Navigating Risk in *Iloilo City*

KLIMATA ILOILO : Climate Vulnerability Index Web Application Quantifying Climate, Environmental Health, Socioeconomic Vulnerabilities

The Problem Statement:

A Complex Picture of Risk

Iloilo City faces multiple, overlapping risks. These dangers are not spread evenly.

- Some barangays face high climate exposure (floods, heat).
- Others have dense populations in vulnerable areas.
- Others lack access to critical infrastructure like health centers and shelters.

This creates a critical challenge for city planners.

The Core Challenge:

Where to Act First?

With limited budgets and resources, decision-makers face difficult questions:

- Which barangay needs investment in flood defenses most?
- Which community is most vulnerable if a typhoon hits tomorrow?
- How do we justify allocating resources to one area over another?

Without a clear, unified metric, we are forced to be reactive instead of proactive.

The Significance:

Why This Project Matters

This project provides the tool to move from guesswork to a data-driven strategy.

FROM:

- Reactive (Responding after a disaster)
- Inefficient Allocation (Spreading resources thin)

TO:

- Proactive (Preparing before a disaster)
- A Unified Index (Looking at 1 clear picture)
- Targeted Investment (Focusing resources for max impact)

This allows for better planning, more resilient communities, and ultimately, saves lives and resources.

Our Solution:

The Iloilo Climate Vulnerability Index (CVI)

- **We developed a single, comprehensive risk score for every single barangay in Iloilo City.**
- **The climate vulnerability index (CVI) combines all the complex risk factors into one clear, scannable metric.**
- **It’s a decision-support tool built to answer one question: "Which communities are most vulnerable and need our help first?"**

How the Index is Built

The Iloilo Climate Vulnerability Index (CVI)

We combined six key dimensions of risk and resilience for each barangay. We weighed each factor based on its potential impact.

1. **Climate Exposure (30%):** Direct physical risk from hazards.
2. **Population Pressure (20%):** How many people are in harm's way.
3. **Infrastructure (20%):** Access to health centers, schools, shelters.
4. **Economic Wealth (15%):** Community-level wealth and resilience.
5. **Environment (10%):** Protective green space (NDVI).
6. **Coastal Proximity (5%):** Risk from being near the coast.

Furthermore we used k-means clustering to cluster the barangays based on risk

The Result:

A Prioritization Map for Iloilo

1. **INPUT:** The 6 key risk pillars for all 180 barangays.
2. **PROCESS:** The data is combined using our weighted index formula.
3. **OUTPUT:** We cluster all barangays into three simple groups:
   - LOW RISK
   - MEDIUM RISK
   - HIGH RISK

Real-World Applications:

From Index to Action

The CVI is a tool for concrete, on-the-ground decisions.

Strategic Planning (LGU):

- Guide long-term land-use planning and justify climate adaptation budgets.
- Example: "We are allocating funds for a new flood defense in Brgy. X because it is in a 'High Risk' cluster."

Disaster Preparedness (DRRMO):

- Prioritize "High Risk" barangays for pre-disaster prep.
- Example: Pre-position relief goods, rescue boats, and mobile health clinics in or near these high-priority zones before a typhoon makes landfall.

Targeted NGO & Community Action:

- Allow NGOs and community groups to focus their efforts and funding (e.g., resilience workshops, mangrove planting) where they are needed most.

