Case Study:
Leveraging Data for Equitable Climate Outcomes

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Introduction: Leveraging Data for Equitable Climate Outcomes

Data is an essential tool for assessing climate change stressors and developing climate action plans. Water utilities across the country are currently leveraging information about current and future climate impacts on their communities and operations so they can continue to provide safe and reliable water service to their communities. A holistic, equity-centered understanding of data leads to greater climate and social resilience by improving decision-making and prioritization of climate-vulnerable communities and infrastructure.

While data is a helpful tool for community representation and accountability, it is important to recognize that it has been used against communities in the US for centuries to perpetuate racism and power inequities and to justify inequitable treatment, often resulting in disparate health outcomes. Historic planning practices such as urban zoning and redlining are linked to disproportionate exposure to pollution and climate stressors among low-income communities and Black, Indigenous, and Communities of Color.[1] These injustices are closely linked to inequitable climate impacts and disparate health outcomes today.[2] In addition, these actions have created a pervasive mistrust by Black, Indigenous, and Communities of Color of public institutions and the data they collect and use.[3] Data carries immense power, and it is important to consider who gathers it, who has access to it, who it describes, and who owns it.[4] Incorporating equitable data practices and principles across the data lifecycle can build community trust; improve data availability, quality, and relevance; and work to mend the structural inequities that continue to prevent communities from thriving.

Data that seeks to inform equitable climate outcomes should center community interests and expertise at every stage of a project and create opportunities for community feedback to increase transparency and accountability in decision-making. Practicing equitable data collection means acknowledging the importance of qualitative data, such as lived experience and storytelling, in addition to quantitative data. It also means adjusting metrics to align with community values. There are many dimensions of equity in data, including organization-wide structures for equity, data governance, and community-led data collection—all of which are important to consider. The practice of incorporating socioeconomic and equity lenses to data frameworks in the climate action context leans heavily on equitable research and engagement frameworks developed by the public health sector. The Indigenous data sovereignty and data governance movements have also advanced principles to inform the management of data and best practices for community involvement. (See additional resources included at the end of this case study.)

This case study includes examples of equitable data practices from leading utilities. Insights were derived from conversations with utility staff and utility publications. The Additional Resources section at the end of this case study includes opportunities for further reading on this topic as well as existing standards and frameworks for designing and carrying out equitable data practices.

Like equitable community engagement itself, seeking to prevent inequitable outcomes and harm in the use and management of data is a complex, ongoing pursuit that requires open-mindedness, continuous evaluation, and trust-building between the collector and impacted communities. This case study is an introduction to best practices around the equitable data practices for climate action in the water sector.

Examples of Data and Equity for Climate Action

Equity Data Toolkit: Portland Water Bureau

A data-driven approach to incorporating equity into bureau ethos and operations

Description

The Portland Water Bureau (PWB) began its systematic effort to incorporate equity as a guiding principle for all its work in 2019. Guided by PWB's 2021—2025 Plan to Advance Equity, Diversity, and Inclusion, this shift requires PWB to change the way it does business. Most importantly, it enables PWB to more effectively meet the needs of all community members—especially those who have been historically underserved—and supports PWB's commitment to the health and success of all Portland residents regardless of their identities.

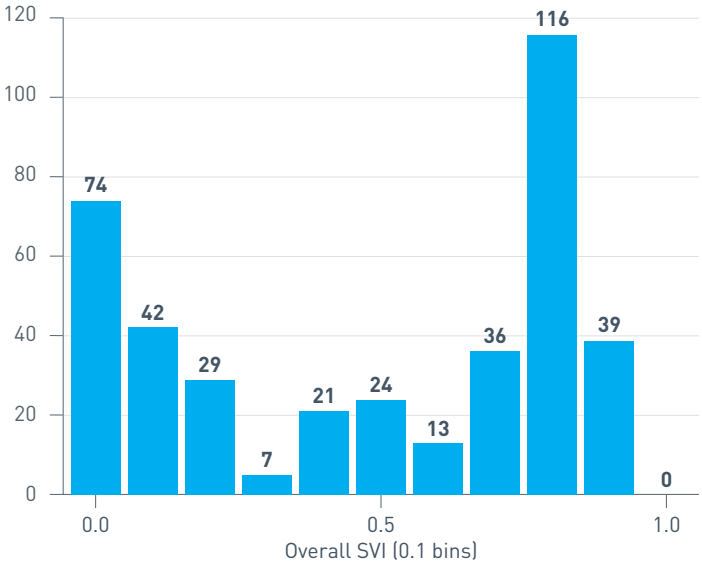
Central to this effort is the development of an Equity Data Toolkit by PWB's Equity and Policy Team—an approach recommended by the community. The Toolkit integrates Portland metro area census tract scores from the CDC's Social Vulnerability Index (SVI) with PWB's existing asset and service data to help staff make more equitable and effective decisions on policies, project selection and criteria, and resource allocation. PWB has chosen to use the Social Vulnerability Index for its objective analysis and inclusion of over 15 different indicators that provide a more nuanced understanding of why a given service area is "vulnerable."

