An Ethical Perspective on Extreme Situations and Nuclear Safety Preservation

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Abstract Extreme situations lead to the collapse of systems together with all existing rules, including symbolic ones. Therefore there are no longer any procedures to comply with, nor any outside guidance to help in making the complex decisions imposed by such situations. The decision-maker has to look elsewhere to find the resources to guide their actions, all the more since they are likely to be held responsible when the situation returns to normal. We argue that ethics, based on practical reason, offer a way out of the dead-end. Practical reason is anchored in individual motivation, as opposed to external rules, and is ultimately guided by solicitude towards other human beings. As it rises from the inner desires, feelings and reasoning of a person it offers a guide for action, even when artefacts collapse. Furthermore ethics could provide common ground on which to build an interdisciplinary approach to resilience in extreme situations, as ethical questions run through all disciplines. Building on Paul Ricoeur's practical philosophy, we describe what an ethical approach to decision-making in extreme situations could look like, as well as its implications for organizations. We show that such an approach requires that organizations allow their members to use their practical reason and act autonomously not only when accidents occur, but also in normal situations. Such a transformation could lead to building "safe institutions", i.e. organizations within which people would preserve safety, rather than organizations that manage safety through people.

Keywords Decision-making · Ricoeur · Ethics · Practical reason · Responsibility

H. Blazsin (✉)
Centre for Research on Risks and Crises, MINES ParisTech/PSL Research University, Sophia Antipolis, France
e-mail: hortense.blazsin@mines-paristech.fr

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1 Introduction

This book and the underlying workshop, entitled "Becoming Resilient in Extreme Situations: A New Paradigm of Nuclear Safety", bring together scientists from Europe, Japan and the United States, from disciplines as diverse as anthropology, sociology, history, philosophy, epidemiology, physics, engineering and biology.

Such heterogeneity raises the question of what could possibly unite us, and whether we would be able to find common ground. The topic definitely is not enough, especially one as complex as the collapse of a nuclear power plant following a tsunami. The issues are so complex that each discipline alone would find it difficult to reach scientific certainty, or even consensus. If even this initial level of agreement is not guaranteed, it seems fair to question the ability of a multidisciplinary group to find common ground.

However, there is one thread that seems to have run throughout the workshop. Either explicitly or implicitly, the question of ethics has filled the air, and occasionally fueled debates. At this stage we use the term "ethics" in a broad sense; it refers to the set of moral principles guiding human (individual and collective) action, which determine what is acceptable, i.e. respectful of human nature (that of the actor and that of those potentially touched by their actions). Diverse ethical questions, ranging from the victim's identity to evacuation-related decisions and public engagement with scientific knowledge have surfaced. We must not forget that under sophisticated concepts such as "resilience" or "extreme situations" lie more basic aspects of safety, i.e. respect for the humanity of those impacted by the management of extreme situations, either as victims or as actors. Therefore, it seems reasonable to argue that an ethical framework could provide some common ground for our multidisciplinary efforts, forming a "dictionary" that we can use to translate [2] individual standpoints into a shared language.

Here, we sum up and put into perspective the most pressing ethical issues that were raised during the workshop. We raise many questions, but answer few, if any at all. Nevertheless, hopefully we show that this lack of answers does not render the exercise useless. Rather, we endeavor to show that an ethical perspective on safety and the management of extreme situations not only provides a moral safeguard; it also offers a very practical guide for individual and collective action. To achieve this, we reflect on the management of the Fukushima Daiichi accident through the prism of "practical reason". The concept, which first appeared in the work of Aristotle [9], reappears in the work of Kant [8], and more contemporarily, Paul Ricoeur [11]. We use the work of the latter to illustrate the heuristics of ethics for safe action and the management of extreme situations.

2 The Management of Extreme Situations, Multiple Dilemmas

Broadly speaking, the application of ethics to major accidents and the management of extreme situations leads to a focus on the relationship between people (both individuals and collectives) and these events.

During the workshop, the concept of the victim (which makes the relationship between people and the accident explicit) emerged as a heuristic that united the various ethical questions that were raised. For instance, how should the public (who are all potential victims of major accidents) be taken into account, and involved in decisions that may impact them at some point? As major accidents unfold, how do we determine what truly helps victims, and what is in their best interest? Should such a "best interest" be acted upon, even if victims do not give their consent? Finally after an accident has occurred, who should be considered as a victim? How can victims be recognized as such—and ultimately, be compensated for their loss, assuming that such compensation is possible?