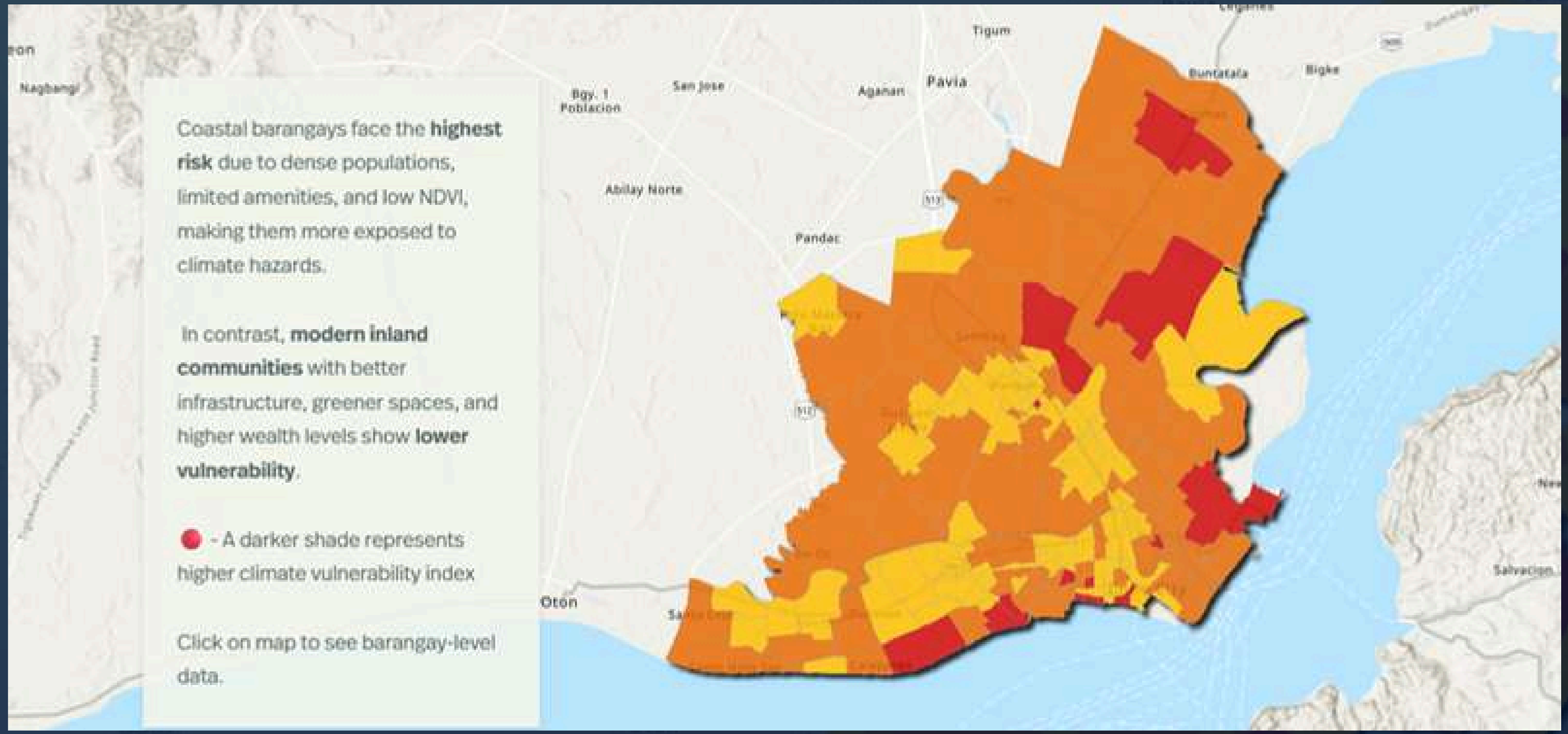
Future Directions:

Making the Index Smarter & Wider

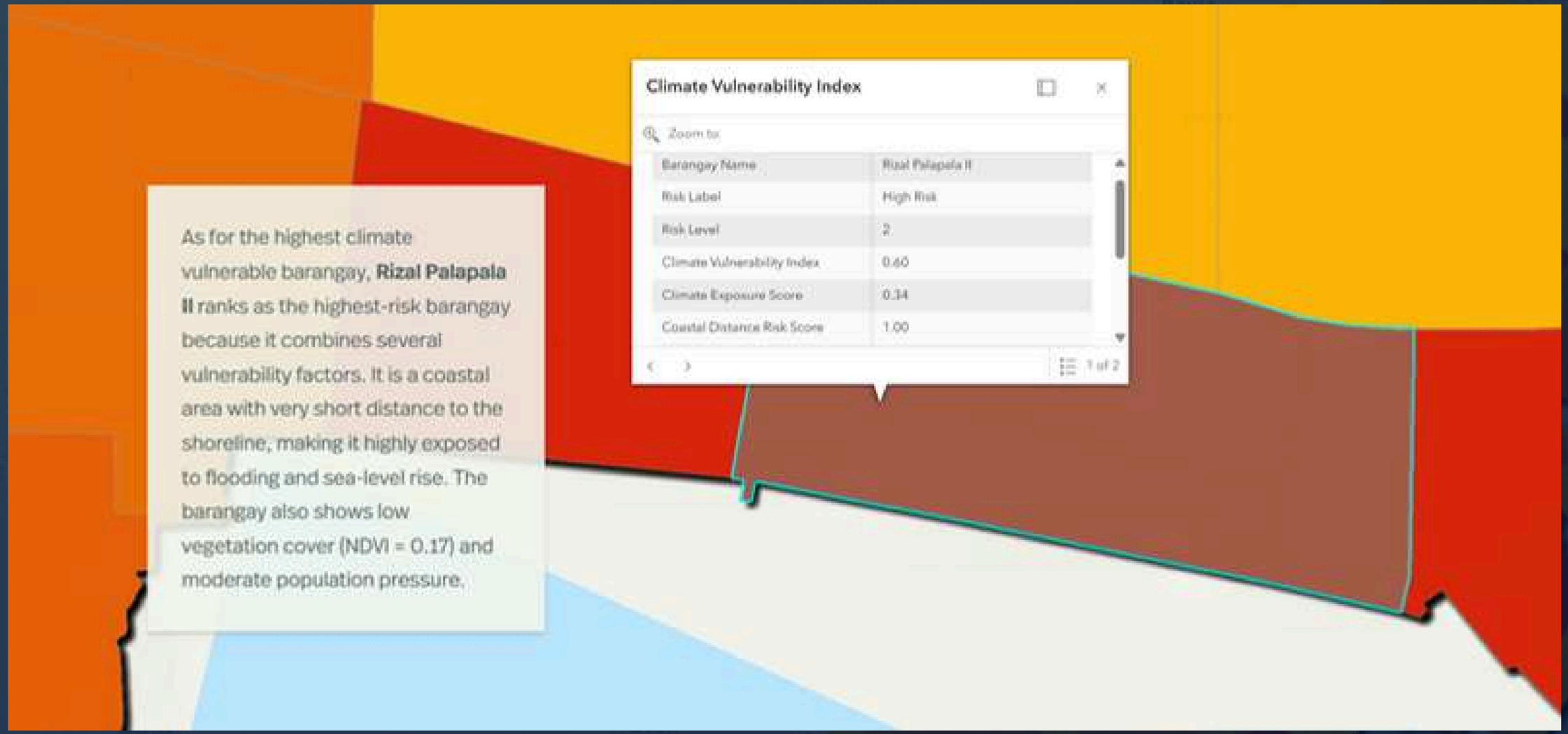
This Iloilo model is a powerful blueprint. Here's what's next:

