

Estimating The Contribution of Different Tourism Sectors to NO_x and PM_{2.5} Emissions in the Netherlands

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Abstract

While many studies have explored tourism induced CO₂ emissions globally, there is limited literature on spatially explicit method for calculating NO_x and PM_{2.5} emissions from this sector. To address this gap, this study developed a bottom-up approach to estimate tourism emissions encompassing three modes of transport (aviation, cars, cruise ships) and accommodation, focusing on the Netherlands as case area. The contribution of tourism induced NO_x and PM_{2.5} emissions to total NO_x and PM_{2.5} emissions in the Netherlands was further identified. In two sectors of tourism (cars and accommodation), GIS based spatial distribution was applied to observe the variation of emissions across different provinces of the Netherlands. The calculation of aviation emissions included the number of landing and take-off (LTO) cycles and total fuel burn for each aircraft type. Car emissions calculations took into account the total number of tourists and the annual distance driven based on vehicle technology. The method of cruise ships focused on the hoteling phase, including nominal power of auxiliary engines, load factor, gross tonnage, and hoteling duration. In the case of accommodation, electricity generation sources, gas consumption, and overnight stays were considered. The application of this developed method showed that NO_x emissions from all tourism sectors were higher than PM_{2.5} emissions. Aviation was the largest contributor to NO_x emissions (40-64%), while, accommodation contributed most (62-64%) to PM_{2.5} emissions. In contrast to the declining trend of NO_x and PM_{2.5} emissions for the Netherlands as a whole, emissions from tourism have notably increased from 2015-2019. The contribution of NO_x emissions has increased from 1.8% to 3.4%, and PM_{2.5} has increased from 0.5% to 1.1%. While this study focused on the Netherlands, the same method can also be applied to other countries for tourism related air pollutants emission inventories.

Early Career Scientist

YES, I am an early career scientist.

IGAC Activities

GEIA: Global Emissions Initiative

IGAC Regional Working Groups

MANGO: Monsoon Asia and Oceania Networking Group