as well as global setting seen through time as an element

This cluster opens up a series of questions mostly with regard to the way the IAEA is viewed as an international organization. This will help to analyze how collaboration and organization is imagined and what this tells us about the structures as well as the boundaries of IAEA's communication on the Fukushima disaster. From that perspective, it is interesting to ask:

- *How does the IAEA see itself as an organization with global "authority"?*
- *How does the IAEA position itself within the context of its role in the Fukushima nuclear disaster?*
- *What kind of communication model does the IAEA use?*
- *How have forms of storytelling within the context of risk communication changed over time?*
- *What is the IAEA's boundary (limitation) with context to its outreach?*

## Public understanding of science — decoding the IAEA/media link

Finally, the third cluster focuses on the public understanding of science and relates to the media. The media acts as a key link between the nuclear agency and the public — playing a dominant role in all phases of a nuclear emergency with a wider notion of public understanding of science. Various questions can be decoded from the IAEA/media link, as Nelkin notes in circumstances in which demand for the communication of risks from authorities to the public, that the media represents "*both a source of information and an indicator of public opinion*" (Nelkin, 1989). Through the narration of the Fukushima disaster by a media editor, I can reflect on such questions:

- *What is IAEA's role in public communication?*
- *How will the IAEA/media link help to understand various notions of the debate and IAEA's media relationship?*
- *How is the construction of the public imagined by the IAEA?*

# 7 Materials and Methods

This chapter will introduce the materials and methods that were used to answer these research questions on an empirical level, and how the data produced from this research was analyzed.

## Entering the Field

## Qualitative Interviews & Document Analysis

In order to approach these research questions, the empirical analysis of this research work rests on data generated via two qualitative methods, i.e. semi-structured qualitative interviews and document analysis. These two qualitative methods are intertwined in the narration, and they equally contribute and balance the empirical analysis. The primary source used for data generation for this research project was a collection of three semi-structured qualitative interviews with key actors having different roles surrounding the topic of this research. Therefore, gathering and analyzing the views of these actors was crucial to the research project. I shall now discuss in greater detail how these methods were applied recurrently to generate data.

Conducting formal, but semi-structured interviews was perhaps the ideal method to obtain necessary and substantive data in order to address the above research questions and issues around the overall debate. Mainly by "talking through" the major aspects of the matter and related issues with the major stakeholders, I succeeded in obtaining very insightful and well-versed answers to some of the research questions.

Interviews are among the most challenging and rewarding forms of measurement in social science research work. My research work includes interviews with experts who play a significant role in generating information on the issue as well as on other perspectives. As a qualitative methodology, interviews will not only help to understand the communication channels of the IAEA, and how the IAEA co-produced various orders but it will also touch upon a series of related topics on various aspects of the research that would contribute to understanding these issues in much greater detail. These in-depth methods of studying through interviews will help elicit information in order to achieve a holistic understanding of the interviewee's point of view or situation and it can also be used to explore interesting areas for further investigation.

The interviews were directed and examined according to the procedures defined by David Silverman in his book about qualitative research: '*Interpreting Qualitative Data. Methods for Analyzing Talk, Text and Interaction*'. During the interviews with the three participants, ample chance was given to them to elaborate on their subjects of priority relating to the research topic. A strong focus was also placed upon the most relevant research questions and topics that would help generate a sound analysis. Even though the roles of the three interviewees are very different, some similar questions were used in all of the interviews in order to obtain a general consensus on the research topic. While the sequence of the questions was diverse, it fitted with the natural

flow of the conversation, and the individual follow-up questions were asked whenever necessary, with interviewees asked to elaborate as much as possible. This point is referred to here, as whenever the conversation was breaking or slowing down, or if I felt that major points of the research had not been addressed, it was necessary to return to the general questioning in order to give the interviewee a route back to the rhythm of explanatory answering (Silverman, 2006).

The language used in the process of arranging the interviewees as well as in interviewing was English. This point is addressed here since the research work was conducted in the Austrian capital of Vienna, where German is the official language. Even though only one interviewee was of Austrian nationality, there were no complexities with regard to conducting the interviews in English. All three interviewees are experts in their fields and are of international stature. The initial contact was made by sending all participants a brief e-mail with a description of my research work and thereby requesting their time for a face-to-face meeting.

The three semi-structured interviews were conducted between the months of May and November 2014, which included weeks of negotiating with context to the time of meeting, nature of the interview and explaining other details. Each of the interviews lasted approximately one hour and a half. The conversations were recorded by an audio recording device and were later transcribed for further analysis.

Conducting interviews in this personalized way allowed complex topics to be addressed in such a style as to intensify the interviewee's trust, and thus craft a greater directness and sincerity, as Bridget Bryne points out in her text "Qualitative Interviewing." This often enables the interviewer to bring up themes and other facets related to the research that the interviewees would otherwise have felt unwilling to talk about at first. In this way, the flow of the conversation was not disturbed to a great level, and a more effective interview environment is achieved, in which interviewees may be more willing to share their opinions and interpretations. As Byrne notes in her book, this kind of open-ended interview is a strong method particularly for gaining knowledge about the interviewees' assertiveness towards the subject and expert observations. This is a major part of my research interest with regards to understanding the communication behavior of the IAEA in the case of the Fukushima nuclear crisis (Byrne, 2004).

This, of course, allowed me to focus mostly on the conversation, rather than on note-taking; a technique outlined in "Making and Managing Audio Recordings" by Duncan Branley (Branley, 2004). All three interview partners (Christian Müller Science Editor at APA, Peter Rickwood of Atomic Reporters and one anonymous Source from the IAEA) authorized the recordings.

Anonymity was offered to one of the interviewees upon his/her request. This interviewee holds a prominent position and wanted to avoid using his/her name, which would have put me in the difficult position of also having to be careful about statements I would have made about his/her role relating to my research. Further, I will brief each of the interviewees in detail as well as share my journey in interviewing them and explain why they fit best for this research.

## The Interviewees

In the following section, it will be helpful to acquaint the reader with the interviewees participating in the empirical part of the research project. Special focus is placed upon the role they play in their position and expertise they have in their fields which correlates with my research topic. Firstly, I interviewed an information broker whose organization helps journalists and media improve their understanding of the coverage of nuclear issues; acting as a bridge between the nuclear community (also the IAEA) and the media community. Secondly, I interviewed a science editor who followed the IAEA and the Fukushima nuclear crisis for the purposes of reporting upon it and also gave a strong media perspective. Finally, I interviewed a source in the IAEA who shared deep knowledge about the IAEA as an organization and how the IAEA as an agency saw the Fukushima communication story. All interviews were held in Vienna, Austria.

### 1st Interviewee: Peter Rickwood (Referred to as PR in the analysis chapter)

I started the research journey by talking to Peter Rickwood of Atomic Reporters. Atomic Reporters (AR) is an independent and non-partisan organization established in Canada as a non-profit organization with its base of operations in Vienna, Austria. Atomic Reporters "*acts as an information broker improving journalistic understanding and coverage of nuclear issues. Policymakers themselves need to be better-informed as does the general public."* (Atomic Reporters n.d.). It supports the interests of journalists and the media in obtaining better access to information relevant to the public. Peter Rickwood is the chief at AR. He also serves as the adviser for public information at the IAEA at the UN Vienna International Centre (VIC). The interview with Mr. Rickwood, who also served as press officer and Media Outreach and Public officer at the IAEA for several years, was a key link in understanding various notions of the IAEA and UN's institutional communication in general and how the IAEA communicates during nuclear emergencies both in vertical and horizontal perspectives. Atomic Reporters were established to encourage and support better-informed and more accurate reporting about nuclear-related issues, especially for a fact-based resource for reporters, particularly when there are major events in the nuclear world that require better public understanding.

AR also notes on its website: "*AR provides resources for journalists reporting stories about nuclear weapons proliferation, the safety of nuclear power, security, and other related topics. As an independent body it sustains worldwide network of journalists, particularly those working in non-industrialized countries, is a key purpose*" (Atomic Reporters, n.d.).

Peter Rickwood provided a great deal of insight into this multifaceted topic. Rickwood, through both his organization as well as his experience at the IAEA, has also carried out a substantial amount of professional work on the issue of nuclear communication which has been extremely instructional in terms of discerning IAEA's policy in this matter, and establishing the leitmotifs and the investigative viewpoints of this thesis. Additionally, the historical accounts he provided not only enriched my understanding of the subject but also opened up roles of major stakeholders who are still active on this topic. Overall, from the face-to-face interview and by reading some of

his literature on the issue, a broad picture emerged of IAEA's emergency communication role and the policy institute's functioning and position on various subjects.

Following this, I approached one of the other key influential figures in my research who dealt with the issue from a media viewpoint.

## 2nd Interviewee: Christian Müller (Referred to as CM in the analysis chapter)

In the second phase, the IAEA/media link was unraveled - which answered a multitude of questions posed in a separate chapter devoted to my analysis as 'Decoding IAEA-media link.' For this, it was necessary to interview a prominent media personality who follows the IAEA regularly and has followed Japan's triple disaster very closely. During the time of approaching such a media personality, fortunately, I was working as an International media researcher at the Austria Press Agency (APA or Austria Presse Agentur), which is the leading provider of news coverage in Austria. During my work, I was well acquainted with the Agency's Science Department. I was briefed about Christian Müller, the Science Editor at Austria Press Agency who followed the IAEA and Fukushima story for APA quite extensively. Mr. Müller started his career in journalism in 1986 and since 1989 has been working in the field of science and education. Since 2000, he has been the head of APA Science, and his work won him the Austrian State Prize for Scientific Journalism in 2006 (APA Campus, n.d.). Upon our various meetings, I inquired as to whether he was willing to undertake a face-to-face interview for my research. I was prepared for the eventuality that he may not have sufficient availability to schedule a face-to-face interview. Surprisingly, he promptly accepted my request and following several days of negotiating over a final date and time we were able to arrange a face-to-face interview several weeks later, where he elaborated on a variety of subjects, which, in STS terms, would emerge as themes within the context to the IAEA's media outlook and the media's role in the Fukushima nuclear crisis.

Briefly summarizing the Austria Press Agency (APA); it has grown to become one of the most economically successful government-independent news agencies in the world. There are 15 Austrian newspapers and the national broadcaster ORF (Österreichischer Rundfunk) which owns the agency and guarantees its future independence and unbiased reporting. They provide real-time coverage across the world in the form of video, audio, articles and photographs.

This also being a semi-structured interview helped to understand from a media perspective; how the media views public communication, which was handled by the UN nuclear agency with regard to the Fukushima nuclear crisis. The interview with Christian Müller not only helped in understanding various notions of the debate but also projected some light to gray areas I wished to analyze. Hence, by interviewing Mr. Müller, I grasped firsthand information about how the media views the IAEA and its communication channels. With the interesting insight provided by Mr. Müller, the exposition of the media perspective, in many ways essential to this study, was extremely fruitful.

Having conducted two interviews according to my field work planning, it was time for the final interview, which will be named simply as "the Source" as the interviewee requested anonymity.

### 3rd Interviewee: Source from the IAEA (Also referred to as **Source** in the analysis chapter)

The last semi-structured interview, for which the initial contact was initiated by my supervisor Univ.-Prof. Dr. Ulrike Felt and after several weeks of negotiation with her on my behalf, the Source from the IAEA agreed to be interviewed. Due to requested anonymity, detail about the Source is limited here, however, it suffices to point out that the Source had been with the Agency since many years and knew they could provide sufficient information with context to the nature and activities of the Agency.

The interview with the Source was crucial for multiple reasons. Firstly, it was important to know how the agency itself sees the Fukushima nuclear disaster. Secondly, it was also important to know the organizational details of the agency, which could be best provided by a person from the IAEA itself. And lastly, it was extremely important to have interviewed a person from the IAEA who has followed the Fukushima story more closely.

The information provided by the Source offered interesting details on how the IAEA as an agency functions, its role and the reasoning on the way it communicates. It is also necessary to make clear that the Source was not a public spokesperson for the agency, but spoke from his/her personal capacity and viewpoint. The Source pointed out special details on what the limitations are for IAEA in regard to its communication policy and what seems to be missing in the whole story through the IAEA's perspective.

On the whole, the Source provided valuable insight into the interplay of science (including public understanding of science, nuclear science, scientific research and social science) with a brief touch on the politics and normative values of the Fukushima issue. With such interview accounts from various experts, useful arguments in the overall debate and discourse unfolded, and hence became an essential reference for the empirical analysis.

Furthermore, I would like to discuss the role of experts and their closeness to the subject and how this is crucial when doing empirical research.

## Interviewing Experts to Understand Broader Context

Conversations with experts are very different to interviewing a regular contributor. In my research work, all the interviews can be considered as a certain form of expert interviews, as the interviewees are not only highly educated on the subject, but also have a deeper understanding of the overall complexities that surround the subject. This usually reflects in the confidence with which they speak and the way their dialogue is held. Thereby, retrieving information from an expert in their position can be very tactful for empirical research. As Harry Collins and Robert Evans defined in their book: 'Rethinking Expertise', "*traditional analyses of the word "expert" refer only to rare, high-level, specialists*' (Collins & Evans, 2007, p.5), and during the course of the interviews it became evident that many of the interviewees thought of themselves in this traditional sense

of the word; as having a special status, being "contributory experts" in the field of my research (Collins & Evans, 2007).

Another element that dwells in this context, is the expert interviewees' preconception that the interviewer has prime knowledge on the subject. During my interviews the three of the interviewees accredited me with having a certain degree of "tacit or primary source knowledge" (Collins & Evans, 2007). Having done initial research for this project it became apparent that they started using complex terminology, short forms of various meanings in the IAEA and in general of nuclear matters and communication, thereby, expecting me to understand them with no further explanation. The subject matter is highly important when dealing with expert interviews. All the interviewees are experts in their own field of profession: PR as nuclear information expert, CM in the field of media and Source providing details about the IAEA.

This form of interpreting the interview situation had both advantages and some drawbacks. On one hand, it creates a situation where the interviewees are very open to speaking about any difficult question and their know-how about the issue, which is highly beneficial for a positive atmosphere during the interview. However, during semi-structured interviews, there were moments where there was a slight hesitation or perhaps disagreement with what they said. This is a bit problematic because as experts, they do not expect their statement to be subject to any questioning.

Furthermore, when interviewing experts, narratives are also produced in situ, both by the interviewee and interviewer. As such, meaning is made and narratives are thus configured of various "*situationally relevant and long-standing resources*" (Holstein & Gubrium, 1995). Interviews with experts tend to take a different shape, compared to those of regular contributors as their acknowledged levels of expertise in the field provide a great deal of insight. This gave me a strong opportunity to immerse myself in their body of work for some time, equally as an outsider in the work they are doing, it is easy to ask questions from a layman's perspective. Thus, I not only gained valuable and first-hand information from them but also because of their influential positions in their organizations, in a longer run, they may also turn out to be an important channel for the dissemination of the research.

## Document Analysis

As an important social research method, and tool in its own right, document analysis involves reading and studying a substantial amount of written material that relates to some aspect of the overall research. Document analysis is generally described as the scientific study of the content of the communication and it is the study of the content with reference to the meanings, contexts and intentions contained in messages. The prime objective of this analysis is to convert recorded "raw" phenomena into data, which can essentially be treated in a scientific manner so that a body of knowledge may be built up.