To test the applicability of the Equity Data Toolkit, the PWB Equity and Policy and Asset Management teams partnered to develop an Equity Impact Assessment Tool to evaluate the impact of equity on PWB's customer service levels and asset risk management framework. The tool integrates CDC SVI scores into PWB's Consequence of Failure ratings for its assets, allowing PWB to plan for the reality that infrastructure and system failures impact populations differently and prioritize investments accordingly. The teams also developed a framework for equity impact assessment of customer service levels using the service level of "at least one hydrant within 500 feet of a service connection" as a pilot. PWB determined that 401 of its 189,000 service connections were not meeting this standard and that 50 percent of these

missing connections were in high-vulnerability neighborhoods (SVI score of 0.5 or higher). A high-level spatial analysis indicated that the installation of 67 new hydrants would close most of this gap, starting with the areas with a higher SVI rating. This process tested an approach that could ultimately help the Asset Management team address disparities by prioritizing system reliability investments in communities with the highest need and highest vulnerability.

Development of this data-based, standardized equity data toolkit will enable both the operationalization of equity to the wide variety of projects undertaken by PWB and its use by engineers, planners, operators, and executives across the organization. The Equity and Policy Team is exploring the application of the toolkit to more Bureau programs, like financial assistance, and is testing approaches to adjust the toolkit to account for climate change impacts.

Figure 1.
High-level spatial analysis of hydrant connection service level by count of services vs. overall SVI
The figure below shows the distribution of the 401 services that are at least 500 feet from the nearest hydrant across the Overall CDC Social Vulnerability Index (SVI) in buckets incremented by 0.1, where the higher SVI rating indicates a more vulnerable area.



Source: Data courtesy of Portland Water Bureau.

Insights

- **Incorporating equity into utility-wide processes is most successful with institutional and leadership support.** Hiring staff to prepare and analyze data, engage the community, and center social indicators across the utility demonstrates long-term support for this work and leads to more effective and informed decision-making. In Portland, hiring an Equity Manager to strategize equity efforts across the utility demonstrated the utility's long-term support of this work and will continue to foster more effective and informed decision-making.

- **Adopt a growth mindset and create an environment where employees feel safe trying new approaches and making their voices heard; celebrate achievements and do more of what works well.** Systemic equity takes time, and there is no exact formula for achieving equitable outcomes—what works in one location or at one time may not work in another. Take the time to evaluate and adapt processes, center equity actions around current and robust data, and build staff creativity and community engagement into project development.

- **Incorporate climate change risks as well as adaptation and mitigation strategies into service level assessments and risk management.** In addition to equity indicators, the effects of climate stressors and climate action on asset failure risk and service level delivery are important to incorporate into an assessment framework to support equitable and resilient investments.

- **Working with a variety of datasets is challenging and requires considerable preparation and intentionality.** Before embarking on a data-driven project, think critically about the intended purpose of each dataset. This will aid time-intensive data preparation and allow more streamlined use of these datasets.

Learn More

For more information about Portland Water Bureau and this project, please contact Erich Pacheco, Portland Water Bureau, at Erich.Pacheco@portlandoregon.gov. For further reading, please reference the article, "Equity and Water Utilities," authored by Portland Water Bureau staff in The Water Research Foundation's *Advances in Water Research* magazine.

