Communication and Enforcement of Scientific Outcomes among Vulnerable Communities: An Environmental Justice’s Perspective in North Charleston Neck Communities, South Carolina

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OVERVIEW

- Background
- Significance
- Objectives
- Design
- Findings
- Potential impacts
- Communication of outcomes
- Barriers to effective dissemination
- Model for enforcement of outcomes and community participation
MODEL FOR ENFORCEMENT OF OUTCOMES AND COMMUNITY PARTICIPATION

Enforcement/Compliance | Dissemination | Outcomes | Design | Preliminary actions

- Assure the health and wellbeing of community by ensuring compliance
  - Be first, be right, be credible
  - Assure transparency and neutrality
  - Strengthen the community’s knowledge about potential outcomes
  - Identify other research gaps and concerns

- Activate the feedback mechanism
  - Define community roles in design
  - Ensure conformity with culture and literacy

- Establish relationship with community
- Define research goals and objectives
- Identify specific stakeholders
- Establish performance standards among stakeholders
- Ensure clarity of goals and focus
- Develop feedback mechanism
The Charleston Metropolitan Statistical Area (MSA) is one of the largest industrialized port cities in the nation.

Median household income ($52,302) and many residents live in poverty (14%).

Children account for 19% and the elderly 12%. Unmarried women (33%) and family households (11%) earned income below the poverty line.

In North Charleston, Median household income ($36,461)

Children (39%) and female headed households (43%) live below the poverty line.

Residents are differentially burdened by port activities, diesel truck traffic, an incinerator, Superfund sites, leaking underground storage tanks, TRI facilities and other environmental hazards.
SIGNIFICANCE

- The port of Charleston, one of the busiest US ports, currently operates five terminals (North Charleston, Wando Welch, Veterans, Columbus Street and Union Pier)
- SC Ports Authority has commenced on terminal expansions, harbor deepening and constructions to accommodate bigger container vessels from the proposed Panama Canal expansion
- Such expansion is expected to increase traffic within local vulnerable North Charleston neck communities by at least 7,000 diesel truck trips per day (>70% increase) from the present average rate of 10,000 trucks per day
OBJECTIVES

• To determine the spatial variability of PM concentrations in residential areas of the Charleston Neck impacted by environmental injustice

• To collect sufficient information and representative measurements of PM in the Charleston Neck communities prior to the new port development

• To compare the newly collected saturation data with the temporal trends in air pollution within the region over several decades from the late 1960s
DESIGN

- Study area: Accabee, Chicora/Cherokee, Howard and Union Heights
- Saturation study was performed to determine spatial variability of PM in local Charleston Neck communities
- Temporal trends in particulate air pollution within the region were determined across several decades
- With the BGI Sampler, PM samples were collected for 24 hours comparable to the Federal Reference Method protocol
- Gravimetric analysis of the PM filter samples were conducted following EPA protocol
• Charleston, South Carolina peninsula indicating areas of port activity and South Carolina Ambient Monitoring Network sites

• Air Quality Monitoring Saturation Study Area; North Charleston, South Carolina; 2008

• Legend: Large Yellow dots- Current SC DHEC air monitoring stations

• Large Green dots- Planned project monitoring sites

• Small Red Triangles- Air emission sites registered with SC DHEC

• Small Yellow Dots- discontinued ambient monitoring sites

• Small Blue Dot- Howard Heights saturation/FRM site
FINDINGS

- The range of the PM$_{10}$ annual average across the region from 1982 to 2006 was 17.0µg/m$^3$ to 55.0µg/m$^3$
- On only two occasions were the records of PM$_{10}$ averaged above the 50.0µg/m$^3$ national standard
- In the case of PM$_{2.5}$, the annual average for 1999-2006 ranged from 11.0µg/m$^3$ to 13.5µg/m$^3$ and no annual average exceeded the 15.0 µg/m$^3$ PM$_{2.5}$ annual standard
FINDINGS

Trend in Annual PM$_{10}$ Averages in Charleston across Ambient Monitoring Stations (1980-2012)

Range of annual averages was 17-55ug/m$^3$ (1982-2006)

Trend in Annual PM$_{2.5}$ Averages in Charleston across Ambient Monitoring Stations (1998-2012)

Range of annual averages was 11-13.5ug/m$^3$ (1999-2006)
POTENTIAL IMPACTS

• Air pollution from local sources (public health significance)
• Previous studies showed port activities will increase atmospheric levels of particulate matter (especially PM$_{2.5}$) and other air pollutants within the North Charleston Neck communities
• EIS (2005) predicted daily PM$_{2.5}$ average of 47ug/m$^3$ due to port expansion
• Each 10ug/m$^3$ elevation in PM was associated with approximately a 4%, 6% and 8% increased risk of all-cause, cardiovascular, and lung cancer mortality
• High level of PM concentration can potentially elevate cardiovascular risks among the 600,000 residents in metropolitan Charleston
COMMUNICATION OF OUTCOMES

- Overburdened minority communities and low-income populations will be mostly affected.
- Comprehensive monitoring of the ambient air quality of the region is required periodically.
- Additional research and data gathering through community-based participatory research.
- Future studies should include spatial variability of NO\textsubscript{x}, SO\textsubscript{4}, PM and VOC.
BARRIERS TO EFFECTIVE DISSEMINATION

• Helicopter Scientist Phenomenon “In the academia, dissemination is defined myopically as publication in peer-reviewed scientific journals and there are no plans to disseminate feedback to the study communities”

• Diverse needs and objectives of stakeholders (economic vs environmental, politics vs policy)

• Cultural and literacy differences between the stakeholders (residents and researchers)

• Deadlines and limitation of resources
STRATEGIES FOR EFFECTIVE DISSEMINATION

- Identification of Community Partners (CP)
- Involvement of CP in planning and research execution
- Defining consensus goals among stakeholders
STRATEGIES FOR EFFECTIVE DISSEMINATION

- Involvement of CP in analysis and interpretation of research results
- Involvement of CP in dissemination of research results
- Follow-up on CP to ensure enforcement and compliance
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REFERENCES