Ethical Aspects of Long-Lived Waste Disposal

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Introduction

Independent of the long debate on the use of nuclear power, waste management specialists have a clear, unassailable set of environmental goals aimed at protecting the public and workers from any unjustifiable exposure to radiation. It is recognised that releases to the environment must be minimised, operational doses from waste handling kept low, and storage facilities constructed and operated with very high levels of safety. A philosophy of how to make best use of the available resources is embedded into the established principles of the ICRP, requiring justification of practices, limitation of doses and optimisation.

Absolving these responsibilities within the scope of most current waste management practices requires a philosophical or ethical basis, primarily addressing the issue of **intragenerational equity**. Are we being fair and equitable to our present society? Are the levels of protection required in the radiation field compatible with those for other hazards? Could one promote public health and safety better by allocating resources differently? These questions are difficult to answer in practice. However, they can, in principle, be resolved by making the costs and benefits of enhanced radiation protection transparent to today's society which can then, explicitly or implicitly, make the appropriate choices. This approach is possible as long as the same individuals who benefit from any enhanced protection measures also are those who pay for these additional benefits.

The situation is different when we consider the particular case of disposal of long-lived radioactive waste. Properly designed and sited repositories will present only low levels of risk - but these risks are predicted to peak only after many thousands of years. It is obvious, therefore, that this disposal involves the present and immediately following generations investing resources into the protection of far-future individuals. Attention has focused upon this **intergeneration** issue in recent years, leading to intensified debate on all ethical aspects of waste disposal. In this paper, I will try to provide a short overview of recent relevant work, to indicate the ethical principles agreed upon and to highlight the currently most controversial issues.

Does waste disposal really present unique ethical issues?

As mentioned, the specific point leading to emphasis on ethical aspects of waste disposal is that any negative impacts are likely to affect far-future generations who will not directly benefit from the activities producing waste and who will not have shared in the relevant decision making. There are, in fact, other activities today for which the same dilemma arises. Global warming due to CO_2 is the most topical subject, but there are numerous older examples for which the issue of fairness to future generations has

not been recognised explicitly enough. A clear case is the exploitation of natural resources in the earth's crust. The fact that our current voracious consumption of fossil fuels will exhaust in centuries valuable resources which have been built up over millions of years, leaving future generations a fundamentally altered planet, deserves more emphasis in ethical debates. Why is the debate on the long-term aspects of radioactive waste disposal so much more intensive than for other cases where much more dramatic permanent changes in the environment may occur?

One reason, paradoxically, is that the radiotoxicity of nuclear wastes is not permanent but decays with time. This draws attention to the sometimes very long timescales and increases public anxiety; the timescales tend to be compared to human lifetimes and not, for example, to the infinitely long-lasting toxicity of some other wastes. A further reason for so much time and effort being devoted to debate on radioactive waste issues is that, relative to other comparable areas, high funding levels and advanced technological solutions are available for solving nuclear waste disposal problems. The nuclear power industry produces concentrated volumes of long-lived wastes which are small when measured against the energy produced; waste management is a minor (although growing) part of nuclear power costs. Thus, resources have been made available for developing advanced solutions which are hardly practicable for more voluminous wastes (e.g. heavy metal mine tailings) or for more diffuse wastes (e.g. CO_2).

A further reason for particular controversy surrounding the ethics of waste disposal is, of course, that some nuclear power opponents are constantly seeking chinks in the armour of this technology and are therefore interested in hindering any "solution to the waste problem" and in generally raising public anxiety. This is no difficult task since the well documented "nuclear dread" to be found in our westernised societies can be exploited here.

There are also more objective explanations for the topicality of the discussion on ethics and on inter- and intragenerational equity in waste disposal. Repository projects are becoming more mature and both the technical community and the public are conscious of the importance of responsibly taking care of hazardous wastes. This implies that specific guidelines for judging the safety and the acceptability of such projects must be formulated. Accordingly, there has been debate at national and international levels on the principles and criteria which must be applied and this debate has included intensive discussions on the ethical questions involved.

