

Using NASA Earth Observations to Support Environmental Justice Communities in Atlanta, Georgia

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I. BACKGROUND

- In Atlanta, Georgia, many communities face serious environmental justice (EJ) issues such as having higher levels of exposure to extreme heat, air pollution, and the lack of green space.
- However, the lack of ground monitoring sites in EJ communities presents a challenge for decision-makers to assess the health burdens of associated exposures.

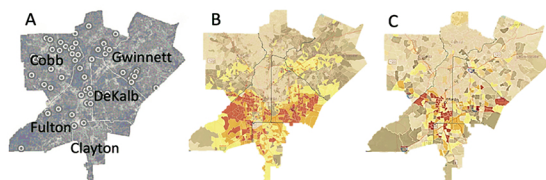


Figure 1. (A) The location of weather stations in Atlanta. Data derived from NCDC and Weather Underground. (B) The percentage of people of color, and (C) averaged low life expectancy in Atlanta, 2010-2015. Data derived from Census Bureau's American Community Survey 5-year summary estimates.

II. DATA AND METHOD

- Satellite observations can effectively extend ground monitoring networks to produce full-coverage exposure estimates that provide required information to advance progress in EJ.

Table 1. Examples of environmental risk factors that Earth Observations can capture.

Environmental Risk Factor	Sensor	Temporal Resolution	Spatial Resolution
Fine Particulate Matter 2.5	MODIS	1 - 2 days	0.5 - 1 km
Extreme Heat			
Green Space			
Flood and Drought Hazards	TROPOMI	< 1 day	5.5 km × 3.5 km
Ozone Pollution			
Nitrogen Dioxide Air Pollution	Landsat	16 days	< 0.1 km
Sulfur Dioxide Air Pollution			
Urban Structure			

- Applying Earths Observations in EJ issues based on projects co-designed with community stakeholders.

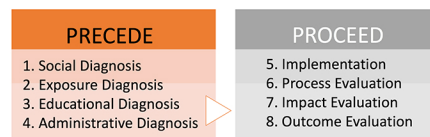


Figure 2. PRECEDE-PROCEED model is adopted to guide community engagement. PRECEDE and PROCEED are acronyms of "Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluation" and "Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development".

III. RESULTS

- Successful community engagement workshops in Atlanta



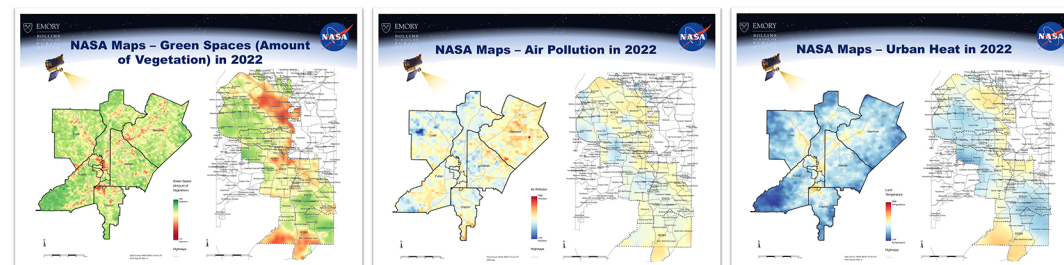
Figure 3. (A) First workshop flyer. (B) NASA sponsored EJ workshops hosted in Atlanta in December 2022 and April 2023.

- Community concerns on environmental justice and climate change

Table 2. Examples of community feedback on "What do you think the impacts of climate change will be in your community?"

