The researchers combined several data sources to build their framework, which accounts for city-specific factors that produce and concentrate PM$_{2.5}$. Sixteen air quality monitoring stations provided hourly PM$_{2.5}$ estimates across the city. Landsat 8–derived data products provided maps of vegetation, impervious surfaces, and aerosol density. Weather data were incorporated through the use of NASA's Goddard Earth Observing System-Forward Processing (GEOS-FP) forecasts, and road data from OpenStreetMap helped quantify the contributions of automobile and bus traffic.

The input data were used to estimate real-time PM$_{2.5}$ concentrations on a grid across the city. That grid was then overlaid by a graph with nodes representing street intersections and edges.
representing the streets themselves. Each edge was assigned a pollution "cost" based on the PM$_{2.5}$ in the grid cells it crosses. The pollution breathed during a journey between two nodes is the sum of the costs of the edges that most efficiently connect them.

The Hong Kong case study included PM$_{2.5}$ estimates for 70,788 roads. Using the developed app, which is visually similar to commercial mapping apps, a user can compare the fastest and healthiest routes between two points. The researchers observed that healthy route planning could reduce PM$_{2.5}$ exposure by 5%–25%. In one highlighted example, the app indicated that choosing a route between two Hong Kong universities that was 100 meters longer than the shortest available route would result in a 5%–10% reduction in breathed pollution.

The researchers note that the generalizability of their approach for estimating high-resolution PM$_{2.5}$ levels means it may be applicable in other cities and useful in other route planning applications and services to minimize people's pollution exposure.

The research is published in the journal *GeoHealth*.


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