FOR IMMEDIATE RELEASE: Ganges Lab Advances Remote Sensing Methods to Map Pollution in the Ganga River Basin - July 30th, 2026

Determining where to prioritize pollution remediation and environmental conservation projects in a river basin that spans thousands of kilometers and is home to 650 million people is a massive undertaking limited by data availability and financial constraints. New open-access research published in *PLOS Water* demonstrated that midsized (Tier 2) cities along India's Ganga (Ganges) River Basin are highly vulnerable to pollution. The research was done by Collaborative Earth's Ganges Lab, leveraging an Analytical Hierarchical Process (AHP) model that factored population density, land use and land cover, rainfall, drainage density, slope and temperature, to help characterize pollution vulnerability.

Collaborative Earth's Ganges Lab is a team of interdisciplinary researchers and practitioners led by Dr. Anthony Acciavatti of the Yale School of Architecture and School of the Environment. The lab focuses on pollution in the Ganga River watershed, bringing together expertise in machine learning, ecology, design and visualization to support public health and the adoption of green infrastructures. In this publication, the lab used AHP model outputs to characterize vulnerability across a 1,330 km long by 20 km wide corridor of the river. Per Acciavatti, "This critical 1,330 km stretch passes through India's most populous state, Uttar Pradesh, a patchwork of agricultural plots and human settlements totaling over 235 million people. By decoding the vulnerabilities of this living landscape, Ganges Lab developed a framework to guide conservation and sustainability efforts."

AHP is a multi-criteria decision making process which, when coupled with remote sensing and geospatial data, supports complex analyses of large environmental systems under uncertain conditions. To account for uncertainty and limitations of AHP, the team ran four additional multi-criteria models to compare outcomes and created a composite analysis. This comparative analysis demonstrated that:

- Population density is insufficient in itself to explain variations in pollution vulnerability. The AHP model effectively includes other parameters (e.g., drainage density) that influence vulnerability.
- Combining models into a composite variable and identifying discrepancies that exceeded a composite threshold of 95% allowed for identification of particularly vulnerable river stretches.
- Across all models, cities had higher levels of vulnerability. However, forest and cropland regions with low population densities were more vulnerable to pollution as rainfall levels increased, indicating a need for holistic approaches to vulnerability mapping.

As policymakers adopt methods such as digital twins and remote sensing to monitor river basins at scale, it is critical to reflect vulnerability in order to plan effective environmental interventions rooted in local socio-ecological processes. This research provides a novel method to visualize pollution vulnerability in a data-constrained environment and identify high-priority areas for pollution interventions. Ganges Lab is committed to collaboration and open source knowledge creation to support River Ganga. Future efforts from the lab include using AHP to predict and classify surface water inflows to match flood mitigation and pollution control with specific ecological and physical characteristics of the Ganga riverscape.

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