

PLANTING WITH PURPOSE:

**10 x 10,000 Trees for a
More Resilient Pittsburgh**

“Public investments and stewardship of the urban forest produce benefits that far outweigh the costs...investing in Pittsburgh’s green infrastructure makes sense economically, environmentally, and socially.”

- Pittsburgh Urban Forest Master Plan

In 2018, with the publication of its Climate Action Plan 3.0, the City of Pittsburgh made a commitment to expanding its urban canopy but has yet to realize this vision with a coordinated program. Historically, because of budget constraints, Pittsburgh has used a by-request approach to planting trees both in the right-of-way (ROW) and on private property. This ad hoc strategy, combined with historic disinvestment due to discriminatory practices like redlining, has resulted in an uneven canopy and, in some cases, a lack of trees where they are needed most. Without a strategic approach to distributing new trees, Pittsburgh is leaving on the table significant tree-related benefits that can help the City mitigate worsening climate risks including extreme heat and flooding.

In a collaborative effort spanning 2024-2025, the City of Pittsburgh’s Department of City Planning, Forestry Division, and Department of Innovation and Performance partnered with Tree Pittsburgh, The Congress of Neighboring Communities, and Resilient Cities Catalyst to develop a data-driven approach for prioritizing an expanded urban tree planting program. This proposal outlines a plan to plant 100,000 trees over 10 years through the **10 x 10,000 program** and establishes **Tree Impact Zones (TIZ)** which represent the highest-impact places for planting trees. The TIZ system incorporates climate risk data by parcel for heat and flooding (pluvial and riverine), social vulnerability indices, and proximity to public schools to prioritize each parcel in the city into one of six zones (TIZ 1-6). The TIZ system is designed to provide Pittsburgh with a replicable framework to leverage urban forestry to help neighborhoods navigate the changing climate while addressing patterns of historical disinvestment.

As part of the project, the City of Pittsburgh purchased climate risk data from First Street Foundation that provides property-level climate risk scores for different threats including flooding, extreme heat, and air quality. The First Street data goes beyond simply scoring different climate risks—it provides dynamic, forward-looking modeling that helps assess both present and future climate-related vulnerabilities. By incorporating projections for flooding probability, extreme heat events, cooling costs, and flood-related repair costs, the dataset not only identifies at-risk areas but also quantifies the financial and infrastructural impacts if no action is taken. The data’s use cases are many: planning tree planting efforts is just one way that the City can leverage First Street’s models.

The following report outlines how this data-driven approach was developed, details the Tree Impact Zone methodology, and presents a strategic framework for implementing the 10 x 10,000 program across Pittsburgh’s diverse neighborhoods to address both climate resilience and historic inequities in the urban canopy.

