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A Blind Spot of Sustainable Development - Integration of Radioactive Waste Accumulation into the Planetary Boundary Framework

The Sustainable Development Goals are the cornerstones of the United Nations' 2030 agenda for sustainable development. However, efforts to achieve these goals must be conducted within the ecological capacity of our planet, defined by the framework of planetary boundaries. Climate change, one of nine identified boundaries, requires a rapid decarbonization of global energy systems, for which nuclear power, as low-carbon technology, is often considered. However, nuclear fission has long lasting anthropogenic impacts through the production of highly radioactive waste, which must be isolated from the biosphere for several hundred millennia. To date, there is no deep geological repository in operation but the radioactive waste stockpile continues to accumulate due to ongoing operation of nuclear power plants, posing an increasing challenge to its safe management. As radioactive waste is currently insufficiently addressed within the planetary boundaries framework, this paper proposes to incorporate radioactive waste as a control variable for the boundary named "novel entities". For this purpose, possible control variables will be defined and their suitability will be assessed by three criteria (feasibility, relevance, and comprehensiveness) following the approach of Persson et al. (2022). This implementation will support environmental policy makers to formulate more comprehensive decisions on sustainable development while emphasizing the need for increased efforts in radioactive waste management and waste reduction.

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