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Evacuation in case of a nuclear power plant accident – Discussion of some ethical questions

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ABSTRACT

Although the probability of a nuclear power plant accident in the Czech Republic is considered to be extremely low, authorities and citizens have to be prepared. An important part of emergency preparedness is the provision of clear guidelines for the possible evacuation of people from areas of radioactive contamination. In this context, different types of questions need to be addressed: What are the health risks that people remaining in a contaminated area would have to face? When are people to be evacuated, i.e. which radiation levels warrant action? Who is to be evacuated first, i.e. which groups, if any, should take precedence? What are the ethical principles that determine the when and who? This latter question is addressed here. The paper looks at the guidance given by the relevant public documents and identifies a number of ambiguous and contradictory points. It recommends that decision-makers are provided with additional information and are made aware of the ethical aspects of their decisions. It suggests that classical ethical theories such as utilitarianism and deontology can be taken into consideration, but that in an age of globalization a cross-cultural approach may be more appropriate.

Introduction

Nuclear power plant accidents are rare events. In about 50 years of civil nuclear power, there have been two events that have led to a major release of radioactive material and have necessitated large-scale evacuation of contaminated areas – Chernobyl in 1986 and Fukushima in 2011. These two have been categorized as "Level 7" accidents, i.e. accidents "with widespread health and environmental effects requiring implementation of planned and extended countermeasures" [1]. That it was "only" two such events does not mean, of course, that there would be nothing to worry about, or that one major accident world-wide every two-and-a-half decades would be acceptable. It just shows that we have very little experience with such events and do not know everything we would need to know about their prevention and the prevention of health and environmental consequences.

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Chernobyl and Fukushima both involved a meltdown of the nuclear core, but in the course of the 50 years of nuclear power there have been at least nine other accidents with complete or partial meltdown [2]. This is an order of magnitude more than what used to be expected in the 1970s, when risk analyses suggested that there could be one accident with core damage in 10,000 [3] or 20,000 [4] reactor-years; the eleven accidents just mentioned occurred within 14,500 reactor-years worldwide. But considering the huge uncertainties in the calculations, perhaps one order of magnitude is not that far off after all. Anyway, with today's advanced reactor technology and the experience from a number of real accidents, the frequency of core damage events is now assumed to be in the order of 2–5 in 100,000 reactor years [5,6], if not even smaller than 1 in 1,000,000 reactor years [7]. For modern central European reactors such as those in the Czech Republic these estimates may indeed be reasonable, but it must also be noted that the assessments usually consider technical and natural risk sources, whereas they cannot really take account of things like terrorist assaults, internal sabotage, or cyberattacks. And there may be risk factors that we are not even thinking of. After all, the combined effects of technical shortcomings and human failure in Chernobyl, and of natural disaster and wilful negligence in Fukushima came as a surprise to most experts.

So, we cannot deny that there is some uncertainty about the uncertainties, even though the probability of another ''Level 7'' event would still seem to be extremely small. There is no other option than preparing for the day that will hopefully never come. National and regional authorities have to carry out emergency planning for the case of a major release of radioactivity from a nuclear power plant. This paper addresses ethical questions which arise in this context, especially with respect to evacuation from contaminated areas. It takes as a starting point a number of official documents of emergency preparedness in the Czech Republic, such as the Decree 307/2002 on Radiation protection [8] and the Evacuation plan within the External emergency plan for the Nuclear power plant Temelin [9].

Some notes on applied ethics

Ethics according to a standard Czech Dictionary is a philosophical discipline which analyses ''views on morality, on the origin and nature of moral consciousness and behaviour''. Morality on the other hand means ''a set of conventions and rules of conduct that are considered binding for the individual conscience'' [10]. So while morality descriptively refers to what is acceptable behaviour in a society, ethics analyses the underlying principles, values and norms. It is therefore somewhat misleading to speak about ethics as if it was something that unambiguously and objectively tells us what to do and what not to do. There is no one ''ethics'' that must be reasonably accepted by everybody. There are rather a number of different schools of ethics or ethical theories which try to find one or at least no more than a few principles that in any given situation tell us what is right and what is wrong.

Just two of these theories will be mentioned here, because they are the most discussed when it comes to radiation risks. One of them is ''utilitarianism'', which judges right and wrong on the basis of what is useful (Latin ''utilis''). We should do what leads to the best balance of pleasure over pain, or – in other words – ''the greatest happiness for the greatest number of people''. Motives of people's actions are of no importance. What counts is only the outcome of our actions or of the rules that guide them. This theory was developed by Jeremy Bentham (1748–1832) and John Stuart Mill (1806–1873) in England and so it has been most influential in the Anglo-Saxon world. An alternative concept is ''deontology''. It proceeds from the concept of ''duty'' (Greek ''deon''). Our fundamental duty, according to the most common version of the theory, is to ''treat humanity, whether in your own person or in the person of any other, never merely as a means to an end''. In other words, even if it would lead to more happiness overall, we should not exploit some individuals for the benefit of others and thus violate their individual rights. That was the advice of Immanuel Kant (1724–1804), and as he was German his theory has been of greatest influence in central Europe.

It is easy to see that the two theories can sometimes be at odds with each other. If, for instance, we asked a few individuals to remediate a radioactively contaminated site we might reduce the health risk of many others and so, by the logic of utilitarianism, should be ready to ''sacrifice'' those few. Deontological ethics would not find that acceptable and would rather recommend distributing the risk as fairly as possible, in which case however the health of many more people would be at risk. It has been argued that the principles constituting the recommendations of the International Commission of Radiological Protection [11] are based partly on one and partly on the other ethical theory outlined here, which may cause problems when a decision has to be taken in a concrete situation.

Apart from the incompatibility between utilitarian and deontological arguments, however, a more fundamental question needs to be asked: is it at all appropriate in a more and more globalized world to base the international system of radiation protection on ethical theories developed in Europe during the era of enlightenment? Less than 30% of the world's population is living in Europe and the Americas, but over 50% in Asia and another 20% in Africa and the Middle East. Can we really expect the majority of mankind to accept principles developed in a conceptual context largely alien to them?

I have argued elsewhere [12] that rather than basing our system of radiation protection exclusively on certain theories of ''Western'' ethics, we should work towards a ''cross-cultural'' concept, and I see a model of this in the ''principles of biomedical ethics'' developed by Beauchamp and Childress [13]. They propose four principles which in their view form the basis of all decision making in medical practise:

1. Respect for autonomy: Let people choose for themselves![1]
2. Non-maleficence: Do not harm!
3. Beneficence: Do good!
4. Justice: Be fair!

[1] Beauchamp and Childress relate ''autonomy'' mainly to ''individual decision making'', but there is some debate as to whether this can be considered a cross-culturally agreed understanding [13], and ''human dignity'' has been proposed as a more widely accepted and broader concept [12,17].