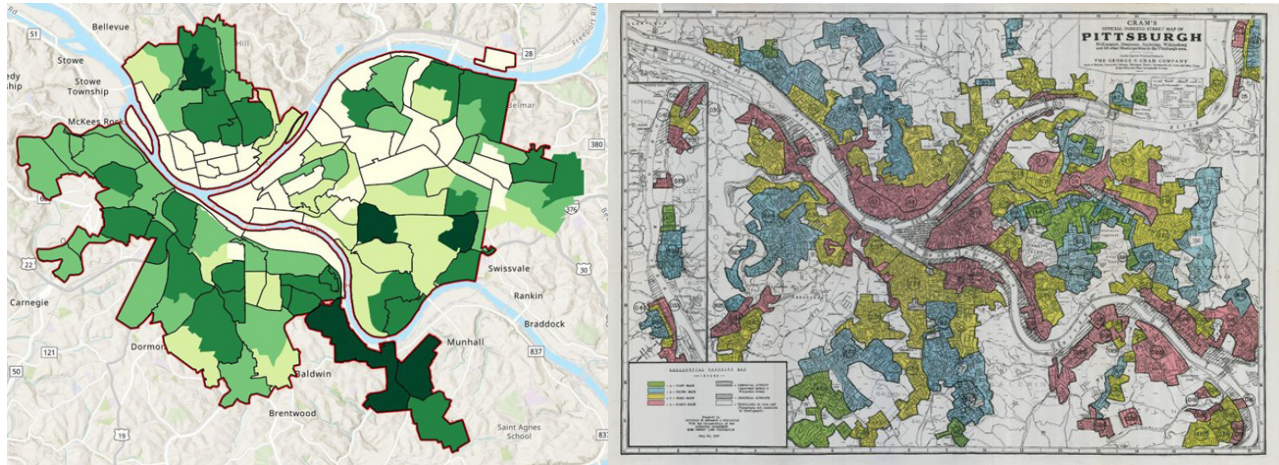


Figure 1: (left) Tree canopy coverage map by census block, (right) 1937 City of Pittsburgh redlining map courtesy of [Mapping Inequality](#).

BOX 1

ABOUT THE PROJECT

Beginning in 2023, the City of Pittsburgh partnered with Resilient Cities Catalyst, a New York-based nonprofit, to develop a data-driven, replicable approach for urban forest management that advances the city's Climate Action Plan Urban Canopy goals. The project, funded by Google.org via ICLEI USA's Climate Action Fund, sought to focus Pittsburgh's urban canopy investments such that they could achieve multiple co-benefits, preparing climate-vulnerable neighborhoods to manage risk while offsetting carbon emissions and reducing energy consumption. As part of the project, the City acquired best-in-class data sets, including climate risk data from First Street Foundation, which is already being used to help target planting efforts towards areas where trees will provide the greatest climate resilience benefits to the city.



**RESILIENT
CITIES
CATALYST**



With grant support from
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10 x 10,000: Investing in Pittsburgh's Future

To capitalize on trees as key components of the City's critical infrastructure and protect vulnerable populations from increasing climate threats, Pittsburgh must build out its urban forestry program to include significantly more planting and dedicated funding for proactive maintenance. The 10 x 10,000 Program is a proposal to achieve this: committing Pittsburgh to planting 100,000 trees at a cost of \$50 million (see Table 1) over the next 10 years. This investment would plant 10,000 off-street trees in each of the City's nine council districts and 10,000 ROW trees along streets citywide as well as dedicating funds to operations and maintenance. Within each council district and in the ROW, tree planting could be prioritized according to the City's values, with more trees going to the areas facing the greatest climate risk, areas with high levels of socioeconomic need, and areas where vulnerable populations gather, such as around schools.

Table 1: 10 x 10,000 Program Budget Breakdown				
	Total Number of Trees Over 10 years	Price Per Tree	Cost Over 10 years	Cost Per Year
Off Street Trees	90,000	\$250	\$22,500,000	\$2,250,000
Right of Way	10,000	\$1,750	\$17,500,000	\$1,750,000
Operations and Maintenance			\$10,000,000	\$1,000,000
			Total Program Cost Annually	\$5,000,000
			Total Program Cost Over 10 Years	\$50,000,000

By making this investment now, Pittsburgh will reap significant benefits over the next 15-30+ years in terms of reduced energy costs, improved public health, enhanced property values, and greater climate resilience. In comparison, the risk of taking no action is immense. The First Street Foundation modeled costs of cooling and flood repair if Pittsburgh does not take mitigating action are outlined in Table 2. There is not a 1:1 relationship between planting trees and reducing these costs. However, the astronomical expected costs for the City demonstrate the need to invest in solutions, like tree planting, that mitigate the impact of climate-related events.

Table 2: Projected cooling and flood damage repair costs based on First Street Foundation data		
Council District	Total Projected Cooling Costs for Years 20–30 in First Street Foundation Model	Total Projected Repair Costs for Flood Damage (Based on a 20-Year Flooding Event Over the Next 30 Years)
CD 1	\$29,556,660	\$395,827,931
CD 2	\$31,315,020	\$114,597,235
CD 3	\$28,788,730	\$102,193,376
CD 4	\$27,259,310	\$32,414,714
CD 5	\$31,646,170	\$100,895,682
CD 6	\$22,738,840	\$131,589,275
CD 7	\$30,584,060	\$160,200,756
CD 8	\$25,463,550	\$21,214,529
CD 9	\$31,362,580	\$39,399,102
Total Projected Cost	\$258,714,920	\$1,098,332,600

The 10 x 10,000 Program could help to offset some of these costs. Moreover, backed by appropriate levels of staffing and funding for maintenance, updating municipal code language around trees, expanding partnerships, and implementing an improved standard operating procedure, the program could lay the groundwork for a more safe, welcoming, and thriving Pittsburgh for generations to come.