This use of document analysis combined with the semi-structured qualitative interviews for empirical analysis will provide a valuable assessment to the research questions needed to be addressed.

In the research, mainly official documents from the IAEA were used as material, such as initial press releases, and media advisories. A thorough reading of IAEA's book on crisis communication that was published post-Fukushima as well as some final reports on various topics by the IAEA on the Fukushima nuclear crisis were done. These documents have been carefully studied, as IAEA's own communications on the topic are intended to be read as objective statements, but as they are "socially produced", they are thus to be considered crucial elements, and can provide content analysis over the subject.

Figure 12: Screenshot of IAEA's Press Releases and Media Advisories, alongside IAEA's book on communication with the public in a Nuclear or Radiological Emergency. Source: (IAEA Website, 2015)

At this point, it is necessary also to briefly clarify why document analysis and not any other social sciences research method was chosen for this research. The reasons are three-fold: firstly, the official documents from the IAEA were mostly used as initial research in order to prepare for the semi-structured qualitative interviews. Secondly, while there were a number of facts and figures conveyed by the three interviewees, document analysis presented a way of checking the validity of the information given by the interviewees as well as leading to a more critical interpretation of both sources. Lastly, the data obtained from these documents also provided insights which the interviews were unable to sufficiently detail. Therefore, the documents were mainly used to compensate for information which may not have been achieved through the interviews, thereby, giving the empirical analysis a complete representation of the field.

Here, the analyzed documents will be briefly presented and contextualized for a complete summary of all the materials used for the following empirical analysis. Since the Fukushima Daiichi nuclear disaster on the 11th March 2011, the IAEA as a global nuclear regulating body has written numerous press releases and media advisories at frequent intervals. This communication phase was seen as very sensitive as the modern world was constantly looking for information through

traditional and new media platforms (Felt, 2016). Therefore, it was necessary to analyze these documents by the IAEA, which will help to understand the vocabulary they use, how they inform the public as well as what social order these communication messages contain. The documents were included in this research and were then used to assess the various details.

Although for the IAEA, the traditional approach of interacting with the media and public was through the use of press releases, media advisories, short-hand books and reports to explain the situation on nuclear-related emergencies. As highly informative material for his research, I read most of their documented material with regard to the Fukushima nuclear crisis to date. However, only press releases, media advisories were taken into account for analysis purposes.

As the sociologist Monageng Mogalakwe suggested, "*It must be noted that documents are not deliberately produced for the purpose of research, but naturally occurring objects with a concrete or semi-permanent existence which tell us indirectly about the social world of the people who created them"* (Mogalakwe, 2006, p.2). Therefore, I made an archive of all the press releases and media advisories of IAEA on the Fukushima nuclear crisis that is also available on their web portal in chronological order.

Also, in the later stage, when the Fukushima event unfolded from a broader landscape and was recognized as a technological disaster, long-term planning was made for remediation efforts in the affected area and IAEA's experts published a series of catalogs and short-hand books about the incident and the international response to the accident. In late January 2014 they came up with a report, "*The Follow-up IAEA International Mission on Remediation of Large Contaminated Areas Off-Site the Fukushima Daiichi Nuclear Power Plant*". For my empirical work, the function of these documents counts as a data source in qualitative research which the IAEA Office of Public Information and Communication have published. As the report tended towards the more technical details of the incident, it will not be addressed in much detail.

However, the documented material by the IAEA such as the reports, key booklets and books help summarizing information (as well as through the frequency of statements) and analyzing a set of procedures for collecting and organizing information in a standardized format. This assisted not only in deciphering the characteristics and meaning of written material like media advisories and press releases but also of other recorded visual resources.

I followed the steps of a social science research methodology in order to focus on the document material. Firstly, I had to have a clear objective as to how these texts are to be understood, thereby, categorizing into different content and then filtering out different patterns and identifying themes that emerge from the resource. For the process of analysis, the most important content was screened out and a discourse was prepared by performing discourse analysis to finally analyze the collected data (discourse analysis will be discussed in the next chapter).

A significant book published by the IAEA in 2012, '*Communication with the Public in a Nuclear or Radiological Emergency*,' was an important reading before jumping on to the document analysis as it provided an understanding of how the public is not fully aware of the nuclear emergencies

and are often ill-informed during such crises. In analyzing this book, I focused on understanding how the IAEA allowed the public to interpret information in a transparent manner as well as the kind of style they use, thereby focusing on their use of language. Further factors, such as source of documents, authenticity, credibility, representativeness, and meaning are very crucial in a documentary research method. Thus, it is important to clarify here that since I would be using only official documents of and from the IAEA, all these factors remain present in my research work as well as how the IAEA uses language to construct their accounts of the social world. As Potter and Wetherell explains in Mogalakwe (1987) that, "*Language, whether written or spoken, subtly orders our perceptions of situations, and thus also constructs and creates social interaction. Social texts do not merely reflect or mirror objects, events and categories existing in the social world, but also actively construct a version of those objects, events, and categories*" (Mogalakwe, 2006, p.8).

To conclude this section, it would be helpful to make the reader aware that document analysis and discourse analysis as research methods were done for various documents of different types. By taking the entire readings as a sampling frame, an analysis of the way IAEA communicates was made. This was done by coding all the cases and then analyzing the resulting data in a formal and systematic manner that allowed the observation of the results. The use of discourse analysis, which is underpinned by a social constructionist orientation to knowledge and rests on assumptions, allowed focusing on generating theoretical ideas or hypotheses from the data that helps to develop new theories, which of course was supported by the data. Using the research methods, the empirical work produced some very interesting details within the context of the research questions, as to how the IAEA relates to facts and figures, the kind of vocabulary it uses to communicate with the public and how they conduct outreach, with what image, as well as defining their boundary and largely what kind of communication model they use.

## Limitations

This project (like other research work) finishes with a thesis, and tries to come to some form of preliminary closure. It is, therefore, limited in some ways. One of the major limitations that come from the methodological part is its inability to take into account the IAEA's comprehensive report on Fukushima which was published after the research work was performed. As the final report by the Agency, it may detail to a much larger extent the kind of communication which took place during the emergency preparedness response by the IAEA as well as other facts and figures that could detail a deep understanding and hence a stronger analysis. At the time of writing, the report has not been published by the IAEA and hence if this research misses any details, it should only be seen as the result of a preliminary first insight.

Secondly, the material (leaving aside the upcoming final report by the IAEA) is also somewhat limited. Given that the topic of nuclear disaster and the IAEA is a huge one, it was necessary to take more time, more material, and different interview questions. However, given that this is research work for a master's thesis, anything beyond this should be considered out of scope. Also, with regard to interviews, I would emphasize that a more detailed sampling of the interview transcripts (through grounded theory i.e. analyzing the data that involves levels of coding) could

have been undertaken, but given the research being time dependent, my first insights are being guided by my central theoretical framework and sensitizing concepts. Likewise, the role of the IAEA as an international agency needs further study. However, in the context of this project it was not feasible to do so, as I would have needed additional material and time resources to let the initial phases of interpretation and analysis be accompanied by this approach.

Finally, my research is not only limited by methodological options but necessarily limited by my own situation. This I would like to address in the next section.

## Situating Myself in the Research

Regardless of whatever research methods we may choose, our research is always somewhat biased due to certain aspects such as social background, interests, presumptions and views and social positions. This allows me to address in brief where I situate myself in the entire research work. As a sole researcher guided by my supervisor, I strongly see myself positioning and looking at things from an STS perspective. This seems to have been inherited ever since I started learning about the program. Also, with regard to the two interviewees whom I myself approached (Christian Müller and Peter Rickwood), both of whom I happen to know from my professional background, hence it was easy for me to request them for this research. Of course they are also experts in their fields and are valuable sources of information for my work. But for the final interview, which was arranged by my supervisor, anonymity was given to the interviewee (as far as this is possible in this context) and I hope that none of these excerpts which are shared in the Appendix will have negative consequences for any of my interviewees.

As far as those who may benefit from my work; colleagues who study STS, as well as those focusing on the IAEA and the Fukushima disaster, will certainly find this document useful, even though work on this research is of limited capacity as compared to that of a doctorate researcher. Lastly, with regard to time and resources, which is a vital part of my situation throughout this research. I believe I have taken a considerably long time in writing this thesis and the reason rests mostly on my professional life, which allowed me to work only sporadically on this study, over the past months. I hope the time I took to put together the thesis has not taken its toll on the research work. In the next chapter, I will focus on the empirical analysis and also shed light on how the data was analyzed.

# 8 Empirical Analysis

This chapter will attempt to answer the research questions by combining and interpreting the gathered data, as well as connecting it to previously outlined literature, theoretical frameworks, and sensitizing concepts. It consists of two parts: firstly, the analysis of the press releases and media advisories by the IAEA in a semi-descriptive/semi-analytical process through document analysis, and secondly, through critical discourse analysis of the semi-structured interviews conducted with the experts.

## Analysis of the Press Releases and Media Advisory from the IAEA

I collected IAEA press releases as well as media advisories on the Fukushima disaster since March 11, 2011, the day when the triple disaster happened, until June 9, 2014 (the date on which I limited my follow-up on updates by the IAEA). A total of eighty articles appeared from the Department of Public Information at the IAEA, which also included a few public statements (most of them annually) made by the Director General of the IAEA on the Fukushima nuclear disaster. These articles provide sharp detail on to the vocabulary the IAEA uses as well as the discourse it aims to provide through communicating with the media or the public. Here, at the outset, I must note that for the document analysis I have considered all these articles as a collection and carried out the analysis of the documents from the IAEA as a whole.

To begin with, I would first like to combine the content of these eighty articles in detail in order to put things in an organized manner. Most of the articles are short news pegs describing the very nature of the Fukushima crisis and focusing mostly on the nuclear aspect of the triple disaster that unfolded in Japan. Some are simply media advisories that one may consider as having their readership limited to the media personnel. Among the articles, a small fraction also consists of public statements given by the Director General (DG) of the IAEA, of which, most are yearly addresses commemorating the anniversary of the disaster or further updates on IAEA's activities in Fukushima. These annual public statements, I must note, are very Agency centric, with the text revolving around the IAEA's Statute and functions, though aimed at a broader audience. The DG statements are far more explanatory not just in length but also in content (with details of the activities performed by IAEA) than the normal press releases which are prepared by the Public Information Unit of the IAEA.

In the beginning as the event unfolded, most of the press releases by the IAEA have phrases such as: "*following the information we received from the Japanese authorities*" (IAEA Press Release n.d.). Such phrases indicate that IAEA is strongly relying on the information provided by the Japanese government. Various other press releases that were issued in the early period of the accident mainly concentrated on the activities the IAEA as an organization planned to do, such as to brief that the IAEA aims to coordinate a fact-finding mission in the aftermath of the accident as well as to provide a limited emergency response in this context.

In order to give the reader of this thesis a first overview, which is completely in line with the central idea of this research work i.e. to understand how IAEA communicates in a situation of a techno-natural disaster, shared below is a tag cloud visualization which was created by analyzing the full texts of the eighty articles between March 11, 2011 and June 9, 2014. An online application, *Wordle*[3], allows the "generating of word clouds from text" that is provided and gives greater prominence to words that appear more frequently. The size of the word on the cloud visualization signifies the frequency of its appearance; the bigger it is illustrated, the more often it is used in the texts of the articles (which include: press releases, media advisories, and DG statements). The version of the cloud visualization below is without removal of any common English expressions as well as without any manual change in the articles.


Figure 13: Wordle[4] with the most frequent words from the 80 articles (press releases, media advisories, IAEA DG statements)

In the above cloud visualization, there are some significant words that have come to light, if we leave aside the most visualized words such as "IAEA," "Fukushima" and "nuclear," which are obvious given the content. However, words like "safety," "power (nuclear power)," "Member," "States," "Agency," "accident," "action," "international," "information," "conference," "press," etc. give a slight idea of the key terminology that is often used as the information being shared by the IAEA. These words seem to play an important role in IAEA's communication when addressing to the media or the "general public."

[3] www.wordle.net

[4]Made with a word-count-based tag-cloud visualization tool at www.wordle.net

I found the use of the word “disaster” missing across IAEA’s communication documents and this is very much visible from this cloud visualization, indicating that the IAEA considers the Fukushima event a mere accident and not a disaster. A sense of analytical keywords surface, as the words seem to give deeper notions to various contexts used in the documents. Given the size of words, which designates their recurrence across the eighty articles that were processed, significance can be given to how the IAEA uses a certain vocabulary of words in its documentation among most articles that are open to the public on its website.

The IAEA’s frequent use of words like “accident”, “action”, “security”, and “power (nuclear power)” appear to provide cross-linking with each other through the way the organization sees the Fukushima nuclear accident. In particular, the use of words “safety”, “security”, and “action” describe the tone of the language the IAEA wants to share in the context of Japan’s Fukushima accident. The use of the word “action” seems to indicate providing an emergency response, and “security” is in context to safeguarding the nuclear power plant, which is a constant debate the IAEA has been asserting. This first impression on the variety of words that are predominantly covered in their articles, helps to understand the systematic review of documentation the IAEA has in place, which in turn reflects how various knowledge orders and practices are co-produced in the IAEA.

Subsequently, I wish to detail the frequency with which the IAEA communicated with the media and the public. The intensity of its communication with the media was quite high within the first year of the accident, however the communication documents were neither long nor detailed. Especially during the first weeks, in which the IAEA mostly made live press conferences addressing only the media at their headquarters at Vienna International Centre (VIC) in Austria.

During the early days of the disaster, there was very limited direct communication with the public on a large scale. The media and other online publications simply used quotes straight from IAEA’s press conferences, which in themselves were not particularly easy for ordinary citizens to understand (an example of which can be read in the later stage of this chapter).

At this point, it can be asserted that during the early phase of the emergency communication, the Agency slowly realized the size of the accident and the accompanying need to inform the “public.” Proof of which is very much visible through its social media activity (Tweets and posts on Facebook updating on Fukushima in the early weeks of the disaster, mainly between March 2011 and June 2011). The IAEA started communication through social media networks, mostly via their Twitter and Facebook pages to keep their audience updated in real-time. Many observers like Brumfiel and Findlay have found that the IAEA, despite being an international nuclear regulatory body, communicated far less frequently on the subject (Brumfiel, 2011; Findlay, 2012) than the media.

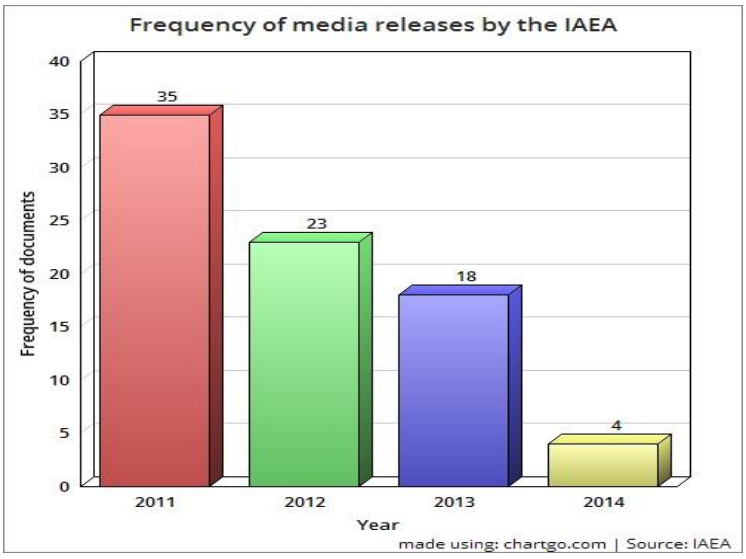


Figure 14: A graphical representation showing the frequency of media releases by the IAEA during the last four years.

