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Ethical Issues in Nuclear Waste Management

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1. Introduction

Nuclear experts claim that the health risks from radioactive waste disposal are low compared to other environmental hazards, yet the general public is sceptical of the industry's ability to guarantee acceptable safety standards. Many allude to what might be deemed morally relevant factors, such as potential harms to future generations, possibly catastrophic consequences and environmental effects. Industry has often tended to respond with a claim that the public has an irrational perception of radiation risks, particularly those from man-made rather than natural sources. From a philosophical point of view it is interesting to consider exactly how nuclear risks might differ from other hazards, not least to evaluate which ethically relevant factors could be used to defend the stringent demands made by society for nuclear waste disposal.

2. Small Risks, High Cost

Nuclear installations are subject to some of the most stringent safety and waste disposal constraints of any industry, with the consequence that the "price" paid to reduce the risk of cancer is one of the most expensive "lives saved" in Western society [1-3]. Nuclear experts note that the public exhibits an intense concern about relatively low radiation doses from the atomic power industry and radioactive waste disposal, yet shows apathy towards radon and medical radiology [4,5]. The nuclear industry and some risk assessors feel that the public is being irrational in forcing it to waste money on trivial risks—money which, theoretically, might be spent more efficiently saving other lives [1,3]. Some claim that public attitudes reflect ignorance or a misunderstanding of the probabilities of harm, largely attributed to media sensationalism and negative symbolism [6-9] or statements by radiologists that "there is no safe level of radiation" [3,10].

Many people have objected to this over-simplistic portrayal of the public's perception. Economists highlight the difficult issues raised by nuclear power and other potentially harmful industries, pointing out that it is not irrational to be averse to a risk of harm for which one sees no benefit [11]. Environmentalists suggest that aversion to nuclear power is fuelled by the possibility of a catastrophic accident and problems of waste disposal, rather than the small doses from routine discharges [12,13]. Philosophers have examined some of the complex social and ethical problems that surround any risk assessment, such as the inequitable distribution of risk and benefits and the question of how to deal with future generations [14-17]. They warn that we should not be too hasty in dismissing these factors as irrational perceptions, as some are clearly grounded in ethical norms [18-20].

3. Public Perception

Over the past 20 years, risk assessors, psychologists, and anthropologists have conducted numerous surveys, questionnaires and interviews designed to evaluate the public's perception of risk [see reviews in 21,22]. These psychometric studies confirmed that experts and the public often disagree in the way they rank risks, but they also showed that the public's perception of risk is complex, multifactorial and by no means unsophisticated. Perhaps one of the most important results of these studies is that varying attitudes to risk cannot always be attributed to a misunderstanding of the probabilities of harm [23, 24]. Choice, control, familiarity, closeness and numerous other social and psychological factors all play an important role in shaping perceptions towards hazards.

However, the majority of work carried out on risk perception is descriptive rather than normative. These studies help us understand how people behave, namely why they are averse to certain types of risk, but they do not tell us which risks should be acceptable and which should not. Many ethical norms tend to be reflected in social attitudes, for instance the tendency to be averse to risks imposed without consent [25]; but some values influencing risk perception are ethically relevant, others are not. For example, it would be dubious to impose heavier speeding fines on females simply because a study showed that the public was more averse to motoring risks associated with women drivers. In order to defend discrimination between different cases we need to show that the discrimination is supported by ethical principles [26]. In other words, if society is to treat nuclear risks differently to other hazards then they should be able to appeal to morally relevant factors to support that discrimination and show *why* those distinctions are relevant for morality.

4. Ethical Evaluation

Both risk assessment and radiological protection often come down to the question of not only who we are going to protect from harm and at what cost, but also whom we are going to allow to be harmed and by how much. Since such decisions represent some of the most fundamental problems in moral philosophy, it follows that risk assessors are often faced with conflicts and dilemmas that are grounded in matters of values and ethics.

Ethical evaluation requires an assessment of the assumptions behind a decision, and an examination of the facts of a case and their relevance for morality. Ethical evaluation can also guide us in cases where values come into conflict, for instance in how to balance causing harm to a minority in order to benefit the majority (e.g., bringing about a few cases of cancer in order to provide electricity to the majority). And whereas ethics cannot always tell us what the right answer is, such evaluations force us to clarify the premises upon which decisions are being made and help to document the assumptions and reasons behind eventual disputes. For instance, it is helpful to know whether experts disagree on ways of managing radiation risks due to a matter of fact (e.g., they might disagree about dose estimates or the probable cost of reducing risks) or a matter of ethics (e.g., they may disagree about the relative importance of net consequences against inequitable distribution of risks). Finally, ethical risk evaluation extends the issue of whether a risk is acceptable to dimensions that go beyond its probability of harm; ethical risk management asks questions other than those connected to dose and cost [20,26].

The extended paper will evaluate alleged distinctions between nuclear risks and other environmental hazards, including biotechnology risks and natural radiation, and examine potential ethical conflicts and trade-offs. Issues considered include the distribution of risk and benefit, public control and consent, stakeholder involvement, effects on future generations, catastrophic consequences, and potential environmental effects. Although the paper will suggest that a number of the alleged distinctions are controversial from a moral philosophical point of view (i.e., catastrophe), ethical evaluation is important since many of the public perceptions are grounded in morally relevant factors (i.e., distribution of risks, uncertainties, agency and consent). The paper will conclude with recommendations for ways in which the industry and regulators might address and alleviate ethical conflicts in waste disposal policy.

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