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Nuclear energy in a sustainable development perspective

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The characteristics of nuclear energy are reviewed and assessed from a sustainable development perspective highlighting key economic, environmental and social issues, challenges and opportunities relevant for energy policy making. The analysis covers the potential role of nuclear energy in increasing the human and man-made capital assets of the world while preserving its natural and environmental resource assets as well as issues to be addressed in order to enhance the contribution of nuclear energy to sustainable development goals.

Regarding the economic dimension of sustainable development, the paper addresses aspects relevant for existing and future nuclear power plants and distinguishes between direct and external costs of generating electricity. The issue of financial risk is investigated in the context of adapting discount rates to the objective of meeting sustainable development goals.

Environmental aspects relevant for nuclear energy include natural resource management, safety and radioactive waste management. The unique features of nuclear energy in term of recycling capabilities are highlighted as well as the security of supply offered by the size and geographic distribution of uranium resources. Nuclear safety issues and challenges are reviewed in the context of comparative risk assessment, management and perception. Similarly, the ethical aspects of long-lived radioactive waste management and disposal are put into perspective.

The contribution of nuclear energy, and more broadly nuclear science and technology, to human and social capital in the form of knowledge, high quality employment and institutions is described. In particular, the legal and institutional frameworks established around peaceful applications of nuclear energy are presented as an example of infrastructures increasing the human assets passed on to future generations. The challenging social aspects of risk aversion and public perception are discussed in a broad context, taking into account lessons learnt from experience in the field of nuclear energy as well as other advanced technologies.

The paper concludes by some findings and recommendations, drawing the attention of policy makers to the importance of adopting a comprehensive and integrated long-term approach, incorporating economic, environmental and social aspects. It stresses that, while national decisions should result from trade-offs reflecting specific priorities, society at large needs to be served by decisions reflecting fair and robust assessments of all alternative options.