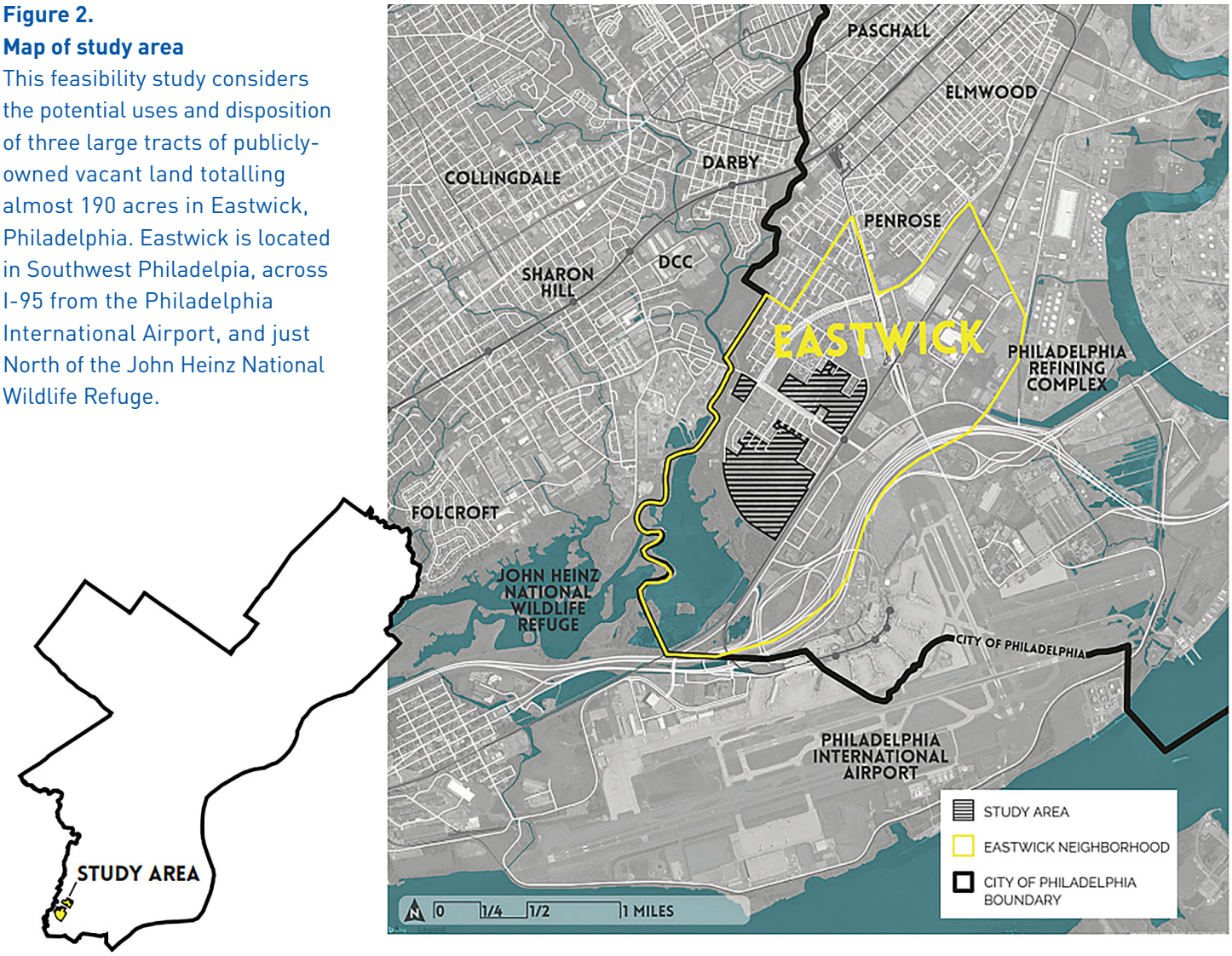
Darby-Cobbs—Watershed-Scale Compound Flood Modeling and Community Resilience: Philadelphia Water Department and Academic Partners

Universities as an intermediary for community and watershed-scale collaboration

Description

The Darby-Cobbs Watershed is a 50,000-acre (78 square-mile) watershed in southeast Pennsylvania that includes portions of Philadelphia and 31 boroughs and townships in Delaware, Chester, and Montgomery Counties. The Darby and Cobbs creeks converge near the neighborhoods of Eastwick, a low-lying, predominantly Black community in Lower Southwest Philadelphia, and Sharon Hill (in Delaware County) before draining into the Delaware River. Like many coastal regions in the northeastern United States, watershed residents are at risk of flooding due to the historical processes of urbanization paired with an increased frequency of heavy precipitation and higher sea levels brought about by climate change.

