

### (3) Overview of strategies for surface disposal and lifetime of disposal facilities

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**Abstract**—All human activities produce waste. Also, the applications of radioactivity produce waste: radioactive waste. As radioactivity decays with time, radioactive waste can be dealt with by isolating it from human and environment as long as it may be harmful. This is the aim of disposal facilities which have to provide protection during the necessary period of time. This period depends on the radioactivity content of the waste and can range from centuries up to millions of years. All type of waste can be disposed of in underground facilities in deep geological layers the waste being isolated from the biosphere for time periods comparable with geological timeframes. After closure, the facility must be able to operate independently as a stand-alone facility for assuring the requested level of isolation, e.g. without human intervention. Some waste can be disposed of in near surface facilities provided that the decay time and the inventory in long-lived radionuclides are compatible with the needed active surveillance, e.g. no longer than a few centuries. Indeed, instead of deep underground disposal facilities, surface disposal facilities are located in the biosphere. The choice of the disposal types is a matter of national strategy, and should be optimized considering the waste fluxes and volumes, the interim storage available capacity, and the transportation issue. The ICRP system of radiological protection applies to disposal facilities taking into account their specificities, e.g. the long-time frames involved and the related uncertainties and the relevant risk of human intrusion. The safety functions (containment, retardation and isolation) are implemented along the successive time phases according the ICRP system of radiological protection for the different exposure situations. A strategy has to be developed, with participation of all stakeholders, to guarantee the expected level of protection during all the time phases. This strategy applies to the disposal system as a whole: the site, the waste inventory and the disposal facility. The strategic options are bounded by uncertainties related to post-closure radiological impact, socio-economic and policy factors, available sites. Impact calculations have to be supplemented by assessment of various designs and material choice options to face a wide range of events and processes: the long-term safety is supported by robust design implemented throughout sound and effective management systems. It is also clear that at siting stage, the radiological assessment will be only one of the factors but will be unlikely to dominate the decision due to its preliminary nature and associated uncertainties at this stage.