abqMaps

an interactive environmental justice map for Albuquerque, New Mexico

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THE UNIVERSITY OF NEW MEXICO

GeoAIR Lab

Where novel geospatial AI solutions are developed

R.H. MALLORY CENTER FOR COMMUNITY GEOGRAPHY

Overview

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- Motivation
- Background
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  - Environmental justice literature review
- Introduce *abqMaps*
- Limitations
- Future work

Land acknowledgement

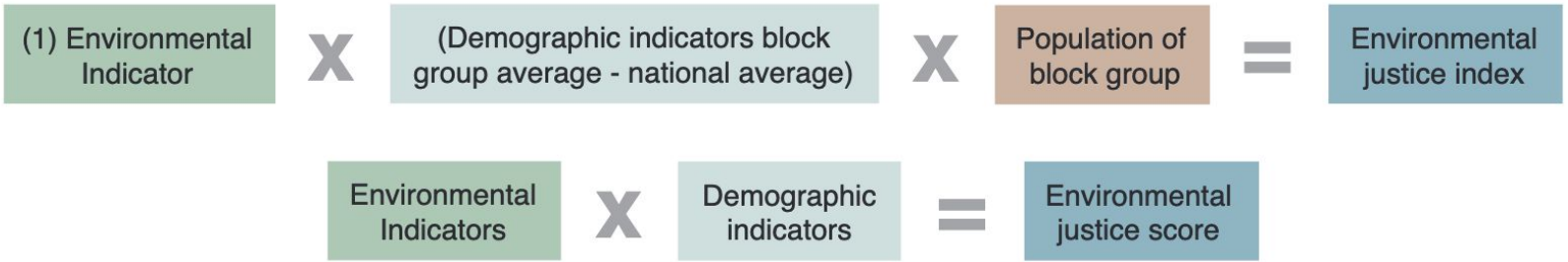
The City of Albuquerque sits on the unceded lands of the Tiwa Pueblo people. The Pueblo, Navajo, and Apache Tribes have stewarded this land since time immemorial. The Tribal areas used on the map are administrative and downloaded from Census.gov. I acknowledge that Indigenous People may have different ideas of how they want to be represented and that the land shown on the map is contested space. If local Tribes are interested in collaborating, using this tool, or changing how their lands are represented on this map please do not hesitate to reach out to the Center for Community Geography.

A definition of environmental justice (EJ)?

What even is it? Ravichandran et al. (2021) say **it depends on the place**, but should consider inequities around social and economic progress, environmental pollution, climate vulnerability, access to food, housing, internet, transportation, health disparities, etc.

Environmental justice scores versus indices

This definition is complicated by the fact that some EJ tools use environmental justice ***scores*** while others use environmental justice ***indices***.



The difference between an environmental justice score and index, from (Arriens & Schlesinger, 2020)

Motivation: building a tool for non-GIS folks

- Build a tool so that people interested in EJ can make maps and explore data, regardless of prior GIS experience
- Make the tool completely free and open-source
- Open-source is not enough: ***need to think about what/who map is for***

"Transparency and openness are not equivalent to reflexive practice....Recent calls to open data, utilize open source technologies, and make analysis or workflows public are not enough." (Kelly & Bosse, 2022, p. 401)

Takeaways: successful EJ web maps

1.) Creating an environmental justice map takes a ***lot of work***. There are considerations on what ***data to use and data availability***.

2.) An EJ map should have ***clear documentation related to where the data comes from, how it is processed, and how it will be used in the future*** to make decisions related to environmental justice work.

3.) The map should be ***easy to use and navigate*** and needs to consider how to represent ***multiple datasets*** on the same map.

4.) The most impactful environmental justice maps are the ones with ***a clear focus, attempt to tell a story, or create intuitive datasets***.