Ethical issues are debated in many national programmes

At a national level there have been numerous meetings and position papers on ethical issues. In Sweden, for example, the advisory council, KASAM, organised a Symposium on the subject in 1987; emphasis was placed in the discussions on the overriding importance of keeping future options open - a topic to which we will return later. In Canada, a workshop was held to give ethical input to the national strategy for disposal

of spent fuel. In Switzerland, as a preliminary to revision of the government regulations governing long-term disposal of radioactive wastes, a seminar was held at which ethical issues were presented by experts from outside the nuclear community. The USA has an extensive literature on the general question of achieving equity between successive generations and this discussion has been taken up by those concerned with radioactive waste management.

The ideas developed in these national programmes and many others have fed into international efforts aimed at achieving consensus on the ethical aspects of waste disposal. As a result, the IAEA produced in 1995, following a long period of iterative comments, an important document entitled "The Principles of Radioactive Waste Management". This paper with its strong emphasis on ethical issues is described in more detail below. A further, equally important document is the "Collective Opinion on the Environmental and Ethical Basis of Geological Disposal" produced by the NEA/IAEA/ EEC in 1995. This consensus view, drafted following a 2-day, wide-ranging workshop on Environmental Aspects of Long-Lived Radioactive Waste Disposal, is also commented upon in more detail below.

Ethical issues highlighted by the IAEA

In the above mentioned IAEA paper on waste management, the following 3 principles are most directly related to issues of ethics:

Principle 3: ***Protection beyond national borders***
Radioactive waste shall be managed in such a way as to assure that possible effects on human health and the environment beyond national borders will also be taken into account.

Principle 4: ***Protection of future generations***
Radioactive waste shall be managed in a way that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today.

Principle 5: ***Burdens on future generations***
Radioactive waste shall be managed in a way that will not impose burdens on future generations.

Each of those principles is obviously based on sound ethical beliefs and may appear at first sight to be immune to criticism. Each, however was the subject of intensive debate and a source of substantial disagreements. Principle 3, for example, was originally framed so as to prohibit explicitly any state from causing potential radiation exposures in neighbouring countries **higher** than those in the country of origin. Some countries, however, - especially those with no, or limited nuclear programmes - did not believe it ethical to expose their populations even to impacts **equal to or less** than those in the source country.

These states advocated that, ethically, a source country should have to accept any potential exposure limits set by the receiving country. With a no-threshold assumption for dose to risk conversion, however, this proposal could allow any state, by imposing a zero limit, to render disposal activities in neighbouring countries impossible - even if only trivial releases at far future times could be predicted. The final formulation leaves scope for bilateral discussions; it could set a good ethical example for other technologies where localised emissions can have regional or global impacts.

Principle 4 provoked a long debate on acceptable levels of exposures for future generations. Should these exposures be, as stated, "not greater" than those allowed today? Should they be decidedly **lower** than today's levels since future generations will not have the benefits of today's nuclear energy? Should they be allowed to be **higher** because far-future detriments may be (and are in practice) discounted.

The comforting logic of Principle 5 is shaken by the conviction of a large body of persons who believe that imposing burdens on future generations is, in fact, **more ethical** than unnecessarily restricting their freedom of choice. This body of opinion includes the vocal lobby calling for (indefinite) surface storage of radioactive wastes as an alternative to implementing deep repositories. Included amongst the supporters of this view are, however, not only declared opponents of nuclear power (such as those propagating the "guardianship concept") but also more neutral bodies such as the KASAM organisation mentioned above or the Dutch Government, which has recently ruled that all toxic wastes must be retrievably stored.