The frequency of the media briefings from the IAEA reduced by almost 40% in 2012 of what were made in 2011 (see Figure 14). This drop continued for the following two years. However, it is understandable that the lowering of the frequency of articles over the years lessened mainly from the fact that the topic of Fukushima departed from the media's center stage. However, this surely does not mean that the general public did not wish to update itself on the Fukushima crisis.

In fact, the first communication messages (leave aside the social media updates) made by the IAEA were merely short briefings to the media, highlighting the very nature of only the natural disaster occurring in Japan. The media briefings only focused on the natural calamity that had taken place in Japan, sharing the scale of the earthquake and the tsunami but gave no information on the distress calls and turmoil that was building up at the Fukushima Daiichi nuclear power plant. With regard to the public, it seemed to be missing important updates about the threats of the technological disaster taking place at the Fukushima nuclear plant. As an international nuclear regulatory body, one expects the IAEA to have an impartial correspondence and also an immediate response to the nuclear facilities around the world. However, having followed their early days of communication on Fukushima, it rather gives a contrasting impression. Since the beginning of the incident, the IAEA was merely able to update the information solely based on what its Member State Japan could communicate to the Agency through their internal communication channels. There is no reference to its own verification of the information coming out from Japan in the early days of communication.

This in particular has been one of the sharpest criticisms the Agency faced from various public forums as to why it received information merely on the basis of what the Japanese authorities communicated. This is in contrast with what has been reported by some of the global media publications who alleged that the Japanese authorities kept the information about the ongoing crisis in the early days to themselves in order to keep the entire techno-natural disaster low-profile (citing economic reasons). At the same time, they wished to escape the condemnation and allegations that the government's Tokyo Electric Power Company (TEPCO), which is in charge of

the Fukushima Nuclear Plant, had manipulated key information that should have been disclosed to the public and the IAEA for a productive emergency response.

Below is the first message shared by the IAEA on its Facebook Page on the day that the triple disaster struck (3/11). The IAEA posted this information as an AlertLog, its communication mechanism during emergencies. The post makes it apparent that the IAEA had very little information on the ground despite the Agency claiming to have a strong communication mechanism (IAEA, 2012) in place.


Figure 15: IAEA's first post on its Facebook Page on March 11, 2011. Source: (IAEA Facebook, 2011)

To further illustrate this point, the IAEA's second update on Facebook, posted on the second day of the disaster, details the seriousness of the issue. This was the time when its website (IAEA.org) went down due to a massive increase in web traffic, as the public's search for information was enormous. The general public moved to the internet in search of more information, most trying to access the IAEA's web page to find the latest information on the Fukushima Nuclear disaster. Netizens (users of internet) include concerned citizens across the world, international organizations, world governments including NGOs and media. Dealing with the issue of the IAEA's online web platform's failure, they switched to their Facebook page to deliver some emergency messages. All of this, at first, created more confusion for the public around the world who were looking for credible information from the IAEA.

Sharp criticism of this came from netizens, who commented on the Facebook page of the IAEA, notifying them of the difficulties in accessing the IAEA website. For several hours, during which the general public needed fast access to information and updates, and whilst trying to look for answers on the IAEA's website, netizens were let down due to the shutdown of its website. This generated negative sentiments and anger towards the Agency which is known to be a major force in the response to the nuclear crisis across the globe.

This also reflects upon the fragility of the communication infrastructure during those crucial moments. The complete shutdown of IAEA's website shows the failure of its communication infrastructure and also allows one to question whether any on-demand communication network

was quickly put in place to recover communications to those in the affected area during those critical moments in order to coordinate an emergency response.

The technical challenges faced by the IAEA made a relevant impact in the flow of information during those crucial moments and underlined the importance of having a strong capable communication infrastructure in place to deal such nuclear emergencies. Below is the IAEA's Facebook post that mentions its communication problems on March 12, 2011.

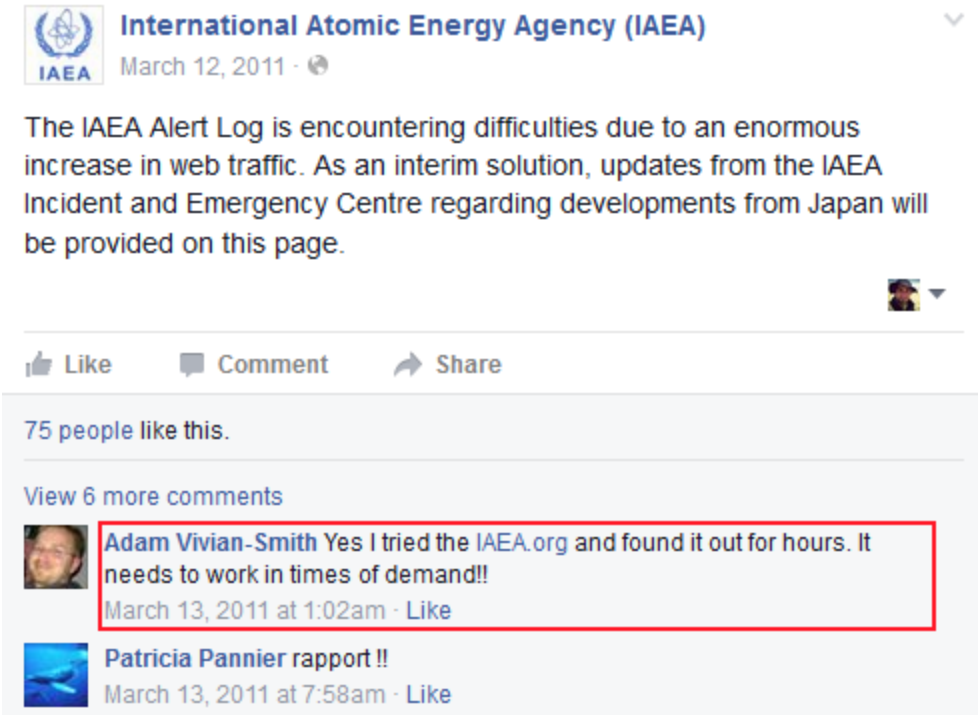



Figure 16: IAEA's 2nd Facebook post on its page since the disaster. Also see the Facebook user's comment: "It needs to work in times of demand!" Source: (IAEA Facebook, 2011)

A similar tone was shared by Geoff Brumfiel, a nuclear science reporter who wrote about this issue and highlighted the IAEA's partial dysfunction during the nuclear emergency communication on Fukushima. This is despite the fact that seeking sensitive information in the middle of a nuclear emergency is not always easy. In his article "*Nuclear Agency Faces Reform Calls*" published in the Nature magazine, he writes:

*Experts contacted by Nature agree that the IAEA must deal with emergencies more quickly than it has in Japan. Under a 1986 convention, member states are obliged to report certain details of any nuclear accidents to the agency, which has an Incident and Emergency Centre ready to respond. Accordingly, the IAEA was in touch with Japanese nuclear regulators within hours of the earthquake and tsunami that triggered several reactor shutdowns at the Fukushima nuclear power plant on 11 March. After a massive explosion rocked the unit 1 reactor the following day, the agency posted a series of brief statements on its website as the situation developed. But IAEA officials did not hold*

*a press conference until 14 March, and its technical experts did not begin on-the-ground assessments for a full week.*

(Brumfiel, 2011)

Brumfiel's article reflects upon two interesting and relevant findings in relation to how the IAEA lacked an emergency response during Fukushima. With no press conference for three days after the accident happened nor did any ground assessment taken place for a full week, it questions IAEA's emergency preparedness mechanism. It also indicates the weakness in communication between the IAEA and the Japanese government during those crucial moments and the failure to comply with the 1986 convention that provisions an exchange of information.

From the above reading, which reflected mostly on the frequency of articles and posts that shed light on the early emergency communication phase during the Fukushima crisis, we definitely gain an indication that it was a very challenging time for the IAEA, especially because the Agency is taking "a very proactive role in advocating nuclear safety". This places the IAEA in an uncomfortable position by firstly being in a 'complicated mandate' with its member states and secondly, implying itself to the 'constraints imposed by its member state.' The Agency had to face serious critique for performing risk communication.

Eventually, months later, when the broader picture of the Fukushima disaster had become more visible, the increasing "*pressure on the IAEA*" remained from the side of public forums and various world governments. Because of this, the IAEA underwent a change and started publishing regular status reports on the current status of the Fukushima Daiichi nuclear power plant. As before (since March 2011 until October 2011) IAEA was only communicating through short media briefings, press releases and media advisories that did not offer detailed information on the technical details and the on-the-ground information which was the need of the hour during this period. A sign of which can be seen below from its October 27, 2011, Facebook post, in which it notes "The IAEA now issues regular Status Reports…"

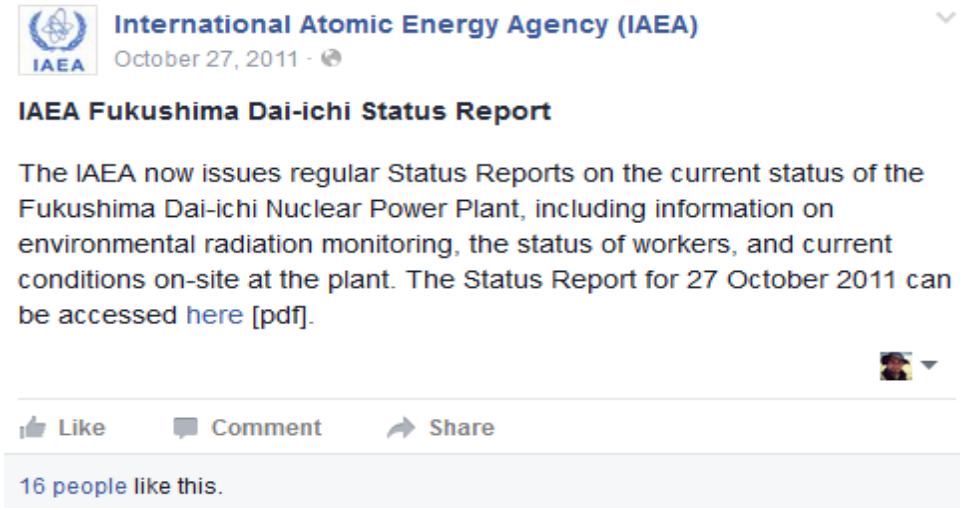



Figure 17: IAEA's Facebook fan page post on October 27, 2011. Source: (IAEA Facebook, 2011)

These regular "Status Reports" are weekly updates that are issued by the IAEA to the public on the current status of the Fukushima Daiichi Nuclear Power Plant. Such reports include information on environmental radiation monitoring, current conditions on-site at the plant and the status of workers. The information cited in the status reports is strictly compiled from official Japanese sources. The above Facebook post mentions of a Status Report (the first on Fukushima) issued by the IAEA on 27 October 2011 detailing on-the-ground information.

It is hoped that the above reading will help to understand the complexities in which the IAEA was mired during the Fukushima emergency. It also reflects how the public sees the IAEA as a global authority on nuclear safety topics and wants to connect with the IAEA to seek as much information as possible during the emergency period. Having just briefed on the frequency of the IAEA's communication through its Public and Information Unit, it would be helpful to take a closer look at the articles (or documents) shared by the IAEA during its early phase of communication on this technological disaster.

In order to delve further into the empirical analysis, I would like to share three articles, of which one is a media advisory, the second a press release and finally an IAEA news story; all issued by the Public Information Unit of the IAEA. These three articles were published as part of IAEA's emergency communications during the Fukushima nuclear crisis between 13 March, 2011 and 14 June, 2011. I have examined them through document analysis using a 'nuts-and-bolts' approach by describing the very nature of the articles, their different ways of storytelling and relating those documents to some aspect of the social world. As we know, they are considered to be official documents of the organization with the intent to be read not just as objective statements of fact, but also knowing that they are socially produced within the organization. This shall answer how the IAEA positions itself within the context of its role in the Fukushima nuclear disaster as well as with the kind of communications (e.g. through documents) that are present. It would also reflect on how different forms of storytelling emerge: from the one in the media advisory with that from the press release. In this manner, the IAEA's boundary with context to its outreach will be revealed.

# 8.1 Analyzing IAEA's modes of outreach

To be able to analyze IAEA's communication through its media, I would first like to show the IAEA's press release that was published two months after the Fukushima disaster. Below is a screenshot of the press release that is published on the IAEA's website (Note: It was one of the first press releases the IAEA issued before they made only short briefings and video press conferences by directly engaging with the media from the headquarters).

IAEA Sends International Fact-finding Expert Mission to Japan

2011/06

17
May 2011

The International Atomic Energy Agency will dispatch an international expert fact-finding mission to Japan.

Based upon the agreement between the IAEA and the Government of Japan, the mission, comprising nearly 20 international and IAEA experts from a dozen countries, will visit Japan between 24 May and 2 June 2011. Under the leadership of Mr. Mike Weightman, HM Chief Inspector of Nuclear Installations of the United Kingdom, the mission will conduct fact-finding activities at Tokyo Electric Power Company's Fukushima Dai-ichi Nuclear Power Station (NPS) site and in other locations.

The expert mission will make a preliminary assessment of the safety issues linked with TEPCO's Fukushima Dai-ichi NPS accident following the Great East Japan Earthquake and Tsunami. During the mission, areas that need further exploration or assessment based on the IAEA safety standards will also be identified.

In the course of the IAEA mission, the international experts will become acquainted with the Japanese lessons learned from the accident and will share their experience and expertise in their fields of competence with the Japanese authorities.

Mr. Weightman will present the mission's report at the *Ministerial Conference on Nuclear Safety* organised by the IAEA in Vienna from 20 to 24 June 2011, as an important input in the process of reviewing and strengthening the global nuclear safety framework that will be launched by the Conference.

Related Resources

Fukushima Nuclear Accident Update Log

In Focus: Fukushima Nuclear Accident

International Fact-Finding Mission Updates

Press Contacts

Press Office
Office of Public Information and Communication
[43-1] 2600-21273
Press Enquiries

Figure 18: Screenshot of IAEA's press release published on May 17, 2011.
Source: (IAEA News center, 2011)

From first impressions, the above press release with the title "IAEA sends International Fact-finding Expert Mission to Japan," makes it clear that at that time the IAEA was soon to perform an activity in response to the emergency at the Fukushima nuclear site. However, the fact that they released this document on May 17, 2011, speaks for itself, given that it took them more than two months since the accident occurred to send their first fact-finding experts on-site. This is a matter of concern and needs to be highlighted. This is regardless of the fact that the IAEA had issued multiple short updates and had numerous video press conferences. This press release gives another hint to the IAEA's slow response in sending its first fact-finding mission to Japan, which of course was much later than one would expect from an international nuclear regulatory organization dealing with a complex national (Japan) situation and the politics at work. This also points to the IAEA's performance when dealing with such nuclear emergencies. Having learned the compelling nature of this evidence, it allows hints at another aspect to the slow response by the IAEA in safeguarding the Fukushima nuclear site.