EJ literature review: data grounded in theory

- Municipal and state (boundary) data
- Demographic (census) data
- Environmental data
- Waste and pollution data
- Transit and mobility data
- Food access data
- Sustainability data
- Connectivity data
- Carceral and policing data

Datasets used in the web application

- City of Albuquerque Data (ABQ Data): link
- City of Albuquerque GIS Data (ABQ GIS): link
- City of Albuquerque Department of Municipal Development: link
- Environmental Protection Agency: link
- New Mexico Community Data Collaborative: link
- New Mexico Environmental Health Department: link
- New Mexico Resource Geographic Information System: link
- The Nature Conservancy New Mexico: link
- UNM Geospatial and Population Studies: link

Overview of *abqMaps* site

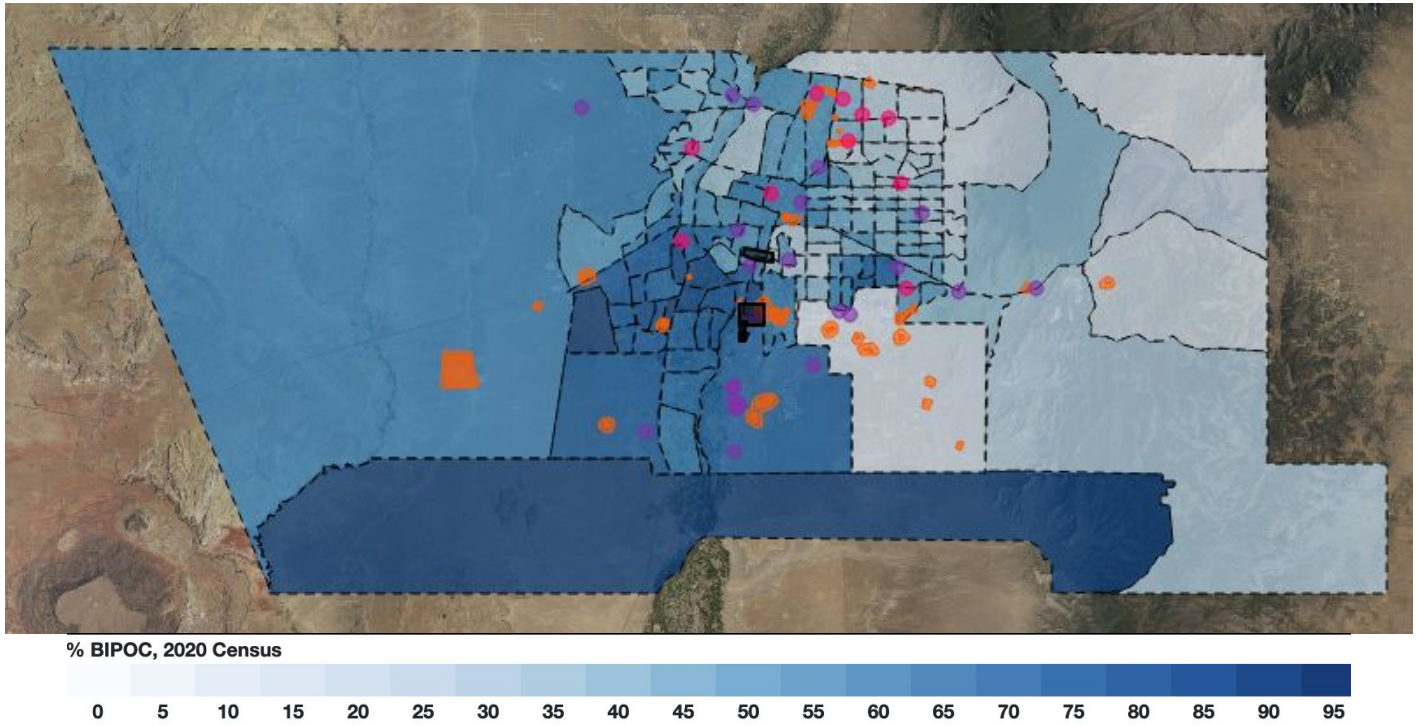
- GitHub repository: https://jakidxav.github.io/abqmaps_v2/src/map.html

