Using GIS to Advance Transportation Equity

Case Studies of Select MPOs

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Acknowledgments

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- Broward Metropolitan Planning Organization
- Delaware Valley Regional Planning Commission
- Greater Nashville Regional Council
- Puget Sound Regional Council

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1. Introduction

1.1 Background

An equitable implementation of transportation infrastructure is essential in addressing and alleviating the burden of transportation issues for disadvantaged communities. Metropolitan Planning Organizations (MPOs) hold the responsibility of ensuring equitable transportation policies are implemented at a regional level and that there are no inequities in allocating federal funds and resources to transportation projects and policies. GIS and geospatial data provide a powerful tool for MPOs to assess unique characteristics of their communities when evaluating and executing transportation policies and projects. This allows them to make informed equity decisions on transportation investments to help disadvantaged communities with transportation burdens and barriers and undo damaging policies from the past. Geospatial data showing barriers, burdens, and concentrated areas of community distress helps MPOs create criteria, scorecards, plans, and guides unique to their communities that can be used to gauge and address transportation needs and inequities. GIS further displays this data using visuals and models that can be easily understood by the public and policy makers in assessing, allocating, and implementing transportation projects, funding, and resources.

1.2 Methodology

This case study report examines how MPOs utilize GIS to advance their equity goals and address disadvantages in transportation accessibility in their respective regions. A particular emphasis was placed on how the data is folded into the equity policies, projects, and plans that the MPO is currently working on or intends to work on in the future. The research team conducted interviews with four select MPOs that were noted to have robust and unique GIS applications and/or tools that were being utilized to assist in their transportation planning, assessment, and project implementation process. The MPOs were provided with a list of interview questions on the topic, and then interviewed by the research team to further discuss in detail some of the questions provided. The interview questions can be found in Appendix 4.1.

2. MPO Profiles

2.1 Broward MPO

Broward MPO in Broward County, Florida has created a Transportation Planning Equity Assessment application that is used to generate a transportation "Equity Score" for each census block group in the county based on various demographic criteria and indicators. The resource allows Broward MPO to have a comprehensive and consistent evaluation method when assessing environmental justice, equity, and Title VI regulations and needs on transportation projects.

The inception of the application began in 2018, with the goal of applying census data to project prioritization metrics. Broward MPO met with FHWA to discuss opportunities for how they could better assess and address equity as a part of the regional transportation plan and project prioritization process. The MPO had previously utilized multiple metrics and applications to perform assessments on Title VI, equity, and environmental justice analyses, but noted the need to create one consistent tool that was able to capture the needs of all programs. Since various stakeholders require different metrics for equity needs, they knew it would be challenging to create an all-in-one application that would be consistent but adaptable. An interdisciplinary team was formed to guide the design of the application; their priorities included ensuring data were available and accessible, incorporating flexibility of the application to fit various plans and programs, and providing objective open-source data absent of any subjectivity.

The final product, the Transportation Planning Equity Assessment application, generates equity scores in an area based on various demographic indicators such as age, race, disability, and language proficiency. The composite score is based on the indicators and delineated to the census block group level. The score is then displayed as "low," "medium," and "high" on the map based on how many standard deviations away the score is from the county average for the indicators (Figure 1). The application can also display discrete data based on select indicators, but the composite score is used for equity assessments. This allows the application to cater specifically to Broward County's unique demographics as an area with many minority-majority communities.

The data used in the interactive application was originally engineered by a consultant who developed a formulated Excel spreadsheet to compute imported census data into mappable data. The MPO utilizes this map to better visualize regional needs, assess cost feasible plans, note where projects are located with respect to Equity Areas, and to prioritize transportation projects. The application assists the MPO in public outreach by noting areas where unique, individualized outreach measures may be needed due to the populations residing in the area and allows for local advisory councils and committees to present visual displays of technical information in a simple and digestible format. Broward MPO has also created ArcGIS story maps to supplement the application (Figure 2). Story maps provide an easily digestible form of information for members of the public to visually see how each equity indicator is measured in their respective communities. Overall, the application has proven useful in integrating numerous data sources to establish correlations with inequities. One successful example is the MPO's efforts to overlay crash and safety information to see if there is a parallel to areas of inequity and high crash areas in Broward County. Both local municipalities and neighboring MPOs can use the application as a basis for their planning documents and equity analysis applications.

Challenges in developing the application include presenting information in a way that is easily digestible for public viewers, using legacy tools, and displaying qualitative data reflective of the lived experiences of the public. Making a GIS application public-user friendly has proven to be challenging as GIS capabilities evolve. This also impacts the staff at Broward MPO, who need to consistently learn and adapt new skillsets to work with high-level technical data and updated features to GIS software. Furthermore, there have been challenges in using legacy tools from the original consultants who assisted in the development of the application as the consultant is no longer involved with the project. Displaying qualitative data in the application has also proven to be challenging given Broward County is unique in that many areas and communities are minority-majority. As a result, and when compared nationally, Broward County appears to have many areas that are highlighted for possible equity concerns due to its unique demographic makeup. However, the team at Broward MPO noted qualitative data can be obtained with on the ground community engagement and through feedback from local planners in Broward County. This allows for a deeper understanding of what other unique inequities may be impacting communities.

Going forward, Broward MPO hopes to showcase true conditions on the ground and integrate lived experiences into the Transportation Planning Equity Assessment. Broward MPO hopes to enhance the use of their application and GIS data by providing an open portal data center where other agencies and users can access their work. The team plans to customize the tool further, making it more accessible for members of the public through splash screens and user guides. They also plan to garner direct feedback from users via the application in hopes of clearly defining what a benefit looks like to areas of inequity that receive investments in transportation, as well as how these benefits can best be displayed visually to highlight the ongoing work and investments the MPO is putting into the community.

