iii) to avoid interfering with present or future exploitation of natural resources; and
iv) to minimize, as far as possible, any impact on future generations.[11]

The fundamental principles of radiological protection on which nuclear waste management practices are based, are derived from the system of dose limitation recommended by the International Commission on Radiological Protection (ICRP). The goal of this system is to ensure that human exposure to radiation is maintained at acceptable levels. Certain standards, called "derived emission limits",[12] are applied which in Canada are set by the Atomic Energy Control Board, with the cooperation of Health and Welfare Canada and the provincial departments of health. Derived emission limits are established, not through direct measurements of radiation levels in environmental media (air, water, soil), but rather by making assumptions and modelling predictions about the movement of radionuclides through various environmental media and the food chain. These assumptions are used to relate the global distribution of radioactivity to the dose received by humans.[13]

Radioactivity is not a simple phenomenon. It is the property inherent in certain atoms by which the nucleus spontaneously disintegrate into a new structure. Radiation, in the form of alpha (helium nuclei), beta (electrons) and neutron particles; and gamma or X electromagnetic rays, is emitted during this transformation. Radiation that is emitted is ionizing radiation, that is, it causes the molecules of any substance which it touches to become electrically charged (ionized). It can thus change the chemical structure of cells, including those of living tissue; and if enough radioactivity is absorbed, cells may be damaged or killed.[14]

Radioactivity acts on human beings by irradiation or by contamination. Irradiation occurs when someone is exposed to radiation emitted by a radioactive source. Contamination results from contact with radioactive material, either externally (on the skin) or internally (in the digestive system, lungs, etc.), and obviously it leads to localized irradiation.

Innumerable studies have been done on the effects of ionizing radiation since the ICRP was founded in 1928. The frequent changes in the standards set by that organization testify to the difficulties in determining the critical dose at which radionuclides become dangerous to human beings. For example, between 1979 and 1981, less stringent standards were announced for the "maximum allowable dose" of radium 226 (a radionuclide naturally present in uranium mine and mill tailings), while new standards for neptunium 237, in soluble form, were *3,600* times more severe than previously.[15]

The biological effects of radiation may become apparent in the individual who has suffered an exposure ("somatic effects"), or in his or her offspring ("genetic effects"). Some somatic effects appear in all subjects exposed to a sufficiently high dose ("obligatory effects") and other effects appear in only a few ("random effects").[16] There is a whole range of units of measurement for quantifying radiation and the dose received by the subject, some of which are defined in Table 2. We must bear in mind, however, that in addition to radiation's dangers to health, there are certain artificial sources of radiation that can be used to maintain human health. For example, we need look no further than the treatment of cancer by cobalt. Equally, we all receive several millirems (1000ths of a rem) of radiation every year from cosmic rays, water (which dissolves radon and radium salts), and various industrial products and medical instruments. In the United States, for example, every person

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(11) OECD Nuclear Energy Agency, *Long-Term Management of Radioactive Waste: Legal, Administrative and Financial Aspects*, Paris, 1984, p. 17.
(12) This expression has now replaced "maximum permissible concentration" or MPC.
(13) Environmental Assessment Panel, *Second Nuclear Reactor, Point Lepreau, New Brunswick*, 1985, p. 9.
(14) Atomic Energy Control Board, "Radiation: A Modern Tool", *Control*, Ottawa, 1986, p. 4-5.
(15) Louis Puiseaux, *Crépuscule des atomes*, Paris, Hachette, 1986, p. 129-130.
(16) Leclercq (1986), p. 158.