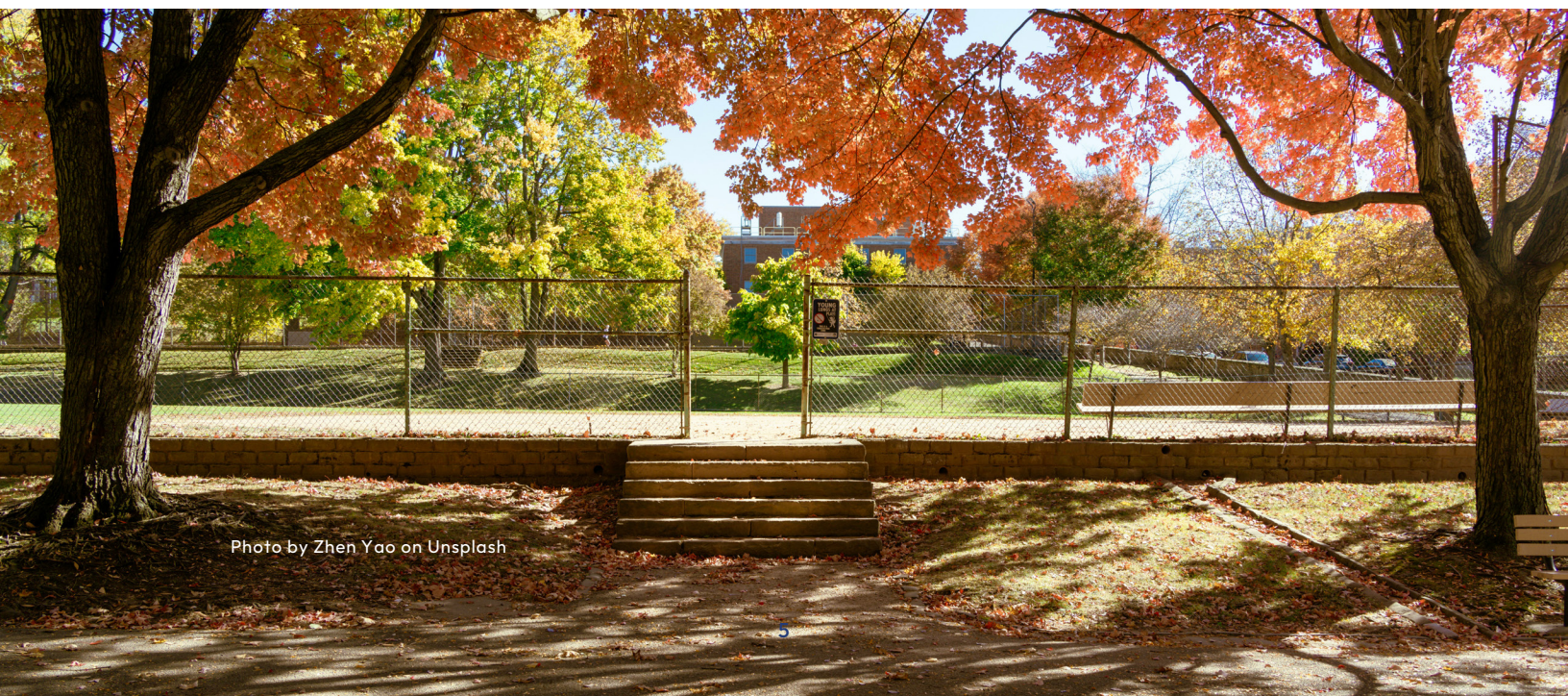


Photo by Zhen Yao on Unsplash



Using Data to Maximize the Impact of 100,000 Trees

Pittsburgh has made clear through their approach to the Pittsburgh 2050 Comprehensive Planning process that the City wants to take strides towards a more equitable, climate resilient future. Tree planting is a key strategy to achieve these goals, but it requires an understanding of the risks and inequalities residents face to prioritize effectively. To understand and map these factors, the City of Pittsburgh worked with Resilient Cities Catalyst to source and employ relevant datasets.