2.1.1 Figures and Resources

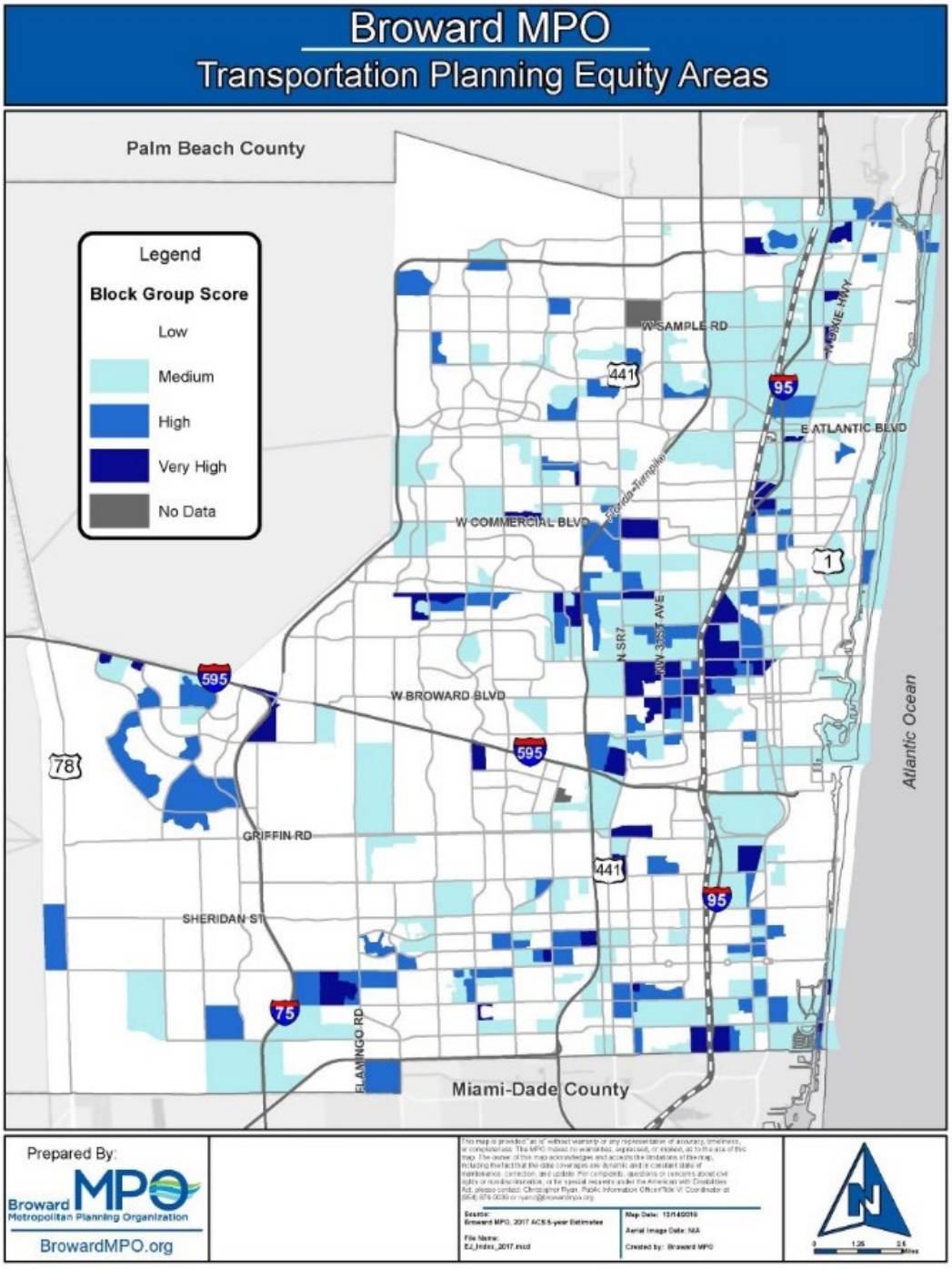

Figure 1. *Broward MPO Transportation Planning Equity Areas Map showing the composite scoring for various census block groups in Broward County, Florida based upon the indicators for each block group. (Transportation Planning Equity Assessment (browardmpo.org)) (https://www.browardmpo.org/carousel-articles/500-transportation-planning-equity-assessment)*

Source: Broward MPO

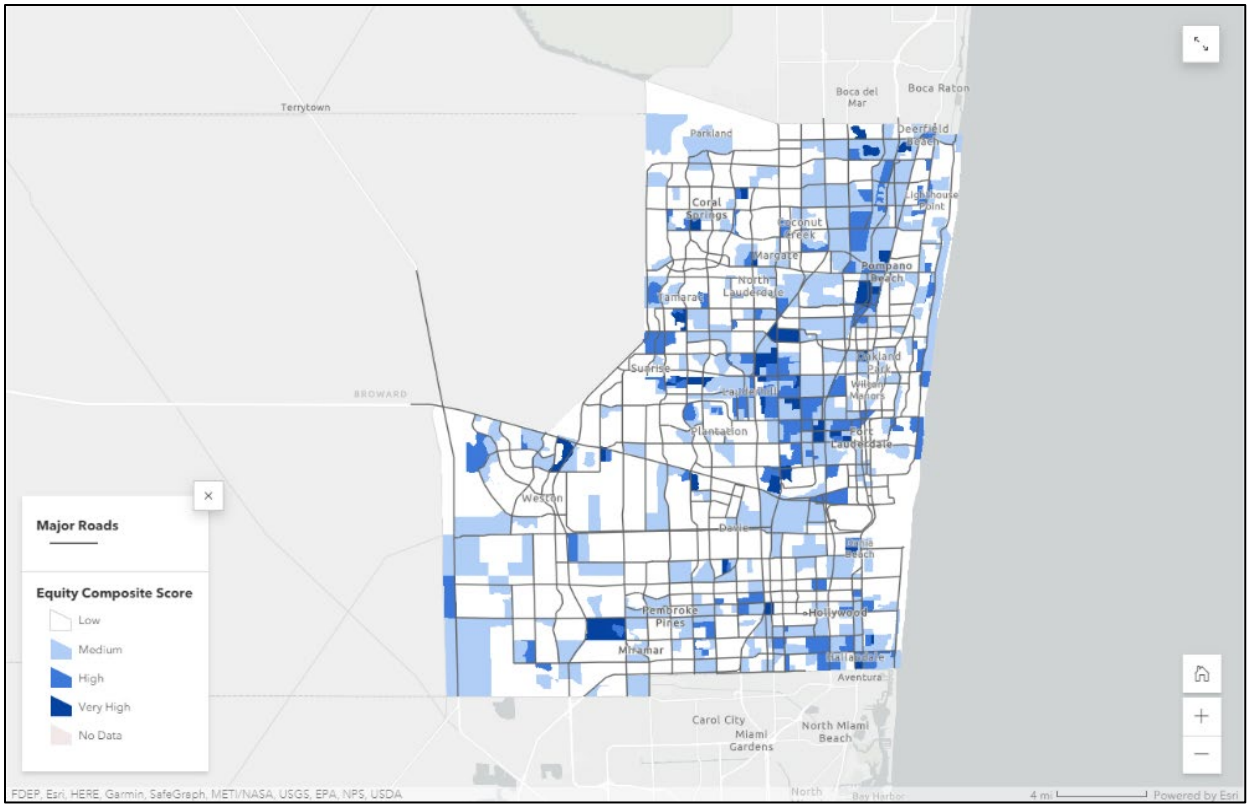

Figure 2. *Screenshot of the Equity Composite Score map from the Transportation Planning Equity Assessment Tool StoryMap. This was created to engage and inform the public on the demographic data used by the MPO for transportation investments and prioritization.*
(Transportation Planning Equity Assessment Maps (arcgis.com)
(https://storymaps.arcgis.com/stories/7b81b04ead3b4d5c9aae8735e3b48434)

Source: Broward MPO

2.2 Delaware Valley Regional Planning Commission (DVRPC)

At DVRPC, the Office of Data Coordination works on finding and managing data. In addition, five full-time GIS staff members work within the Planning and Innovation Department. The GIS staff work on data architecture and database management, particularly working with Esri products. In the past, DVRPC's GIS practices in relation to equity mainly involved showcasing where projects overlap with communities on static maps. As GIS technology has become more advanced, the team has transitioned to incorporating higher-level spatial analysis tools.

DVRPC has developed an Equity Analysis tool that assesses the protected population groups covered in Title VI and Environmental Justice federal guidance within the greater Philadelphia region using Census Bureau data (Figure 3). The map shows Census Tracts and their scores known as "Indicators of Potential Disadvantaged" (IPD). The IPDs are nine demographic indicators – Youth, Older Adults, Female, Racial Minority, Ethnic Minority, Foreign Born, LEP, Disabled, and Low Income. The indicators are compared to regional averages and the standard deviation is taken, which then results in a holistic IPD score for the tract indicating the level of inequity and disadvantage the community may be experiencing (Figure 4). The tool is used by DVRPC to ensure a robust equity analysis for new projects and policies – assessing potential impacts, and prioritizing projects that will benefit disadvantaged populations the most.