Figure 2.
Map of study area
This feasibility study considers the potential uses and disposition of three large tracts of publicly-owned vacant land totalling almost 190 acres in Eastwick, Philadelphia. Eastwick is located in Southwest Philadelpia, across I-95 from the Philadelphia International Airport, and just North of the John Heinz National Wildlife Refuge.



Source: Map courtesy of the Philadelphia Redevelopment Authority (developed for the Lower Eastwick Public Land Strategy).

A team of researchers has been working to characterize current and future flood exposure in the watershed through two National Oceanic and Atmospheric Administration (NOAA)-supported grants. This includes engaging watershed stakeholders to evaluate the potential effectiveness of flood risk reduction strategies implemented either downstream in the Eastwick community or across the entire Darby-Cobbs Watershed.

The first project, "Compound Fluvial-Coastal Flood and Climate Adaptation: A Transferable Framework of Engagement, Modeling, and Cost-Benefit Analysis," was a collaboration between Stevens Institute of Technology, Drexel University, and the Philadelphia Water Department (PWD). The project was funded under the NOAA Coastal Ocean Climate Applications and Sectoral Applications Research Program and resulted in the development of three models that simulate and visualize watershed-scale dynamic streamflow, surface flooding in Eastwick due to both riverine and coastal impacts, and building spatial distribution and related information (e.g., demographic, occupancy type, and area). The interaction of these models has enabled the estimation of damages in the lower Darby-Cobbs Watershed due to climatic, land use, and stormwater management scenarios. The academic investigators used PWD data in the model development stage, and the PWD co-investigators facilitated collaboration and coordination with other City agencies and relevant stakeholders to ensure that the project would meaningfully inform the City's efforts to increase flood resilience in Eastwick.

Technical analyses were informed by community input—especially regarding the accuracy of preexisting flood data and the development of potential adaptation strategies. One example is a community-supported relocation concept that emerged from conversations with Eastwick United Community Development Corporation, a local community-based organization. The idea would set up a "land swap" to support the movement of the most vulnerable Eastwick residents to another higher elevation area in the community, reducing flood risk and keeping the community intact. Drexel modeled this idea alongside existing options, like a US Army Corps of Engineers levee, to protect some of the most flood-prone portions of the neighborhood.

The second project, "Connecting Upstream and Downstream Communities: A Methodology to Collaboratively Build Resilience in the Darby-Cobbs Watershed, Pennsylvania," is a collaboration between researchers at Drexel University, the Water Center at the University of Pennsylvania, and CUNY Hunter College, constituting the Resilient Darby-Cobbs project team. The team is working with watershed stakeholders to co-develop a system dynamics model that represents the acute and chronic stressors faced by watershed communities to enhance climate adaptation capacity and develop a preliminary adaptation plan for the Darby-Cobbs watershed. This model serves as a foundational research tool and provides capacity-building experience for watershed stakeholders through the creation of both a multi-stakeholder Watershed Partners Team (WPT) and a community-based Watershed Adaptation Corps (WAC).

Drexel will share the results of the completed flood risk system dynamics model at the seventh and final WPT meeting in 2024. WAC members were recruited from communities throughout the watershed, trained to conduct community interviews and surveys and understand the landscape of local stormwater management, and paid to help gather physical, socioeconomic, and ecological data to inform the development of the modeling tool. Their work also included meetings with representatives of all upstream municipalities to identify current green infrastructure implementation plans. In many communities, WAC members were the face of the Resilient Darby-Cobbs project who in turn helped to validate the system dynamics model results and shaped the adaptation alternatives that Drexel modeled and evaluated.

Throughout both projects, community members came to view the academic team as an unbiased group that worked for and with them to support communications with local government officials (including PWD), increase their technical capacity, and provide them with the information needed for flood risk mitigation and climate adaptation advocacy. As a result, community members now feel empowered to effectively participate in conversations with city, state, and federal agencies. Drexel's involvement in both projects also facilitated broad coordination of technical and planning work. Data collected through the second project, Resilient Darby-Cobbs, has informed the simulation of watershed-based flood mitigation strategies—specifically green stormwater infrastructure—for both Darby-Cobbs watershed communities and communities engaged in Eastwick flood modeling through the first project. In turn, Philadelphia Water Department's partnership empowered Drexel and other academic partners to be effective technical intermediaries.