1. **Go Deeper (Better Data):**
   - Integrate hyper-granular data for a more precise picture:
     - Specific flood hazard maps (from Project NOAH).
     - Building footprints and density.
     - Locations of informal settlements.
2. **Go Smarter (Better Model):**
   - Create an interactive "what-if" scenario tool for planners to adjust weights (e.g., "What if we prioritize 'Population' over 'Climate' for this decision?").
3. **Go Wider (Better Scope):**
   - Use this successful Iloilo pilot as a template to scale the climate vulnerability index to other vulnerable Philippine cities (e.g., Cebu, Davao, Manila) and build a national risk dashboard.

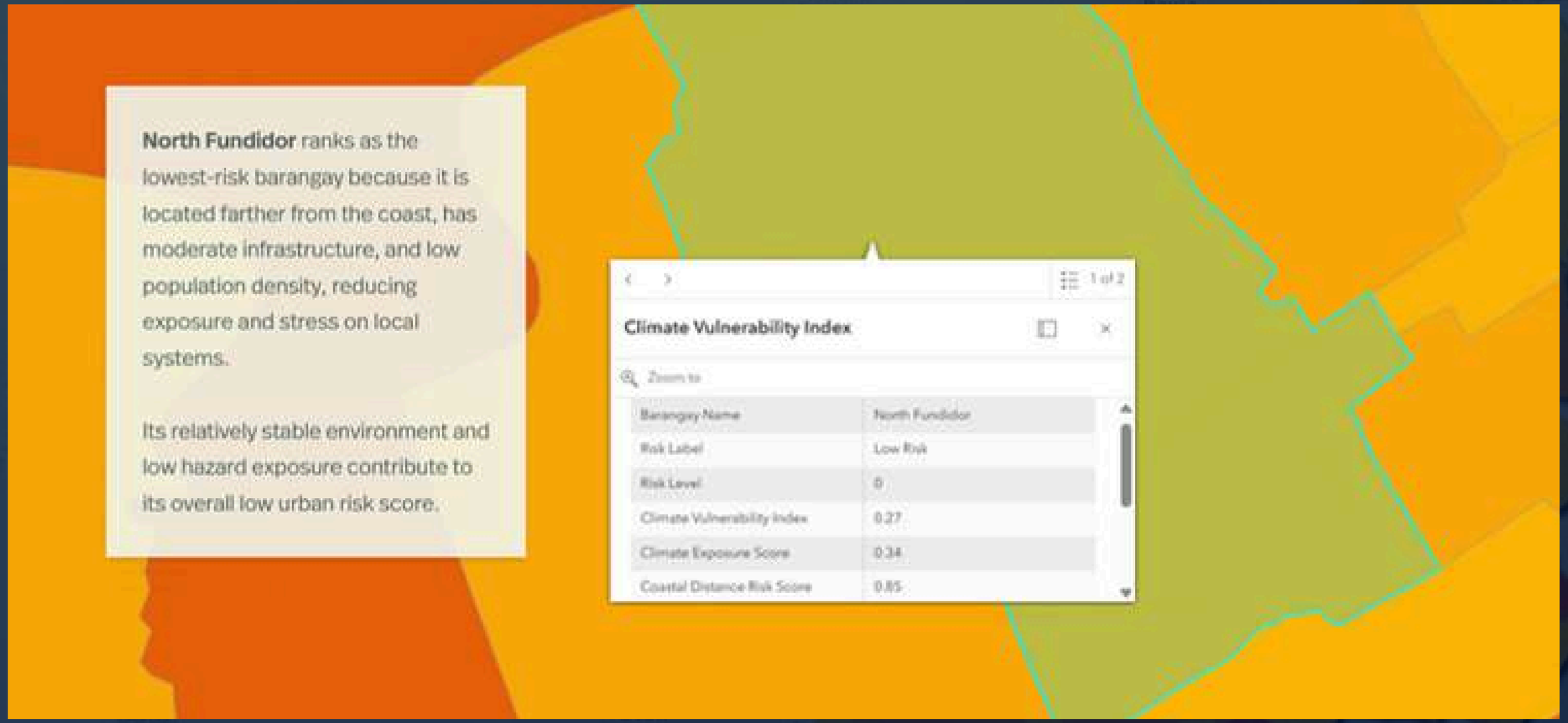
Analysis:


Coastal barangays face the highest risk due to dense populations, limited amenities, and low NDVI, making them more exposed to climate hazards.
In contrast, modern inland communities with better infrastructure, greener spaces, and higher wealth levels show lower vulnerability.
- A darker shade represents higher climate vulnerability index
Click on map to see barangay-level data.
Tigum
Pavia
Buntatala
Bigke
Bgy. 1 Poblacion
San Jose
Aganan
Abilay Norte
Pandac
Oton
Salvacion

Analysis:


Climate Vulnerability Index
Zoom to
Barangay Name
Rizal Palapala II
Risk Label
High Risk
Risk Level
2
Climate Vulnerability Index
0.60
Climate Exposure Score
0.34
Coastal Distance Risk Score
1.00
1 of 2
As for the highest climate vulnerable barangay, **Rizal Palapala II** ranks as the highest-risk barangay because it combines several vulnerability factors. It is a coastal area with very short distance to the shoreline, making it highly exposed to flooding and sea-level rise. The barangay also shows low vegetation cover (NDVI = 0.17) and moderate population pressure.

Analysis:


North Fundidor ranks as the lowest-risk barangay because it is located farther from the coast, has moderate infrastructure, and low population density, reducing exposure and stress on local systems.
Its relatively stable environment and low hazard exposure contribute to its overall low urban risk score.
1 of 2
Climate Vulnerability Index
Zoom to
Barangay Name
North Fundidor
Risk Label
Low Risk
Risk Level
0
Climate Vulnerability Index
0.27
Climate Exposure Score
0.34
Coastal Distance Risk Score
0.85

Key Takeaways & Recommendations

- A Powerful "Where to Look" Tool: The CVI is a prioritization tool. It tells you where the hotspots are so you can focus your efforts.
- Start the Conversation, Don't End It: The next and most critical step is ground-truthing. We must share this "High Risk" list with Iloilo's local planners to validate it with their on-the-ground knowledge.
- A Living Index: This index can and should be updated. By adding new data—like detailed flood maps or informal settlement locations—it will only become a more powerful tool for building a resilient Iloilo.

Challenges and Mitigation Strategies

Where to Act First?

1. Strengthen Coastal Infrastructure – Prioritize upgrading infrastructure in high-risk coastal barangays like Rizal Palapala II. Build resilient evacuation centers, flood barriers, and better drainage to reduce flood and storm surge risks. Investing in climate-resilient facilities protects lives and livelihoods.

2. Expand Green and Open Spaces – Develop more parks, mangrove buffers, and tree-lined streets to reduce heat, improve air quality, and serve as natural flood barriers. These nature-based solutions boost urban resilience and community well-being.

3. Improve Access to Basic Services – Provide more health centers, schools, and community hubs within 15–30 minutes of residents, especially in underserved barangays. Equitable access strengthens social resilience and adaptive capacity.

Data Source and Aquisition

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Project CCHAIN dataset: https://www.kaggle.com/datasets/thinkdatasci/project-cchain/data

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