IPD GROUP 38

AIR VISION

Predicting tomorrow’s AQI with AI

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MOTIVATION FOR THE IDEA

A critical gap in existing research and data has been identified:
the impact of landfill incinerations on AQI. Despite being a significant contributor to air pollution, this area remains underexplored due to inconsistent or incomplete datasets.

- Solving discrepancies in already existing datasets: Inefficiencies and inaccuracies in current waste management practices exacerbate pollution levels. By identifying discrepancies in waste segregation, incineration, and landfill data, our project aims to spotlight areas requiring reform.
- Helping government bodies to drive Policy and Action: A data-driven approach to predicting AQI spikes caused by landfill fires can empower governments and organizations with actionable insights to develop stricter waste management protocols and policies.

OUR PRODUCT

FORMULA

This formula is generated using ward
wise data collected from government sources and using projections

Total Waste per Year (kg)
=
P × Wp × Df × Ef × Uf × (1 + Sf + Sm) × 365

MODEL 1

Model 2 focuses on predicting the environmental impact of non-biodegradable waste incineration, with a particular emphasis on the Air Quality Index (AQI).

Calculations through-

a. Elemental Emissions

Retrieved from data of Model 1

b. Holistic view of AQI

from vehicular emissions, constructions sites, major cultural activities, residual pollution,etc.

↓

FINAL AQI

MODEL 2

It will handle future prediction by comparing the calculated data from Model 2, historic data and also the necessary data from upcoming major events.

All the streamlined data from the three models will give rise to a product which allows anyone to predict AQI levels in the near future.

With the final goal being

↓

21st JULY, 2029 12 P.M

ISSUES IN SIMILAR EXISTING SYSTEMS

Landfill	SOLID WASTE COLLECTED	GENERATED	TREATED	LANDFILLED
DEONAR	6000 TPD	6500 TPD	10%	88%

The above data is from a government issued research paper which clearly points out to the discrepancies in the data-

There is no clear information on how much waste is incinerated prior to being landfilled.

The data does not clarify how much organic waste is composted or incinerated. If incinerated, organic waste, due to its high calorific value - produces more CO_2 compared to non-biodegradable waste.

It is unclear whether the reported quantities of recyclable waste are accurate. If not recycled, is it being incinerated instead?

With the most important point being-
The reports do not disclose the amount of waste incinerated before landfilling or the criteria used to segregate waste for incineration.

TECH STACK

FORMULA

Total Waste per Year (kg)
=
P × Wp × Df × Ef × Uf ×
(1 + Sf + Sm) × 365

Next.js
framework

React
javascript library for building UI

Typescript
language

Tailwind.css
CSS framework for making website more interactive

MODEL 1

TensorFlow
training ML and deep learning models

PyTorch
dynamic computational graph and ease of experimentation.

LSTM
RNN designed to capture temporal dependencies in sequential data.

Keras(API)
building and training deep learning models

MatPlotlib
library for data visualization

MODEL 2

ARIMA
statistical method for time-series forecasting

PyTorch
dynamic computational graph and ease of experimentation

Statsmodels
statistical modeling and time-series analysis

Plotly
visualization library for creating dynamic and shareable plots

Prophet
open-source library developed by Facebook for time-series forecasting

IMPLEMENTATION OF THE FORMULA

Total Waste per Year (kg) =

$$P \times Wp \times Df \times Ef \times Uf \times (1 + Sf + Sm) \times 365$$

This is the formula which we have generated using the data which we have collected for our dataset, using various government sources and projections.

Where:

P = Population of the area (number of people)

Wp = Base per capita daily waste generation (kg/person/day), which can be adjusted based on population density or typical values (0.3 kg/day depending on urbanization and economic status)

IMPLEMENTATION OF THE FORMULA

Df = Population density factor (dimensionless), representing how population density influences per capita waste generation; can be modelled as:

$$Df = 1 + kd \times ()$$

where kd is an empirical coefficient (0.3), and Density(ref) is a reference density (10000 persons/km²)

Ef = Education index factor (dimensionless), accounting for rural behaviour of burning waste (less waste collected):

$$Ef = 1 - ke \times (1 - \text{Education Index})$$

Uf = Urbanization index factor, representing built-up area influence on waste generation:

$$Uf = 1 + ku \times ()$$

where ku is a coefficient (0.4), and BUA is the fraction of built-up area

Sf = Surge factor due to festivals (0.20 for 20% increase)

Sm = Surge factor due to monsoon (0.10 for 10% increase)

365 = Number of days in a year to convert daily waste to annual waste

SCOPE OF THE PRODUCT

As for the initial phases, the initial datasets will be made by us and a few trusted relatives.

Currently the scope of our project is limited to the DEONAR landfill, which is operating since 1927. Our primary domain of focus are wards:
A,B,C, D,E,F,G,H,L,M,N,K,S,O
The AQI models shall only help calculate the pollution participation caused due to incineration of non-biodegradable waste at these landfills.

As for the predictive analysis, it will take into account the model data, historic data and obvious future events. Any unexpected events such as natural disasters shall not be taken into consideration.

ESTIMATED TIMELINE

SEM 3

Surveys and Outcome of the surveys.

Determining gaps in existing papers or technologies

SEM 4

Data collection.

Design formulation.

Took on a social initiative by developing a website creating awareness

Technical Paper based on the literature collected.

SEM 5

Formulation of-
ER diagrams
Use Cases
Data flow diagrams
GUI designs

Complete Implementation

Testing and Validation

Technical paper draft

SEM 6

Implementation after suggestions

Result analysis

Patents/Copyrights

Publishing Papers

AIR VISION

THANK YOU

for your time and attention

Presented by IPD GROUP 38