



# EcoReport Civic Complaint Management System

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**Abstract:** Environmental complaint management systems in many regions suffer from inefficiencies arising from manual workflows, delayed responses, and limited transparency, which often lead to unresolved grievances and diminished civic engagement. This paper presents EcoReport, an intelligent, web-based environmental monitoring and complaint management system that aims to enhance responsiveness, accountability, and citizen participation. EcoReport leverages artificial intelligence for automated complaint classification, prioritization, and semantic analysis, enabling faster decision-making and more efficient resource allocation. A role-based access control model defines distinct operational layers for citizens, administrative authorities, and field officers, ensuring structured workflow execution across the system.

The system incorporates key capabilities such as GPS-based field verification supported by image evidence, offline data capture for use in low-connectivity areas, and automated notification mechanisms that provide real-time status updates to users. Implemented with a modern web stack, EcoReport combines a reactive frontend, a scalable backend architecture, and API-driven AI integration to deliver a cohesive and extensible platform. In contrast to traditional complaint systems, EcoReport minimizes manual intervention, strengthens traceability, and accelerates resolution cycles through workflow automation and intelligent data processing.

**Keywords:** Environmental Monitoring, Complaint Management System, Artificial Intelligence, Smart Governance, Role-Based Access Control, Workflow Automation, GPS Verification, Citizen Engagement, Web Application, Semantic Analysis.

## I. INTRODUCTION

Environmental degradation in rapidly urbanizing regions strains ecosystems due to population growth, industrial activity, and weak waste-management systems. Existing grievance mechanisms are often inefficient, with fragmented workflows, limited real-time monitoring, and low citizen involvement. Conventional complaint systems are largely manual or semi-digital, relying on static channels that lack dynamic prioritization and transparent tracking, leading to delays, inconsistent validation, and weak accountability.

Recent advances in web technologies and artificial intelligence enable the redesign of such systems as intelligent, scalable platforms. AI-driven natural language processing and classification allow automated interpretation of complaints and severity-based prioritization, which, when combined with role-based access control and workflow automation, can improve efficiency and decision-making in environmental governance.

This paper proposes **EcoReport**, a web-based environmental complaint and monitoring system that overcomes these limitations. It uses a modular architecture with a reactive frontend, an API-driven backend, and AI-based analytics to support structured interaction among citizens, administrators, and field officers through role-specific dashboards. Key features include automated complaint classification, GPS-enabled field verification with visual evidence, offline data capture, and real-time notifications, all of which enhance traceability, speed up resolution, and improve transparency. EcoReport also includes participatory mechanisms such as public feedback and live status visibility, strengthening citizen engagement and accountability in environmental governance.

## II. LITERATURE REVIEW

The evolution of environmental complaint management has closely followed e-governance trends, with early systems mainly digitizing submissions while retaining static, opaque workflows. Such systems suffer from inefficient routing, weak accountability, and linear processing, often without dynamic prioritization. Recent work has applied AI and natural language processing for automated classification and sentiment analysis, but most implementations remain limited to categorization and do not fully integrate workflow automation or multi-stakeholder coordination.



Role-based access control (RBAC) has proven effective for structuring interactions among citizens, administrators, and field staff, yet its integration with complaint workflows is often superficial. Location-based verification using GPS and image evidence improves authenticity in domains like urban management, but rarely spans the full complaint lifecycle. Citizen engagement research highlights the value of transparency, dashboards, and status visibility, yet many systems treat participation as an auxiliary feature.

These gaps—fragmented use of AI, weak workflow coupling, limited verification, and shallow engagement—result in systems with limited real-world effectiveness. **EcoReport** addresses this by integrating AI-driven complaint analysis, role-based workflow management, GPS-enabled verification, and user-centric engagement into a single architecture, thereby offering a more cohesive and responsive platform for environmental grievance redressal.

### III. METHODOLOGY AND PROPOSED SYSTEM

The proposed **EcoReport** system is designed as a web-based platform that enables efficient management of environmental complaints. The system integrates frontend, backend, and database layers to ensure smooth interaction, intelligent processing, and secure data storage.

#### 3.1 System Architecture

The system follows a three-layer architecture consisting of the following components:

##### Frontend Layer:

Developed using modern web technologies, this layer provides an interactive interface where users (citizens, admins, and field officers) can log in, submit complaints, view complaint status, and navigate through the system via dedicated dashboards.

