ECOSENS - a European project on Economic and Social Considerations for the future of Nuclear Energy in Society

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Our society faces significant challenges shaping desired energy futures: growing energy demand, decarbonization, and ensuring the economic, environmental and social sustainability of energy systems. Nuclear energy presents a potentially important yet contested low-emission option for tackling these challenges. In this context, the ECOSENS project - *Economic and Social Considerations for the Future of Nuclear Energy in Society,* funded under Horizon Europe (GA 101060920), set forth to open up the techno-scientific issues of nuclear energy to the social, political, cultural and ethical context, and guide policies in the nuclear field. *The investigation of societal perspective on existing and emerging nuclear technologies* through desk research, focus groups, interviews and surveys in different European countries, and international stakeholder workshops revealed different national attitudes towards nuclear and SMRs, and mixed views on SMRs compared with traditional reactors and renewables. The SMRs future deployment is seen as potentially valuable, but vague and uncertain. Public lacks information about SMRs and there is a strong request for transparency and active public engagement. *Sustainability of the whole nuclear power cycle* was assessed based on a methodology co-developed in ECOSENS by experts in energy, social scientists, and stakeholders, containing 62 indicators (environment, economics and social). The comparative assessment of the main technologies considered for energy transition (renewables, nuclear, hydro, and gas) over the entire life shown that all technologies are seen as having similar levels of effectiveness or suitability, with no single option emerging as significantly superior or inferior to the others. Nuclear technology was particularly appreciated for the high energy density and the large amounts of electricity generated with minimal greenhouse gas emissions, making it a strong candidate for reducing carbon footprints. Additionally, it provides a stable and reliable energy source, with consistent output unaffected by weather conditions. ECOSENS also proposes a *new economic model based on the system of provisions approach* which accounts for the complex interplay of economic, political, technological, socio-cultural, and environmental determinants and provides decision makers a tool for a comprehensive analysis of nuclear large technological systems role within diverse socio-economic and political landscapes, as well as the identification of key enablers and barriers to nuclear deployment.

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