Publications of the Institute of Geophysics, Polish Academy of Sciences
Geophysical Data Bases, Processing and Instrumentation
vol. 455 (P-5), 2025, pp. 239–240
DOI: 10.25171/InstGeoph_PAS_Publs-2025-138
40th International Polar Symposium – Arctic and Antarctic at the Tipping Point, 4–7 November 2025, Puławy, Poland

Assessment of Anthropogenic Pollution Associated with Intensified Tourist Activity in the Longyearbyen Area (Svalbard, Arctic)

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A b s t r a c t

Climate change in the Arctic is among the most dynamic and visible worldwide. Particularly rapid warming is observed in the Svalbard archipelago, where recent years brought record-breaking temperatures, including 21.7 °C in Longyearbyen in July 2020 (Reuters 2020). Due to its geographical location and unique natural value, the region serves as a natural laboratory for monitoring global climate processes, ocean circulation, and related environmental transformations. At the same time, it is increasingly exposed to anthropogenic pressure, mainly resulting from the growing influx of tourists, which in 2023 amounted to approximately100,000 visitors (Kaltenborn et al. 2025). The dynamic expansion of tourist infrastructure and the growing popularity of recreational activities have led to noticeable changes in environmental quality.

One of the most common forms of outdoor recreation around Longyearbyen is snowmobile tourism. Approximately 2,500 snowmobiles are registered in Svalbard, a particularly high number compared with the size of the local population (Kaltenborn et al. 2025). Snowmobiles emit multiple pollutants, including nitrogen oxides, carbon monoxide, and polycyclic aromatic hydrocarbons (PAHs), which negatively affect air, water, and the snow-ice cover. Previous studies confirmed the presence of PAHs and their derivatives in air (Drotikova et al. 2020) and snow (Abramova et al. 2016) in and around Svalbard settlements, linking their occurrence to local anthropogenic sources. Soot and other light-absorbing particles deposited on snow accelerate its melting, thereby intensifying the regional warming effect (Réveillet et al. 2022). Furthermore, PAHs belong to a group of toxic and carcinogenic compounds that pose a significant threat to human health and Arctic ecosystems.

This study focuses on assessing the environmental impact of tourism, with a special emphasis on snowmobile use, in the Longyearbyen area. Chemical and microbiological methods

were applied to determine the level of contamination and to evaluate potential ecological risks. The results will provide new insights into the relationship between the intensification of tourism and the state of the natural environment in the Arctic. They may also form a basis for recommendations aimed at reducing anthropogenic pressure and supporting the protection of this highly vulnerable region.

Acknowledgments. "Financial support of these studies from Gdańsk University of Technology by the DEC – 29/1/2024/IDUB/III.1a/Ra grant under the RADIUM LEARNING THROUGH RESEARCH PROGRAMS – 'Excellence Initiative – Research University' program is gratefully acknowledged."

References

Abramova, A., S. Chernyanskii, N. Marchenko, and E. Terskaya (2016), Distribution of polycyclic aromatic hydrocarbons in snow particulates around Longyearbyen and Barentsburg settlements, Spitsbergen, *Polar Rec.* **52**, 6, 645–659, DOI: 10.1017/S0032247416000243.

Drotikova, T., A.M. Ali, A.K. Halse, H.C. Reinardy, and R. Kallenborn (2020), Polycyclic aromatic hydrocarbons (PAHs) and oxy- and nitro-PAHs in ambient air of the Arctic town Longyearbyen, Svalbard, *Atmos. Chem. Phys*. **20**, 16, 9997–10014, DOI: 10.5194/acp-20-9997-2020.

Kaltenborn, B.P., J. Lebel, and V. Slaymark (2025), Shaping sustainable tourism: local insights for Svalbard's future, *Polar Geogr*. **48**, 1, 1–15, DOI: 10.1080/1088937X.2024.2402759.

Reuters (2020), Temperatures at Norway's Arctic archipelago hit record high (21.7 °C), Reuters News Service, 25 July 2020.

Réveillet, M., M. Dumont, S. Gascoin, M. Lafaysse, P. Nabat, A. Ribes, R. Nheili, F. Tuzet, M. Ménégoz, S. Morin, G. Picard, and P. Ginoux (2022), Black carbon and dust alter the response of mountain snow cover under climate change, *Nat. Commun*. **13**, 5279, DOI: 10.1038/s41467-022-32501-y.

Received 15 September 2025
Accepted 20 October 2025