Litter and Waste (n=6, total votes = 8) <ul style="list-style-type: none"> Garbage not collected Garbage + waste outside (litter) (2) Garbage and waste material and management (1) When we walk in the street u see pee (human waste) Blow waste from factories (2) 	Water (n=4, total votes = 7) <ul style="list-style-type: none"> Water pollution (3) Potable water (1) Water crisis (2) 	Air Quality (n=5, total votes = 9) <ul style="list-style-type: none"> Air quality (poor) (4) Bad air impacts health (1) Burning fossil fuels 	Vehicle or Traffic Pollution (n=5, total votes=6) <ul style="list-style-type: none"> Economic impact: roads (4) Vehicles (gas) emissions Issue is the interstate goes through the community causing pollution from automobiles (2) Reliance on individual vehicles, traffic, non-walkable cities Cars, public trans 	Housing (n=6, total votes = 0) <ul style="list-style-type: none"> New homes for the poor Affordable housing Housing burden, eviction Key impacts is the building where we live how old and new the structure Economic impact: housing Gentrification housing
Migration or Displacement (n=3, total votes = 3) <ul style="list-style-type: none"> Forced migration Displacement (3) Climate change is displacing communities 	Greenspace (n=7, total votes =1) <ul style="list-style-type: none"> Mental health: Reduced Walkable areas (1) Access to green space Reduced tree canopy Cutting the trees down for property development Deforestation Get rid of highways, close off with trees 	Flooding (n=5, total votes =3) <ul style="list-style-type: none"> Flooding runoff Property damage from flooding Disease from flooding (2) Economic impacts: home flooding 	Increased Temperatures (n=6, total votes = 2) <ul style="list-style-type: none"> Extreme heat (2) Heat related stress Heat related respiratory issues Rising community temps Urban heat islands Heat issues 	The Natural Environment (n=5, total votes = 1) <ul style="list-style-type: none"> Animals & biodiversity Lack of species (1) Thirsty wildlife Chemical imbalance Landscapes, ocean, forests, deserts
Community Interaction (n=10, total votes = 3) <ul style="list-style-type: none"> Your neighbors and the people that live in your community The owners of the property where you live Recreational, playground (1) Increase in fear of community (neighborhood), less engagement (1) The climate change in the summer social (1) Neighborhood meetings Group meetings Economic impact: schools Marriage & relationships 	Community Wealth (n=4, total votes=4) <ul style="list-style-type: none"> Because the wealth of the community is taken out because there is no store where people can spend (3) Decrease in economic investments Reduced land value (1) Supply/demand 	Community Awareness (n=2, total votes =0) <ul style="list-style-type: none"> Not enough people informed on the matter Getting the younger peoples more involved 	Food (n=7, total votes = 6) <ul style="list-style-type: none"> Food security Other fresh food desert Food availability (4) Food desert not enough healthy food choice (1) Increases in food prices, grocery stores Food shortage, poor nutrition (1) 	Rising Energy Costs (n=5, total votes = 5) <ul style="list-style-type: none"> Energy burden (3) Energy cost are rising because of increased weather change (high + low) High temps causes high energy bills Financial awareness (2) Expenditures related to climate change
The Government (n=5, total votes = 1) <ul style="list-style-type: none"> Government not helping or warning the people (1) Greedy politicians and big corporations Economic impact: regional procurement needs Geopolitical space treaties Economic: NASA is a big help to the community 	Respiratory Issues (n=6, total votes=7) <ul style="list-style-type: none"> Increase in respiratory related illnesses (1) Lungs, respiratory (3) Breathing Asthma (1) Climate change health impact weather is (teucnaion) as him allergy irritation (1) 	Health and Wellbeing (n=11, total votes=9) <ul style="list-style-type: none"> Quality of life Life expectancy Health and physical wellbeing vs. obesity and chronic disease (4) Mental behavior illness "cancer" pesticides (1) Lack of health insurance & resource (1) Stress/wellbeing: problem solving, comfort, uncertainty (1) 	Employment (n=7, total votes = 5) <ul style="list-style-type: none"> Social issue: income (2) Increase stress on laborers Economic impact: workforce planning Lack of job security (1) 	<p>Note: We removed duplicates or ideas that simply copied our prompts (like "health impacts"). However, these were included in the totals (both the total number of statements per category and the total votes). Green = rating over 5 Yellow = 4-5 Grey = below 4</p>

- Community co-designed environmental exposure assessment posters using NASA MODIS data



IV. SUMMARY

- Major environmental risk factors faced by the community has been initially assessed with NASA Earth Observations;
- Community stakeholders' knowledge on health effects of environmental exposures is enhanced by the awareness of NASA Earth Observations;
- More socioeconomic data and advanced exposure assessment are needed to fulfill the community's concern on environmental justice;
- More community engagement workshops are needed to continue the conversation with Atlanta underserved communities.

V. FUTURE WORK

- In-depth local environmental exposure assessment



Figure 4. Time series of NDVI change between the metro Atlanta and the zip code areas where workshop participants live.

- Continue community engagement workshops



VI. ACKNOWLEDGEMENT

This work was supported by the National Aeronautics and Space Administration (Grant 80NSSC22K1659). The content is solely the responsibility of the authors and does not necessarily represent the official views of NASA.