With regard to the context of this document as a press release between 200-250 words, it seems to be surely serving its very purpose of being precise and directed at the members of the news media with the intention of publicizing something seemingly newsworthy.

An interesting element that came to my notice in this press release is the kind of literature used overall. Undoubtedly, the language of the text seems to be very precise and it is quite evident that the public relations professionals or the team of IAEA's Public Information Unit have a certain order in publishing such press releases. As official statements, these outreach messages are very clear-cut and do not wish to provide a great deal of explanation. Even though the press release is publicly visible on their website and can be accessed by the general public (mainly netizens (users of internet))), one of the major things that is noticeable is that this text seems to be only limited to media personnel which can be observed from the sidebar of the text. The IAEA mentions "Press Contacts", which relates to the communicated channel they are offering for press officials to communicate. This is a web link which directly connects to the IAEA's Press Office for further questioning concerning any press inquiries.

A further point in this examination is the use of language. As part of the document analysis, there is a strong visibility relating to technical literature alongside the non-technical literature in the document, suggesting that the IAEA's press releases are meant for an educated reader and not for those who have no knowledge about IAEA's workings and the nuclear topic in general. This subsequently also raises the point that since this press release is mainly directed to the media themselves, there are still significant press readers who are well acquainted with the IAEA's standards and the topic of nuclear science. Hence, in short, these press releases are either taken as they are, or with minor edits by the media, or they are meant only for those in the press who report science-related topics, who mostly have the knowledge of the IAEA and the nuclear industry. To determine the media's work remains out of scope for this research work. But it could be said that the very basis of such press releases merely gives the IAEA a communication link between them as an organization and the world outside. In fact, I would note here that there seems to be no clarity about whom the IAEA really wants to address with these press releases.

Upon further exploration, it is also noticeable that there is no mention of an author's name(s) in the press release. They are published by the IAEA, which suggests the fact that either a collective team of media professionals are co-producing these press releases or the Agency does not wish to disclose the author's information and wants it published as from the Agency collectively. Even though it can be well argued that such institutional messages rarely have an author, but there have been instances where there has been a mention of an author in its press releases.

In this particular press release, one also can witness that there has been a change in the development of the emergency response. As documents provide a means of tracking change and development, this is something very much visible here pertaining to the activities IAEA performs i.e. from initial reporting how events unfolded and information sharing to preliminary assessment of the accident. As the press release reads, "*The expert mission will make a preliminary assessment of the safety issues linked with TEPCO's Fukushima Dai-ichi NPS accident following the Great East Japan Earthquake and Tsunami*" (IAEA Press Release, 17 May 2011).

Another insight from this article is how the IAEA sees itself as an authority. As an Agency "sending a fact-finding mission of international and IAEA experts", this inevitably puts the IAEA in a position of authority in the nuclear industry to investigate the preliminary assessment of the safety issues tied to the Fukushima nuclear power plant. The following can also be learned from the press release where it states that the Agency "will send international experts from a dozen countries". This gives the IAEA an upper edge that is not only consisting of its own team of experts but also its collaboration with other international experts to make the preliminary assessment, hence representing the IAEA's global role in the Fukushima accident.

One of the most interesting dimensions of the document that could be seen not just in this press release but indeed in almost all of them, is how the IAEA describes its efforts or operations. It mentions "*Based upon the agreement between the IAEA and the Government of Japan, the mission....*" This phrase directly hits at the IAEA's mandate "ARTICLE VIII: Exchange of information," where each of its member countries is seen as a Member State and the Agency is in a treaty with them to comply over the exchange of information. This guides to the fact that it is the Member State that has to provide all information to the IAEA whenever an accident or event concerning the power plant occurs, under their agreement (The Statute of the IAEA). However, whether or not there is a constant and timely flow of information between the IAEA and the Member State, is something hard to judge and has often been regularly criticized by various international forums and media. Many nuclear experts place the blame on the Agency's complicated mandate and the various constraints levied by its Member States that do not allow the Agency to take a more proactive role in nuclear safety. This argument can be complemented by the following statement of nuclear expert Olli Heinonen which was shared in Brumfiel's Nature magazine article on the IAEA that stated, "*It (IAEA) should give its own independent assessment using all the information that is available. If information isn't available, he adds, the agency "should seek it actively*"" (Brumfiel, 2011). This argument mostly details the context-specific issue the IAEA is facing and sheds light on one of the key areas where one can perceive the IAEA's communication as difficult.

Given the discussion in the preceding paragraph, as a final point, I wish to note that the larger purpose of this document, given that the press release is available in the public domain, seems to be part of the IAEA's outreach to address the general public by using the media as a tool to disseminate the information. The press release is one of the many methods its Public Information Unit uses to reach out. However, through document analysis, interesting details have emerged from the document such as the use of language, where the IAEA situates itself and to whom they wish to address themselves, the change over time (the development), etc. In respect to the forms of storytelling, it was also interesting to notice that what is made clear in the document and what is conspicuous by its absence (e.g.: no mention of the author's name, less explanation, etc.). Mainly from an analytical viewpoint, it looks more like a one-way communication, or, in short, it is simply a delivery of messages by the IAEA.

The findings from the research on the press release address the pertinent questions of how various venues of the IAEA's communication contribute to its overall outreach policy and define the role of the IAEA. As predicted, the organization's risk communication, in view of the emergency

response to the Fukushima disaster, is slow and directed only one-way; using the media as a tool and not aiming to address the general public directly. To further support this argument, a brief analysis will be undertaken of IAEA's one media advisory and one news story which is also one of the ways through which the IAEA's Public Information Unit conducts outreach.

Firstly, however, it will be helpful to briefly explain what a media advisory is and what its original purpose is. Acting very similarly to a press release, a media advisory is simply a document which an organization or institution creates, according to which they identify a news as relevant enough to send to members of the media. One of the primary objectives is to pass on specific information about an event or development which is taking place in the organization. However, a media advisory should not be confused with a press release. In general, the specific purpose of a media advisory is not the same as that of a press release, as the media advisory has a different audience and usually the format also varies. Moreover, a media advisory purpose is to alert editors or journalists about any event by providing them with the five Ws—what, why, who, when and where (Pendleton, 2013). Usually, a media advisory is sent the day before and/or the morning of the event while a press release is just an official statement issued to newspapers (or aimed at certain groups or organizations, even the public) giving information on a particular matter (Christensen, 2007).

On the whole, a media advisory is a document an organization composes with the sole intention of getting members of the media to attend an event. The event or development is similar to a press conference and is envisioned to share significant information with the members of the media in order to try and gain press coverage. A media advisory is not for the public eye but is instead packed full of information journalists should specifically find useful (Pendleton, 2013).

The IAEA published various media advisories during the initial course of the Fukushima crisis. An invitation to attend an IAEA event was not open to the public but only to members of the accredited media. In the year 2011, the majority of media advisories focused on press arrangements in relation to the briefings on the Fukushima nuclear accident and their updates. Not having chosen an early media advisory from 2011, I concentrated however, on a particular media advisory that goes in line with this research project. It is a media advisory published by the Public Information Unit of the IAEA on the 14 June 2012 that emphasizes the "IAEA Hosts Meeting on Enhancing Transparency and Communication Effectiveness."

This particular media advisory has been singled out because it directly focuses on information and communication aspects of the IAEA. It was perhaps the first time that a media advisory of this sort was published by the IAEA since the Fukushima nuclear disaster. Below is a screenshot of the IAEA's media advisory "*IAEA Hosts Meeting on Enhancing Transparency and Communication Effectiveness*," published on June 14, 2012.

Home / News Centre / Media Advisories / IAEA Hosts Meeting on Enhancing Transparency and Communication Effectiveness

# IAEA Hosts Meeting on Enhancing Transparency and Communication Effectiveness

14
June 2012

2012/06

The International Atomic Energy Agency (IAEA) will host a three-day *International Experts' Meeting on Enhancing Transparency and Communication Effectiveness in the Event of a Nuclear or Radiological Emergency* from 18 to 20 June 2012. This meeting will provide a forum for discussing and exchanging information on the challenges of effective public communication during major emergencies. The communication experts come from Member States' parliaments, emergency response agencies, nuclear regulatory, safety and technical support organizations, as well as nuclear power plant operators and international organizations. The meeting is part of the Agency's implementation of the *IAEA Action Plan on Nuclear Safety*, endorsed by the Agency's Member States in September 2011.

The primary objectives of the meeting are to:

- Share experiences and identify lessons learned in communication and information dissemination during the Fukushima Daiichi nuclear accident, including case studies of demonstrably effective outreach to the public;
- Identify means to improve transparency in public communications during a nuclear or radiological emergency; and
- Exchange best practices for developing explanatory and advisory information that can be issued in emergencies of major public concern.

The first working session will begin on 18 June at 14:00 CET in Conference Room M1 of the M-Building, in the Vienna International Centre (VIC). Please note that all sessions of the meeting are open to the press. Journalists are invited to attend the meeting and participate in discussions.

Journalists with permanent accreditation to the VIC need no further credentials. We encourage those journalists who do not yet have permanent accreditation, to request it at UNIS Vienna.

All others must seek accreditation by contacting the IAEA Press Office; tel: [43-1] 2600-21279 or [43-1] 2600-21273).

Related Resources

In Focus: IAEA Action Plan on Nuclear Safety

Related Story

Press Contacts

Press Office
Office of Public Information and Communication
[43-1] 2600-21273
Press Enquiries

Figure 19: Screenshot of IAEA's June 14, 2012 Media Advisory. Source: (IAEA News Center, 2012 )

Upon first impression, the length of the media advisory is very concise. It contains between 240 and 260 words, which is acknowledged ("How To Alert Media About Your Event" n.d.) to be an ideal length for a media advisory to invite members of the media. The title itself addresses the issue that the Agency is soon to perform an activity on "Enhancing Transparency and Communication Effectiveness", which comes over a year after the Fukushima accident took place. The title contains words such as "Transparency" and "Effectiveness" which are very declarative. This is something which will be explored in further detail in later paragraphs. With regard to the distribution of the media advisory, it is unclear as to how many members of the media or to how many press agencies the IAEA must have addressed this document. However, given the Agency's location at the Vienna International Centre (VIC), one can assume that numerous Austrian media houses, as well as international journalists residing in Austria and nearby, would surely have received this media advisory via their press counterparts from the Public Information Unit in the IAEA.

Interestingly, there are some similarities between the IAEA's various forms of communication – between a press release and media advisory. In the example, there is no mention of the author(s)

in the press release. The same goes for the media advisory. The responsibility of the media advisories is taken by the IAEA as an organization, shared by the Press Office of the IAEA for the article, which can be discerned from the final sentence, which mentions that in any event of contacting, the journalists should get in touch with the Press Office.

On the point of the timing of publication, the media advisory was published over a year after the Fukushima nuclear accident took place and the focus was on enhancing transparency and communication effectiveness in the event of a nuclear emergency, particularly in regards to the 'poor emergency response' of the IAEA during the Fukushima crisis. The fact that the Agency hosted a three-day workshop on this particular topic speaks for itself. It realized that the overall risk communication model or the emergency role from the IAEA's side did not efficiently work the way it should have and now the Agency is trying to gather experts and identify the lessons learned from its outreach to the public. In the Director General's Report on Fukushima Daiichi Accident issued on 31 August 2015, the IAEA's Director General Yukiya Amano shares that "*the report considers human, organizational and technical factors and aims to provide an understanding of what happened, and why, so that the necessary lessons learned can be acted upon by governments, regulators and nuclear power plant operators throughout the world*" ("IAEA Releases Director General's Report on Fukushima Daiichi Accident," 2015). This may be seen as a positive sign that the Agency is learning lessons from its past mistakes as well as acknowledging its shortcomings, after strong criticism from international forums, concerned citizens and members of the media over how the IAEA mishandled its emergency response. However, the foregoing discussion does imply that the IAEA was lacking in its communication or outreach to the public in the most important period of the Fukushima disaster.

Within the context of the language of the media advisory, it is certainly intended to address the members of the press, highlighting the prime objective of the meeting with a mention that the "*Journalists are invited to attend the meeting and participate in discussions*". If in the future an accident of such a nature occurs again, suggesting the fact that the Agency also wants members of the media and respective expert groups to participate for a better and efficient part of the communication model. An interesting element here is that the general public, or those concerned groups are not invited to the IAEA's meeting, which adds up to the assumption shared in the last document that the IAEA does not directly communicate with the public. Yet, it uses specific expert groups and the media as its source to disseminate its information to reach out to the public. Without a doubt, it seems a well-thought-through outreach campaign by the IAEA which includes both media advisories and press releases.

As part of the document analysis, one can also witness the tracking change with regards to the context, notion of development and the declarations made in the documents from the IAEA. In this particular media advisory, on one side as the sensitivity and objectivity of the text seems to be maintained, there is also a strong notion of change or development that one can become aware of during the examination of this document. The Agency asserting that this meeting is a reflection of the "*Agency's implementation of the IAEA Action Plan on Nuclear Safety, endorsed by the Agency's Member States in September 2011*", suggests an effect of the criticism of the IAEA. This is notwithstanding that these actions reflect that they are revising their emergency

communication response over time, which is directly in line with my initial expectations that the Agency is doing a considerable amount of work in refining communication activities mainly in dealing with context to reach out to the general public. Overall, the heart of the debate lies in the simple fact that the Agency was unable to undertake crisis/risk communication in an effective way during the Fukushima nuclear crisis.

From a different perspective, as a researcher, this document acts as evidence to my initial assumptions and hence confirms through these discoveries that the IAEA is beginning to act on the areas that have hit the image of the Agency the most. This document provides the scalability to understand the extent to which the Agency is acting.

A few other points emerge from the document during analysis. Firstly, the document draws attention to the challenges faced during an emergency response and communication role, which relates to the fact that the IAEA is pushing its focus to the management aspect of nuclear safety. From the media advisory's perspective, one can witness that the IAEA also wants to take the media alongside in order to host such a meeting in educating them on nuclear aspects which has been a crucial topic from a nuclear emergency response's perspective.

Secondly, from the above-shared document, one can also become familiar with the strong role of the IAEA as an authority. This can be witnessed from the reading with the title being very declarative, and that it is hosting a meeting by taking various members of the IAEA Member States, various communication agencies as well as the media altogether. This puts the Agency in the very significant role of combining experts from various corners of the world, as it positions itself as an Agency dealing with issues of utmost importance. Lastly, the media advisory emphasizes that sharing experiences and lessons learned from the Fukushima nuclear crisis is a significant step forward in unraveling the mistakes made during the emergency communication role and what measures are needed to fill the gaps that have hindered effective risk communication and outreach to the general public during nuclear disasters.

