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Team Name: Fireflies



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Traffic & Environmental Impact: Geo-Intelligence

Problem Statement 4 (Code: 304)



Why We Chose This Problem

Perfect Nexus: Blending TomTom's real-time mobility insights with a goal to reduce congestion and pollution for a healthier future.

Dual Crisis: In Delhi NCR, congestion is a primary driver of two major crises:

- Economic: Costs ₹60,000 crore (approx. \$7.2B) annually from congestion-related losses.
- Public Health: Contributes to an estimated 17,200 premature deaths in Delhi each year from air pollution.

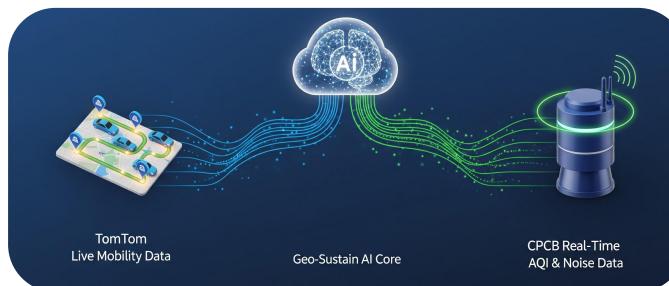
Our Idea: "EcoFlow"

What it is: A real-time, scalable geo-intelligence platform.

How it works: Ingests and fuses two distinct, live data streams in real-time.

1. **Live Mobility Data:** From the TomTom Traffic API (e.g., traffic flow, average speed, congestion hotspots).

2. **Live Environmental Data:** From government sources (e.g., CPCB's real-time AQI and noise pollution feeds).



Toxicity: 15% of deaths in Delhi linked to air pollution, says study

Kushagra Dixit / TNN / Updated: Nov 01, 2025, 14:49 IST

Shocking data reveals air pollution claimed one in seven lives in Delhi during 2023. Ambient particulate matter was the primary culprit, responsible for approximately 15% of all fatalities, totaling around 17,200 deaths. This pollution also led to a stag... [Read More](#)



Representative Image

NEW DELHI: One in seven deaths in Delhi in 2023 were due to polluted air, states the latest Global Burden of Disease (GBD) data released this month by the Institute for Health Metrics and Evaluation (IHME).

An analysis of the data by the Centre



Delhi air pollution: AQI 'very poor' at 346; Delhites gather at India Gate to protest for clean air

Delhi air quality: On Monday morning, as per the CPCB data, all monitoring stations recorded an AQI of over 300, with many recording well above 350.

Unique Innovation

Dynamic Eco-Routing:

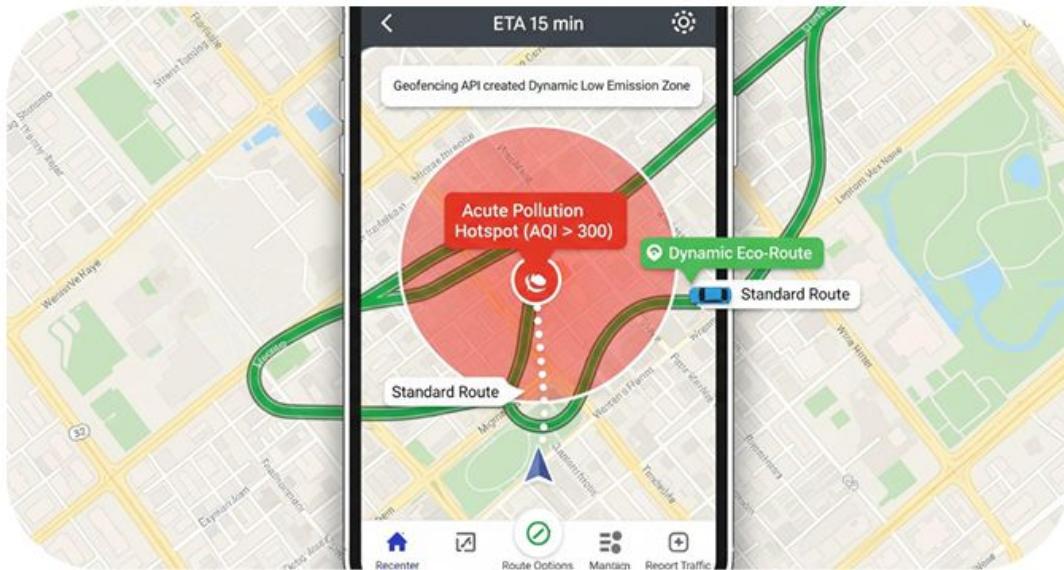
- Finds pollution hotspots.
- Flags them using TomTom's Geofencing API to create dynamic Low Emission Zones.
- Routes vehicles around these zones in real time.