##### Backend Layer:

Implemented using an API-driven backend, this layer processes user requests, verifies login credentials, manages complaint workflows, applies AI-based rules, and communicates with the database to store or retrieve complaint and user data.

##### Database Layer:

A structured database is used to store complaint records, including complaint type, description, images, GPS coordinates, priority level, and status history, along with user information and system logs for auditing and traceability.

#### 3.2 System Workflow

The system operates through the following steps:

Environmental complaint data are stored in the database.

Citizens log into the system and submit complaints with text, images, and GPS location.

Admins log in using secure credentials and review, classify, and assign complaints to field officers.

The system verifies the credentials through the backend server and retrieves the assigned complaint details from the database.

Field officers perform on-site verification using GPS-tagged images and update the resolution status.

The system stores the updated status and triggers notifications to the user and relevant stakeholders.

This workflow ensures secure access, efficient complaint handling, automated decision support, and transparent tracking from submission to resolution.

### IV. COMPARATIVE ANALYSIS

To evaluate the proposed system, **EcoReport** is compared with traditional environmental complaint systems and existing digital grievance platforms based on key parameters such as automation, transparency, verification, and user engagement.

#### 5.1 Comparison Parameters

The analysis considers complaint processing method, automation level, transparency and tracking, verification mechanism, user engagement, and scalability and flexibility.

#### 5.2 Comparative Table

Parameter	Traditional Systems	Existing Digital Portals	EcoReport (Proposed)
Complaint Submission	Manual / paper-based	Online forms	Web + offline support
Processing Method	Manual	Semi-automated	Fully automated (AI-assisted)
Classification	None	Basic categorization	AI-based



Priority Handling	First-come, first-serve	Limited rules	Dynamic priority
Transparency	Low	Moderate	High (real-time tracking)
Verification	Manual	Basic field check	GPS + image verification
Workflow Automation	None	Partial	Complete
RBAC	Minimal	Limited	Full
Citizen Engagement	Very low	Limited feedback	Public feed + interaction
Notifications	None	Basic alerts	Real-time
Scalability	Low	Moderate	High (modular)

### 5.3 Analysis Discussion

Traditional systems suffer from manual processes, delays, and weak accountability, while existing digital portals improve accessibility but lack intelligent processing and full workflow automation. EcoReport uses AI-driven classification and prioritization to reduce manual effort and speed up responses. GPS-based verification and image evidence improve authenticity, while real-time tracking and notifications enhance transparency. Citizen engagement features like public interaction and feedback make EcoReport a participatory platform, offering clear advantages over current systems through integrated automation, structured workflows, and user-centric design.

## V. NOVELTY OF THE PROPOSED SYSTEM

EcoReport is evaluated by comparing it with traditional environmental complaint systems and existing digital grievance platforms on parameters such as automation, transparency, verification, and user engagement. Traditional systems are manual, slow, and lack accountability, while digital portals improve accessibility but remain semi-automated with limited tracking and weak workflows.

EcoReport addresses these limitations through AI-driven classification and dynamic priority assignment, which reduce manual effort and speed up responses. It uses GPS-based verification with image evidence to ensure authenticity and employs real-time tracking and notifications to enhance transparency. Full role-based access control structures interactions among citizens, admins, and field officers, improving coordination and accountability. Citizen engagement features such as public feedback and interactive status updates make EcoReport a participatory platform, offering a more efficient, transparent, and scalable solution than current systems.

## VI. CONCLUSION AND FUTURE SCOPE

This paper presents EcoReport, an intelligent environmental complaint management system that overcomes the limitations of traditional and existing digital platforms. By combining AI-based complaint analysis, role-based workflow automation, and GPS-enabled verification, the system improves efficiency, transparency, and accountability in handling environmental grievances. It reduces manual intervention, supports structured decision-making, and boosts user participation through real-time tracking and feedback. With a modular architecture, EcoReport offers scalability and adaptability, and serves as a practical framework for modernizing environmental governance using intelligent technologies and user-centric design.

## VII. FUTURE SCOPE

The system can be extended in several directions:

- Development of a mobile application for wider accessibility
- Integration with government databases and smart city systems
- Implementation of advanced AI models for predictive analysis and trend detection
- Addition of multi-language support to increase inclusivity
- Incorporation of data analytics dashboards for policy-level decision-making

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