One important issue that was raised is that of a mediator who arbitrates between victims and the accident. Such a mediator is necessary to establish a relationship between people and what has happened to them. This relationship is a prerequisite for the evaluation of the post-accident situation and attempts to restore harmony, from which a new cycle can begin. The question becomes even more difficult when one looks at non-human victims (i.e. nature), that have no voice to express the damage it has suffered and where it may not be possible to restore harmony.

During the workshop, the Sorites paradox[1] was used to illustrate the immense difficulty of giving an identity to victims of major accidents. This is not only a question of the number of victims: tens of thousands could be named. But, for example, who should be considered as a victim of the Chernobyl accident, where millions were exposed to very small doses of radiation? If someone lives in an area that was affected by radiation from Chernobyl and develops cancer, how can we determine whether s/he is a victim of the Chernobyl accident? This philosophical argument is supported by epidemiology, which highlights the difficulty of correlating radiation maps with actual damage to human health. Together, these issues question the ability of traditional models to shed heuristic and instrumental light on phenomena that are as complex as major accidents.

The issue of traditional models was only one way in which the relevance of current scientific approaches to major accidents was questioned. Other issues concerned how to establish a relationship between scientists and the public, and how to make scientific knowledge available to less-expert audiences and include them in decisions that may ultimately disrupt their life. Consequently, public

[1]The Sorites paradox, also called the "little-by-little paradox" highlights the difficulty that arises from indeterminate or fuzzy boundaries. Using the concept of the "heap", it shows that if one takes grains out one by one, it is impossible to establish which grain was the limit that turned the heap into a "non-heap".

engagement, disclosure of scientific information and consent emerged as questions to be addressed.

Another series of questions concerned the management of evacuees. For instance, should elderly people be evacuated from the disaster zone? Although they may suffer from nuclear radiation if they stay, uprooting them from their environment can trigger other effects, such as desocialization and loss of reference points. This reminds us that major accidents do not only trigger physical damage, but also psychological and social damage. Furthermore, what should be done if people are unwilling to be evacuated?

The question of public engagement and preparation is not only an ethical matter (i.e. maximizing people's involvement in life-changing decisions). It is also a matter of social resilience. It is an illustration of how ethics and safety can strengthen one another. It supports the idea that—far from being a purely abstract and theoretical perspective—ethics may have very concrete implications, and offer a practical guide for individual and collective action to manage extreme situations and preserve safety.

3 Ethics: Not Only a Way Out, but also a Way up

We use the definition of ethics given by the contemporary French philosopher Paul Ricoeur. According to him, ethics refers to a person's attempt to lead "a good life, with and for others, within just institutions" [11]. Therefore it lies at the heart of human behavior towards oneself as well as others. It offers a guide for both day-to-day actions and "extreme situations". In extreme situations everything collapses, from rules to structures to meaning to values, leaving nothing to guide action but one's inner conviction that a particular decision is the right one. To act when faced with this "tragic dimension of action", where no rule is applicable, calls for a higher purpose. Ricoeur calls it solicitude towards others. Such solicitude is expressed through "practical wisdom" [10], which is the result of a process of "deliberation", i.e. critical analysis and the comparison of existing rules with the higher purpose of solicitude.

In the following section, we show how practical reason can help when reflecting on safety and the management of extreme situations. Based on the testimony of Masao Yoshida, who was director of the Fukushima Daiichi plant at the time of the tsunami, we illustrate the role played by individual intention and voluntary action in the preservation of safety. We then generalize these lessons to show how Ricoeur's practical philosophy can provide inspiration for an approach to safety that is different to traditional, engineering approaches; we term this "practical safety".

3.1 *Voluntary Action and Decision-Making, the Ethical Way Out of Extreme Situations*

As Masao Yoshida indicates in his testimony, in Japan, the law on nuclear catastrophes is invoked when an exceptional situation develops in a nuclear power plant. Under this law, he became responsible for crisis management [5]. He had the power to make decisions, and take responsibility for any actions supervised by him. Considering the potentially immense consequences of any decisions made in this context, it seems reasonable to reflect on the implications of such a responsibility for an individual, to question whether s/he is in a position to hold it, and the attribution of responsibility by legal and organizational systems. Furthermore, such situations make individuals responsible "not because one is free by nature, but because society judges it 'fair' to place responsibility in a particular social location", displacing the source of responsibility "from the individual onto society" [3].

