# CleanNet: Optimizing 5G Node Placement

Enhancing Connectivity While Minimizing Air Pollution Exposure

L **by Luna**

# Connectivity Challenges in Rural Areas

## Problem

Limited 5G connectivity in rural areas like Machakos County, Kenya, plus air quality challenges.

## Solution

An AI-driven tool to optimize 5G node placements for maximum coverage and minimal pollution exposure.

## Alignment

Supports the hackathon’s goal of bridging the digital divide.

# CleanNet: How it works

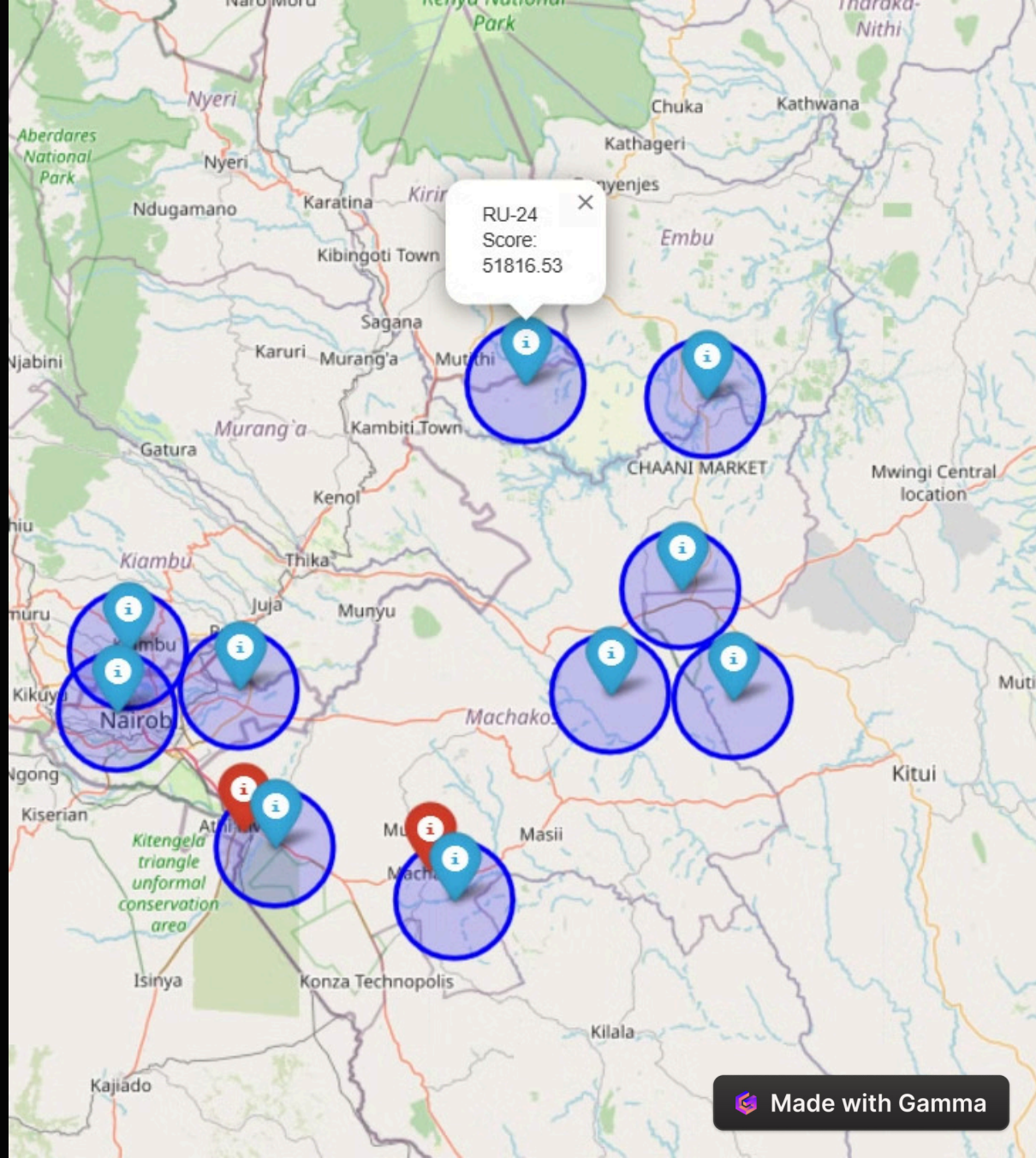
1. Define any boundaries
2. Input population Data
3. Simulate air quality index (AQI) with baseline
4. Generate 100 potential node locations.
5. Score nodes based on coverage and AQI.
6. Optimize to 10 nodes using a greedy algorithm.

# Key Findings

1. 10 optimized nodes to any region (e.g., MT-07: -1.5622, 37.3049, Score: 238,861.54; AR-12: -1.4812, 37.0271, Score: 159,225.17).
2. Total score (for example Machakos): 724,891.21.
3. Coverage: Urban hubs and rural areas, no 10 km overlap, customizable for user inputs.
   Try it at **https://cleannetonquest.streamlit.app**

**RESULT:**

**Blue markers for 10 nodes with 10 km coverage circles, red markers for user defined urban centers (e.g., Machakos Town, Athi River)**