The first dataset the team employed was the [First Street Foundation](#) property-level climate risk data—specifically the heat risk and riverine flood risk scores. In addition to First Street data, the team incorporated [Historic Streams](#) data which maps streams that have been culverted or buried to approximate areas of the City that are likely to flood during extreme rainfall events.

The [Allegheny County Community Need Index \(CNI\)](#) was also identified as a useful dataset to pair with climate risk in order to approximate communities that may have a higher level of social vulnerability to climate and environmental risks. The concept of social vulnerability recognizes that though individuals or communities may be exposed to a similar level of climate or environmental risk, their sensitivity to the risk factors depends on their access to resources that helps them adapt to and recover from events like floods or heat waves—i.e. access to healthcare, insurance, emergency communications, transportation, air conditioners, etc. Many of the CNI tracts overlap with areas historically impacted by discriminatory redlining practices, so including this data set represents a pathway to repair past harms in alignment with strategic focus area #1 of the Just Transition Strategy Framework for the City’s Comprehensive Plan.

School location data was also sourced for use in the system of prioritization. The locations of schools were included for two reasons. The first is that [research](#) has [shown](#) that children are more vulnerable to climate-related and environmental risks such as extreme heat and air pollution, making them a critical population to protect as climate impacts worsen. The second is that the City of Pittsburgh is committed to efforts to make schools and the areas around them safer for children through its [Safe Routes to Schools](#) Program. Although this program focuses on traffic safety and walkability, and [evidence suggests](#) trees can contribute to traffic calming, it may be worthwhile to expand the goals of the Safe Routes to Schools program to understand climate risk as a danger students face on and en route to their school campuses. Ensuring that children are protected from climate risks will be increasingly important in the coming years. Beginning a program now that encourages planting near schools will help safeguard both today’s and tomorrow’s children from the threats of climate change.

Leveraging Tree Impact Zones for Tree Planting

The City of Pittsburgh and Resilient Cities Catalyst used the data on climate risks, community need, and locations of schools to identify Tree Impact Zones: prioritized areas for tree planting that maximize climate resilience benefits for vulnerable communities. The zones were created using GIS technology for spatial analysis and Microsoft Access for data aggregation (more detailed methodology can be found in the Appendix).

TREE IMPACT ZONES (TIZ)

TIZ are priority areas for tree planting based on climate risk factors, social vulnerability, and proximity to public schools

KEY DATA LAYERS



Climate Risk Data

First Street Foundation



Social Vulnerability

Allegheny County
Community Need Index



School Locations

1/2 mile walking
to/from schools

To map the TIZs, each parcel in the City of Pittsburgh was assigned a TIZ score between 1 and 6 according to the conditions outlined in Table 3.

Table 3: Tree Impact Zones Methodology					
Tree Impact Zone	Heat First Street Foundation	Rainfall Flood Risk parcels intersecting historic streams	High Community Need Allegheny County Community Need Index	Near to School 0.5 miles	Riverine Flood Risk First Street Foundation
TIZ 1					
TIZ 2					
TIZ 3					
TIZ 4					
TIZ 5					
TIZ 6	Remaining Parcels Not Meeting Above Conditions				

The resulting map (Figure 2) displays the results of the Tree Impact Zone (TIZ) analysis, illustrating priority areas for tree planting efforts. The darker the color (purple), the higher the priority, as these parcels face multiple overlapping risk factors and are home to vulnerable populations. In contrast, TIZ 6 is highlighted in yellow, representing areas with a lower priority level for tree planting.

