

Environmental Impact of Psychiatric Outpatient Visit: Emissions Analysis of Travel and the Sustainability Potential of Remote Consultations

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INTRODUCTION

The healthcare sector contributes approximately **4–5% of global CO₂ emissions**, with hospitals identified as major energy consumers. Aligning with the World Health Organization's objective of achieving **net-zero healthcare systems by 2050**, increasing attention is being directed towards reducing emissions associated with outpatient services, particularly through the adoption of remote consultation modalities where appropriate.

OBJECTIVE

This study investigates the potential reduction in transport-related energy consumption and emissions resulting from the transition of 10–20% of psychiatric outpatient appointments to **remote consultations** at a community hospital in Istanbul, Türkiye.

METHOD

Patient address data from a one-year period (1st of March 2024–28th of February 2025) were extracted from psychiatric outpatient clinics

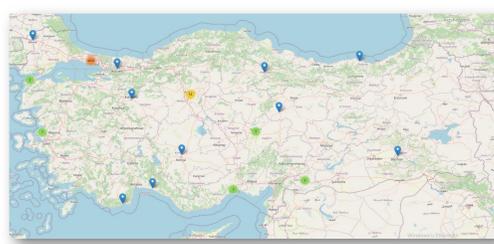
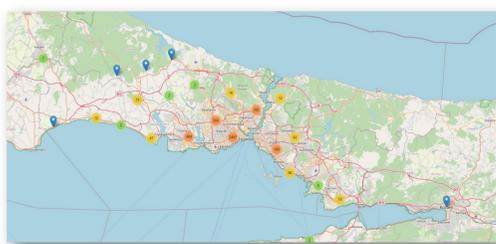
Using the Google Maps Distance Matrix API, the round-trip public transport distance and duration between each patient's home address and the hospital were calculated. When the address was reported outside of the city, the emission was calculated based on a travel with a private car. Emissions were estimated using EU average per-passenger-kilometre factors for public buses:

- ❑ 100 g CO₂/km,
- ❑ 500 mg NO_x/km,
- ❑ 20mg PM₁₀/km,

as outlined in the EMEP/EEA air pollutant emission inventory guidebook

RESULTS

- ❑ A total of 3,908 patients were included in the analysis. 62 Patients reported addresses outside of the city, with mean one-way distance travelled 480km(S.D:370). These 62 patients emitted 79 kg CO₂ in average (**31 times higher than patients in the city**).
- ❑ The mean one-way distance travelled was **20.06 km** (SD: 32.31) for all group, with a corresponding mean travel time of **56 minutes** (SD: 74).
- ❑ The total travel-related emissions amounted to:
 - **15.6 tonnes of CO₂** : requiring 720 trees to offset annually,
 - **78 grams of NO_x** : approximately equivalent to operating a diesel generator indoors for 16 hours,
 - **3 grams of PM₁₀** : roughly comparable to passive exposure from 3–4 cigarettes in a closed room.
- ❑ A 20% reduction in in-person visits could prevent up to **3.2 hours of diesel-equivalent NO_x exposure** and halve PM₁₀-related risks, while achieving the carbon sequestration equivalent of up to **144 additional trees annually**.



Geographic distribution of Patients

The vast majority of patients came from Istanbul, although some also travelled from other cities to visit the clinic.

- ❑ To contextualize emissions, **CO₂ output was translated into the number of trees required for annual sequestration**, based on IPCC and FAO data (21.77 kg CO₂/year per mature tree).
- ❑ Emitting 1 gram of NO_x has roughly the same respiratory health impact as **2nd-hand smoke** exposure in a closed room for 30min. Enough to cause measurable **respiratory irritation in sensitive groups**
- ❑ NO_x contributes to the formation of ground-level ozone and smog, both of which irritate the lungs. Long-term exposure can cause or **worsen asthma, bronchitis, and increase the risk of CV disease**.
- ❑ PM₁₀ particles are inhalable, can enter deep into the lungs, and are linked to: **Lung cancer, Heart disease, Premature death**.

CONCLUSIONS

Remote psychiatric consultations — when clinically appropriate and accepted by patients — represent a significant opportunity to reduce healthcare's environmental footprint. Integrating digital care into mental health services supports progress toward the Sustainable Development Goals (SDG 3,12, 13). Health policymakers should consider these benefits when developing environmentally sustainable service models.



REFERENCES

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