Having analyzed the IAEA's press release and media advisory, another means through which the IAEA communicates with both the media and the general public will be shared, namely through its regular news stories. The IAEA uses news stories in its News Centre on its website and reports all information about its activities i.e. sharing news of interest for the media and the public. The news stories are created by the IAEA Division of Public Information.

When the Fukushima nuclear crisis unfolded, the IAEA outreached with a series of news stories on a daily basis following the information it received from the Japanese authorities. The IAEA also uses its articles as short news pegs to provide a timely release of information from the Agency to the media and the interested public. Since March 2011, it has communicated heavily through its own news stories to widen its outreach, which one would largely believe is due to the sharp criticism the Agency was faced with in the early yet slow communication process during the first weeks of the disaster's unfolding events.

Today, on the IAEA's website, which has been revamped since 2011, the IAEA shows news stories from March 11, 2011 until June 2, 2011 as a Fukushima Nuclear Update Log period (a purpose-built emergency update website) that lists a chronology of updates the Agency made to keep the media and the public informed of the status of the Fukushima Daiichi Nuclear Power Station accident following the Great East Japan Earthquake and Tsunami.

In the Agency's efforts to have an emergency response, each day from March 11, 2011 until June 2, 2011, the IAEA's Division of Public Information came up with a short news article detailing the current status of the nuclear crisis following the information they received from their Japanese counterparts, as well as stating the IAEA's emergency response to the situation in the news article. Below is the screenshot that showcases all the updates between the above-mentioned dates which the IAEA compiled as the Fukushima Nuclear Accident Update Log.

Figure 20: Screenshot of the Fukushima Nuclear Accident Update Log
Source: (IAEA News Center Fukushima Accident Update Log, 2011)

These update logs were the first news stories shared by the IAEA in its effort to communicate with the general public. In order to dig further, one of the IAEA's news stories is being shared here. It is also an update log, and was published on March 13, 2011, highlighting the then ongoing situation at the Fukushima nuclear power plant and the IAEA's response in monitoring that situation.

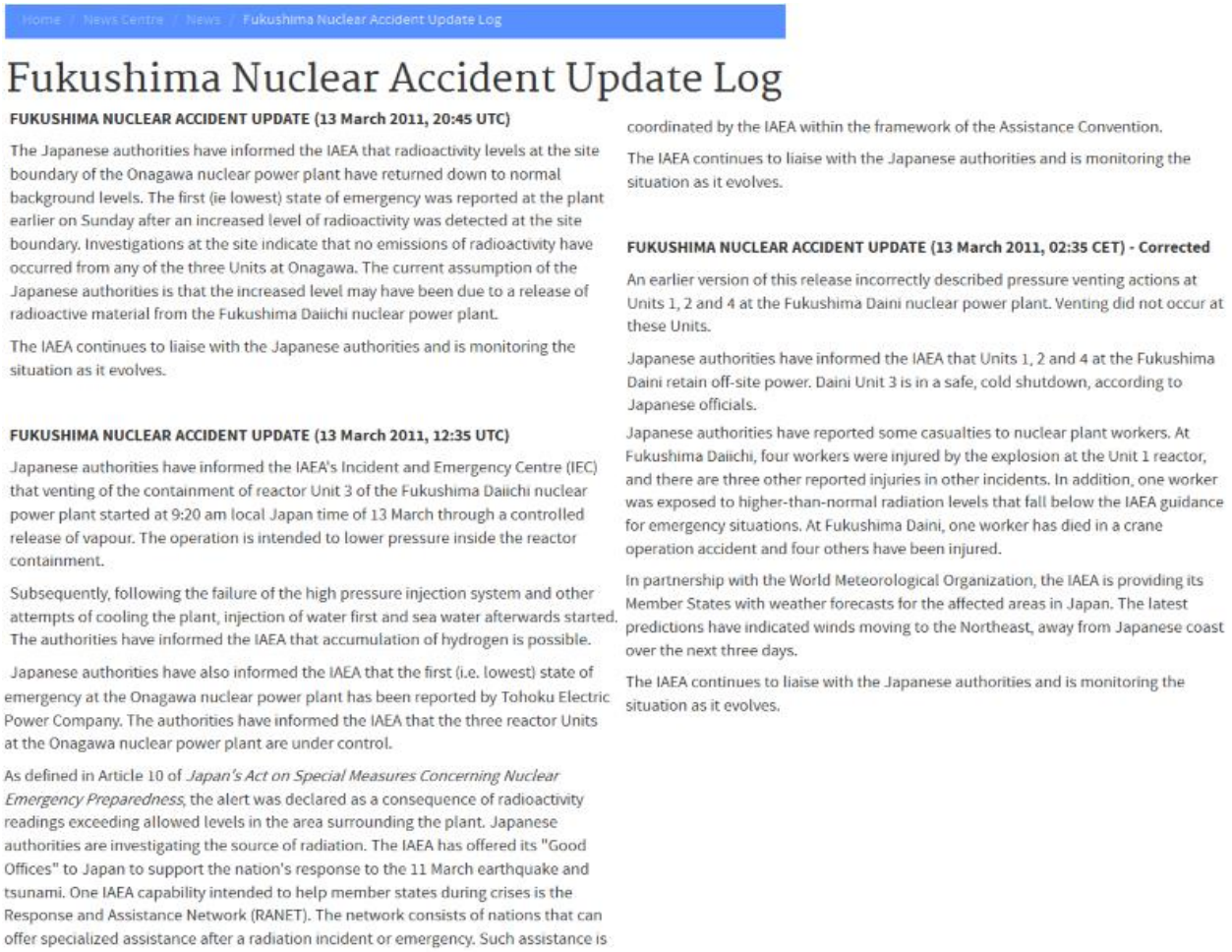
The news story (as update log) details very briefly what was happening at the Fukushima nuclear site. Nevertheless, it also encloses strong technical literature which is believed to be rather difficult for the public to understand. However, it seems that their news story was more likely intended for certain members of society who have a deeper knowledge of nuclear power and/or to the specialized media with its science editors and reporters who will further report to 'lay' people.

The screenshot of the news story is on the next page. Upon first impressions, the news story looks like a short news peg of the day and displays a compilation of the events of the catastrophe's third day. From the literature, it is quite clear that these are first-hand information reports of what is happening at the Fukushima site. The IAEA is only sourcing information based on what it has

received from the Japanese authorities, which, as previously noted, is an issue that has come under sharp criticism as to why the IAEA could not independently verify information.

Another interesting element in this news story is that, despite this being shared as an update in the chronology of the events, the IAEA seems to miss updating what the previous status was and what is new with regard to the emergency and situation. Hence, there seems to be no strong connection between the chronologies of the updates shared by the IAEA.

The mention of "*the IAEA continues to liaise with the Japanese authorities and is monitoring the situation as it evolves*", is in itself a firm note that the IAEA has very limited access to information and has not verified any information, which the Japanese authorities have given to them. This could be seen as the Agency acting out on the '*behest*' of the Japanese authorities, thereby, giving no room to further believe in the information stated in the news story but as being factually correct.



Home / News Centre / News / Fukushima Nuclear Accident Update Log

# Fukushima Nuclear Accident Update Log

**FUKUSHIMA NUCLEAR ACCIDENT UPDATE (13 March 2011, 20:45 UTC)**

The Japanese authorities have informed the IAEA that radioactivity levels at the site boundary of the Onagawa nuclear power plant have returned down to normal background levels. The first (ie lowest) state of emergency was reported at the plant earlier on Sunday after an increased level of radioactivity was detected at the site boundary. Investigations at the site indicate that no emissions of radioactivity have occurred from any of the three Units at Onagawa. The current assumption of the Japanese authorities is that the increased level may have been due to a release of radioactive material from the Fukushima Daiichi nuclear power plant.

The IAEA continues to liaise with the Japanese authorities and is monitoring the situation as it evolves.

**FUKUSHIMA NUCLEAR ACCIDENT UPDATE (13 March 2011, 12:35 UTC)**

Japanese authorities have informed the IAEA's Incident and Emergency Centre (IEC) that venting of the containment of reactor Unit 3 of the Fukushima Daiichi nuclear power plant started at 9:20 am local Japan time of 13 March through a controlled release of vapour. The operation is intended to lower pressure inside the reactor containment.

Subsequently, following the failure of the high pressure injection system and other attempts of cooling the plant, injection of water first and sea water afterwards started. The authorities have informed the IAEA that accumulation of hydrogen is possible.

Japanese authorities have also informed the IAEA that the first (i.e. lowest) state of emergency at the Onagawa nuclear power plant has been reported by Tohoku Electric Power Company. The authorities have informed the IAEA that the three reactor Units at the Onagawa nuclear power plant are under control.

As defined in Article 10 of *Japan's Act on Special Measures Concerning Nuclear Emergency Preparedness*, the alert was declared as a consequence of radioactivity readings exceeding allowed levels in the area surrounding the plant. Japanese authorities are investigating the source of radiation. The IAEA has offered its "Good Offices" to Japan to support the nation's response to the 11 March earthquake and tsunami. One IAEA capability intended to help member states during crises is the Response and Assistance Network (RANET). The network consists of nations that can offer specialized assistance after a radiation incident or emergency. Such assistance is coordinated by the IAEA within the framework of the Assistance Convention.

The IAEA continues to liaise with the Japanese authorities and is monitoring the situation as it evolves.

**FUKUSHIMA NUCLEAR ACCIDENT UPDATE (13 March 2011, 02:35 CET) - Corrected**

An earlier version of this release incorrectly described pressure venting actions at Units 1, 2 and 4 at the Fukushima Daini nuclear power plant. Venting did not occur at these Units.

Japanese authorities have informed the IAEA that Units 1, 2 and 4 at the Fukushima Daini retain off-site power. Daini Unit 3 is in a safe, cold shutdown, according to Japanese officials.

Japanese authorities have reported some casualties to nuclear plant workers. At Fukushima Daiichi, four workers were injured by the explosion at the Unit 1 reactor, and there are three other reported injuries in other incidents. In addition, one worker was exposed to higher-than-normal radiation levels that fall below the IAEA guidance for emergency situations. At Fukushima Daini, one worker has died in a crane operation accident and four others have been injured.

In partnership with the World Meteorological Organization, the IAEA is providing its Member States with weather forecasts for the affected areas in Japan. The latest predictions have indicated winds moving to the Northeast, away from Japanese coast over the next three days.

The IAEA continues to liaise with the Japanese authorities and is monitoring the situation as it evolves.

Figure 21: Screenshot of IAEA's News Story on March 13, 2011.
Source: (IAEA News Center, 2011)

A further point in this examination is the use of language in the news story. As another way of communicating with the public, this news story seems to go much beyond the normal literature of a news story intended just for the public. The use of technical literature on nuclear power as a subject is quite difficult for a lay person to understand, especially with the use of technical terms and discussions about reactors and containment.

However, if we leave aside the content of the news story, the latter does aim to reach out either to the media or the general public or both (which, of course, remains unclear). The news story keeps to the point and shares direct information which the Agency wishes to share. Formulated by the Division of Public Information at the IAEA, the news story is presented in a straightforward style and without any editorial comment.

With regard to the availability of this document, it is open to the public on its website and, therefore, can be accessed by anyone. The length of the news story is very precise and has been well managed to keep it brief. In an inverted-pyramid style, the IAEA's news story tries to give the most important information first and additional details later which can be distinguished from the press release and media advisory, also available on its website.

In most of the news stories, the name of any author is mentioned. Nevertheless, upon further exploration, it becomes clear that the current news stories are published with mention of the author being the IAEA Office of Public Information and Communication. This may suggest that there is a change in strategy by the Agency in its way of outreaching by means of highlighting the name of the person who writes the news story on behalf of them.

As to whether the news story solves its purpose of outreaching is hard to say. But from the initial findings it seems that the news stories are bites of timely information release from the Agency, comprehensive for the media as to which important message the Agency wants to convey and hence an additional news story written by a science reporter could give a broader message that is much more explanatory for the general public. It should also be noted, that given the numerous means of outreaching that the Agency has in place, there seems to be a considerable amount of work that is done beyond the public eye and even though their messages are not quite direct for the general public, given the complexity of the matter, the IAEA seems to take a step forward in communicating during nuclear emergencies.

One of the other key observations based upon my previous assumptions is that, despite the IAEA having shared each update on a daily basis during the first weeks of the disaster, the public wasn't directly provided with this information. It is mainly because many in the general public, those who were looking for this kind of information were mostly left out in the cold because of difficulties in accessing online information, an issue previously addressed in the same chapter. For those who by any chance were able to gain access online, if lacking in technical knowledge, they wouldn't have been able to fully understand the message.

Furthermore, during that time not many in the public were directly introduced to the IAEA's website as a major source of information, because a nuclear emergency of such high intensity has

not occurred in decades (the last was in Chernobyl). Hence, the general public mostly looked up the media coverage for information and did not directly look for communications from the IAEA.

Lastly, the Agency's characteristic of being an authority is also well visible in this article and is common with the other ways of IAEA's outreach (in the press release as well as media advisory). The mention that the IAEA will "*continue to liaise with the Japanese authorities*" for regular information is a sign in the news story that holds a certain authority in retrieving information from Japan and can properly address the emergency response.

For the most part, these reports or official documents are substantially well-ordered in a way that it creates a feeling of authority. For example, the Update Logs are marked with symbols that guide its place in a rigidly systematized collection of documents with a sequence of preceding and foreseen Update Logs. Each Update Log thus seems to be playing a part that helps to produce the Agency as an order. These Update Logs, published as news stories, show the date and time (with time zone) in which they were published, which could rightly indicate to readers whether they are party to these documents or not. This surely positions these documents in a multifaceted web of document construction as well as institutional authority.

An important aspect that I was able to witness is the element of time, which through these chronological updates share how the IAEA co-produces different knowledgeable material and hence constitutes a broad body of knowledge and social orders. As an organization with global settings, the production of this informational material gives the Agency not just an authority but also a view of science in society wherein various policies are constructed.

Having analyzed the IAEA's three major modes of outreaching, my exploration allows the reflection that it appears not be a two-way communication process but rather simply delivery of a message by the IAEA with regard to its communication activities. Also, with various online communication channels in place by the Agency, it is not entirely clear whom they are addressing, nor is it easy to know who the real followers of the Agency are. The major finding is, of course, that the IAEA does not know the right audience to whom they are referring. Rather, they seem to be playing with the mix of media and the general public whilst some of their outreach messages directly aim for the public. It is certainly not clear whether the news story, as part of their emergency management response enriched with technical literature, is tailored for the general public. Through document analysis, the overall communication or outreach of the IAEA seems to have gaps in its quest for effective risk communication during nuclear emergencies.

I will now answer the research questions by analyzing the interviews and for this, the responses have been structured into three categories. They are addressed as follows: firstly, by pondering upon the IAEA as an organization with an authority, i.e. how the institution reflects upon itself and how the experts view IAEA's image in the public. Secondly, when looking at the IAEA with regard to its operations and activities i.e. how co-production of knowledge and different orders transpires in the Agency as well as what effect that has on the organization. Lastly, by attempting to explore how the IAEA's communication is shaped, especially during the early days of the Fukushima nuclear disaster.

