Decomposition of Lifecycle CO2 Emissions Associated with International Flights of the Japanese Airline Industry

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International Civil Aviation Organization (ICAO) has decided a concrete plan to reduce CO2 emissions from international airline industry after 2021. The plan set the CO2 emissions for a specific airline company, therefore it is crucial for each airline company to decrease the CO2 emissions from their long-distance flight activities. Previous researches focused on the CO2 emissions from airline industry at country level (e.g., Lenzen et al., 2018), however they didnâ€™t analyze the CO2 emissions affected by flight schedules . The previous studies have a limited understanding of how airline companies manage the international flights and reduce the CO2 emissions through modifying the flight schedules. To address this important question, we focused on two major airline companies of Japan, Japan Air Lines (JAL) and All Nippon Airways (ANA) and made a comprehensive database including timetables for their international flights, number of international flights per week, air plane used for each international flight, round trip distance for each international flight, and fuel efficiency of the air plane used for the international flight. Using the database, we estimated the lifecycle CO2 emissions associated with the international flights of the two airline companies in 2005, 2010, and 2015. The result shows that the CO2 emissions for the JAL decreased by 4.1 Mt-CO2 between 2005 and 2015, whereas the CO2 emissions for the ANA increased by 3.8 Mt-CO2 during the same period. For the ANA, the decomposition analysis revealed that changes in total number of international flights was a major driving force to increase the CO2, whereas CO2 reduction effects through improvements in fuel efficiencies of airplanes used in the international flights was relatively small. We conclude that it is important for the Japanese airline industry to make a greener flight plan by considering a relationship between the major driving forces crucial for mitigating CO2.