A successful use of the application is the Crashes and Communities of Concern analysis, in which the MPO is seeking to understand whether a higher concentration of populations identified by the Equity Analysis Tool correlates with a higher rate of crashes. Other analyses include exploring the correlation between where there are more people walking to work and if those areas correlate with fewer or more sidewalks. This analysis was used in the Transportation Improvement Program (TIP) to determine if safety projects will address safety measures in the community the project is physically located in or the surrounding communities. Additional successful uses of the tool include using data to understand where there are higher concentrations of elderly and disabled communities, and identifying a list of services they need access to, such as parks, schools, hospitals, and other community facilities. This analysis identified the hotspots of overlap for consideration during the planning of future shuttle stops.

Using Esri's ArcGIS Online settings, DVRPC can collect the number of registered Esri ArcGIS Online users who have accessed the map, and number of site views to the Equity Analysis Tool. DVRPC has created an online survey and questionnaire to assess usefulness and specific applications of the tool for users. Additionally, DVRPC has leveraged Bang the Table, an agency that specializes in public outreach, to assist with community engagement activities and the acquisition of qualitative data. DVRPC has found that engaging in thoughtful conversations centered around particular projects and applications can be more insightful than asking very technical questions or pulling data from surveys. The team at DVRPC notes the value in using public feedback to gauge and evaluate who is engaging with the tool and for what purposes.

One challenge encountered by DVRPC is that when there is a plethora of data available, some users still have trouble understanding why it's important or how to use it. DVRPC has found that it is important to provide descriptive metadata so that users are encouraged to engage with the tool correctly and responsibly. Another challenge has been gauging if projects that have been prioritized as a result of using the tool have truly benefitted communities that have been the most impacted from a history of redlining and racial discrimination in the region. The goal is to improve conditions in disadvantaged

areas to create a higher quality of life for community members; however, there is concern that community members may be pushed out of their community through gentrification due to infrastructure improvements.

Moving forward, DVRPC hopes to enhance the tool to better show how transportation investments are benefiting disadvantaged communities. The team wants to continue to understand the makeup of populations highlighted in the Equity Analysis Tool, what the intersection of these groups are, and how they fit into Title VI and EJ legislation. Currently, the Equity Analysis tool links to a Google Form survey, allowing for public users to annotate the map with their own lived experiences and subsequently bring them to the team's attention. The DVRPC public participation staff hope to build upon this by working to understand the public perceptions of DVRPC's work, learn about non-profit and community-based organizations they should interact with more directly, and ultimately acquire public feedback.

2.2.1 Figures and Resources

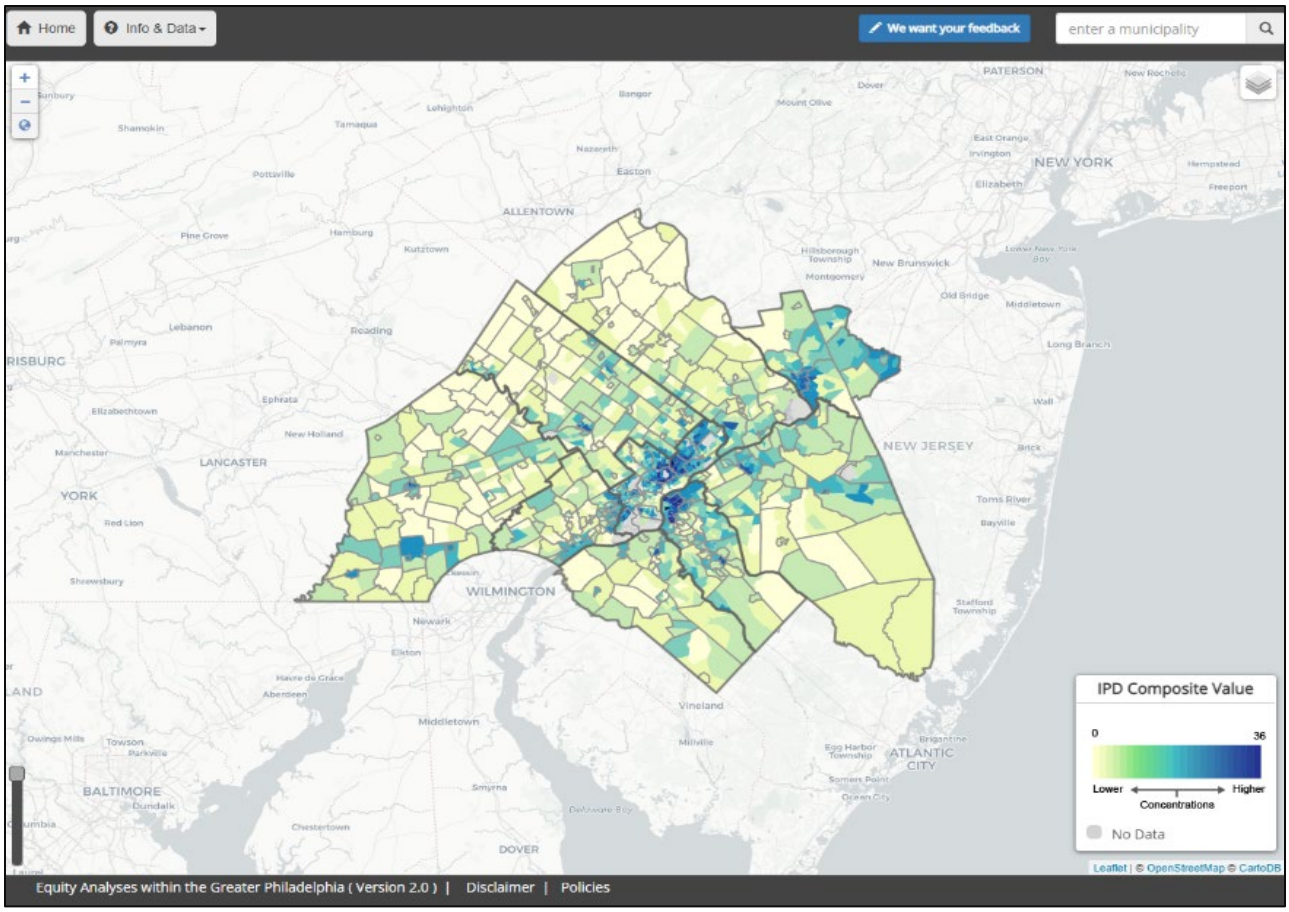

Figure 3. *Screenshot of map detail of the Equity Analysis for the Greater Philadelphia Region tool, showing the Indicators of Potential Disadvantage composite score for each Census Tract in the MPOs jurisdiction. (Equity Analysis for the Greater Philadelphia Region - v2.0 (dvrpc.org))*
(https://www.dvrpc.org/webmaps/ipd/#map)