## 8.2 The IAEA as an organization with authority yet faced with criticism

As we know, the IAEA promotes nuclear energy across the world, and verifies safeguards and the nuclear material in its Member States who entered into agreements that it is only to be used in peaceful activities. With this, the IAEA gains, of course, a worldwide reputation from implementing nuclear material safeguards under the Non-Proliferation Treaty (NPT). Today, the Agency describes itself as being built on three pillars: (a) safety and security, (b) science and technology, and (c) safeguards and verification. It is the world's hub of cooperation in the nuclear field, making it the center point around which all other parts of the global nuclear governance system revolve. The Agency's legitimacy is mostly restored upon the degree to which its expertise and its production of technical knowledge, as well as its professionalism, is seen as apolitical.

However, in spite of this well-deserved reputation, the Agency holds a complex position where its power seems intentionally overplayed and its technical accomplishments are often mired by political controversies. Though analyzing the IAEA as an institution from various dimensions was not the scope of this research work, through observing the outreach and communication units of an organization with an authority which promotes science and technology, I was able to explore interesting details about the Agency mainly through the prism of the Fukushima nuclear disaster. Going through the views of both the internal and external experts, it does allow one to get a sense of how the IAEA as an Agency is looked upon.

During my interview with the Source from the IAEA, there was surprise at my initial remark referring IAEA's work as humanitarian effort (with regards to IAEA's emergency response on Fukushima). The Source immediately pressed to the point:

*"No, not humanitarian work. We do professional work. The IAEA is not a charity organization, it is a specialized organization of the United Nations"* (Source from the IAEA).

This comment by the Source actually struck me, just for the fact on how the staff working for the IAEA considers the Agency having a specialized identity apart from other UN bodies, even though the general public considers the IAEA very well as a part of the UN system (according to the external expert PR). The immediate reaction to my remark is connected to what Trevor Findlay shared in his book at the moment when the topic of Fukushima was debated, "*The IAEA was faltering in its public reaction to the biggest nuclear crisis since Chernobyl. Other players leaped into the void, threatening the Agency's status and future prospects"* (Findlay, 2012, p.6).

As the dialogue goes on, the Source gave a firm reply upon my asking how the IAEA actually communicates. The response gave striking details and more or less positioned the IAEA's stand concerning its outreach.

Source: "*The IAEA has a proper channel to communicate with the public and it's called the Division of Public Information – we have media professionals, communication officers. Everything has to be through a proper channel, we are a very organized inter-governmental organization.*

*Each word that we say has a meaning.*

*So there is a Division of public information, if you need more information, you go directly to the public domain. The mandate is to share information with the public. If you go to the website there's daily updated information such as information of breadth of activities and information on radioactivity, what is harmful, etc. That website is the information provided by the IAEA for the public."*

(Excerpt from the interview with the Source)

During my initial investigation by focusing on the outreach documents, I found out that the IAEA as an organization communicates everything only through its Division of Public Information Unit, which was confirmed by the Source. However, an interesting revelation came to light from the Source's response, stating that, "*Each word that we say has a meaning*". This makes it obvious that the IAEA has one common language across the organization and that seems to be maintained very well across the Agency. Moreover, it also affirms my initial assumption that the various departments in the IAEA align together to speak one language which its Division of Public Information Unit finally shares with the entire world — as an authoritative bureaucratic language.

It also appears that the voices of various experts and professionals within the IAEA are transformed into one voice, which is that of the Agency and is finally witnessed in the production of all official documents (Latour, 1988) published by the Agency. This, likewise, can be confirmed in Anna Weichselbraun's research '*The discursive production of technical independence at the IAEA,'* who spent time researching at the IAEA and found that, "*These official documents* (from the IAEA) *do not carry the names of individuals and they are in a sense anonymously official. It might be useful to think of the IAEA's bureaucratic voice as an ideologically constructed standard language, as has been theorized by sociolinguists and linguistic anthropologists"* (Weichselbraun, 2014, p.3).

This gives a strong indication that the Division of Public Information Unit at the IAEA is in direct command of the higher management (most likely at the level of the Agency's Directorate), and the Agency offers an interesting example of how individuals and diverse expert groups are well-ordered into one diplomatic voice.

Another interesting theme that emerges in this discussion is how the IAEA legitimizes its work, especially with reference to the statements and documents that are made publicly available. Surprisingly, due to the requirements of confidentiality, the Agency's work cannot be evaluated by any other agency, notes Weichselbraun in the same paper. This leaves the Agency to be the only inter-governmental body that could assess the impartiality of its own technical evaluations. Meaning that the Agency itself has the right to verify or falsify its findings and make assessments about nuclear activities. While this legitimacy is often endangered by the political stakes in the industry, the IAEA as an organization seems to have quite a composite position. External expert

Peter Rickwood (PR) of Atomic Reporters (also an ex-IAEA employee) toned down the position of the IAEA during his interview:

PR: "*The Agency, you know, has this difficulty to be a Member State driven organization. So the sensitivity is always to the Member States cause they, you know, there's a Scottish expression "you pay the piper to play the tune," right? So there's an ambiguity in the relationship because the Member States pay the IAEA's way, but on the other hand, the Agency IAEA has to be a police man of the Member States, in terms of Safeguard. So, clearly, there are issues in nuclear where for security reasons you don't necessarily, you can't share everything with the public. But then I feel get it… creates an obstacle that isn't always necessary. There were a lot of things you can share with the public that isn't shared."*

Suggesting the fact that the entire organization of the IAEA, despite having its own legitimacy, speaks with one authoritative voice, but when it comes to matters related to Member States (i.e. countries that area members of the IAEA), it remains rather restricted in the information it can share with the public. This binding on the Agency was clearly witnessed in the case of the Fukushima nuclear crisis and even Science Editor Christian Müller (the interviewee from the media) openly claimed:

CM: "*In my opinion, the IAEA is more like a political body than a scientific body. That is probably the main reason, I would never call them to know the latest information. It often happens, if you call the IAEA or their other UN bodies, they never tell anything about the effects of the Fukushima crisis or related news because I think they were not allowed to. So that is often the case that you don't get information from such an inter-governmental organization."*

When I asked what image he has when he thinks of the IAEA, CM's viewpoints were quite different to the others. CM believes that "*In connection with science, I don't really see it so much. It is more towards policy and shaping new dimensions*". The response from the science editor has to be highlighted here. It looks as if from a media viewpoint the IAEA as an organization is not playing a particularly active role in information sharing. From CM's response, one can suggest that this rather hints at or alleges certain political motives of the organization. While there appears to be a distrust of the media towards the IAEA, it does reflect a weak IAEA/media link which is, of course, not conducive to a good risk communication cycle during the time of a nuclear emergency (this issue will be discussed in much more detail in my further analysis). Returning to the point of '*politicization*' within the Agency; it does call into question its legitimacy, especially with regard to its broad range of activities and techno-scientific research that it has in place. The Source, however, justifies the workings of the IAEA and notes that there is a proper consensus made within the organization about sharing any news with the public. Sharing an example in his/her own field at the IAEA, the Source's response gives enough indication that the IAEA works democratically, but whether the final note of information sharing with the public is subject to any alteration is hard to find. Below is the response from the Source upon my asking how the IAEA works in its departments to communicate with the public in connection with the techno-scientific research.

Source: "*We make a lot of use documentations and consultants for these things. Let's say, in my field we have some research, so we have plenty of scientists to come along, to give us some expertise, some recommendations and from that consensus based science. You know science is not black and white, it is socially constructed. We have consultants with their own expertise in a particular field and they make a recommendation to us and then the public information channels as well as the communication channels of the IAEA provide information to the public on the basis of consensus"* (The Source).

This correlation of science being socially constructed and of informing public policy is rightly in line with what Latour argues, how scientific facts being built-in labs (Latour & Woolgar, 1986). Seeing the IAEA as a laboratory where scientific and expert knowledge is being co-produced, the Source's argument does stand valid that the IAEA has an authority to inform the public through unanimity within the organization. Given the amount of classified nuclear information the Agency has to deal with, it does give them an authority to work and not let others evaluate their work. Hence, the point of alleged 'politicization' within the organization cannot be verified. However, given the remarks from the Source, it has led me to understand the process of how expert knowledge is publically informed from the Agency's viewpoint.

Within the context of the Fukushima nuclear crisis, when it comes to finding the IAEA's position, there seems to be a gap between what the various official documents of the Agency say (this has already been explained in the document analysis) and what the Source has revealed in his/her personal capacity. The Source does indicate that the Agency could have been more proactive in its emergency response, yet it couldn't do much beyond its "mandate" . From his/her narrative it seems that (and given his/her position at the Agency) this restricts him/her from openly sharing the details on how the Fukushima crisis was watched by the organization. Sharing his/her personal account, the Source finds the IAEA's responsibility dispensing on various factors and it did what it could do during that period.

Source: "*I think when it happened, it was a major crisis, and it was a challenge for everybody, not just for the IAEA. The IAEA was doing as much it could to accommodate the government by helping according to our mandate, nothing to do beyond our mandate. From a response dimension. There are multiple players in the organization, the IAEA had only not only to do with the radiation but mental healthcare, social responsibility.*

*I cannot say anything personal. I am still a part of the IAEA. When one day when I will leave the IAEA and be a scholar then I will have a personal opinion of the IAEA. When you work with an organization like that of a UN/IAEA, particularly at this position, whatever you say is an official statement.*"

To a certain extent these remarks neatly outline the difference in the diplomatic tone of the language used by the Agency which can be seen in their outreach through the various documents and the one that is shared by the Source from the Agency in the interview. Clearly, the Source gives a hint of the double voice within and without the organization. Above all, the Source, in mentioning his or her restrictions in sharing further details from a personal viewpoint, feels

constrained from speaking openly on complex matters given his or her official position at the IAEA. These comments also validate my initial assertions that the Agency's boundary regarding its outreach is limited. It also means that the IAEA does not go beyond the communication channels they have in place, which is rather a one-way communication model that does not allow any reciprocation and hence, the criticism against the IAEA's functioning is very well evident.

Henceforth, the IAEA situates itself in a very complex position where its diplomatic language is often being interpreted in multiple ways. And, its boundary with context to public outreach is limited and is often viewed as a one-way communication. In spite of having one bureaucratic voice across its organization, serious questions arise over the fact that its coproduction of various social or knowledge orders cannot be verified by external players. Indeed, a fundamental tension does play out in the numerous discourses that circulate within the IAEA. In the absence of any other major player in global nuclear governance, it becomes difficult to criticize an inter-governmental body that specializes in nuclear science and technology. However, from an outside perspective, it is attention-grabbing to observe how much diplomatic action goes into ensuring that the official voice of the Agency is restored throughout the IAEA.

## 8.3 The IAEA participates in the co-production of Science & Society

The IAEA performs numerous activities under its umbrella and across those activities are domains with levels of expertise that combine in order to produce knowledge. With its specific role in global nuclear governance, the IAEA's activities shape the global nuclear science and technology policies. The organization, with its vast pool of experts, and by hosting worldwide conferences, workshops and meetings focusing on research and international collaboration, helps generate new knowledge and various orders through the dynamic interaction between the society and technology.

During my interview with the Source from the IAEA, he/she shared interesting information on how knowledge is created in the IAEA. Coming up with his/her own account from his/her professional experience at the IAEA, the Source also spoke about how the Agency plays a unique role which no other organization could do, such as interaction with the Member States.

The Source shares: "*The co-production of knowledge in the IAEA comes with experts. Let's say if I or my colleagues want to look on the role of …, we invite specialists from all over the world, so we bring one group from one part of the world and one from the other, (Singapore, Canada, and Egypt) because all these bring different perspectives, the … varies from country to country. We tell them we have a problem here, we need your recommendation and thus, there is a co-production of knowledge from the same field, but also from others. The co-production of knowledge is very professional and very scientific.*"

The Source very interestingly shared how the IAEA brings together expertise from different countries and how they then take a deeper look at the issues and collectively, through consensus, the Agency accounts the achievements of new nuclear science and technology policies. This combination of co-producing from the mix of scientific and society (herein worldwide experts) pushes towards a more systemic understanding of research and policies evolving within the IAEA. This also reflects how the IAEA takes its Member States along, especially by letting their experts contribute to the various research on nuclear science and technology that shape the global policies.

However, this kind of "co-production" is somewhat different to what Jasanoff speaks about. In my case, the IAEA can be seen as a setting where multiple stakeholders work together from various fields of science, technology, research and society to build a world order that has in itself a particular view of social and societal orders that hints towards a more 'linear model' of science and society. Scholars like Melissa Leach view co-production in that sense by ways in which knowledge, social order, science and society are produced together. Leach gives a fair definition of the kind of co-production that we see in the IAEA in an interview, "*Any position – any way of looking at the world – taken by researchers or other stakeholders, always contains implicit social and political commitments, that contain views of the world and the way one wants the world to be. The process of carrying out science and delivering results is also then a process of putting that view and that vision into action and producing society, so the co-production of science is also the production of society and social orders*" ("'Co-design for relevance and usefulness' - Q&A with Melissa Leach", n.d.).

Through the remarks of the Source, it is also explained that a strong consensus building exercise takes place every time the Agency needs to form a policy or level up its research on nuclear topics. I believe similar instances happen when it comes to debating public outreach or risk communication policies within the IAEA. The reason for this is the frequent workshops that take place within the IAEA on the topic of addressing the need to educate the public about nuclear technology as a subject (Findlay, 2012). The Agency's information sharing policy, which has been constantly criticized, is perhaps connected to the one diplomatic voice that runs across the organization and leaves no room to further enhance its outreach activities.

Months after the Fukushima nuclear crisis, the IAEA hosted various meetings on emergency preparedness as well as forums that directly talked about the lessons learned from the Fukushima disaster. Given the evidence the Source shared about how collective expertise leads to shaping better nuclear science and technology policies, the international forums that were hosted by the IAEA in the aftermath of the Fukushima nuclear crisis – such as IAEA Action Plan, Emergency Preparedness as well as conferences on nuclear safety and the various preliminary reports on Fukushima by the IAEA – should be seen as various venues that contribute in different ways in the co-production of science and technology (Source; Findlay, 2012).

In the same way, the various outreach and communication channels that the Agency has in place in order to communicate about their activities and news to the world should also be seen through the same prism, i.e. as knowledge in the making, where collective expertise from various experts

are witnessed through their documents, publications into one voice and thereby contributing in their own ways to the co-production of science and technology (Jasanoff, 2004; Hindmarsh, 2013; "'Co-design for relevance and usefulness' - Q&A with Melissa Leach", n.d.)

Having previously discussed how the IAEA uses communication by means of its documents, I have taken the same case to share the details on how the IAEA's documents and outreach publications are produced. This is an interesting angle to share because the debate on how the IAEA participates in the production of various kinds of knowledge is tied to it. These documents or publications that the Agency uses for its outreach or even internal purposes are very substantial in nature, as they are the only way the Agency can ratify its regulatory tasks. Only through the documents can the Agency endorse and evaluate itself. This is mainly because of its design which does not allow it to be regulated or administratively wrought by any other organization (Findlay, 2012). Hence, the role of documents becomes central when viewed as a different form of storytelling. The documents should be perceived as fitting to certain kinds of '*authority-enacting*' documented objects and can be examined for the forms of authorship (Riles, 2006) and the type of knowledge they claim to enclose.