ML Advantage:

Our machine learning model predicts future pollution hotspots using traffic and weather data, enabling proactive eco-routing and smarter city planning.

The Win:

Protects citizens today — and prevents pollution tomorrow.

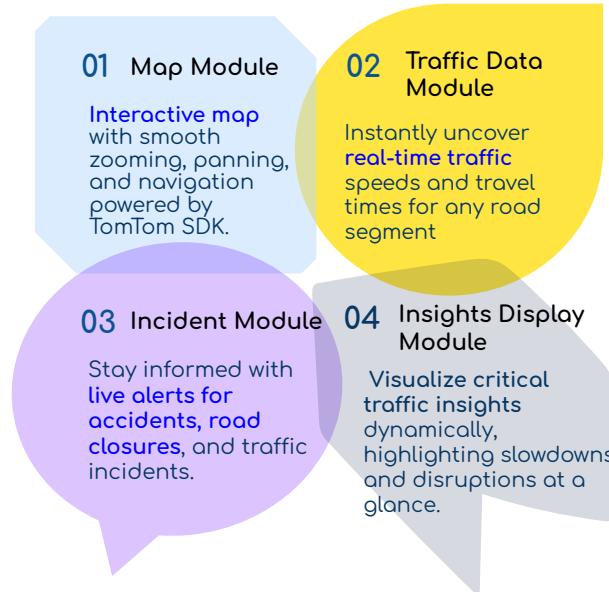


Technical Approach

Tech Stack:



Key Modules:



APIs used: Freeflow API, Incident API, Route API

Key Features:

1. **Traffic Pattern Analysis**
When we click on a route, it gives current speed, free flow speed, Travel time, Free Flow travel time, Congestion Level.
2. **Environment Impact Analysis**
Displays live air quality (PM2.5, PM10, NO₂), noise estimation, and emission levels (CO₂, NOx) linked to actual traffic conditions.
3. **Safe Route Recommendation**
Find the safest, low-risk path by avoiding accident-prone and congested zones based on real-time traffic & incident data.
4. **ML Model Prediction**
...
5. **Personalized dashboard on user POI**
...