Source: DVRPC

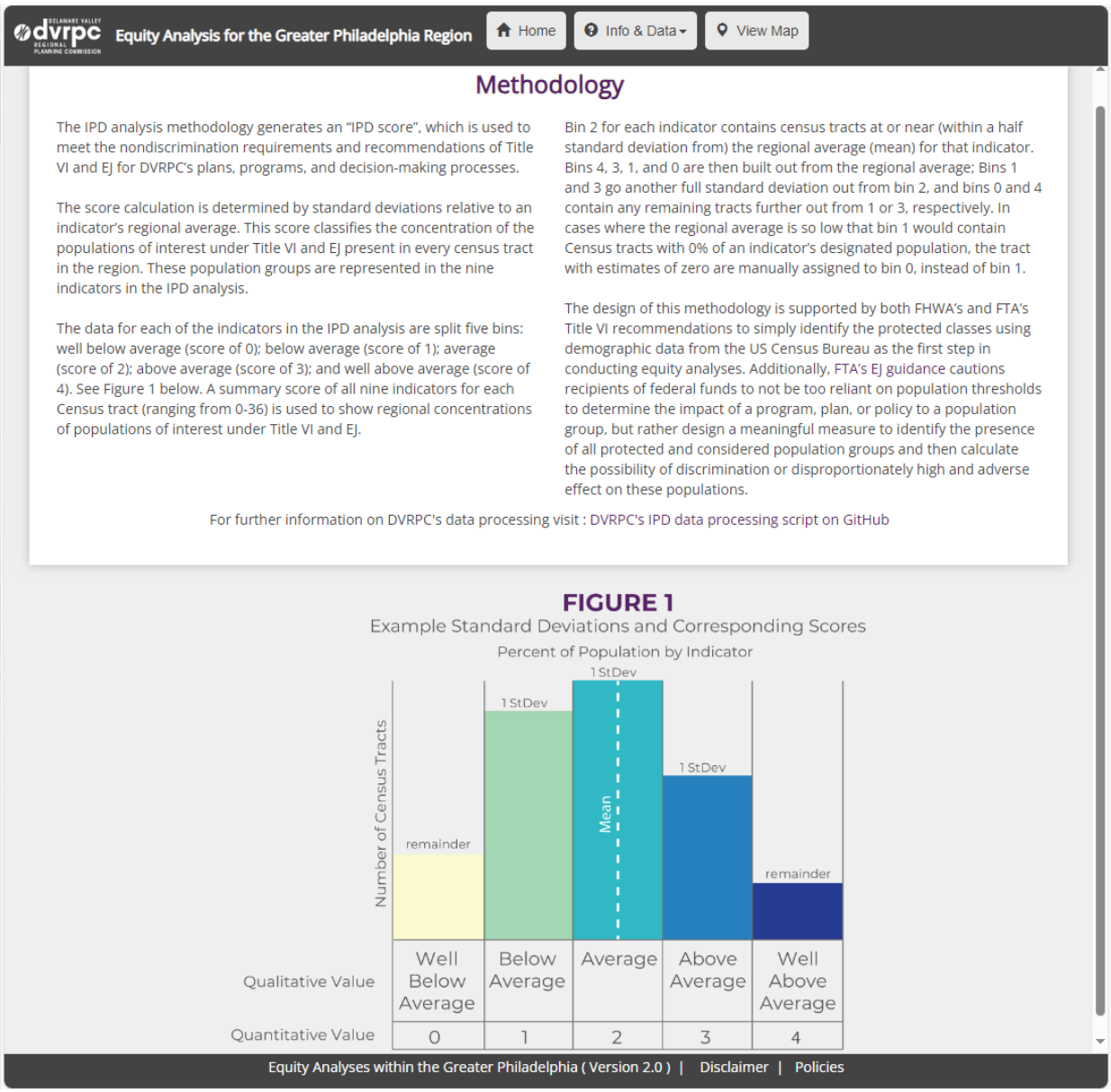

Figure 4. *Screenshot of the Example Standard Deviations and Corresponding Scores from The Indicators of Potential Disadvantages tool. The methodology is accessible via the Equity Analysis map and outlines the technical approach to calculating the composite score. It also includes a link to the GitHub repository for the tool.*
(Equity Analysis for the Greater Philadelphia Region - v2.0 (dvrpc.org))
(https://www.dvrpc.org/webmaps/ipd/#home)

Source: DVRPC

2.3 Greater Nashville Regional Council (GNRC)

GNRC is structured as a council of governments that has a variety of responsibilities throughout the Nashville metropolitan area – one of which is serving as the region's Metropolitan Planning Organization. Through GNRC's duties as the MPO, the agency has developed the Active Transportation and Equity Evaluation Application Web Mapping Application, which is accessible to the general public and other regional entities and serves as a GIS application that provides a comprehensive spatial analysis of demographics and transportation related variables in the Nashville metropolitan area. The map displays spatial data under demographic variables such as vulnerable populations, transportation cost burdened populations, healthcare access, mobility safety, and transportation demand. The spatial data further combines density, transit use, and demographic variables, to visualize transportation infrastructure gaps and inequities throughout the city and region.

The agency has a unique ability to host a large technical capacity in house, integrate data from other regional organizations, and collaborate with those organizations that fall under the council's jurisdiction. In developing this tool, GNRC also tapped into their Aging and Disability department to acquire more data and information that could be helpful for transportation investments and community engagement. This collaboration incorporated a large public health component into their tool that made its use more adaptable and comprehensive. This comprehensive coverage of public health, equity, and transportation data has proven useful for other agencies within the council as well, such as the Council's Economic Community Development Department. The department uses this tool to assess, review, and prioritize investments for their respective programs and grants.

The Active Transportation and Equity Evaluation Application first started as a public health initiative that mapped what were known as "Health Priority Areas." This included communities within the Nashville area comprised of populations at risk of or already suffering from poor health outcomes due to surrounding infrastructure. The initiative's data collection included monitoring the relationship between residents' physical health and the transportation methods and infrastructure used by them. The council noted this yielded valuable and helpful data, and wanted to expand to visually display and find more areas and variables that could be studied. The Equity Atlas was then developed to highlight areas of inequities in the region that could be targeted for investments and improved infrastructure. This led to the current implementation of the application with its "Degrees of Vulnerability" scoring, which categorizes the level of vulnerability and disadvantage within a census block group. Originally, the application had nine degrees of Vulnerability but has since expanded to incorporate thirteen unique criteria and scoring metrics (Figure 5). These criteria are gauged on a regional level and depending on a census block group's average it will score a point if it is above the average for the region. If the total points meet a certain threshold, the census block group is defined as disadvantaged. GNRC uses the application for transportation investment prioritization, community needs assessment, and impact analysis, among other uses (Figure 6).

A major success of the application is that it provides a consolidated means for evaluating and prioritizing projects. Previously, GNRC evaluated and reviewed projects using an interdisciplinary team of 8-10 people, each with their own review for impacts and evaluations. The application allowed these teams to consolidate their reviews into one single live map with all variables and disciplines overlayed onto one another. Thus, improving efficiency and encouraging further collaboration amongst agencies and divisions within the GNRC. It has also proven to be a source of data and information for local

governments in the area. GNRC has noted that counties and municipalities often use the Active Transportation and Equity Evaluation Application to assess transportation needs and inequities in their communities. The fast-growing region has demographics that are in a constant shift and the application has provided a means to assess these changes and note where areas are improving or where displacement and inequity may be occurring on a regional level. It has also provided a basis for a front facing Dynamic Degrees of Vulnerability dashboard which provides an additional interactive mapping application for users. The dashboard displays the census block groups throughout the region and when a block group is clicked on, the dashboard displays percentages that measure the amount of population that falls under each degree of vulnerability in that block group. It also displays the holistic degrees of vulnerability score for each bock group in the region. The dashboard is currently in the process of updating with new data and provides users the ability to see temporal changes throughout the Nashville region.

