

Microplastics

Indianexpress, dt: 18.4.26, pg. no. 14 IN PRISTINE HIMALAYAN LAKES TIED TO TOURISM AND URBANISATION

plastic contamination,” said Dr Neelavannan, the lead author of the study, to TNIE.

The study found that Nainital Lake recorded the highest concentration, with an average of 813 ± 346 microplastic particles per cubic metre (m³), followed by Bhimtal Lake (413 ± 274 items/m³) and Garudtal Lake (175 ± 108 items/m³). “This gradient, from Nainital to Bhimtal to Garudtal, strongly reflects the influence of population density, tourism pressure and land-use patterns on microplastic accumulation,” Dr Neelavannan explained.

These differences closely mirror levels of urbanisation and human activity in the respective catchments, reinforcing the link between land use and pollution. Nainital, a major tourist hub receiving 7–8 lakh visitors annually, showed the highest pollution levels. The lake’s catchment includes extensive built-up areas, roads, and boating activity, all contributing to plastic waste input. A key scientific contribution of the study is its integration of land use/land cover (LULC) analysis. “We demonstrate that watershed development and built-up areas are major drivers of microplastic accumulation in lake systems,” the lead author noted.

In contrast, Garudtal Lake, located in a forested region with no permanent population, had the lowest microplastic levels, though contamination was still detectable. “The presence of microplastics even in Garudtal highlights the role of atmospheric deposition and indirect human influences, including nearby roads and limited tourism,” Dr Neelavannan said.

The study further noted that “the abundance of microplastics was positively correlated with watershed development and anthropogenic activities such as waste management, transportation, and fishing.”

A striking finding is the dominance of microplastic fibres, accounting for 84% of all particles, followed by fragments (12%). These fibres are largely linked to synthetic textiles, released during washing and entering water bodies through sewage and runoff.

“Textile-derived microfibrils appear to be a major contributor, especially in urbanised lake catchments,” the researchers observed.

Microplastics enter these lake systems through multiple pathways, including surface runoff, wastewater discharge, atmospheric deposition and tourism-related activities, making lakes effective long-term sinks of plastic pollution. Polymer analysis showed polyester as the most common material (31%), followed by polypropylene (15%), rayon (8%), and polyethylene (6%). The dominance of polyester is particularly concerning due to its higher hazard potential.

Most particles were in the 1000–5000 micrometre size range (53%), suggesting relatively slow degradation in cold, high-altitude conditions. While the pollution load index (PLI) indicated relatively low contamination levels, the polymer hazard index (PHI) exceeded 1000 in many samples, pointing to potentially serious ecological risks.

**MICROPLASTICS (MPs)
FOUND IN ALL 24 SAMPLES**

Nainital: 813 ± 346 MPs/m³,

Bhimtal: 413 ± 274 MPs/m³

Garudtal: 175 ± 108 MPs/m³

31% Polyester

15% Polypropylene

8% Rayon

6% Polyethylene



S V KRISHNA CHAITANYA
@ Chennai

Our findings clearly show that no freshwater system, however remote, is free from microplastic contamination. This gradient, from Nainital to Bhimtal to Garudtal, strongly reflects the influence of population density, tourism pressure and land-use patterns on microplastic accumulation

- Dr Kannaiyan Neelavannan

A new study published in *Scientific Reports* has revealed the widespread presence of microplastics (MPs) in high-altitude freshwater

lakes of the central Himalayas, raising concerns over the growing ecological footprint of human activity, even in seemingly pristine environments.

The study, led by Dr Kannaiyan Neelavannan, was carried out through an international collaboration involving King Fahd University of Petroleum & Minerals (Saudi Arabia), IIT Kanpur (India), Cefas (UK), and the University of Madras. Researchers analysed surface water samples from three lakes in Uttarakhand’s Kumaun region - Nainital, Bhimtal, and Garudtal - and found microplastics in all 24 samples tested, including those from remote and sparsely populated areas.

“Our findings clearly show that no freshwater system, however remote, is free from micro-

