

Preliminary Study on the NCRP's Recommendation¹⁾ for Establishment of Risk-based Radioactive Waste Classification System

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I. Introduction

In general, radioactive wastes are generated in a number of different kinds of facilities and arise in a wide range of concentrations of radioactive materials and in a variety of physical and chemical forms. There is also a variety of alternatives for treatment and conditioning of the wastes prior to disposal. A number of schemes have evolved for classifying radioactive wastes. The primary purpose of waste classification system is to facilitate development of efficient strategies for the whole of waste management and to provide guidance at conceptual and operational levels on appropriate to waste management and disposal for many kinds of waste exhibiting widely varying potential hazards.

II. Existing Radioactive Waste Classification Systems

The existing classification system for radioactive waste in the United States is schematized in Figure 1. This classification system is in the form of a hierarchy of basic waste classification and waste subclassification. The distinction between nuclear fuel-cycle and NARM (naturally occurring and accelerator-produced radioactive materials) wastes is based on the definitions of source, special nuclear, and byproduct materials in Atomic Energy Act (AEA).

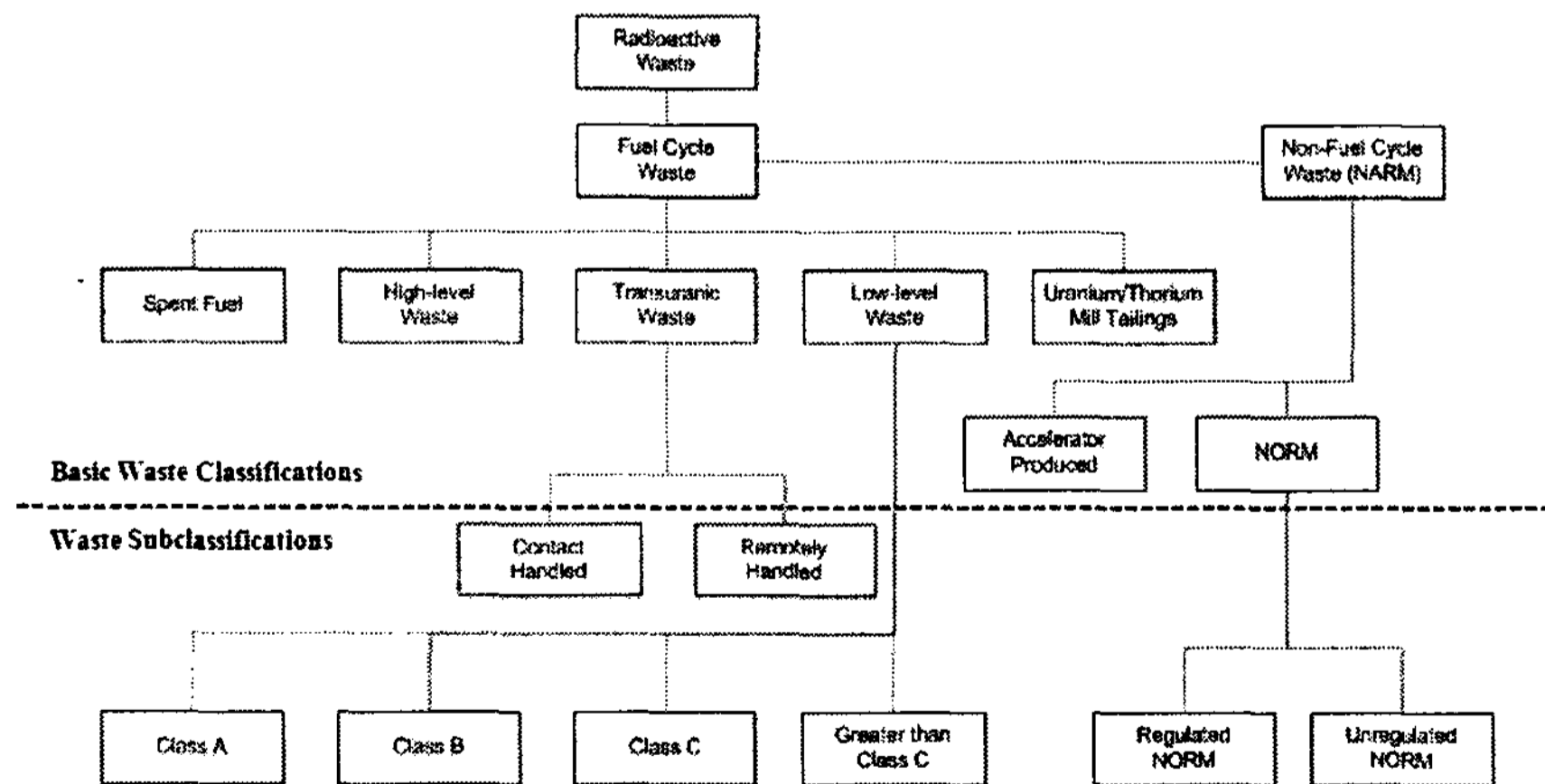


Figure 1. Current radioactive waste classification system in the United States

For the radioactive waste classification system recommended by IAEA, the basic waste classification system consists of exempt waste, low and intermediate level waste, and high level waste [1]. The radioactive waste classification system recommended by IAEA differs from the existing classification system in the United States. One of them is that the basic waste classification system includes a

1) National Council on Radiation Protection and Measurements, 2002, Risk-based Classification of Radioactive and Hazardous Chemical Wastes, NCRP Report No. 139

general class of exempt waste, which is defined in terms of a dose to an individual member of the public, resulting from waste disposal. Another difference is nuclear fuel cycle and NARM wastes are included in the same classification system.

