Problem Statement for AI/ML

PS1: AI-Driven Pollution Source Identification, Forecasting & Policy Simulation Platform for Delhi NCR

Delhi-NCR faces recurring air pollution episodes, particularly during winter, caused by a combination of factors such as crop residue burning, vehicular emissions, industrial activity, and meteorological conditions.

Features:

1. **Pollution Source Detection** – Identifies main pollution sources like traffic, crop burning, industries, and weather effects using smart rules and AI, with clear explanations.
2. **Smart Data Usage** – Combines simulated data with real-time and official pollution data to improve accuracy and reliability.
3. **AQI Prediction & Trends** – Forecasts air quality for the next 24–72 hours and shows long-term seasonal pollution trends.
4. **Local AQI & Health Advice** – Displays area-wise AQI along with safety tips for children, elderly, and people with health issues, plus safer travel routes.
5. **Visual Pollution Maps** – Uses heatmaps, charts, and graphs to show pollution levels across locations and time periods.
6. **Policy Impact Simulation** – Tests the effects of actions like odd-even traffic rules, firecracker bans, and construction limits by comparing before-and-after results.
7. **High-Risk Area Alerts** – Finds pollution hotspots and peak times, providing practical recommendations for both authorities and the public

User Features:

Simulated Pollution Source Identification

1. Uses simulated data based on real pollution patterns.
2. Uses simple rules and AI to find pollution sources.
3. Shows how much pollution comes from traffic, crop burning, and industries.
4. Displays pollution by area and time.
5. Clearly explains why one source is the main cause.

AQI Forecasting (AI-Based)

1. Predicts AQI for the next 24–72 hours.
2. Shows seasonal pollution trends.

Citizen Awareness

1. Shows local AQI for each area.
2. Gives health alerts for Normal, Moderate, and Severe AQI levels.
3. Provides safety tips for children, elderly, and patients.

4. Suggests cleaner travel routes.

Policy Simulation Dashboard

1. Tests actions like odd-even traffic rules, firecracker bans, and construction limits.
2. Compares pollution before and after policies.
3. Uses charts and heatmaps to show impact.
4. Identifies high-risk areas and peak pollution times.
5. Suggests actions for both citizens and authorities.

PS2: Problem Statement: Real-Time Groundwater Resource Evaluation using DWLR Data

At present, groundwater data is not easily available in real time for planning and decision-making. To manage groundwater properly, accurate and up-to-date information is required. Digital Water Level Recorder (DWLR) stations collect frequent groundwater level data, which can help in understanding groundwater conditions better.

Features:

1. Real-Time Groundwater Monitoring – Uses DWLR station (dummy) data to show current groundwater levels with live updates.
2. Clear Trends & Visuals – Displays groundwater trends and patterns through easy-to-read maps and interactive graphs.
3. Recharge & Availability Estimation – Dynamically estimates groundwater recharge and how much water is available.
4. Early Warning Alerts – Sends alerts when groundwater levels become critical to support quick decision-making.
5. Research & Data Access – Provides real-time and historical groundwater data for analysis, modeling, and sustainability studies.
6. Demand–Supply & Risk Analysis – Compares water demand with availability and simulates droughts, overuse, and climate change impacts.
7. Policy Support & Scalable Platform – Classifies zones (safe, semi-critical, critical), evaluates policy impacts, and offers a user-friendly, scalable, and cost-effective system for wide use.

User Features:

For Water Resource Planners / Policy Makers
- Connects to DWLR station data (dummy data) to provide real-time groundwater readings
- Displays trends and patterns using interactive graphs and maps
- Estimates groundwater recharge and availability dynamically
- Provides alerts for critical groundwater conditions to aid decision-making

For Groundwater Researchers
- Access to real-time and historical data for analysis
- Visualization of trends and patterns for research purposes
- Supports modelling and assessment of groundwater sustainability

General Platform Features
- Easy-to-use interface suitable for all users
- Scalable and cost-effective solution for wide adoption

Water Resource Planners / Policy Makers

- Demand–Supply Analysis – Compares groundwater availability with current and future water demand.
- Scenario Planning – Simulates droughts, over-extraction, and climate change impacts on groundwater.
- Zone Classification – Automatically classifies areas as safe, semi-critical, or critical based

on water levels.
• Policy Impact Evaluation – Measures the impact of water conservation policies and regulations over time.

PS3:

Problem Statement – AI-Powered Farmer Decision Support System

Features:

1. Personalized Farming Recommendations – AI/ML suggests optimal sowing times, irrigation schedules, fertilizer/pesticide dosage, pest/disease alerts, and climate-resilient practices based on crop type, soil health, weather forecasts, and field conditions.
2. Data Input & Tracking – Simple registration, input of crop/field details, growth stage, and history of past advisories and actions for context-aware recommendations.
3. Weather & Risk Alerts – Real-time weather forecasts, extreme weather warnings, and pest/disease alerts with preventive measures.
4. Subsidy & Market Guidance – View government vs market prices, subsidy eligibility, quantity limits, and one-click ordering from authorized vendors.
5. Local Language Support & Accessibility – Recommendations and alerts delivered in regional languages with intuitive, low-digital-literacy-friendly interface.
6. Monitoring & Advisory Management – Dashboard to track farmer clusters, crop patterns, adoption of AI/ML recommendations, and risk-prone regions.
7. Intervention & Field Support – Send targeted advisories, plan field visits based on alerts, validate AI-generated guidance, and monitor pest/disease outbreaks or anomalies in specific areas.

User Features :

Farmer (End User) Features

1. Simple registration using mobile number
2. Crop and field details input:
    - Crop type
    - Location
    - Sowing date / growth stage
3. Personalized farming recommendations:
    - Best time for sowing
    - Irrigation schedules based on weather
    - Fertilizer and pesticide dosage
    - Climate-resilient practices
4. Pest and disease alerts with preventive actions
5. Weather forecasts and extreme weather warnings

6. Recommendations in local language
7. History of past advisories and actions
8. View eligible subsidised items:
    - Fertilizers
    - Seeds
    - Pesticides
    - Other agri inputs
9. Display of:
    - Government price vs market price
    - Subsidy amount
    - Quantity limits based on landholding/crop
10. One-click ordering from authorized government vendors

Agricultural Officer / Extension Worker Features

1. Dashboard to view farmer clusters and crop patterns
2. Alerts on pest/disease outbreaks in specific regions
3. Ability to send advisories or warnings to farmers
4. Validation and refinement of AI-generated recommendations
5. Monitor adoption of suggested practices
6. Field visit planning based on risk and alerts