The rate of growth in the region has also proven challenging for the GNRC and the Active Transportation and Equity Evaluation Application. The shift in demographics, increase in cost of living, and the speed at which growth is occurring can make it hard to consistently obtain up to date data in the application as well as assess if local populations are truly benefiting from improvements or projects in their community. The tools adaptability and multiple indicators assist in working with the changes, but obtaining real time data can prove challenging for an area experiencing immense growth. To address this GNRC has purchased services through Replica, an agency that specializes in big data acquisition on users of the transportation network in the Greater Nashville area and to truly see if benefits are reaching the people they are intended to reach. Another challenge has been stakeholder outreach and encouraging the collaboration and use of the application to its full potential. GNRC is brainstorming means to encourage more stakeholder collaboration and input with the application. Through this, the hope is that the application truly encompasses all stakeholder needs and investments on transportation projects and initiatives and encourages more collaboration in enhancing it.

GNRC is hoping to study and understand through the application if areas that have shifted demographically in the region over time have done so because of infrastructure investment and projects or if the investments and projects have been the catalyst for that shift. They also hope to start framing the application and the agencies' equity goals to be more in line with the recent Justice40 initiative. Utilizing the definitions and policies of Justice40 initiative to build a localized version that better addresses the needs and unique demographic characteristics of the Greater Nashville region.

2.3.1 Figures and Resources

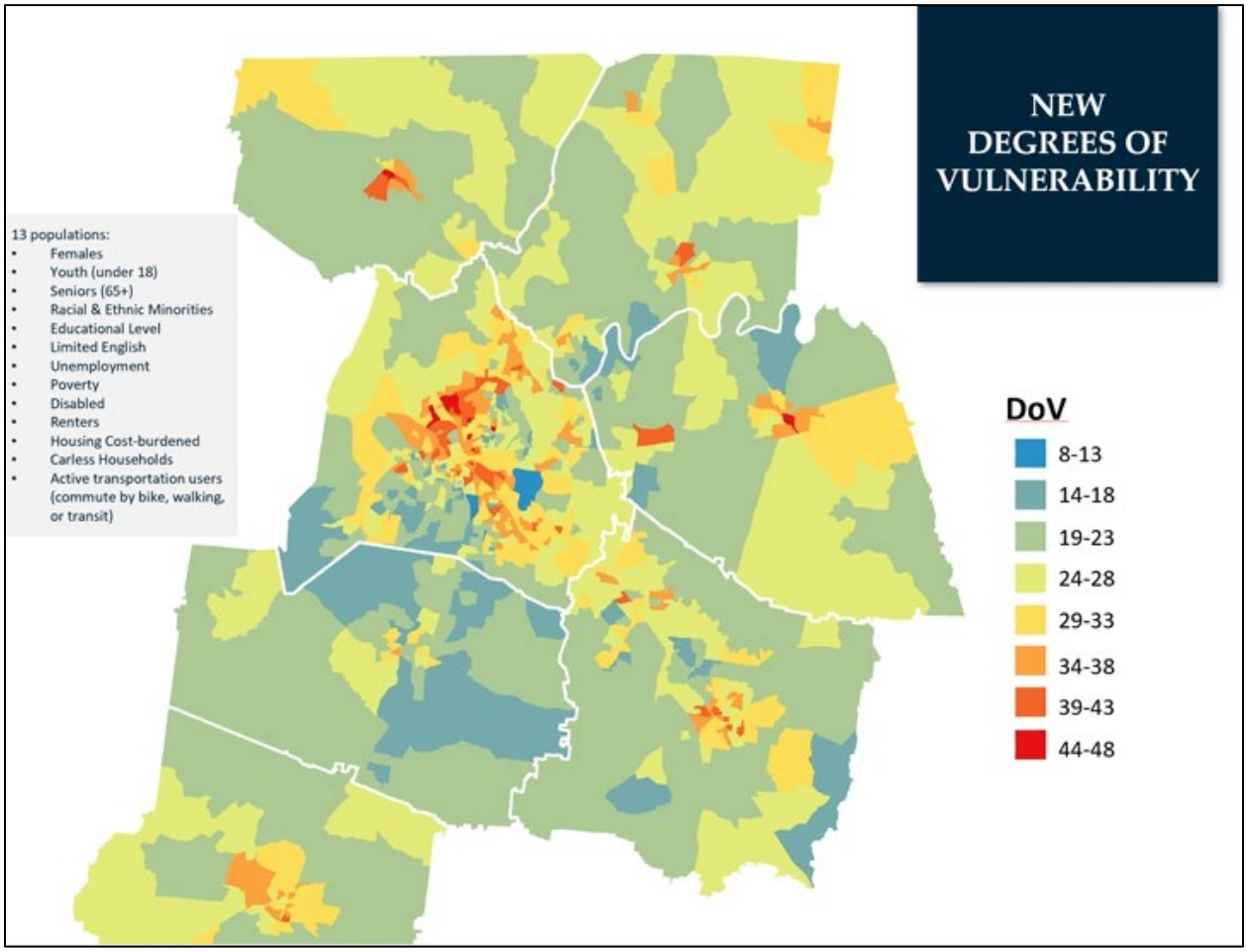

Figure 5. *Static map of the Degrees of Vulnerability for Census Block Groups in the Nashville Metropolitan region. The image also shows the thirteen population types utilized to create the composite score.*

[(GIS and Equity Peer Exchange | June 2021)](https://www.gis.fhwa.dot.gov/reports/CO_AMPO_GIS_Peer_Exchange_Report_June21.aspx)

