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Leveraging Citizen Science for NYC's Real-Time Monitoring and Communication - Using Noise App as Case Study

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Agenda

1. Introduction & Project Scope
2. Interview Insights
3. Future Directions & Conclusion

1. Introduction & Project Scope

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Introduction

- **Urban noise** is a persistent quality-of-life and equity issue in NYC
- Current systems (311 + fixed sensors) leave gaps in real-time coverage and public participation
- Citizen science offers a scalable way to expand real-time environmental monitoring
- This project **explores how citizen-generated noise data can be validated** to be trustworthy and actionable and the **community engagement** part
- Case study: NYC Noise Monitor App

Project Scope & Goal

- Focused on research and strategy
- Performed a literature review on citizen-science noise monitoring and validation
- Conducted **six expert interviews** across academia, government, and private sector
- Analyzed data quality, calibration, bias, privacy, user behavior, and agency workflow challenges
- **To propose a practical framework for validating and operationalizing** citizen-generated noise data which can be integrated into DEP workflows

2. Interview Insights

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Expert Interviewees

- **Dr. Charlie Mydlarz**, Professor, Center for Urban Science and Progress, NYU Tandon
- **Dr. Eben Cross**, Chief Science Officer, QuantAQ
- **Dr. Hamidreza Norouzi**, Professor, City Tech (CUNY), and CEO + Co-Founder, Eco Rising Solutions
- **Dr. Hannah Eisler Burnett**, Professor, John Jay College (CUNY), and Specialist, Science and Resilience Institute at Jamaica Bay (Sea Grant, FloodNet partner)
- **Dr. Lauren Smalls-Mantey**, Environmental Systems Analyst, NYC Department of Health and Mental Hygiene
- **Nate Rauh-Bieri**, Head of Projects, JustAir

Insights on Citizen Science

- Smartphone data is best suited for
  - Pattern recognition
  - Hotspot identification
  - Source categorization (via audio clips)
- Strength lies in **spatial coverage and context**
- Designed to support decision-making, not replace official measurements

Validation Considerations

- Collect essential metadata (device model, GPS accuracy, motion state, noise type)
- Use quality filters and confidence flags rather than accepting all submissions equally
- Leverage contributor behavior patterns
- Device-specific calibration or backend correction
- **Cross-validate** citizen submissions with fixed sensors

How Do We Attract Participation?

Engagement is strongest when users:

- See a clear **local benefit**
- Understand how their data is used
- Incentives should be used carefully
    - Civic framing > monetary rewards
    - Gamification only when quality safeguards exist
- **Privacy clarity and transparency** are essential for trust

Engagement Design Implications

- Shift from top-down reporting to **community-centered design**
- Lower participation barriers (simple flows, clear prompts)
- Close the feedback loop: Show outcomes, patterns, or responses enabled by user data
- Target communities with **specific, visible noise concerns**
- Balance engagement mechanics with data quality safeguards

3. Future Directions & Conclusion

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NYC Noise Monitor App

- Anonymized reports with **decibel levels, noise type, and location**
- **Noise-type classification** adds useful contextual metadata
- **Mapping** supports neighborhood hotspots and temporal patterns
- Designed to expand coverage beyond fixed sensors and 311 complaints