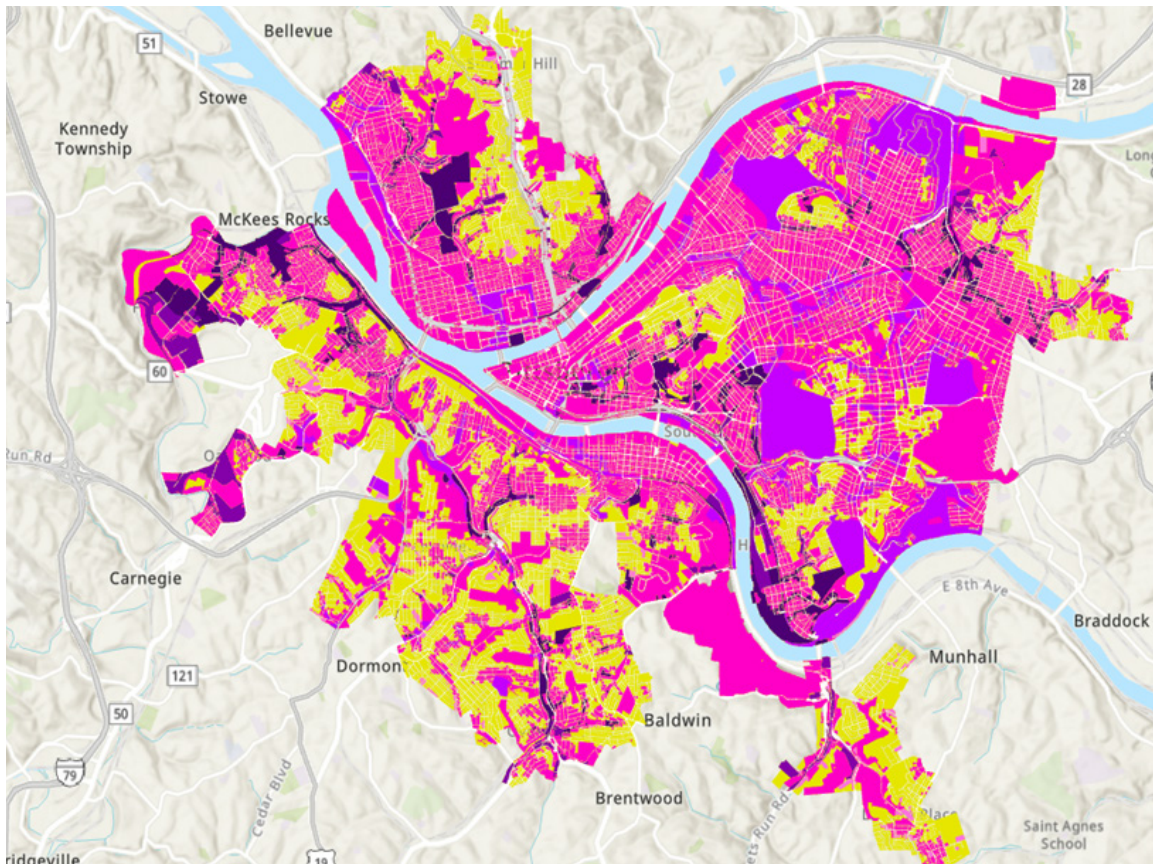


Figure 2: Map of Tree Impact Zones 1-6

A table outlining the number of properties in each TIZ in each council district is shown below, demonstrating that there are high priority parcels in each of the city's nine council districts. In fact, more than **98,000 parcels in the City of Pittsburgh fall in TIZs 1-5**. In each TIZ column, the three council districts with the most parcels in that zone were highlighted for better visibility. If Pittsburgh commits to planting additional trees across the Council Districts, through a program like 10 x 10,000, each district could use the TIZ system to prioritize outreach and provide free trees and planting support to residents and other property owners where they are needed most. Property owners may be more likely to have interest in planting trees if they understand that their property has been identified as having high potential for tree impact.