Insights

- **Universities can be an important intermediary for data-driven collaboration.** Their research and analysis can build technical capacity within communities to support resident-led advocacy and decision-making as well as align utilities and their communities around a common purpose. Additionally, they can facilitate representative community engagement that can withstand changes in leadership within community-based organizations and local government, including utilities. However, they are vulnerable to changes in funding availability.

- **Complex climate and flood issues call for watershed-scale solutions that rely on multi-jurisdictional coordination**. Coordination of multi-sector regional partnerships across a watershed is crucial for developing holistic and lasting solutions. By uniting various stakeholders, this collective approach can better position communities for grant funding resources to fulfill planning efforts, in collaboration with federal agencies and climate service providers.

- **The role of a water utility will vary depending on the situation, geographic scale of the solution, and climate risk.** Some climate risks and adaptation solutions may not be within a utility's power or mandate to address (e.g., levee construction to reduce riverine flooding risks), but the maintenance of relationships between the utility and its academic or community partners can provide opportunities for information sharing and collaboration that lead to more efficient and effective solutions.

Learn More

For more information about Philadelphia Water Department and this project, please contact Julia Rockwell, Philadelphia Water Department, at Julia.Rockwell@phila.gov, or Franco Montalto, Drexel University, at fam26@drexel.edu.

Additional Resources

Equitable Data

- **Actionable Intelligence for Social Policy (AISP) at the University of Pennsylvania's A Toolkit for Centering Racial Equity Throughout Data Integration (2020).** This toolkit includes activity sheets, examples of best practices from organizations across the country, and breaks down both positive and problematic practices across the data lifecycle.

- **Urban Institute's Elevate Data for Equity Project.** This project provides resources and tools for philanthropy, researcher, nonprofit, and local government investment in data capacity and equitable data practices.

- **Bentley-Edwards et al.'s, "The 5Ws of Racial Equity in Research: A Framework for Applying a Racial Equity Lens Throughout the Research Process" (2022).** This journal article lays out the 5Ws of Racial Equity in Research—who, what, when, where, and why—and includes useful questions to ask at each stage.

Data and Community Engagement

- **Duke University Medical Center Library & Archives' A Researcher's Guide to Community Engaged Research: What is CEnR?** This database, organized by the Duke University Clinical and Translational Science Institute's Community Engaged Research Initiative, includes a helpful glossary, continuum of engagement possibilities, and principles of community engagement—all centered around the topic of community-engaged research.

- **US EPA's Policy Guidelines and Checklist for EPA Participatory Science Projects (2023).** These guidelines were created for use by EPA staff to reference related project guidelines and outline industry best practices. Also reference the Participatory Science at EPA StoryMap, which describes terms and includes spotlights of related projects across the country.

Indigenous Data Sovereignty and Data Governance

- **Collaboratory for Indigenous Data Governance's Indigenous Data Sovereignty Networks.** This page lists a variety of Indigenous data sovereignty groups. The Collaboratory for Indigenous Data Governance is a resource for research and policies related to Indigenous data sovereignty.

- **Global Indigenous Data Alliance.** This international network is devoted to advancing Indigenous people's rights through data sovereignty and governance.

- **University of Arizona's Native Nations Institute, Indigenous Data Sovereignty & Governance home page.** Their policy brief, "Supporting Tribal Data Governance for Indigenous Community Climate Resilience," describes concerns and provides policy recommendations related to data governance and climate resilience in Southwest Indigenous communities.

Notes

1 Nardone et al., "Redlines and Greenspace: The relationship between historical redlining and 2010 greenspace across the United States," *Environmental Health Perspectives* 129, 1 (2021): https://doi.org/10.1289/EHP7495.

2 Wing, Lehman, Bates et al, "Inequitable Patterns of US Flood Risk in the Anthropocene," *Nature Climate Change* 12 (2022): 156-162, https://doi.org/10.1038/s41558-021-01265-6.

3 Hoffman et al., "Racial bias in pain assessment and treatment recommendations, and false beliefs about biological differences between blacks and whites," *Proceedings of the National Academic of Science USA* 113, 16 (2016): 4296-430, https://doi.org/10.1073/pnas.1516047113.

4 Rainie, et al., "Data as a Strategic Resource: Self-Determination, Governance, and the Data Challenge for Indigenous Nations in the United States," *The International Indigenous Policy Journal* 8, 2 (2017): 1-29, https://doi.org/10.18584/iipj.2017.8.2.1.

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