The Collective Opinion of the NEA/IAEA/EEC

The OCED/NEA has issued over the years selected "collective opinions" intended to record the views of its senior committee of experts on key waste management issues. Somewhat paradoxical - and directly indicative of the defensive battle being fought by the nuclear community - is the sequence of these opinions. A first paper gave the consensus view that radioactive waste disposal **could be carried out safely**. A second recorded and justified the consensus view that **adequate methods were available for assessing repository safety**. The most recent should in fact have preceded the others in that the documented consensus is that the concept of geological waste disposal **rests on a firm ethical basis.**

The collective opinion on ethical aspects was carefully prepared following the previously mentioned workshop on the topic. For the workshop, a background document was prepared listing in an open manner the numerous issues to be tackled and posing the direct question as to whether disposal concepts fit into the framework of sustainable development and ethical responsibility which is accepted today.

In the background text to the Collective Opinion, attention is focused upon "the achievement of intergenerational equity by choosing technologies and strategies which minimise the resource and risk burdens passed to future generations" and it is recognised "that each generation leaves a heritage to posterity involving a mix of burdens and benefits and that today's decisions may foreclose options or open new horizons for the future".

A set of guiding ethical principles is developed in the NEA document; these are broadly similar to the above mentioned principles of the IAEA. Two issues, however, are more strongly emphasised. One is that "a waste management strategy should not be based on a presumption of a stable societal structure for the indefinite future, nor of technological advance". This principle leads to rejection of indefinite storage strategies in favour of geologic disposal concepts offering permanent protection. The second issue discussed more extensively in the Collective Opinion is the wish to ensure that one does "not unduly restrict the freedom of choice of future generations". It is judged that an incremental process, involving development of deep repositories in a stepwise fashion over decades, meets this requirement - even when disposal facilities have no deliberate provisions for waste retrieval following repository closure.

In its summary opinion on the ethical aspects of waste disposal, the Radioactive Waste Management Committee considers that responsibilities to future generations are best discharged by the strategy of geologic disposal and believes that both inter- and intra-generational issues are thereby taken into account. Ethical responsibilities to current generations require also that we should keep in perspective resource deployment in all areas where there is potential for reduction of risks to humans and that the implementation of geological disposal should proceed stepwise with ample opportunity for proper public participation in the decision process.

Consensus in the waste management community - necessary but not sufficient

It is apparent from the above overview that the waste management community has in recent years devoted much time and effort to examination of relevant ethical issues. A broad consensus, reflected in the international documents described, has been arrived at **within the community**. This consensus is that waste disposal concepts and plans do indeed satisfy the requirements of ethical behaviour. In fact, amongst waste management specialists, there is a widespread belief that, because of the specific measures taken to ensure intra- and intergenerational equity, radioactive waste disposal can actually play a pioneering rôle, pointing the way ahead for other environmental activities.

It is, of course, reassuring for those experts in the waste business to learn that numerous outside, neutral specialists in the topic of ethics agree with this positive judgement. It must not, however, be overlooked that agreement on all issues is by no means unanimous. Even within the waste community there are important divergent views. A strong body of opinion would argue that intragenerational equity is certainly not given

in our society which devotes too much of its resources to reducing already trivial levels of radiation to the public rather than focusing on the many obvious major health concerns. There is also a strong argument that potential doses in the far-future should be weighted less than real doses today. Put extremely, would we sacrifice 10 lives today to potentially save 20, or even 100, lives some generations ahead?

Perhaps more important than these continuing internal debates is, however, the fact that the highly ethical picture which the waste management community has of its activities has not been communicated to, or accepted by, the general public. Anti-nuclear groups, sometimes using real examples of poor waste management and thoughtless environmental contamination, are allowed to push the idea that waste disposal is a cheap and nasty, "out-of-sight, out-of-mind" solution. For those involved in waste management, it is comforting to realise that they can go about their business with a clear conscience. But this is not enough. If the waste community sincerely believes in the high ethical standing of its activities, then they should be out there taking the moral "high ground" in this debate. We have a responsibility to future generations which begins right now. We must make today's public aware of our ethical concerns for these future generations and we must continue to work towards implementing the disposal concepts intended to meet those responsibilities.