Documents in that sense (as certain authoritative objects) hold and transmit valuable information that allows us to unwind the very formation of officialdoms as creators and administrators of governing knowledge (Weichselbraun, 2014). In inter-governmental organizations such as the IAEA, documents convey a unified official voice of the organization (Harper, 1998) and interweave social and technological orders in how documents transport and perform as a process of knowledge production (Jasanoff, 2004) in a bureaucratic setup.

This well-organized production of knowledge reflects that it transpires through an appropriate practice of expert discourse. The language of the reports and documents gives the impression of being a distinct hybrid of legal, political and technical discourses that fit into the IAEA's diplomatic voice. Especially in the way the transformation of these specialized documents happens - as there are, many kinds of translations involved, of the Agency's official languages and by their multilingual staff.

Thus, assuming that several actors are involved in generating multiple forms of expertise, particularly those actors of varied national backgrounds and with different technical and social know-how, it is interesting to observe how they act together under one roof and restore the IAEA's legitimacy on technical expertise, which is known across the globe. The other key observation is how the Agency works on standards - to every part of every work regardless of the field and subject matter. The IAEA has standards that apply to its staff, the organization, to its Member States and to each possible communication and workaround. This can be well established given the numerous publications or reports that are accepted throughout multiple audiences worldwide.

In the post-Fukushima Action Plan, various documents were created with the help of the Member States, the IAEA Secretariat and experts from other international organizations which helped the Agency strengthen its international emergency and preparedness response framework. Thereby, it presents the interweaving of how experts from the society and the nuclear technology give

shape to various policies. In the words of the Source: "*So, from my own experience, we have major advancement in communication and it is very precise and co-production of knowledge is easy as well. The protocols because of resources from various countries could be different but we work on standards. We may differ on resources but standards are same and so it becomes easy as a language to communicate.*"

However, if observed from a different perspective, this '*regularized*' production of knowledge (mainly nuclear science) could also be seen as a way of trivializing the uniqueness of the things surrounding the nuclear topic by engaging it into a technocratic setup. Given that the topic of nuclear technology is so sensitive, it does need an organizational setup functioned through orders where subjects relating the nuclear as a technology or an issue across various aspects can be debated by addressing its social and political nature a setup as the IAEA. Though exploring this perspective was not the scope of this research project, it must be said that this puts the IAEA in a very complex situation in which it has to cope with tensions flanked by technical capabilities it has produced and the political nature of its work. This, of course, further positions the IAEA's central role as a supervising power in the use of nuclear facilities across the globe and in shaping future nuclear science and technology policies.

Relating this to what happened in Fukushima – where the IAEA has been constantly criticized for mishandling its nuclear emergency response and not having been able to establish '*facts*' during the initial phase of the Fukushima crisis from the Japanese authorities – questions are still being raised by the media and the general public as to whether the IAEA is political in nature or its activities hide some of its partisan agenda. PR, the external expert, however, shared in the meeting that: "*No, I don't think you can blame the Agency because it doesn't have jurisdictional powers.*" His views reflected the binding Statute that the IAEA has with its Member States. "*You can't go in there and say oh you shouldn't be doing this, you should be doing that. We had a DDG in the Agency when I was with the Japanese and he would just say: The greatest enemy of nuclear safety is complacency. So, everyone was complacent, I guess. The Agency, I suppose, doesn't share the blame. Well, it's part of the sort of global nuclear village. But again you keep coming back to this argument that the Agency is like the jellyfish, a sort of an assemblage of cells you know? And if member states don't want binding safety laws, then you're not going to get them,' cause that's been a debate for the longest time*", he further added.

Thus, the interpretations from PR make it very clear that whatever situation the Agency puts itself into, it is highly unlikely that that it would accept the blame to any degree when it comes to circumstances that have happened outside the Agency's premises. The words of the Source, in this case, echo well with the remarks of the external expert PR in understanding how the IAEA viewed itself during the Fukushima nuclear crisis.

Alluding to what I have previously written in the context of the production of knowledge, the IAEA does provide an interesting example of how individual and diverse expert groups across various assemblies within the Agency cooperate in order to arrive at a consensus over an issue, which helps formulate policies at various levels. The magnitude of work that the agency is doing through its various segments is, indeed, interesting to witness. Hosting professionals from varied

nationalities and diverse groups under one roof is quite interesting, especially when there are competing voices about what kind of rules, standards and procedures would be most effective within the boundaries of the IAEA's mandate. Additionally, from the remarks of the interviewees, the above reading allows us to shed light on the very practices within the Agency that give an impression on how far various orders are negotiated and how that reflects on the IAEA as a whole.

Finally, I will consider my analysis of the IAEA's risk communication during the Fukushima nuclear crisis and also highlight the IAEA/media relationship which has helped summarize different facets of the overall research work.

## IAEA's Communication Role during Fukushima Nuclear Disaster

Having previously analyzed some of the documents that were part of the emergency response to the Fukushima nuclear crisis, I would now like to contextualize how these experts as individuals or social groups who "*have a certain kind of expertise"* (Def. by Bijker, 2000) viewed the IAEA's communication role when the disaster unfolded and how that sheds light on the image of the Agency and its connection with the media.

In the course of my interview with the nuclear information expert PR and CM, the Science Editor at APA, both seemed absolutely displeased with the IAEA's response to the Fukushima crisis. Both used terms such as "*failure*" and "*unprofessional*" in describing the IAEA's response in dealing with the nuclear disaster. According to the nuclear information expert PR: "*I think it was widely agreed, it was not the finest hour for the Agency… It had a problem in making an initial public response and that's on record*."

The situation during the initial phase was worse than they (IAEA) wanted to admit as some of the preliminary information showed evidence of being completely imprecise and left the Agency totally ill-informed and, at worst, seemed rather dramatic by the Japanese authorities. While remedies were put in place when the Agency's Director General (DG) himself started detailed briefings for the media and the Member States, which is not often the case of how the IAEA generally behaves. Still, the situation backfired as the DG and the IAEA's staff members appeared uncomfortable due to the media attention (Findlay, 2012).

The various documents or news articles prepared by the Agency during the initial phase were of little information and were unable to make the level of impact that could have satisfied the public's thirst for information, as the Agency was only relying on the information provided by Japan. This issue might have offended the IAEA's image the most as they seemed reluctant to release information such as graphics or independent data, which even the media was able to reproduce from their open sources.

While the IAEA claims to have standards when dealing with an emergency situation and response, given the evidence that has emerged, all of this appears to be just a delivery-of-message kind of mechanism, put into practice, instead of a dialogue or something that could have been more

explanatory and could have offered a more satisfactory response to the public. This view was also endorsed and acknowledged by PR who agreed, "*I think so! And I think this is one of the problems. And I mean you can say well, of course, it's the institutional nature of the organization and its historical precedence and all the rest of it. But it is 'slewed' in the sense that this information doesn't go out to the public. There's not much public engagement on a meaningful basis. Papers come out across and press statements by the director general, but I don't think it's quite in the 21st century yet in terms of accountability and public involvement. I think it's reluctant, doesn't quite know how to deal with it*" (PR).

Similar views were expressed from a media perspective by Science Editor CM, who considers the IAEA to be of a political nature in its activities, as an organization, he thinks, the IAEA "*doesn't know who its audience is and lacks regular contact with the media*" and he himself felt disgruntled when it wasn't possible to provide adequate information on the topic at a time when it was highly needed, mainly because of the IAEA's incompetence to feed the media. As to why one must expect the information to come from the IAEA is mainly because the organization has the Incident and Emergency Centre (IEC) unit, that is "*the global focal point for emergency preparedness and response for nuclear and radiological safety or security related incidents, emergencies, threats or events of media interest*" ("IAEA Incident and Emergency Centre," n.d.). It also places itself as the "*world's centre for coordination of international assistance in emergency preparedness and response*", thereby, expecting the media or concerned public to be informed. CM found huge communication gaps between the IAEA and the media during the first days of reporting on the Fukushima crisis. In his own words, he shares, "*Actually, I do not know whether the IAEA was able to get more information from the Member States. They (IAEA) were depending on most of the information from the Japanese side (from the government or the company TEPCO). This wasn't good either*" (CM).

Based on the evidence currently available through remarks of both the experts, it is fair to suggest that the IAEA's communication in the early stage of the Fukushima disaster 'achieved little' in terms of what was needed in the situation of a nuclear emergency. This is not just argued by various forums and international groups including the media but also according to the IAEA's own procedures. The IAEA's book 'Communication with the Public in a Nuclear or Radiological Emergency', focusing on its 'Emergency Preparedness and Response', explains how the IAEA should handle the situation (IAEA, 2012). By looking into the argument made by the interviewees, document material and finally reading through the IAEA's own rule book, in the case of Fukushima nuclear disaster, the Agency's communication during the early period was slow. This allows us to reflect that communication activity on Fukushima could have been more active and could have played a more proactive role in dealing with emergency preparedness and response despite the flood of information that circulated on social media, which added more fuel to the confusion for the the public rather than any clarification. This is in line with what Trevor Findlay, the director of the Nuclear Energy Futures Project found" "*The IAEA was also slow in providing information that was already available to it, which it could readily have obtained or could have prepared in advance for use in any nuclear accident"* (Findlay, 2012: p.31).

While interviewing the Source from the IAEA to know his or her view on the matter, I observed that the views were quite contradictory in comparison with those of the other interviewees. According to the Source, the Agency believes it has standards for everything it does (though this is in line with my document analysis). As explained earlier, these standards are *'established specifications or procedures'* designed to ensure the reliability of the methods, they are often produced as published documents within organizations or institutions ensuring its functionality and influence the way its staff works and communicates. Above all, standards in an organization like the IAEA have the power and authority that allow the functioning of various practices. Often aimed at protecting the organization's interest in view of the international policies and certain frameworks. In view of this, it was startling to know that the Source acknowledges that the Agency's communication is like a delivery of a message. "*Yes, because the IAEA has to comply with the Member States*," the Source confirms. Here the Source also emphasizes that it is not the responsibility of the IAEA to give an explanation. "*We establish standards based on the respective scientists, consensus and also sister organizations like the WHO and some non-UN organization like the ICRP, ILO, thus projecting standard procedures. It is the responsibility of the member states to tell more explanation not the IAEA*," the Source stated. These remarks actually contradict each other. The other experts (PR & CM) believe that it is the IAEA's responsibility for global nuclear safety and it has to be accountable for sharing any information of concern to the general public.

The excerpt in the above paragraph draws a powerful picture as to how the IAEA undermine the IAEA's direct communication with the general public. Certainly, it appears to be that there is not much for the IAEA to deal with on a regular basis (leave part during an event of crisis) when it comes to the general public. The comments from the Source substantiate further that the Agency, despite working as a combination of various assemblies, keeps tight-lipped on the news of its major activities. This brings into the spotlight the broader question of science communication, which the Source him/her-self raises during our conversation "*Science is not well communicated is from whom to what?*" According to the Source, this issue has nothing to do with the IAEA, "*well this is science in general around the world –most scientists the majorities do like to do just science*". The Source acknowledges this as a crucial STS debate on science communication, which often overlooks the general public as an equal partner in making science policies.

To further interpret the remarks of the Source, the topic of science communication touches another essential debate which is on the public understanding of science. From the IAEA perspective, it hints at *maintaining a closed science communication network* when it comes to addressing nuclear research and related policies and what should be told to the public or what should not. This also may well be part of the IAEA's structure as to how it should construct the public's or the Agency's limit to be proactive on certain topics by keeping itself restricted to its Statute.

In this complex relationship between the scientific community and the public, PR, the nuclear information expert ensures that despite the Agency being quite *thin-skinned*, there are efforts made by the Agency to maintain an engaging affiliation with the public. He explains, "*I think there were quite strong efforts made to respond to the public. It's just that it's not proactive… It's just that it's not clearly defined what role the communication process has in the big picture, right? And,*

*I guess what I was saying before that does reflect the constitution, the founding of the organization* (PR)". In addition to this, he also discloses the role of his non-governmental organization, Atomic Reporters, which according to him is doing the job the Agency is failing at. Designating it as an "independent organization", that does not promote one agenda but encourages evidence-based reporting that helps the media and the public understand the subject. Explaining his organization to be just an information broker, which he believes, "*is fulfilling a gap in the process which hasn't been filled before, namely working with journalists" (PR).*

Therefore, from the above reading, given the comments from the Source and PR, I am able to establish that there are gaps in the IAEA in the context of its risk communication activities and efforts that are made to fulfill such gaps, externally, i.e. without any IAEA involvement. However, how the IAEA imagines and draw its boundaries towards these research organizations is not clear since PR mentions that there is no direct contact between the Agency and Atomic Reporters but also asserts that the door is open.

During the early days of the 3/11 crisis, as has been quoted in previous chapters, there was strong criticism by the media towards the IAEA which can be very well observed here. As Science Editor, CM describes, "*It is difficult to say how the IAEA functioned with regard to communicating with the accident, and I can't judge that. The interesting thing in my view is the recognition of the event (in the media), for the first few days we couldn't analyze to what actually it was and the extent of the damage*". CM refers to how even the media was helpless in finding the facts in connection to the events in Japan and as it looked towards the IAEA for information, the media remained constrained. Therefore, these actions contributed to an unhealthy relationship between the two. From what I examined, it could be said that the IAEA/media relationship perhaps had the toughest time during the Fukushima nuclear crisis. Both the media and the IAEA remained discontented with each other at this time. The IAEA witnessed a glut of false information floating in the media that prompted sharp public reactions. In turn, the media blamed the IAEA and the Japanese authorities for irregularities in information sharing.

The state of affairs during that time was such that the IAEA communication could not pacify the situation. Nuclear information expert PR asserts that this complexity lies in the complexity of "nuclear" as a topic itself. "*I always use an awful old joke - I tell people I'm dyslexic so when I see the word 'nuclear' I think it means unclear*", shares PR, as he discourses upon the IAEA/media relationship. Clearly, the notion attached to the term appears at the center of techno-politics. This was even highlighted by CM who shared his views from a media outlook, "*Yes, of course, there was this need. But it was difficult to satisfy the public demand as IAEA's response was initially very slow and what Austrian experts were doing was just interpreting TV pictures actually. It was never satisfying being as a science journalist. And there was no other possibility that I saw at that time*", said CM. This, however, reflects that perhaps the manner in which media framed their coverage of the Fukushima nuclear crisis is critically important to public understanding as well as to policy decisions to understand the public information debate of the nuclear crisis (Entman, 1993). Such events, when represented in the media, influence policies and decisions.

I would also like to reflect that it is clear that despite the fact that the relationship between the two (the media and the IAEA) was not a healthy one during the Fukushima nuclear crisis, an essential link between the IAEA and the media is perhaps a purposeful one for both sides and it is somewhat understandable that the media views the IAEA as a credible and reliable source. Still, the public is still impacted by the potential flaws in the information communicated through the media when an accident occurs.

Thus, there is certainly a greater need for engagement by both the IAEA and media to better cover nuclear related topics in future. Further, in this sense, Fukushima has been a wakeup call about the hazards of nuclear power, and most countries are following the information. In the post-Fukushima world, the need for transparency, as well as gathering, processing and communicating accurate facts about the progression of the emergency has intensified. Again, Fukushima undoubtedly shows the necessity for an overhaul of the nuclear emergency preparedness and response. Perhaps this could start from within the Agency through some reforms.

