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ADDRESSING COMPLEXITY IN ENVIRONMENTAL IMPACT ASSESSMENTS OF MULTI-PARTY CONSTELLATION GROUND SEGMENTS

Abstract

Assessing greenhouse gas (GHG) emissions in ground segment supply chains can be a complex task due to the involvement of multiple companies, agencies, and institutions. Conventional emission calculation models, which are typically designed for individual companies or product lines, may not be sufficient for multi-party services like ground segments, resulting in notable inaccuracies and limitations. The conventional categorization of emission sources (emission scopes based on direct and indirect emissions) is not adequate for addressing the complexities of multi-party value chains. Furthermore, environmental impact assessments in collaborative ventures involving multiple parties may face challenges due to concerns regarding data protection and contractual constraints. This issue can be particularly challenging in smaller international constellations, where ground segments are dispersed across the globe, adding an additional layer of complexity. To tackle these challenges, this study proposes an innovative methodology that has been derived from GHG Protocol guidelines. This methodology is specifically designed for services that involve multiple players within the ground segment value chain. The study thoroughly analyses the ground segment of a small constellation, comprising less than 50 satellites, and identifies all relevant stakeholders in the value chain. Various data collection methods, such as questionnaires, interviews, and earth observation data, are employed to collect the relevant data from the stakeholders. The environmental impact of the ground segment in question is calculated through this methodology and expressed in terms of CO2 equivalent emissions per year, categorized into tailored scope 1, 2, and 3 emissions. This study outlines a methodology that enables the data collection for environmental impact analyses of multi-party ground segments. Through the presented approach, individual emission sources can be identified and quantified, allowing for accurate impact assessment. The application of this approach can lead to significant progress in making informed decisions and developing strategies for implementing emission reduction measures within ground segments. However, it is important to note that accurately assessing Scope 3 emissions and verifying the results remains challenging. Nevertheless, the methodology developed in this study shows great potential for use in other ground segments, which could enable the identification of key sources of environmental impact and facilitate the formulation of strategies for reducing emissions in ground segments without compromising service quality and availability.