A few focused questions as case studies

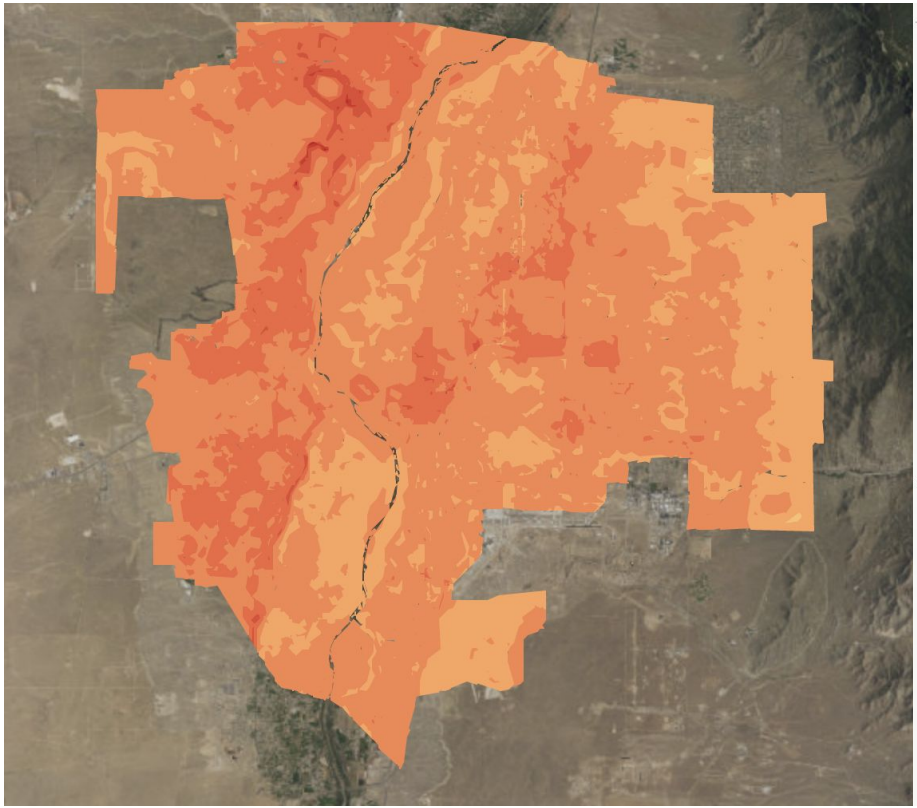
- Do ***low-income communities or communities of color*** live closer to sources or centers of ***environmental pollution***?

- Do we see the pattern illustrated in Ziter et al. (2015), where ***tree cover*** and land use are related to ***urban heat*** in Albuquerque?

Question 1: race and pollution (in progress)



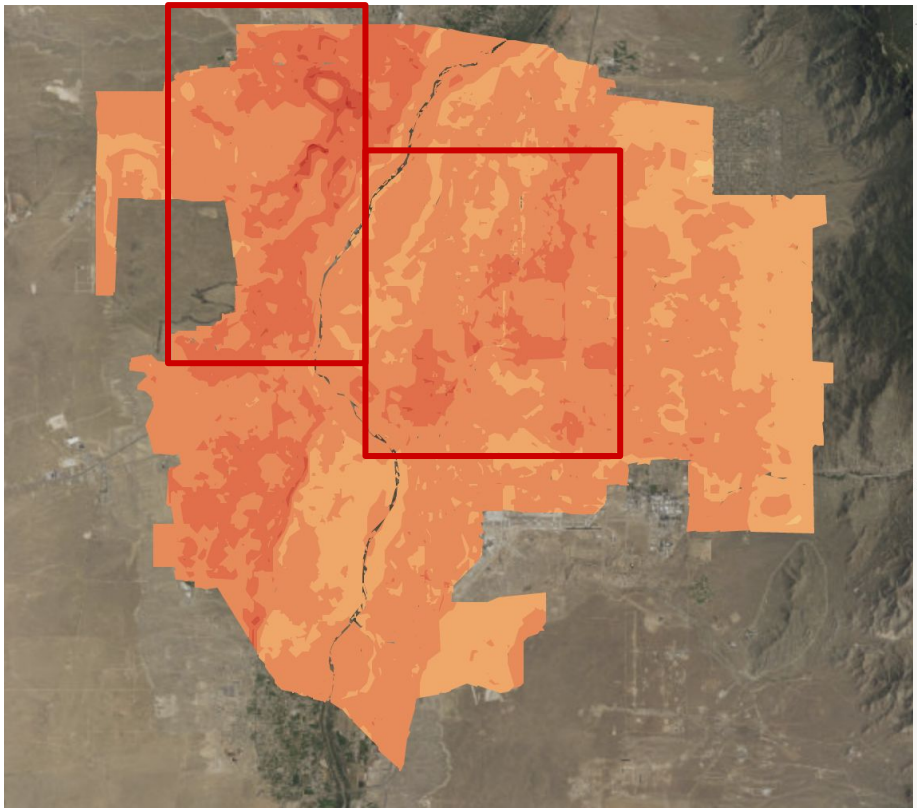
Question 2: urban heat / tree cover (in progress)



Afternoon Temperatures (F)

82 84 86 88 90 92 94 96 98 100 102 >104

Question 2: urban heat / tree cover (in progress)



Afternoon Temperatures (F)

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Limitations: technical difficulties

- It was difficult to wrangle tools developed in a decentralized fashion: open-source tools could benefit from quality control and sometimes the functionality you need does not exist.