III. Framework for Risk-based Radioactive Waste Classification System

NCRP recommends that risks to hypothetical individuals at waste disposal sites should be evaluated in classifying waste, and that risks to an individual that arises from disposal of any hazardous substance be expressed in the form of a dimensionless risk index (RI). The risk index for the *i*th hazardous substance (RI_i) is defined in terms of the risk that arises from disposal of that substance relative to a specified allowable risk for an assumed type of disposal system.

$$RI_i = F_i \frac{(risk\ from\ disposal)_i}{(allowable\ risk)_i}$$

where *F* is a modifying factor ($F > 0$) that can depend on the particular hazardous substance. Furthermore, *F* is intended to represent any considerations of importance to a decision about the general acceptability of waste disposal using an assumed technology.

NCRP's recommendations on a framework for a risk-based classification system that is applicable to any waste containing radionuclides are described in Table 1 and schematized in Figure 2.

Table 1. Framework for the a risk-based classification system

Class	General Definition
Exempt waste	Any waste containing radioactive substances that is generally acceptable for disposition as non-radioactive material
Low-hazard waste	Any nonexempt waste that is generally acceptable for disposal in dedicated near-surface facility for radioactive waste
High-hazard waste	Any nonexempt waste that generally requires disposal system more isolating than dedicated near-surface facility for radioactive waste

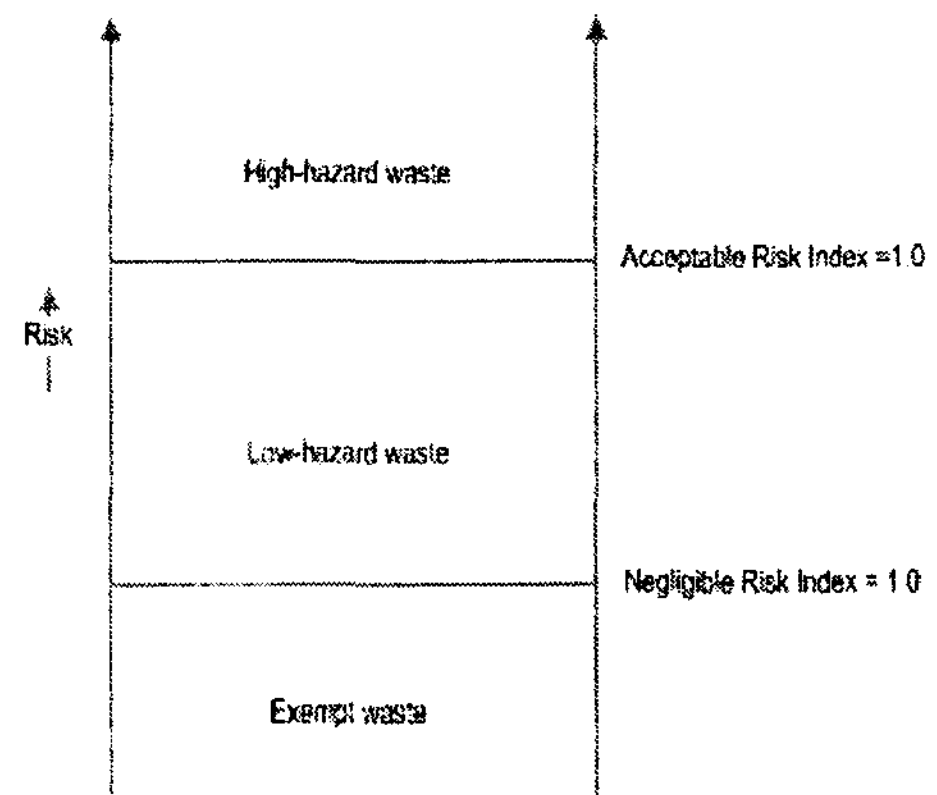


Figure 2. Depiction of waste classes defined in relation to acceptable disposal systems in risk-based waste classification system

IV. Conclusion

Although the existing classification systems for radioactive wastes have worked adequately in many respects, existing systems are deficient primarily because most are not based on risk and some potentially important wastes are not given due consideration. The framework for a risk-based radioactive waste classification system include three classes of waste: exempt waste, low-hazard waste, and high-hazard waste.

References

[1] IAEA, 1994, Classification of Radioactive Waste, Safety Series No. 111-G-1.1