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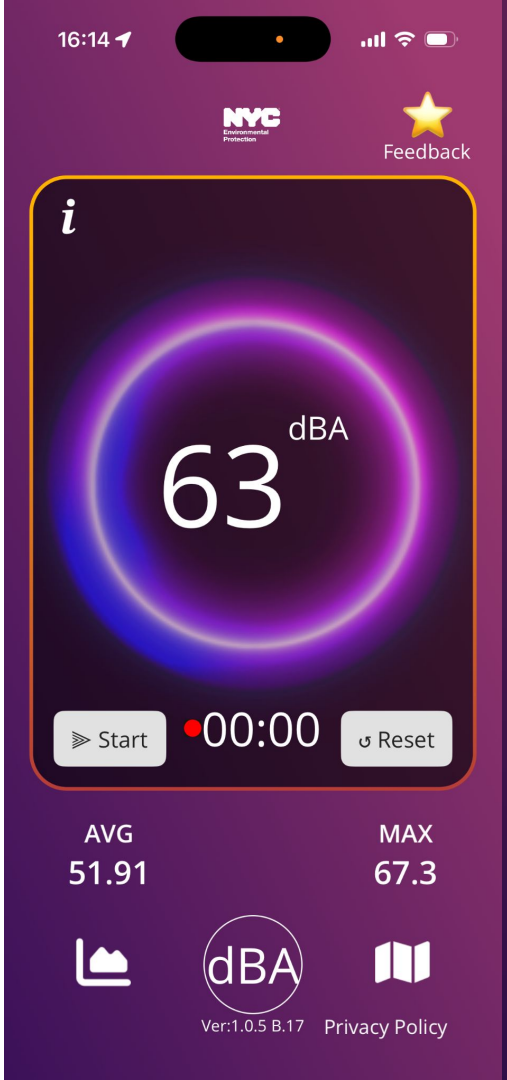
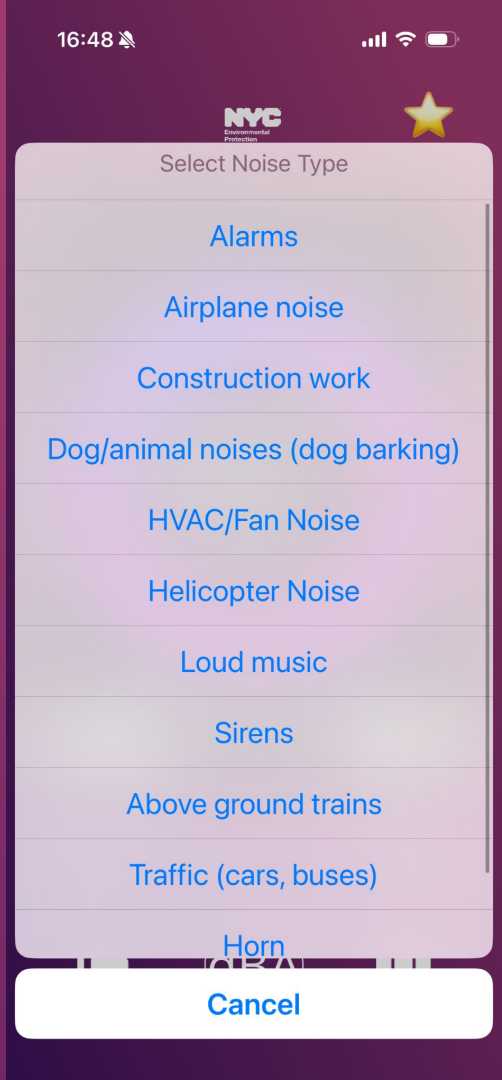
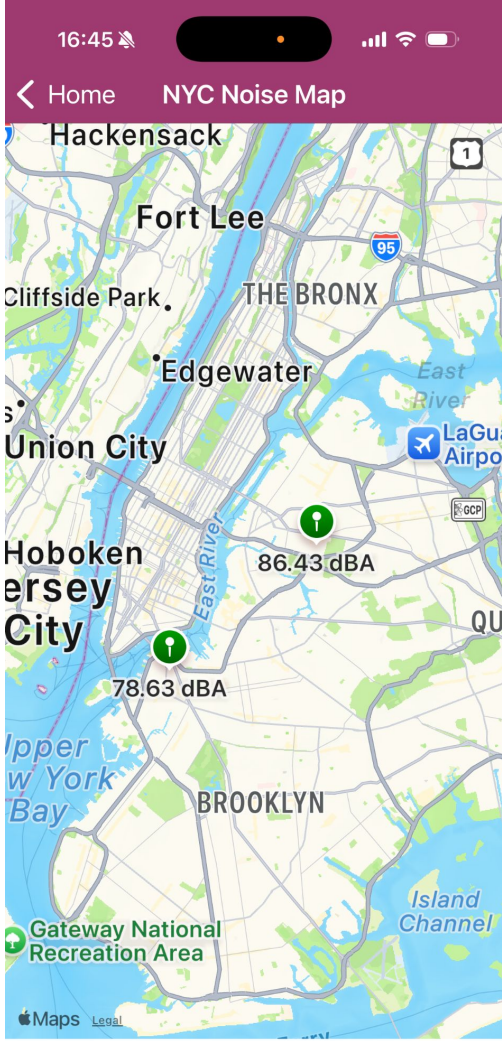




Challenges

- User confusion between 311 and the app
- **Limited feedback to users** & unclear how app-based measurements integrate into DEP workflows
- Accidental reports with no confirmation or deletion options
- The map only shows your own contributions



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Future Directions

- **Hybrid monitoring remains essential:** Community-generated data can provide broad coverage, while fixed sensors are still needed for validation and cross-checking.
- **Community engagement is the next challenge:** Partnering with neighborhood groups, hosting workshops, and growing a diverse user base are critical for data quality and sustained participation.
- **Integrated environmental platforms:** Moving toward unified systems combining noise, flood, heat, and air data, enabled by open data and inter-agency coordination.

Conclusion

- **Expectation alignment** is the foundation of validation.
- Validation can be achieved through **hybrid sensing, pattern aggregation, and contextual metadata**, not just individual device calibration.
- Sustained data quality depends as much on **community engagement and trust** as on **technical design**.
- The value of citizen-generated data is its ability to **reveal patterns, context, and community experience** at city scale.

Thank You