# Result: Interface of the app

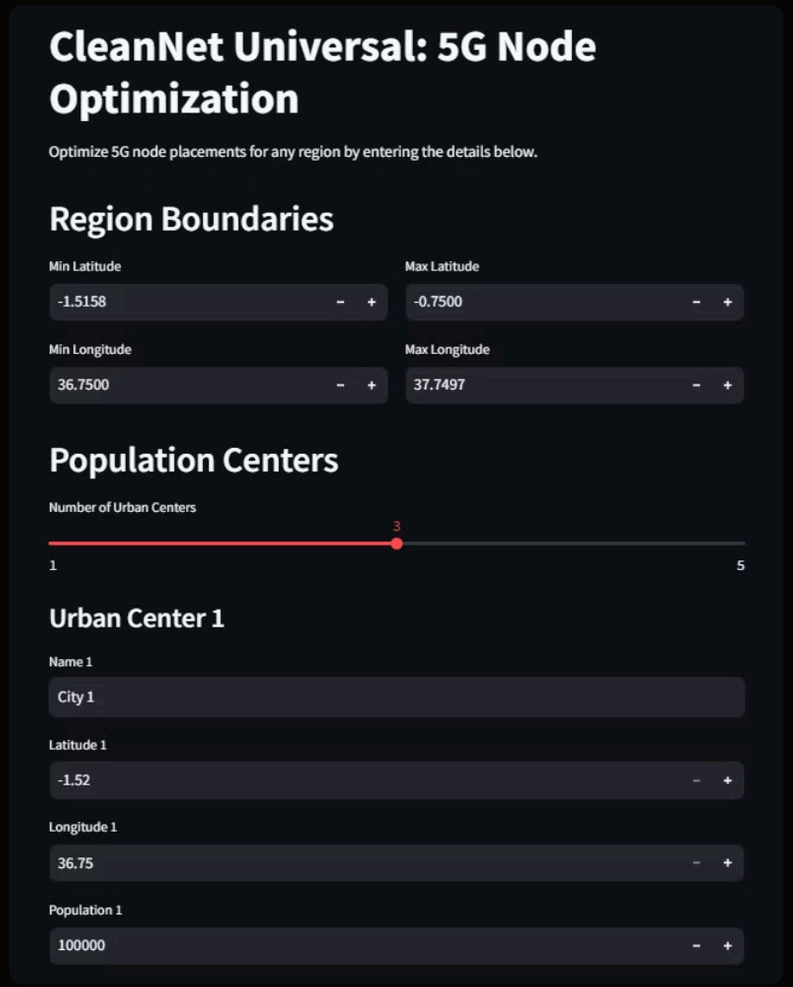



Fig 1. Required inputs

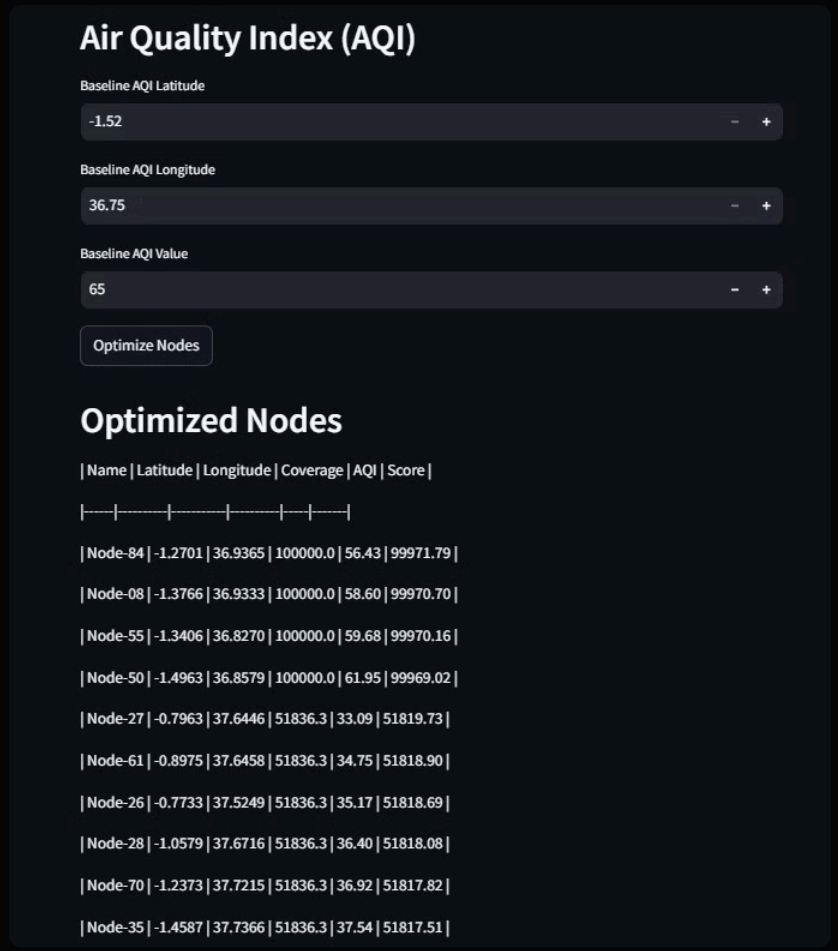



Fig 2 . Reveals the optimized nodes

# Why it matters

1. Improved connectivity for schools and healthcare in underserved areas.
2. Reduced air pollution exposure by optimizing node placement.
3. Scalable AI approach for other rural regions.

# Future Scope:

- **Global Scalability:** Expand CleanNet to optimize 5G networks across rural and urban regions worldwide, capitalizing on the projected $13.1B 5G market by 2028.
- **Telecom SaaS Model:** Offer CleanNet as a subscription-based Software-as-a-Service (SaaS) to telecom giants
- **Real-Time AQI Integration:** Integrate real-time AQI data for dynamic node adjustments, enhancing service reliability and customer health.
- **Smart City Deployment:** Expand to smart city applications, increasing revenue through government contracts.

# Conclusion: Innovative AI optimization

CleanNet demonstrates AI's potential to transform network design.

Ready to enhance connectivity