Technical Workflow

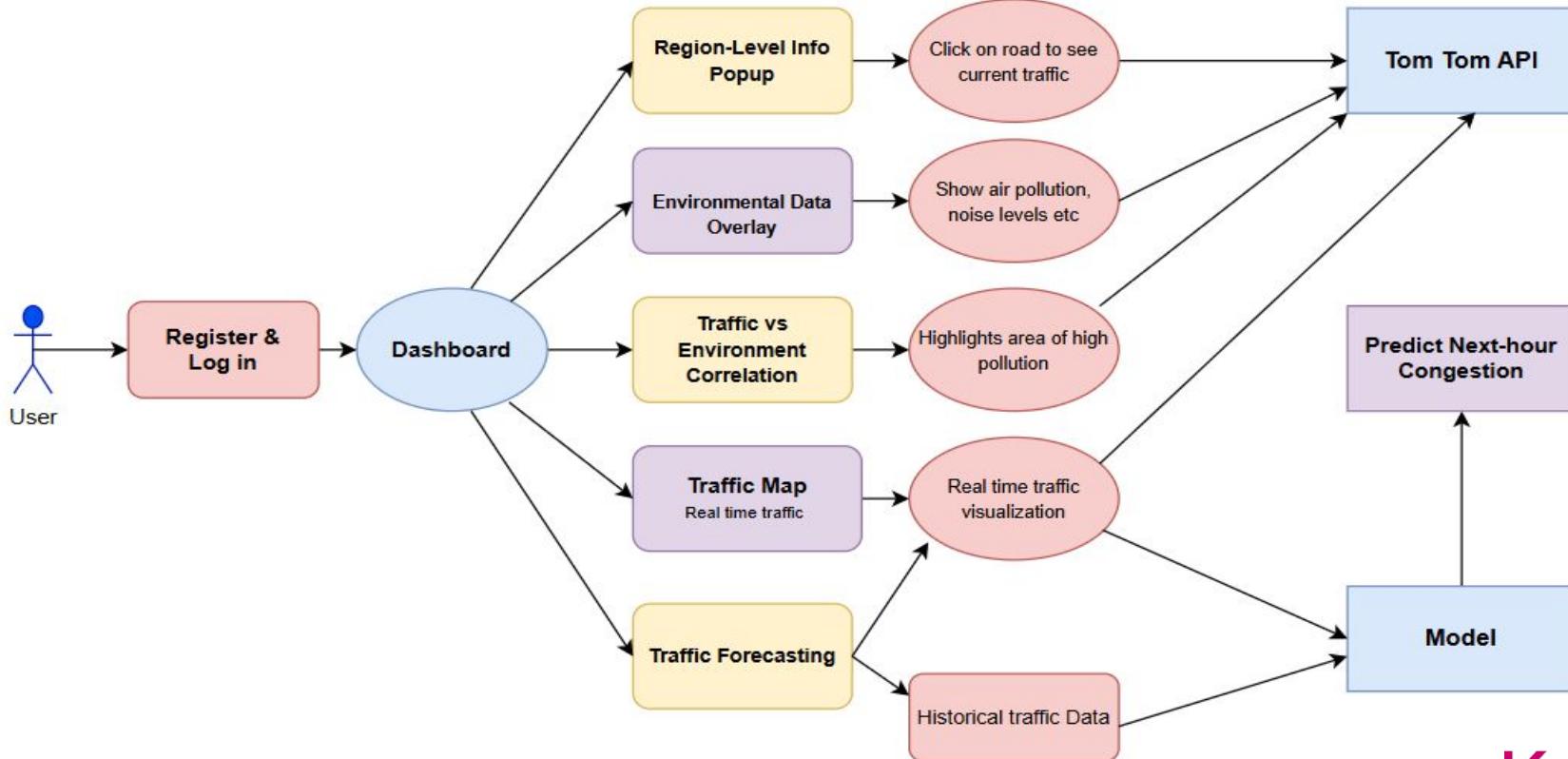


Figure: Complete workflow of the project

Impact and Feasibility

“ Impact

- **Environmental:** Directly enables targeted reductions in air pollution (PM2.5, NOx) and carbon emissions by identifying the worst "hotspots." Allows cities to measure the environmental ROI of traffic interventions.
- **Social:** Improves public health by reducing air and noise pollution, especially in vulnerable communities. It also enhances quality of life (less stress, quieter streets) and provides a tool to advocate for environmental equity.
- **Policy & Planning:** Provides planners and policymakers with the objective data needed to justify and optimize infrastructure spending (e.g., new transit lines) or policies like low-emission zones.

”

“ Feasibility

- **Architecture:** The platform is highly scalable. It can be built on a standard cloud-native architecture (using AWS, Azure, or GCP) designed to process large, real-time data streams. The model can be easily redeployed to new cities by feeding it their specific data.
- **Implementation Strategy (Phased):**
 1. **Phase 1 (MVP):** Start with one district. Focus on integrating existing data (e.g., Google Traffic API, public air quality sensors) to visualize the correlation.
 2. **Phase 2 (Predictive):** Use the collected data to build machine learning models that forecast pollution and model "what-if" scenarios (e.g., "What is the impact of a new bus lane?").
 3. **Phase 3 (Integration):** Create an API so navigation apps (like Google Maps) or logistics companies can query the platform for the "Greenest Route," actively guiding traffic to reduce emissions.

