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SOCIETAL RESPONSE TO NEGATIVE ENVIRONMENTAL EXTERNALITIES: THE CASE OF
SPACE ACTIVITIES

Abstract

Space-based technologies can help achieve Sustainable Development Goals (SDGs) and are increasingly critical for climate action. However, space activities also generate their share of negative impacts on the environment. With the exceptional growth expected for the sector, the magnitude of this impact will grow too if no mitigation strategy is implemented. Society, when faced with the negative environmental externalities of their industries, can respond in very different ways. This paper provides an analysis and assessment of the societal response to the environmental challenges presented by the space launch industry, informed by a comparative analysis with the automotive industry, aviation and the satellite industry (on the issue of space debris). Depending on the perceived importance and urgency of the issues presented, which vary with time, different tranches of society produce their effort to tackle these issues. Three indicators are used to evaluate this effort: the levels of research activity, media coverage and policymaking activity. The analysis is conducted during the period 1990-2021, using respectively research articles databases, newspapers databases and EU law databases. Indicators of the level of activity (or effort) on each dimension are defined using normalized metrics, for comparability across industries. Evolutions over the 30-years period along with Compound Annual Growth Rate (CAGR) comparisons in recent years suggest interrelationships as well as sensitivities to diverse factors (visibility of the issue, existence of local peak events, among others). A systems dynamics model is built at the society level to explain the interdynamics of societal responses. Results indicate that the environmental impact of space activities on Earth is still poorly understood. The space launch industry is receiving insufficient attention considering it emits combustion gases and particles directly into the stratosphere. While some may dismiss this as a minor impact today, there is substantial growth forecasted for this sector. Despite the multiple external factors and uncertainty associated with these macro-processes in society, we show that the inertia creates an urgency to initiate now research programs and investigate on the topic of atmospheric emissions from launch vehicles. Indeed, regulators may soon start initiatives on this topic, which cannot lead to positive results without a more extensive preliminary work from academic research. This is all the more critical as the space industry is designing today the technologies that will generate an environmental impact further in the future.