Table 4: Parcels in TIZ 1-5 by Council District						
Council District 01236 (CD)	TIZ 1 Heat, Historic Streams, CNI, Schools	TIZ 2 Heat, Historic Streams, CNI	TIZ 3 Heat, Air, Historic Streams	TIZ 4 Heat OR Historic Streams	TIZ 5 Riverine Flood	Total Number of Properties per Council District
CD 1	328 (9%)	269 (15%)	179 (4%)	11,017 (13%)	281 (13%)	16,251
CD 2	315 (8%)	394 (22%)	363 (9%)	9,579 (11%)	408 (19%)	18,738
CD 3	260 (7%)	160 (9%)	300 (7%)	10,807 (12%)	215 (10%)	16,649
CD 4	294 (8%)	138 (8%)	157 (4%)	4,530 (5%)	450 (21%)	17,507
CD 5	360 (10%)	215 (12%)	905 (22%)	8,637 (10%)	284 (13%)	16,221
CD 6	737 (20%)	281 (16%)	80 (2%)	9,587 (11%)	232 (11%)	15,334
CD 7	7 (1%)	0	868 (21%)	13,467 (15%)	4 (1%)	15,011
CD 8	22 (2%)	0	830 (20%)	6,350 (7%)	40 (2%)	7,945
CD 9	1,298 (35%)	337 (19%)	473 (11%)	12,996 (15%)	249 (12%)	18,772
Total Number of Properties per TIZ	3,621	1,794	4,155	86,970	2,163	142,248

Parcels in priority TIZs can be cross-referenced with tree potential (Figure 3)—an estimate which approximates the number of trees that could be planted on that parcel taking into consideration where existing trees and buildings are located—and census block data on tree canopy coverage. According to the tree potential estimate, there is room for more than **660,000 additional trees in the City of Pittsburgh**. By overlaying tree potential with the TIZ map, the City can identify specific parcels within high-priority zones that offer the greatest opportunity for new tree planting. In doing so, the City can begin to understand where there is opportunity for adding trees to get the highest return on investment. Given that the benefits of trees amplify significantly as trees mature, planting in the highest priority areas first is key to ensuring vulnerable communities are protected as the climate changes.

