Unveiling the factors influencing energy consumption in the aviation Sector of Saudi Arabia (2010-2019)

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**Abstract**

Nowadays, energy demand is a critical worldwide issue due to the impact that the use of fossil-based fuels could have on climate change. In fact, transportation as an end-use sector has a long tradition of consuming significant amounts of fossil-based fuels compared to residential, industrial, and commercial sectors. The road is the largest fossil-based fuel consumer worldwide, while aviation, marine bunkers, rail, and waterway transport accounted for just 20 to 22% of the total consumption in the transport sector (OPEP, 2021). However, aviation is just behind the road, historically the most significant demanding sector worldwide with 12% (OPEP). Oil demand emerging from air transportation is at the forefront of the agendas of policymakers and researchers worldwide, not only for the depletion of non-renewables but also because of related CO2 emissions are rising.

As mentioned by the IEA (2021), CO2 emissions emerging from the transport sector have steadily risen because of the increased demand and the limited uptake of alternative fuels. It accounted for 7.1 Gt in 2020 (37% of the total end-use sectors). Although aviation only contributes 2 to 3% of the emissions in the transport sector, the expected situation is of the utmost importance because it is one of the most challenging sectors for finding alternative energy sources.

Aviation transport in Saudi Arabia has been growing steadily during the last decade, peaking in 2019 with 103 million passengers considering domestic and international flights. The awareness of the different relations, interrelations, and interactions among the subsystems of the aviation system (i.e., aircraft, airports, and passenger load factors) during the period 2010 to 2019 are crucial to analyze the main drivers that affect energy consumption in the aviation sector of Saudi Arabia. With the benefit of hindsight, this research provides clear evidence of the role of each subsystem on energy consumption. We conclude that changes in the energy consumed in the aviation sector depend on the different subsystems that actively participate in the collective operation.

**Keywords:** aviation sector, energy demand factors, energy in transport.