FIXAM (Facilitating Issue eXchange for Accountable Municipalities)

Event: Big 5 Game Changers Hackathon (MoCTI, Sierra Leone)
Theme: Public Service Architecture Revamp
Repository: https://github.com/kvskoker/FIXAM
Team:

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1. Executive Summary

FIXAM is a crowdsourced civic problem-reporting platform designed to bridge the communication gap between citizens and local government in Sierra Leone. By utilizing a **"Hybrid Bridge" architecture**, the system combines the accessibility of conversational interfaces (**WhatsApp**) with the analytical power of geospatial technology (**GIS/Maps**).

The platform solves the issue of community grievances being "lost in the void" of social media by converting unstructured citizen complaints into structured, actionable geospatial data for municipal authorities.

2. The Problem Statement

Currently, citizens in Sierra Leone lack a formal, effective channel to report infrastructure failures.

- **The Void:** Problems like broken water pipes or potholes are often shouted into the void of social media or radio call-in shows, where they disappear without logging.
- **Lack of Prioritization:** Local councils lack a data-driven way to distinguish between minor inconveniences and critical infrastructure failures. They cannot easily see if a problem affects 5 people or 5,000.
- **The Disconnect:** There is no shared "source of truth" between the government and the governed regarding the status of repairs.

3. The Solution: "Chat-to-Map" Architecture

FIXAM introduces a workflow where the **input is conversational** (low barrier to entry) but the **output is geospatial** (high utility for planning).

Step A: The Citizen Experience (Reporting and Voting): The user interface is built entirely within **WhatsApp**, the most widely used communication tool in the region, ensuring high accessibility.

1. **Trigger:** User sends "Hi" or "Report" to the official WhatsApp Business API number.

2. **Categorization:** An automated bot asks the user to report an issue.

3. **Evidence:** The user is prompted to upload a Photo or Video.

4. **Precise Location:** The bot asks the user to "Share Location" using WhatsApp's native attachment feature, capturing precise Latitude/Longitude coordinates or type address like "8 Jones street", which the bot geocodes to get precise location.

5. **Description (Inclusive Design):** The user can type a text description **OR** send a voice note. This is critical for accessibility, allowing users with lower literacy levels to report issues verbally.

6. **Confirmation:** The user receives a unique "Ticket ID" and a link to track their issue on the live map.

7. **Voting:** User sends "Hi" to the official WhatsApp Business API number, chose to vote (upvote or downvote) for an issue and provides issue ticket ID. The automated bot verifies and registers user's vote for the specific issue.

Step B: The Engine (AI & GIS Backend): This is the "Sanitizer" layer that converts raw user data into structured government intelligence.

- **Geocoding:** The system takes the WhatsApp location pin and pings the **Nominatim OSM API** to convert coordinates into a readable address (e.g., "Jomo Kenyatta Road, Freetown").

- **AI Processing:**

   o **Transcription:** Voice notes are transcribed into text using **AI**.

   o **Categorization:** An LLM (Gemini) analyzes the description to verify the category.

   o **Summarization:** Long rants are converted into actionable "One-line Summaries" (e.g., "Burst pipe causing flooding at intersection").

   o **Deduplication:** The AI checks a **100-meter radius** around the new report. If a similar issue exists, it flags the new report as "Duplicate/Support" rather than creating a new ticket, preventing data clutter.

Step C: The Public Interface (The "Civic Map"): A mobile-responsive Web Application serves as the transparency layer.

- **Visuals:** A map interface (Leaflet.js) using **OpenStreetMap** tiles.

- **Status Indicators:** Issues appear as color-coded pins:

   o 🔴 **Red:** Critical/Unresolved

   o 🟡 **Yellow:** In Progress

   o 🟢 **Green:** Fixed

- **Democratic Prioritization:**

   o Users can click on pins to see the photo and AI summary.

   o **Upvote count:** "It affects me too."

   o **Downvote count:** "Not true/Not urgent."

Step D: The Government Dashboard (Command Center): Instead of viewing thousands of individual complaints, the government sees high-level data patterns.

- **Heatmaps:** The dashboard aggregates upvotes to show "Hotspots." (e.g., Seeing that Lumley has 500 upvotes for Garbage collection vs. 50 for Potholes helps allocate budget effectively).

- **Insight Cards:** Auto-generated alerts such as "Top Priority this Week: Waste Management in Central Freetown."

- **AI Sentiment Analysis:** The system reads the comments and voice transcripts to gauge the "mood of the people," alerting officials if citizens are expressing anger regarding safety risks.

4. Technical Stack (Open Source Focus)

The project prioritizes open-source technologies to ensure sustainability and low operating costs for the Sierra Leonean government.

- **Frontend:** Bootstrap, Leaflet (Map Library).

- **Backend:** Node.js.

- **Database:** PostgreSQL with **PostGIS** extension (Essential for geospatial queries like the 100-meter radius check).

- **Mapping/Geocoding:** OpenStreetMap (OSM) & Nominatim API.

- **Messaging Infrastructure:** WhatsApp Business API (via Meta Graph API).

- **Artificial Intelligence:**

  - **Gemini API** (for summarization/categorization).

5. Impact Potential

FIXAM aligns with the "Public Service Architecture Revamp" theme by:

1. **Democratizing Infrastructure Data:** Giving every citizen with a phone the power to act as a city inspector.

2. **Enabling Data-Driven Governance:** Moving the Ministry and Councils away from reactive, anecdote-based planning to proactive, heatmap-based resource allocation.

3. **Increasing Trust:** The transparent status tracking (Red to Green pins) rebuilds trust between the government and the public.