The imposition of such a responsibility therefore appears to be heteronomous (i.e. obeying an external rule), rather than autonomous (i.e. following a self-imposed rule). This is no surprise, as heteronomy lies at the heart of contemporary organizations. They rest on engineered processes and rules and therefore on a reified rationality, that is external to the individual and imposed upon them [1]. Consequently, actions that are carried out in such a context do not result from individual free will, which implies that they cannot be deemed voluntary. Indeed, according to Ricoeur [10], following Aristotle [8], to qualify as voluntary an action has to have a specific goal and result from free will. From the perspective of these philosophers, individuals can only be held responsible for their voluntary action. As Irwin [7] comments on *Nicomachean Ethics*, "only voluntary actions can be assessed for praise and blame. To find a voluntary action is to find an action it is reasonable to consider for praise and blame. Aristotle (…) assumes that the same conditions make actions candidates for moral and for legal scrutiny and reactions—praise, blame, reward, punishment, and so on." If only voluntary actions can be subject to moral or legal judgment, is it fair to consider the decision-maker in extreme situations as responsible? Given that their responsibility stems from a heteronomous, rather than an autonomous source, and that organizations usually restrict autonomy, can an individual truly be held responsible?

Obviously the question is far from new. However, the fact that the extraordinary collapse of the Fukushima Daiichi plant placed a specific individual, Masao Yoshida, under moral and legal scrutiny, indicates the need to reflect on the relationship between responsibility, voluntary action, and safety when managing extreme situations. Furthermore, if individuals are to be considered responsible for their actions, not only is it fairer to build systems that provide them with the means to act voluntarily and responsibly, it is also a necessity imposed by extreme situations.

Extreme situations lead to the collapse of systems and vitiate all preexisting rules, including symbolic ones [4]. There are no longer any procedures that guide actions and decisions. The individual is no longer heteronomous, and autonomous,

voluntary action is the only option left. The decision made by Yoshida and a number of operators to remain at the plant in order to contain the damage exemplifies the role of autonomous action oriented at preserving safety. The fact that they were willing to sacrifice their own lives to save others may be considered as an example of *solicitude*.

As such, their actions can be deemed ethical and considered as an expression of "practical reason", in the meaning developed by Ricoeur. Ricoeur asserts that rationality is only one of the many forms reason can take; another is practical reason. The main characteristics of Ricoeur's practical reason are that: it stems from individual desires, and therefore free will; these desires are "reasonable", i.e. understood by others as possible motivators for action, meaning that they are made explicit to others who can confirm such reasonableness; it is strategic, i.e. it articulates a means to an end, and leads to the development of complex reasoning, triggering a dynamic teleology; and finally, it is ethical [10]. The concept seems to be an appropriate heuristic for the management of extreme situations. It is anchored in free will, with an explicit connection to ethical aims. Furthermore, the need to make motives explicit (to ensure reasonableness) encourages reflexive thinking about motives and action, which increases the relevance of action. It also emphasizes the importance of complex reasoning and its ability to trigger teleological causation,[2] in a context where it may be crucial to the preservation of safety (cf. Weick's theory of enactment [12]).

According to Ricoeur, all human beings have the capacity for practical reason, while the collective environment may be more or less favorable to its expression. He calls the most favorable collective environment the "just institution". However, as mentioned above, contemporary organizations are built around rational, engineered logic and tools, which estrange people from practical reason and therefore from voluntary, responsible action. Organizations therefore need to transform if they are to enable their members to use practical reason.

3.2 *"Safe Institutions" for the Management of Extreme Situations*

Managing extreme situations requires people to be able to act voluntarily and responsibly, both when there is no other option, and in "normal" situations. This approach strengthens their ability to act appropriately should an extreme situation arise. Building systems that favor voluntary and responsible action therefore becomes a matter of both individual and systemic resilience.

[2]Teleological causation posits that creating a specific goal contributes to the creation of the conditions that ensure that it is reached, by "disposing" the individual to reach it. The logic is similar to that of Weick's theory of enactment according to which picking up certain cues leads the situation to develop in a certain way.