As we have been through many insights and perspectives from various experts on how the IAEA is seen as an organization and what issues arose during the IAEA's communication during Fukushima, in the subsequent chapter these findings will be connected with the theoretical framing. This will help in synthesizing some concluding remarks and will open further debate for research that will help communication and media researchers in the field of STS.

# 9 Concluding Remarks

Throughout the analysis of the IAEA's communication activities, I have explored the various modes through which IAEA reaches out to as part of its emergency response during the Fukushima nuclear crisis to the media and public. During my research, I had the chance to reflect upon IAEA documents that gave interesting details into the forms of storytelling they use to communicate and that also shed light on the way the IAEA as an organization functions. The analysis also allowed me to reflect on the role of the IAEA with regards to risk communication, how knowledge orders are coproduced and how different venues contribute in different ways to the co-production of science and technology especially by reflecting on an interview with the Source from the IAEA. The interviews with the other two experts allowed me to reflect on the IAEA as an organization and its limits, and inform about the various notions of the IAEA/media link. Even though I was able to accomplish much of what was hoped for, from a holistic view, direct engagement with the IAEA was missing. As any research would have, this too, led to new questions and reached points where further exploration from a distant approach was limited and hence could not bring further clarification.

Surprisingly, the week I was about to start writing this chapter, I was made aware of the Austrian government's nationwide *Long Night of Research* project, in which the IAEA was also participating and had invited the public (those mainly based in Vienna; and those curious about nuclear science and technology) to visit its headquarters to "*showcase their work on everything from saving bananas from a deadly disease to preventing proliferation of nuclear weapons.*" ("IAEA to Showcase Nuclear Science at Long Night of Research", 2016). It was a perfect opportunity for this research work to get closer to the IAEA and to directly witness some of the elements that had come up during the research mainly with context to how the IAEA engages with the public and who is their intended audience. This event allowed me to fill this gap (of direct engagement with the IAEA) during my research.

During my visit, it was found that the IAEA was mainly showcasing its research on health, addressing environmental issues and issues concerning food and agriculture. Topics such as nuclear safety or anything relating to communication during a nuclear emergency was not to be found nor was any exhibition stand devoted to these subjects, nor were there any staff members from these departments. Despite this, a number of interesting details were noticeable, especially, when I found that the handouts they were giving to everyone were in German text, which is not an IAEA/UN language (I believe this was done mainly to focus on the German speaking visitors). Secondly, during my 3 hours of observation at the IAEA (VIC) complex I found there were no guides for this exhibition and most people in the crowd who entered the VIC complex did not know where to begin and what to look at. I found a reflection of the same issues that were brought up in my empirical analysis i.e. the lack of IAEA's connection with their audience. When looking into the various modes of IAEA's outreach and how communication is performed with the public during a nuclear emergency this lack of connection was very much apparent here as well. I believe the reasoning of this reflection is very much tied to the complexity of communicating the sensitive nature of nuclear technology as a subject.

Another noteworthy moment was when I found an exhibition stand devoted to Open Data[5], an effort by the UN organizations to show *transparency and build public trust*. Here, various UN organizations had their data on several topics displayed onscreen for the public to see and play with, however, no data from the IAEA was found. Upon asking the staff member (name not disclosed) from the United Nations Industrial Development Organization (UNIDO) as to why there is no open data from the IAEA, the staff responded: "*No. Not with the IAEA. The IAEA has different set of rules and boundaries*". This allowed me to reflect on the special mandate of the IAEA and the agreement the IAEA has with its Member States that does not allow any disclosure of information. This suggested a visible boundary with regards openness and communication, a sign very much reflected when analyzing the interview from the Source.

Although I must state that this was a small initiative made by the IAEA in collaboration with the Austrian government to showcase their research work on science and research, and did not include showing the wide range of activities the IAEA performs. In the audience were visitors of different age groups, and upon observation I found that most of them were very enthusiastic to know what the Agency does and what their science research programs achieve as IAEA scientists and engineers explained at their exhibition booths. From an STS perspective, such participation does suggest a strengthening of public engagement and helping to shape scientific understandings and normative representational performances (Wynne, 2007). Largely, witnessing this public event as a direct engagement with the IAEA (between IAEA & public) further allowed to me reflect on the main conclusions based on my research questions.

A reflection on the empirical analysis confirms that the IAEA uses various ways to communicate with "the public" during a nuclear emergency and the various ways (as documents, communication messages, alerts) through which it outreaches are venues that reflect certain kind of knowledge or social orders that very well echo the single voice of the organization.

The analysis also suggests that new forms of communication (social media) paved a way in the IAEA to communicate with the world alongside traditional mediums. The reflection of which can be very well seen in the way the IAEA communicated through these different methods. In the case of the Fukushima nuclear crisis, the research confirms that the IAEA has introduced itself to the use of the new media channels to communicate with some segments of concerned publics. Thereby, making use of the true benefits of communication through social media such as Twitter and Facebook allowed the Agency to constantly update information to disseminate it to a larger audience and also catalyze the emergency preparedness response.

However, upon further reflection, the analysis suggests that despite the ways of disseminating information being updated at the Agency, little has changed with regard to the language and communication behavior of the organization. In the case of the Fukushima nuclear crisis, the analysis reflects a very linear communication model. A two-way communication process could

[5]Open data is data that can be freely used, re-used and redistributed by anyone - subject only, at most, to the requirement to attribute and share alike.

have possibly improved the deteriorating situation during this period. This ties in with the construction of the public imagined by the IAEA that, though it is not entirely possible with this research work alone to establish, indications from the analysis suggest that it is not entirely clear to whom the IAEA is addressing with these outreach messages.

With regards the communication practices at the Agency, especially with context to risk or crisis communication, the analysis suggests that emergency activities were performed by IAEA. However, a more active role in the emergency response could have helped achieve more during the initial days of the Fukushima nuclear crisis. What I also learned from the analysis is that during those crucial moments (the early days of the Fukushima nuclear crisis) IAEA had difficulties in communicating because an initial breakdown of its communication infrastructure. Tied to the fact that the fragility of infrastructure when dealing with emergencies should be of concern, there is an obvious need to prepare a robust communication infrastructure to predict complex disasters.

The research also suggests key issues with regard to the boundary or limitation concerning IAEA's outreach. This issue mainly rests on the crucial relationship of the IAEA with its Member States. The IAEA Statute upon which it has its agreement with its Member States binds the Agency not to disclose sensitive/relevant information to the general public. Analysis of the documents on IAEA's communication - the various press releases and media advisories on the Fukushima nuclear crisis - suggests that the IAEA received most information from its Member State Japan, and is bound to restrict itself to communicate only that information. This remark is in line with Nature magazine's article that calls for reforms in the IAEA, sharing: "*It will ultimately be up to the member states to determine how much independence the IAEA will have in a future crisis*"(Brumfiel, 2011).

With context to understanding the IAEA as an organization and how various orders are coproduced, research suggests that the IAEA should be seen as the nucleus around which a global nuclear governance system revolves. Being a very large and complex organization, I learned about the process of legitimization and the workflow of documentation in the body. Connecting this point to the subject of risk communication activities on Fukushima, such processes suggest that for each media advisory or press release (or even social media activity) released, there was a systematic workflow by the outreach team that was produced within use of the language in the organization. The idea that there is one central voice across the organization is reflected in the public domain through outreach documents. The IAEA remains the informational hub with regard to the coproduction of knowledge, an organization where various experts engage in scientific (and policy) dialogue that shapes nuclear-related policies. Therefore, across the wide range of the IAEA's work, it is often challenging to bring out the various mandates under which the Agency operates in the field of nuclear safety.

From the document analysis and discourse analysis, a new domain came into light which is about standardization. During the research there were instances that suggest that standardization occurs in every process within the organization (IAEA) and work within the organization is performed through language and documents. For all of the work of the IAEA, there are standards for which they have procedures written in documents (in particular order and language). Viewed from a social dimension, the use of language is often perceived as a driving force behind human

knowledge about the world and how it brings reality into existence. This gives an idea how those knowledge orders come into play within an organization.

An analysis throughout this research also suggests that IAEA regards Fukushima (3/11) solely as a nuclear accident while others (mostly academics, media and the general public) label it as a nuclear disaster. Throughout the analysis of both texts and documents, including examining the views from the Source from the IAEA, there is no mention of Fukushima as a disaster. From an STS perspective, what happened in Fukushima has been a nuclear disaster, an event that was followed by a string of unfortunate consequences. The IAEA has neither pronounced the past nuclear events such as Chernobyl and the Three Mile Island as disasters but accidents. This seems to suggest that there appears to be a 'systematic approach' from the IAEA's side as to what it considers as an accident. The role of the IAEA with context to 3/11 is large and its activities were and are of massive scale. The IAEA has been providing a series of reports, on-the-ground assessments, and supporting various projects across issues at the Fukushima nuclear plant. From what is learned from the analysis, the IAEA as an international regulatory body performs numerous tasks including *lessons learned from Fukushima* with context to communication during a radiological emergency.

I also became aware of the various elements in the relationship between IAEA and the media. While from an IAEA perspective, proper channels are in place to communicate with the media, the media felt that IAEA needs to have a more proactive communication strategy. Analysis also suggests that the understanding of socio-technical disasters owing to the media's framing while the media scene has seen dramatic changes in covering disasters, especially with new media becoming more important, it also poses new problems with regards to the glut of information and the wide spectrum of quality. Above all, the use of language in addressing nuclear topics is highly challenging as the dearth of specialized journalists covering nuclear-related topics also remains an issue.

Last but not least, the analysis also suggests that because of this sensitivity of "nuclear" as a topic (in a global context), radioactivity is a controversial and emotional topic for many people. It is certainly very challenging for any organization (including the IAEA) to share information publicly. Therefore, any techno-natural disaster can have its dimensions headed to a communication disaster and what we have seen in the 3/11 is quite the case. The glut of information in the early phase of the disaster created more confusion than clarification, thereby, weakening the overall crisis communications and risk communications practices in place and affecting the emergency information flow across all levels and within major stakeholders.

However, it must be noted that the reflection from the analysis was somewhat limited by the scale and scope of the document sample and missed analyzing a direct engagement with the IAEA. Still, in this thesis I have tried to open up points for future development and for a critical perspective on how risk communication and disaster preparedness (at least from the IAEA's viewpoint) needs to be strengthened. These points merely reflect on the IAEA with context to the Fukushima nuclear crisis and it would be unfair to interpret these reflections on the IAEA as a whole. Further research on this topic could focus on other aspects, such as public understanding of science and science-media relationship.

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# Appendix I

# ABSTRACT

***Keywords**: STS, crisis communication, IAEA, media, nuclear, public information, Fukushima, new media, techno-natural disaster, document analysis*

This paper examines the different ways in which communication activities of the International Atomic Energy Agency (IAEA), a global organization under the framework of the United Nations (UN), participates in the case of a techno-natural disaster. In particular, this paper looks at those events of crisis communication that took place in the early phase of the IAEA's emergency response on the Fukushima nuclear crisis. I argue that those moments when there is a breakdown of crisis communication and organizational level support to deal with emergencies is not effective, such moments of crisis communication are also moments in which one can observe the "*co-production of knowledge orders and societal orders*." Combining semi-structured interviews and document analysis as main research methods, the main aim of conducting this research was to observe those crisis communication activities of an organization that situates at the center of a techno-natural disaster with context to public information. Besides that an important element 'time' is also studied with regard to how different notions and methods of storytelling have changed over time within the IAEA. With that this research will be able to witness "*co-production in the making*." As from Science and Technology studies (STS) perspective, the communication channel units in the IAEA should be seen as an arena in which "*co-production*" takes place between *knowledge orders, technology orders and social orders,* and these different venues contribute in different methods of *co-production* of science and technology. From the findings it can be seen that scientific knowledge and technological artifacts are defined in a certain social order that is both influenced by cultural and political institutions and how these orders get *co-produced* by the IAEA (in the context of Fukushima nuclear crisis) within the context of science and technology. The IAEA calls for a reform with context to its communication practices and further opening for media or public access. It is recommended that further research could delve into how far this is valid for other scientific areas.

# Zusammenfassung

Keywords / Schlüsselbegriffe: STS, Krisenkommunikation, IAEA, Medien, nuclear, öffentlich zugängliche Informationen, Fukushima, Neue Medien, technologisch-natürliche Katastrophen, Dokumentenanalyse

Dieses Paper analysiert die verschiedenen Wege, über die die Internationale Atomenergie Agentur (IAEA), eine globale Organisation der Vereinten Nationen (UN), Kommunikationsaktivitäten zu technologisch-natürlichen Katastrophen betreibt. Im Speziellen werden im Rahmen dieses Papers jene Ereignisse der Krisenkommunikation behandelt, die im Zusammenhang mit der frühen Phase der Informationsweitergabe zur Fukushima-Atomkrise stehen. Ich behaupte, dass jene Momente, in denen es einen Zusammenbruch der Krisenkommunikation gibt, und in denen die Unterstützung auf der organisatorischen Ebene nicht effektiv ist, auch jene Momente sind, in denen die Gemeinschaftsproduktion von Wissensordnung und sozialer Ordnung untersucht werden kann. Die Kombination von semistrukturierten Interviews und die Analyse der Dokumente als vorrangige Forschungsmethoden waren wesentlich, um die Krisenkommunikations-Aktivitäten einer Organisation zu untersuchen. Dabei stehen die Kommunikation über technologisch-natürliche Katastrophen und die Informationsweitergabe an die Öffentlichkeit im Mittelpunkt.

Weiters wurde auch der wesentliche Faktor "Zeit" untersucht – mit dem Ziel herauszufinden, wie sich Begriffe und Methoden des Erzählens über die Jahre innerhalb der IAEA verändert haben. Damit ermöglicht die Forschung, die „Co-Produktion des Schaffens" zu bezeugen. Aus der Perspektive der Science and Technology Studies (STS) sollten die Kommunikationskanäle, die in der IAEA zusammenlaufen, als Arena gesehen werden, in denen Co-Produktion zwischen Wissensordnung, Technologieordnung und Sozialordnung stattfinden kann. Diese verschiedene Bereiche spielen in den unterschiedlichen Methoden der Co-Produktion von Wissenschaft und Forschung eine Rolle. Die Untersuchungen zeigen, dass naturwissenschaftliche Erkenntnisse und technologische Werkzeuge in einer bestimmten Sozialordnung definiert werden, die sowohl durch kulturelle als auch politische Institutionen beeinflusst werden. Sie zeigen auch, wie diese Ordnungen durch die IAEA (im Beispiel der Fukushima Atomkatastrophe) im Kontext von Wissenschaft und Forschung koproduziert werden. Der Ruf der IAEA nach einer Reform in Bezug auf ihre Kommunikation und die Öffnung hin zu medialem oder öffentlichem Zugang wird laut. An dieser Stelle wird empfohlen, weitere Forschungsarbeit zu leisten und sich damit zu beschäftigen, wie sehr diese Erkenntnisse auf andere Wissenschafts-Gebiete umgelegt werden können.