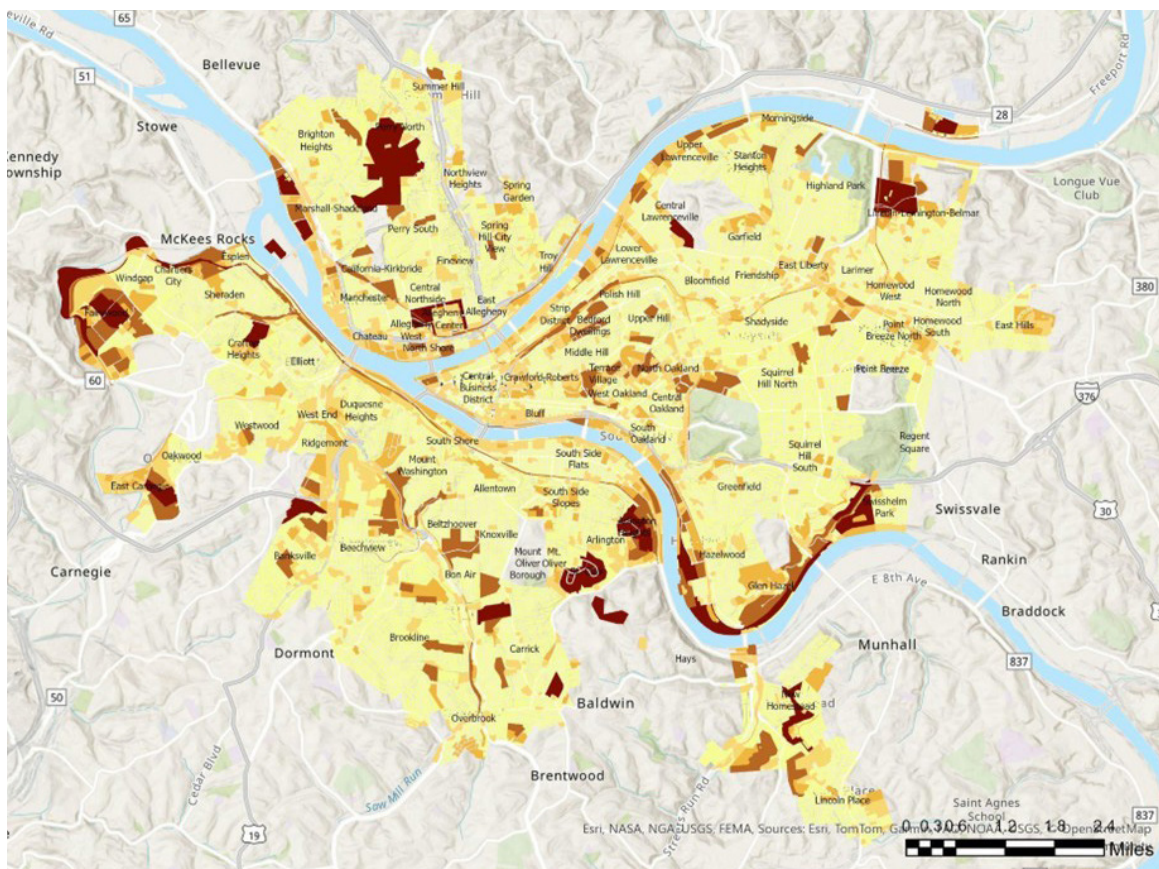


Figure 3: Map of Tree Potential by Parcel (Count)