Ricoeur's concept of the "just institution" offers another lever for the construction of systems that are better able to manage extreme situations and preserve safety. The "just institution" rests on the fact that it responds to the individual's sense of justice, and achieves an appropriate balance between the obligations that are imposed on them and the privileges that are granted [11]. Its primary aim is to ensure that individuals are free to act. The concept of the "institution" refers to a structure with shared interests, or belonging to a specific community: according to Ricoeur, "the idea of the institution rests fundamentally on shared customs, not on binding rules" [11]. It argues that the individual is free to act and pursue ethical aims. It relates to the way people interact, and how they are brought together and live with one another, as these interactions (reified in the form of shared customs) constitute the institutional environment. Finally, it rests on a principle of plurality, which in turn implies diversity and the potential for (potentially contentious) dialogue.

This perspective appears to be at odds with current organizations, which rest on engineered methods and designs and therefore primarily seek uniformity and abstraction from individuality. However, it may be possible to translate it into concrete actions that organizations can implement. Such organizations would be called "safe institutions". At a general level, this means refocusing organizations on people, their sense of justice, their ability to exercise practical reason, and their goal of leading "a good life for oneself as well as others", rather than the design or procedures of organizations themselves. On a more practical level, it suggests actions related to training (i.e. ensuring that people are in a position to maintain safety), and redefining how careers are built and what success means.

Organizations that apply the "safe institutions" philosophy and favor practical reason could be said to enable "practical safety". We define practical safety as "the ability of individuals to appropriate safety as an internal value, which enables them to decide on a course of action that preserves the safety of others as well as their own, when a situation requires them to do so". Such an approach asserts the idea that safety can only be managed *by* people *in* organizations, rather than *by* organizations *through* people. It also reminds us that safety can only be maintained through concrete actions, rather than predesigned, abstract rules and procedures.

More broadly, the concept of the just (safe) institution resonates directly with a number of questions raised during the workshop. For example, the question of consent and self-sacrifice: if an individual's obligations include the potential need to sacrifice oneself, how is it possible to establish a sense of justice? What should the status of voluntary actions be, from both a moral and legal standpoint, when things "go back to normal"? What criteria should be used to judge, both morally and legally, an action that could be nothing but ad hoc and voluntary?

Once again, this raises the question of the moral and legal status attributed to an action and the actor by the collectivity once the situation goes back to normal. And, once again, Ricoeur's philosophy provides a heuristic. He argues that action can be compared to texts, in the sense that once they are achieved, they are out in the world, available for interpretation by third parties who may not share the frame of "reference" for the action, i.e. the situation from which it stems. As action is

primarily a way to bring about a change in the world, it leaves a trace. This "mark" inscribes the action in the world, making it an "archive" of the initial act. Therefore, in addition to the intention that provided the motivation, an action can also be evaluated against the "persisting configurations" that it brought about. This evaluation can only be carried out by third parties at a later date. This difficult task involves retracing the path back to the initial action, which due to the complexity of the world, may be extremely distant from its consequences. Such an approach resonates with some of the problems inherent in actions carried out in extreme situations, and offers a fruitful avenue for further research.

4 To Conclude: Ethics, a Way up and Out of Extreme Situations, not a Set of Solutions

As promised, we raise many more questions than answers. Most of these questions emerged during the workshop, and they range from the decision-making process in high-risk technologies, to the question of how to determine who victims are. This highlights the transverse nature of such questions and the role ethics may play in the emergence of an interdisciplinary approach to major accidents and the management of extreme situations.

The workshop examined the question of potential or actual victims, and this appears to be a possible avenue for an ethical approach to major accidents. It leads us to ask *who* the victims are, in the strongest sense. How—if at all—can they be identified as victims of a specific accident raises a philosophical and social question? How should they be helped, either during the management of the event or afterwards, through medical treatment or compensation? Finally, how should the concept of the victim be defined, both in scientific terms and for decision-making purposes? It is deeply anchored in the concept of solicitude and could offer a heuristic approach to the examination of major accidents and the management of extreme situations from an ethical perspective.

The question of individual action and responsibility opens a second door to ethical reflection on extreme situations. Yoshida's testimony on the management of the Fukushima Daiichi accident shows that individuals were held both legally and morally accountable for actions taken during extreme situations. As we have seen, such judgments require that voluntary action is possible. This in turn requires a radical shift in organizations and how individual actions and their contribution to safety are considered. Ricoeur's practical philosophy shows how ethics not only help to develop a better understanding of what underlies the management of extreme situation, but also open the way for actions that are more favorable to the preservation of safety.

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