

Topics (T)

Space Technology for Climate Adaptation and Mitigation [2] (6B)

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## SUSTAINABLE ROCKET PROPELLANTS: A COSTLESS CONTRIBUTION OF THE SPACE INDUSTRY TO CLIMATE CHANGE MITIGATION

### Abstract

In this paper we assess the environmental footprint of launcher operations and the impact that a switch to sustainable propellants would have on the industry. We begin with an overview of the current and forecasted access to space activities and then build on the existing literature to describe where space fits in the race to net zero emissions and how the sector has a role to play in mitigating our collective impact on climate change. We then characterize launcher propellant as a main source of CO<sub>2</sub> or CO<sub>2</sub>-equivalent emissions when it comes to access to space, and map ongoing initiatives at international and national levels that support a shift towards more sustainable launcher propellants.

Subsequent to this description of the status quo, we apply a cost model to measure and analyze the impact of switching from traditional “grey” propellants to their more sustainable “green” alternatives on both the cost of launch and the expected emissions. We run this analysis for 3 selected use cases that we believe are both emblematic of the access to space market and its diversity, namely Falcon 9, suborbital tourism vehicle New Shepard and Ariane 64. This analysis allows us to assert that switching to more sustainable propellants is almost costless for companies providing access to space or space tourism services while generating substantial CO<sub>2</sub> abatements. We therefore conclude this paper by providing a set of recommendations for policy makers to foster adoption of sustainable rocket propellants and boost the space sector’s contribution to the fight against climate change.