Breakup of tasks amongst team members

01

Divya Verma

- I have developed the dashboard that integrates all the features, worked on the backend structure.

02

Divyanshi Sahu

- I have worked on eco route and safe route feature.
- I have made use of Tom Tom route api.

03

Khushboo Yadav

- I developed the initial front-end structure and finalized the solution by leveraging HTML for structure, CSS for design, and JavaScript for form validation.

04

Tanya Goel

- I have integrated traffic analysis pattern feature in the website that analysis the traffic pattern.

05

Anjali Dubey

- I have helped in ppt and research for Tom Tom API's.

Risks

API Dependency Risk #01

If the API is slow, changes version, rate-limits system goes down → dashboard fails.

Data Availability Risk #02

AQI and traffic data may not always exist for:- Certain coordinates, Certain timings, Rural or low-traffic areas

Privacy & Security Risk #03

Using location data (lat/lon)- Must be securely handled, Avoid logging exact user movement

Model Reliability Risk #04

A predictive ML model built on limited / biased data may:- Give wrong congestion predictions, Mislead users into unsafe or slower routes,

Misinterpretation Risk #05

Users may misinterpret:- AQI ranges, Noise levels, Emission estimates-which may lead to misinformation if not explained clearly.

Challenges

1. Combining Multiple Data Streams Smoothly

You integrate:- Traffic flow, Incident API, Environmental AQI, Routing engine Synchronizing all of them in real-time is complex.

2. Map Rendering Optimization

Handling:- Several layers (route, heatmap, incidents, traffic segment) Smooth zoom, drag, and live refresh, Keeping it smooth requires careful UI throttling and performance tuning.

3.. Limited Training Dataset

Building a reliable ML model requires:- Historical traffic Weather, Seasonal patterns Multi-hour or multi-day datasets. Acquiring and cleaning such data is a challenge.

4. Safe Route Logic Complexity

To compute “safe route”, you must:

- Detect incidents near polyline
- Dynamically generate detour waypoints
- Recompute route multiple times
- This is computationally heavy.

5. AQI Prediction Complexity

AQI depends on:

- Traffic
- Wind direction
- Temperature
- Humidity
- Emission sources

Modelling these in ML is extremely hard without environmental sensors.

Code and Demo

Open Source Code

[Click here for Code Repository](#)

Demo Video.

[Click here for a detailed video.](#)

 EcoFlow Smart Traffic & Environmental Dashboard

Total Incidents 68

Avg Congestion --

Routing

Start (lat,lon) 51.5072,-0.1276

End (lat,lon) 51.5200,-0.1000

Eco Route **Safe Route**

Distance: 2.98 km
ETA: 12.6 min
Nearby incidents avoided: 3

Nearby Incidents

Type: 8 linestring
Type: 8 linestring



AQI Levels (sample)

Pollutant	Value
PM2.5	~2
PM10	~10
NO2	~25

Environmental Impact

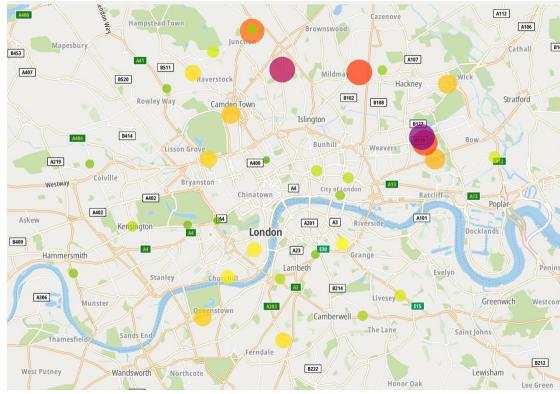
Click on the map to analyze a location

Safe Route Description

Safe Route — Low-Risk Navigation: Calculate routes that avoid current incidents and congested segments to minimise accident risk and exposure to hazardous road conditions.

Dashboard

HeatMap



References Link.
[TomTom API](#)

THANK YOU!