Source: GNRC

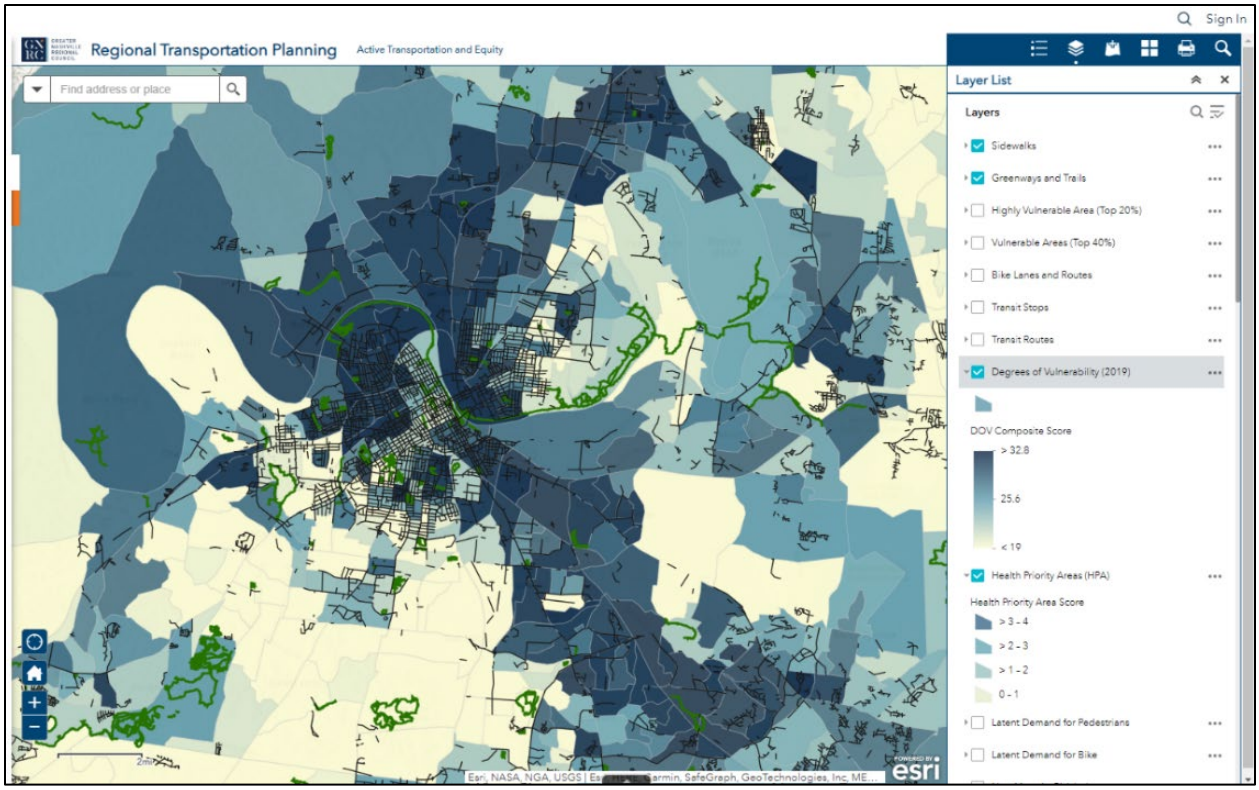

Figure 6. *Screenshot of the user interface of the Active Transportation and Equity Evaluation Application with the degrees of vulnerability shown as a choropleth map overlayed with the Health Priority Areas, Sidewalks, and Greenways and Trails data layers.*

[(Regional Transportation Planning- Active Transportation and Equity Evaluation Application | Greater Nashville Regional Council (arcgis.com))](https://data-gnrc.opendata.arcgis.com/apps/acd25616be154dd2a3a75484bfd6237a/explore)

Source: GNRC

2.4 Puget Sound Regional Council (PSRC)

PSRC serves as the MPO for the central Puget Sound region. The PSRC team is currently in the process of developing a Regional Equity Strategy as a part of their VISION 2050 plan, which stresses the importance of dismantling inequities through long range planning, which includes transportation planning, growth management, and economic development. As part of the Regional Equity Strategy initiative, PSRC has created an interactive Displacement Risk Map that identifies areas in the four-county region currently at an elevated risk of residential displacement. PSRC also offers an Opportunity Mapping Tool that calls attention to areas of high to moderate opportunity and their growth potential (Figure 7). Both interactive mapping tools utilize an index to assess communities in the region and policy makers are encouraged to use the applications to ensure equity is a major component of transportation investments moving forward (Figure 8).

In 2008, PSRC initially received a HUD grant for Growing Transit Communities. The Opportunity Mapping Tool was produced from this grant around 2010, with the goal of connecting communities to federal opportunities. Initially, Opportunity Mapping products were static, PDF maps. In 2017, the PSRC Data team worked to create an ArcGIS story map with the development of the Displacement Risk Mapping tool, which became one of first public, interactive mapping products. PSRC began receiving data requests for shapefiles after the application went online, fueling support to create infrastructure that would make data resources more easily accessible to the public (e.g., developing a GitHub repository & a data portal). The PSRC team seeks to be thoughtful and intentional about the regional growth strategy used in their VISION 2050 plan through the two mapping tools, paying close attention the placement of employment opportunities, transportation investments, and the housing market.

Currently, the Displacement Risk Map is used to identify focus areas for developing displacement risk mitigation strategies as well as project prioritization. The tool assists in prioritizing transportation investments and noting where extra effort and sensitivity may be needed to ensure the community members in areas of higher risk of displacement due to regional growth factors are not displaced or adversely impacted. PSRC is interested in understanding if there is a risk of displacement to the communities located where there is a potential project or transportation investment and what contributes to such risk. Mapping displacement risk is typically done at the census tract level, creating a comprehensive index based on five key elements with various indicators within each element. The five key elements are Socio-Demographics, Transportation Qualities, Neighborhood Characteristics, Housing, and Civic Engagement. PSRC is uniquely dedicated to understanding what the risk of displacement looked like across the central Puget Sound region before, during, and after the COVID-19 pandemic. The team emphasizes that scale and interpretation are incredibly important in producing mapping products. The data team reviews each project manually to make sure there are alignments in what the data shows at various scales. PSRC notes that it is imperative to prevent misalignments and contradictions in data so that users, including both stakeholders and the public, are not misled.

One of the driving forces in GIS and Equity practices at PSRC is the MPO Equity Working Group. This group allows for other local governments in the region to work together and share practices and data for advancing equity in planning practices for the region. Shared learning has been an asset for the organizations and agencies involved because it has allowed for peer agencies to learn about technical strategies in detail. PSRC works with local jurisdictions to make sure they're telling an accurate narrative through GIS tools and data representations. Furthermore, PSRC has benefitted from attending

Government Alliance on Racial Equity (GARE) conferences to deepen their understanding of how they can strive for racial equity through their investments and planning work. In addition, PSRC hosts the Equity Advisory Committee. This group, comprising of residents, staff, community-based organizations, and government organizations meets once a month to discuss the Regional Equity Strategy. Participants are involved in cocreating the plans, and there is a live QA session hosted to increase public engagement and feedback. Overall, various equity tools and resources have been widely received by the community via these forums.

One of the biggest challenges cited in furthering the usage of PSRC's interactive tools is the need for assistance in data interpretation. A future goal is to remedy this by building data centric web pages that are enhanced with mapping to tell a story, which will allow users to view and download data as they please, with guided instructions on how it can be used. The team recognizes that the capacity for stakeholders to engage with data online has increased because of the virtual environment from the pandemic. As a result, the GIS team has started to engage with the Equity Advisory Committee and is working to incorporate their feedback into the data products. PSRC is particularly interested in ensuring that they are providing context for stakeholders on how the data explains phenomena, patterns, and uncertainties. This includes providing options for more technical information including data sources and the GitHub repository for those who are interested. PSRC is also working to make their ArcGIS story maps as accessible as possible to the public through their Communications team, who is involved in vetting the language choices and accessibility of the interactive mapping tools.

