

Environmental Impact Assessment of Air Travel and Consumption by Inbound Tourists to Japan

Topic: Input-Output Analysis: Sustainable Production and Consumption policies (10)

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Following the recovery from the COVID-19 pandemic, the number of inbound tourists to Japan reached 39 million in 2024. While inbound demand brings great economic benefits, there are concerns about its environmental impact. International tourism is often criticized for its high carbon footprint, with some studies suggesting it accounts for 8% of global greenhouse gas emissions. To measure this impact, most previous studies have focused only on “gross” CO₂ emissions from tourism activities.

However, the previous studies may overestimate the actual burden because they did not account for the spending that would have happened anyway. Therefore, it is necessary to consider “alternative consumption” the emissions that would have occurred in a traveler’s home country if they had spent their budget there instead of visiting Japan. This study compares a “Travel-to-Japan Scenario” (including international flights and domestic consumption) with a “Stay-at-Home Scenario” (equivalent spending at home) to quantify the “net” global impact of inbound tourism.

This study used an environmentally extended multi-regional input-output (MRIO) analysis with the GLORIA database. This model calculates both direct and indirect CO₂ emissions from tourism consumption and domestic household consumption. In the “Stay-at-Home Scenario,” we assumed that travelers allocate their entire travel budget to household consumption based on their own country’s economic structure. Additionally, direct CO₂ emissions from international flights in the “Travel-to-Japan Scenario” were estimated using International Civil Aviation Organization (ICAO) data. The total emissions for the Travel-to-Japan Scenario were calculated by adding these flight emissions to the emissions from tourism activities in Japan.

The analysis reveals that in 2024, total emissions in the “Travel-to-Japan Scenario” were 45.2 Mt-CO₂, while the “Stay-at-Home Scenario” reached 47.9 Mt-CO₂. Therefore, inbound tourism to Japan in 2024 contributed to a net reduction of 2.7 Mt-CO₂ globally. In the “Travel-to-Japan Scenario,” international flights accounted for 15 Mt-CO₂, or 34% of the total tourism burden. Japan is an island nation, and over 99% of travelers arrive by plane, so flights are a major cause of emissions. However, the total emissions decreased because Japan’s tourism industries have higher environmental efficiency than household consumption in many other countries.

This study categorized nationalities into three groups based on their emission trends. The “Emission Reduction Group” (e.g., China, South Korea, Thailand, and India) contributes to a global net reduction. These visitors travel short distances, meaning flight emissions are low. Additionally, their home countries have lower emission efficiency than Japan. Thus, visiting Japan is better for the environment than staying home. The “Potential Reduction Group” includes countries where visiting Japan causes a small increase in emissions. Their consumption in Japan is efficient, but it is not enough to offset the fixed emissions from their flights. The “Net Increase Group” (e.g., USA, UK, and France) currently increases global emissions. These countries have long-haul flights and high domestic environmental efficiency. As a result, emissions increase as they spend more on Japanese tourism services.

Industrial analysis shows that Japan's Accommodation and Food Services sector is particularly low-carbon, emitting only 0.23 t-CO₂ per 1,000 USD of demand. This is lower than the average household consumption in all analyzed countries. We estimated the additional stay days needed to reach net-zero emissions by increasing spending specifically in this efficient sector. The results show that the Potential Reduction Group can reach net-zero by extending their stay by a few days to two weeks. In contrast, the Net Increase Group would require a significant extension of stay, such as several weeks or months. This indicates that reaching net-zero is difficult for long-haul travelers under current tourism styles.

Based on these results, this study suggests different policies for each group. For the Emission Reduction Group, Japan should focus on increasing the number of visitors to maximize global carbon savings. For the Potential Reduction Group, policies should encourage longer stays to maximize the emission-saving effect of consumption. For the Net Increase Group, instead of targeting mass volume, the government could consider exploring a Tourism Carbon Tax to help recover the costs of emission transfers.