- For each functionality that I wanted to implement, I had to review several open-source plugins. Sometimes, the feature that you wanted hasn't been implemented yet (as open-source code is largely driven by volunteer contributions).

- Community support: people produce code and then "are done": https://github.com/jjimenezshaw/Leaflet.Control.Layers.Tree/issues/60

Limitations: technical difficulties

- I still had to use QGIS and Python to import data and convert it to a format that I could use for the web.

- I converted Shapefiles, geodatabases, and (when I could) TIF files into JSON format so that they work for the web. Still, there were times that I couldn't do that for TIF files and so had to export them as PNG files (with a non-transparent background), so then overlaying doesn't work.

- I still need to convey the implications of mixing static, time-stamped data with data that varies in timespan or is constantly updated (which may limit the types of data that can be included on the site).

Limitations: software licensing

- I thought a lot about how to license this application over the course of this project.

- One of my goals was to make the project licensing as permissive as possible. There are many licenses that could help me do this: BSD0, Creative Commons Zero v1.0 Universal, the Unlicense, etc.

- Still, it is not clear to me how this license would work when all of the Leaflet plugins have their own copyrights. I am still looking into the question "*Does an open software license give the developer the right to any derivative products produced with that software?*"

Limitations: digital participation

- How do we expect people without prior GIS knowledge to participate in conversations around environmental justice, especially as more and more data is digitized and stored online?

- If there aren't tools that people can use to explore data and ask questions that are relevant to their community, should we expect environmental justice tools to actually represent the communities they are built for?

Future work: documentation, getting feedback, moving offline

- Improving the documentation through a written tutorial and smaller coding examples for specific features.
- Getting feedback on the site.
- Converting *abqMaps* into a desktop/offline program and maybe slowly replacing the Leaflet plugins with own code.
- If this doesn't work, it might be best to migrate fully over to Mapbox

References

- Arriens, J., & Schlesinger, S. (2020). *Environmental Justice Mapping Tools: Use and Potential in Policy Making to Address Climate Change*. National Wildlife Foundation.
- Escobar, A. (2018). *Designs for the pluriverse: Radical interdependence, autonomy, and the making of worlds*. Duke University Press.
- Kelly, M., & Bosse, A. (2022). Pressing Pause,"Doing" Feminist Mapping. *Acme: An International Journal for Critical Geographies*, *21*(4), 399-415.
- Ravichandran, V., Albert, R.M.L., Teirstein, M., Garg, A., Nagovich, J., Wilson, H., & Wilson, S. (2021). *Gaps in Environmental Justice Screening and Mapping Tools and Potential New Indicators*. University of Maryland Community Engagement, Environmental Justice, & Health Lab.
- Wilson, S., Campbell, D., Dalemarre, L., Fraser-Rahim, H., & Williams, E. (2014). A critical review of an authentic and transformative environmental justice and health community—University partnership. *International journal of environmental research and public health, 11*(12), 12817-12834.

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Thank you for listening!

I’d be happy to take any questions or get any feedback that you all might have.

Supplemental material

Locality, knowledge production, and self-determination

Most if not all of these web map applications I reviewed *were developed by government agencies and not community groups themselves*. Municipalities are attempting to collate and publish the data that they have, though it is not clear how much community consultation has gone into the development of these maps. In terms of the Environmental Protection Agency's Collaborative Problem Solving Model (Wilson et al., 2014), I would say most applications are still in Step 1.

Figure to the right: the Environmental Protection Agency's Collaborative Problem Solving (CPS) Model from (Ravichandran et al., 2021), adapted from (Wilson et al., 2014)

Local priorities and the defuturing effect of design

What is the proper scale of an environmental justice map and who is responsible for producing them? I argue that ***maps produced locally are more likely to represent local values and priorities.***

When someone produces an environmental justice map, they should realize that this is akin to producing knowledge, a way of knowing and representing a place and the people that live there.

It is also a way to ***set and limit*** the types of discussions that can be had about environmental justice issues and thus the imagination around the solutions and radical changes that are possible. Escobar (2018) calls this the "*defuturing effect*" of design and is something I wanted to avoid.