2.4.1 Figures and Resources

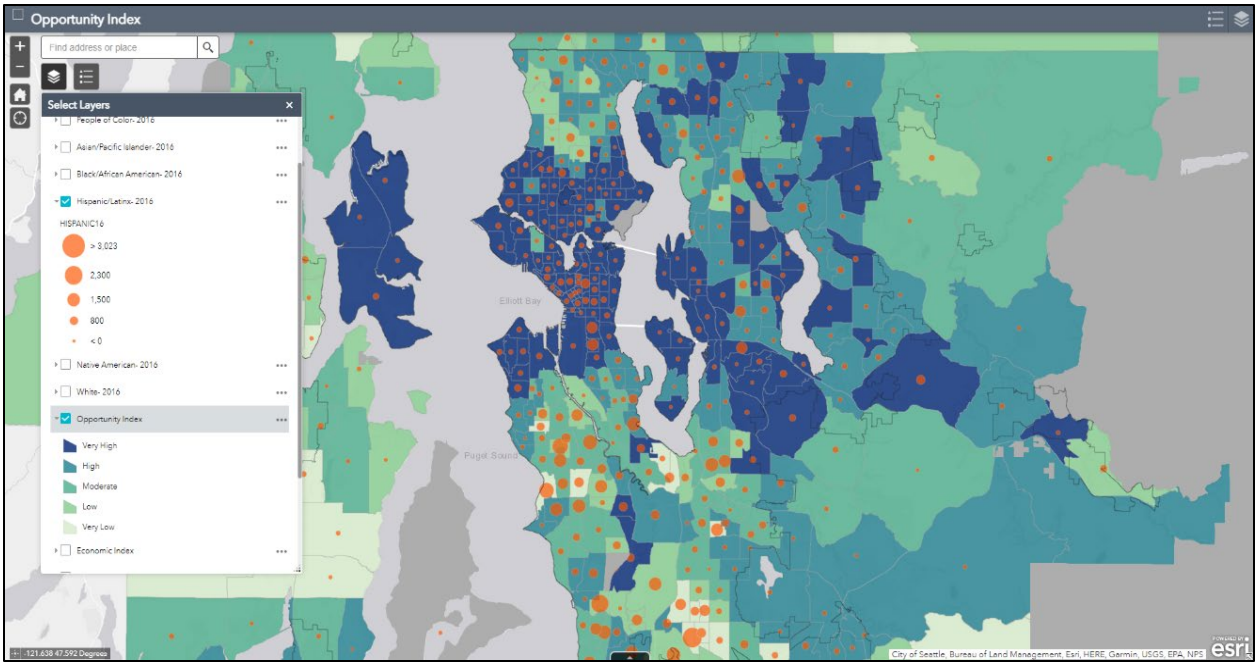

Figure 7. *Screenshot of the Opportunity Mapping Tool. The website states, "Growth in areas of opportunity is based on an "Opportunity Index," which combines measures of five key elements of neighborhood opportunity and positive life outcomes: education, economic health, housing and neighborhood quality, mobility and transportation, and health and environment. The level of opportunity score (very low, low, moderate, high, very high) is determined by sorting all census tracts into quintiles based on their index scores. Areas of opportunity that experience greater proportions of growth may experience an increased risk of displacement."*
(Opportunity Mapping | Puget Sound Regional Council (psrc.org))
(https://psregcncl.maps.arcgis.com/apps/webappviewer/index.html?id=04178e4d496d4cd0ae87bb5182bdc94d)

Source: PSRC

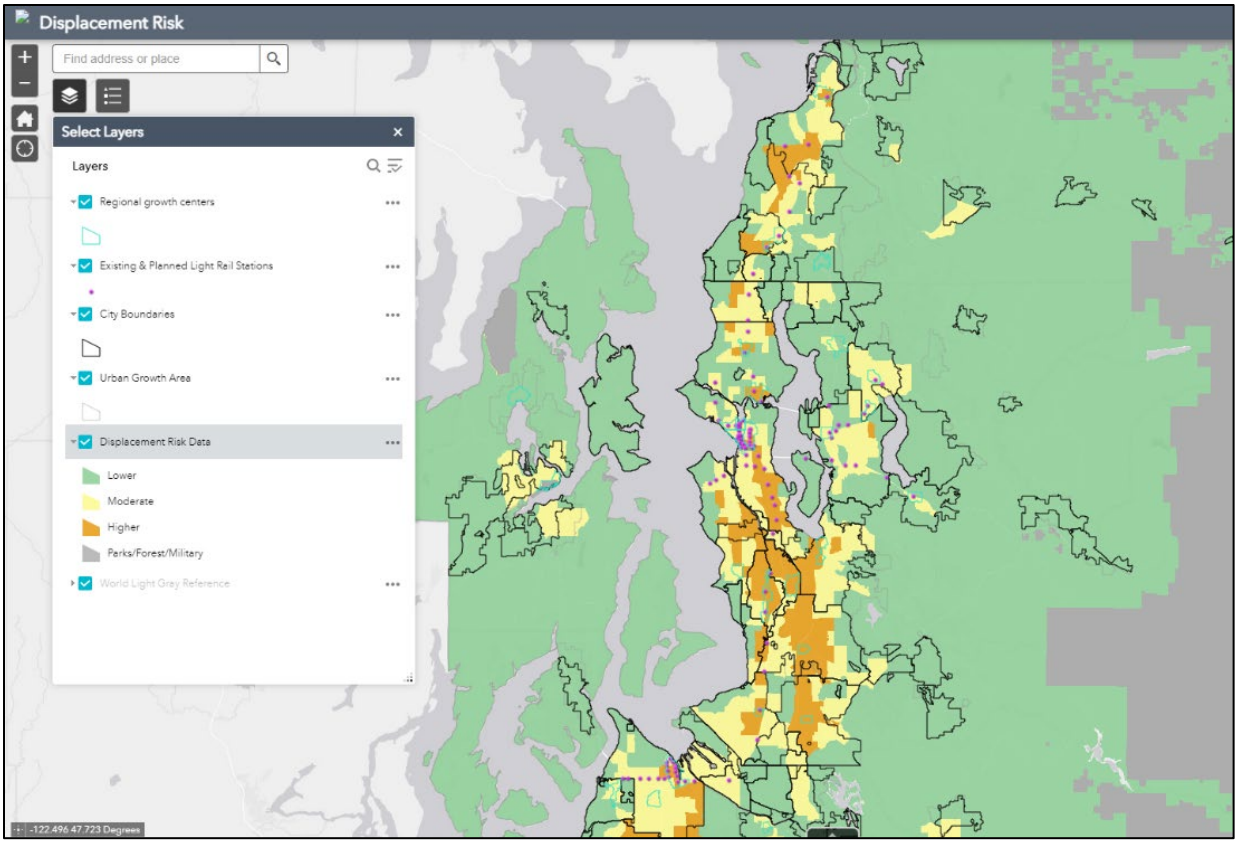

Figure 8. *Screenshot of the Displacement Risk Mapping Tool showing areas in the Seattle region at high risk of displacement due to growth patterns and development investments.*
(Displacement Risk Mapping | Puget Sound Regional Council (psrc.org),
(https://www.psrc.org/our-work/displacement-risk-mapping)

Source: PSRC

3. Conclusion

As GIS technology and its abilities to display and analyze data have advanced, it has become a valuable resource for MPOs to understand areas of transportation disadvantage in their regions and communities. These GIS tools have aided in equitable decision-making to guide investments and project prioritization across communities. GIS practices also serve as a valuable supporting resource for agencies in the realms of public outreach, long range planning, and stakeholder engagement – helping pinpoint the community leaders, local agencies, and necessary outreach methods to reach disadvantaged populations who often require additional engagement.

Two common challenges faced by the MPOs in this report include the difficulty of collecting and displaying qualitative data, as well as how to best use GIS to assess if benefits from transportation investments are truly improving the lives of populations in disadvantaged communities rather than displacing them. To address this, it will be crucial for MPOs to create digestible visuals and technical reports for the public for them to understand the complexities of data being displayed in GIS applications. It is also important that users can incorporate or provide their own anecdotal data and experiences for their communities. As data analysis tools advance, GIS will continue to serve as a powerful tool used to interpret and transform quantitative and qualitative information into visual data representations that can be understood and used by the public. The data collection and modification process must also evolve to remain adaptable and efficient to consistently present the most up to date information to communities. Especially in areas of high growth and changing demographics, where spatial data is essential to ensure the benefits are truly addressing inequities and assisting those who live in disadvantaged communities.

4. Appendices

4.1 Interview Guide

Organization Details

- What is your role within your agency?
- Approximately how many employees work for your organization?
- What department or team is responsible for the equity analysis and decision making? How many people are involved in these activities?
- What is the technical capacity of your team? What department or team is responsible for creating and updating the database or data for the GIS platforms and applications you use?
- Did this project require work across departments? Who championed the work?
- Did your agency partner or engage with any outside partners? If so, who?

Purpose

- What problem(s) are these maps or applications intended to solve specific to your community and transportation equity?
- What equity goals or issues are priority at this time?
- How do you define disadvantaged communities?
- Was there an inspiration behind collecting this type of data on equity and disadvantage?

Process

- Walk us through the collection process of data on equity and disadvantaged communities at your organization:
    - What software do you use for the data?
    - How is your data updated and maintained?
    - How many years of data do you have?
    - What sources do you use for your data? Is the data open source?
    - What are some of the locational and spatial parameters used to organize and visualize the data?
    - What is the technical methodology behind some of your applications or maps and what do they display?
- Walk us through how you use the data:
    - Was the development of your applications or maps completed in-house or contracted out?
    - What map layers are included in your GIS data?
    - What types of maps does the application create? Locations, clusters, hot spots…?
    - Does your application include a dashboard?
    - What types and how many attributes are used for queries in your applications? Location, people involved, minority groups, commute time, etc.
    - What output can be produced by your application? Maps, tables, charts, reports…?
    - What GIS software, platforms and other technologies did you use to create your applications?
    - How do your GIS applications interface with other systems at your agency?
    - Is your application public or only available to personnel?

    - What can GIS show and capture that you think wouldn't be captured otherwise in the realm of equity and transportation?
    - What makes your maps or GIS applications unique/innovative compared to others?

Impact

- How does your organization use these applications to advance informed equitable decisions in transportation? Have they made an impact on any goals, issues, policies, or projects?
- What have been the reactions of internal and external stakeholders to your GIS applications or maps and the information they show on equity and transportation disadvantage?
- How has the GIS -based applications on equity and transportation disadvantage in your community changed your business practices?
    - Has the organization changed any decisions based on this data?
    - Have other users changed any decisions based on this data?
- Who were your intended users of this application? Do they use the GIS data/tool like you imagined they would?
- How are you engaging the public through applications, maps, and data? How is public feedback incorporated?
- What challenges have you encountered in creating an impact using this tool (technical challenges, policy related, etc.)?

Future Goals

- What improvements do you think could be made to the maps or applications?
- Has the organization changed any investment decisions based on the data?
- Are there limitations to using these applications for equity and transportation disadvantage analysis? Are there plans to mitigate these limitations in the future?
- Does your agency plan to undertake any other projects utilizing crowdsourced data? Have they already?
- What lessons did your team learn while working on this project?
- Have these applications or maps impacted projects and initiatives in your agency's jurisdiction? Is there any data to support that?

4.2 Interviewees

Agency	Name	Title
Broward MPO	Carl Ema	Administrative Services Manager
	Peter Gies	Systems Planning Manager
	Roger Miranda	GIS Planner
DVRPC	Shoshana Akins	Senior Public Participation Planner
	Kimberly Korejko	Manager - Office of Data Coordination
GNRC	Max Baker	Director of Research and Analytics
	Carson Cooper	Senior Planner
	Sean Pfalzer	Transportation Planning Manager
	Jessica Hill	Director of Community and Regional Planning
	Ashleigh Glasscock	Senior Research Analyst
PSRC	Brian Lee, Ph.D.	Program Manager – Data Solutions and Research
	Charles Patton, Ph.D.	Program Manager – Equity Policy and Initiatives
	Lauren Engel	Senior Planner/GIS Analyst

4.3 References and Additional Resources

4.3.1 Broward MPO

- Transportation Planning Equity Assessment Maps / https://arcg.is/LDvuL /
- Transportation Planning Equity Assessment / https://www.browardmpo.org/carousel-articles/500-transportation-planning-equity-assessment
- Title VI Transportation Planning Equity Assessment / https://www.browardmpo.org/data/title-vi-transportation-planning-equity-assessment
- Transportation Equity Scoring Methodology / https://www.browardmpo.org/images/WhatWeDo/Title_VI_and_DBE/20181220_BMPO_Equity_Assessment_Methodology.pdf
- Title VI DBE (browardmpo.org) / https://www.browardmpo.org/major-initiatives/title-vi-dbe

4.3.2 Delaware Valley Regional Planning Commission

- Equity Analysis for the Greater Philadelphia Region / https://www.dvrpc.org/webmaps/ipd/
- The Bang the Table Ecosystem / https://www.bangthetable.com/wp-content/uploads/2020/02/The-Bang-the-Table-Ecosystem.pdf
- Equity Analysis for the Greater Philadelphia Region - v2.0 (dvrpc.org) / https://www.dvrpc.org/webmaps/ipd/#home
- Equity Analysis for the Greater Philadelphia Region - v2.0 (dvrpc.org) / https://www.dvrpc.org/webmaps/ipd/#map
- Title VI and Environmental Justice | DVRPC / https://www.dvrpc.org/getinvolved/titlevi/

4.3.3 Greater Nashville Regional Council

- Regional Transportation Planning- Active Transportation and Equity Evaluation Application / https://data-gnrc.opendata.arcgis.com/items/acd25616be154dd2a3a75484bfd6237a
- Updated Methodology for Looking at Vulnerable Populations / https://www.gnrc.org/DocumentCenter/View/2260/2021_DOV_Methodology_Definitions
- GNRC Dynamic Degrees of Vulnerability Dashboard | Tableau Public / https://public.tableau.com/app/profile/gnrc/viz/GNRCDynamicDegreesofVulnerabilityDashboard/Dashboard1

4.3.4 Puget Sound Regional Council

- Opportunity Index / https://psregcncl.maps.arcgis.com/apps/webappviewer/index.html?id=04178e4d496d4cd0ae87bb5182bdc94d
- Displacement Mapping / https://psregcncl.maps.arcgis.com/apps/webappviewer/index.html?id=4e1f07c343534e499d70f1686171d843
- Displacement Risk Mapping Storymap / https://psregcncl.maps.arcgis.com/apps/MapSeries/index.html?appid=1769d732e3de4905ba0bf5ffaf75f602
- Displacement Risk Index Github Repository / https://github.com/psrc/
- Equity | Puget Sound Regional Council / https://www.psrc.org/our-work/equity

- Regional Equity Strategy | Puget Sound Regional Council (psrc.org) / https://www.psrc.org/our-work/regional-equity-strategy
- Displacement Risk Mapping | Puget Sound Regional Council (psrc.org) / https://www.psrc.org/our-work/displacement-risk-mapping
- Opportunity Mapping | Puget Sound Regional Council / https://www.psrc.org/our-work/opportunity-mapping
- Travel Story 2019 - Displacement - Who is Affected? / https://www.psrc.org/media/4916
- Equity Advisory Committee / https://www.psrc.org/committee/equity-advisory-committee-eac
- VISION 2050 / https://www.psrc.org/planning-2050/vision-2050