1-31 32-138 139-351 352-1002 1003-2363

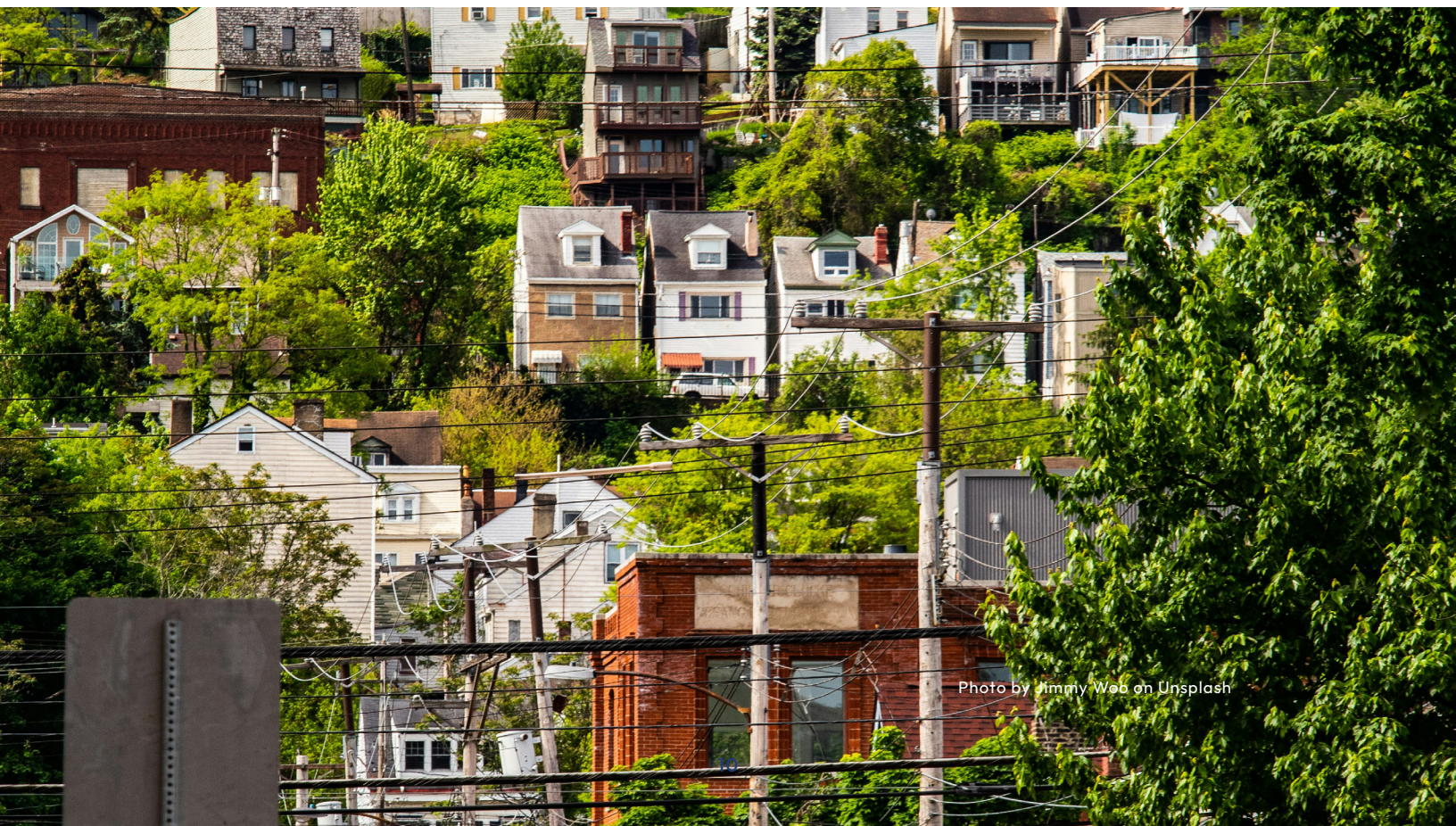


Photo by Jimmy Webb on Unsplash

Piloting the TIZ Approach

Through the ICLEI-USA Climate Action Fund Grant, the City of Pittsburgh is working with Resilient Cities Catalyst to pilot the TIZ approach for a tree planting in the Homewood neighborhood of Pittsburgh which is set to take place in Fall 2025. Homewood has a large number of parcels that fall into the TIZ 1 category, meaning they have high heat and rainfall flooding risk, have a high level of community need according to the CNL, and are located within a half mile of a school. The pilot planting will experiment with innovative outreach methods to meet the challenge of residents' apprehensive attitudes towards planting trees on or near their properties, an element that is key to unlocking the potential for an expanded urban forestry program in the City of Pittsburgh and which requires additional investment.

As the Homewood pilot demonstrates, this framework can be immediately operationalized to guide outreach and planting efforts in the highest-priority zones. By adopting this strategic approach to urban forestry, Pittsburgh would position itself at the forefront of climate-resilient urban planning. The Tree Impact Zone methodology enables the city to maximize the return on its proposed \$50 million investment in the 10 x 10,000 program. It can be used flexibly across all nine of the City's council districts, allowing local priorities to inform planting decisions while maintaining a focus on evidence-based decision-making. Rather than simply increasing canopy coverage, this approach ensures that new trees serve as critical green infrastructure—reducing flooding in vulnerable neighborhoods, mitigating heat islands, improving air quality, and protecting Pittsburgh's most vulnerable residents.



Figure 4: Photos from early pilots of data-driven tree planting in Pittsburgh.



Appendix

Tree Opportunity Map Methodology:

To help visualize the opportunity for trees (where trees could be planted), the City's data team produced parcel-level geospatial data that showed the percentage of specific parcels that are covered by canopy, the site of a building or other built structure, or "empty" (where empty refers to space that is neither tree or building). The Team at Resilient Cities Catalyst was able to further manipulate the data to create an estimated "tree potential" score for each parcel, estimating the number of trees that could be planted on the parcel based on the amount of empty space. This allowed the project team to create a very different map that showed not where trees already are, but where trees could be. It should be noted that the emptiness of a parcel is not a perfect proxy for opportunity for urban forestry, but is a useful first step in identifying potential planting locations.

Tree Impact Zone Methodology:

To identify Tree Impact Zones (TIZs), the team utilized GIS technology for spatial analysis and Microsoft Access for data aggregation in order to accurately determine the total number of Tree Impact Zones parcels by Council District.

Data Preparation: Using ArcGIS, the team first analyzed Climate Risk layers from First Street to select zones with high climate risk scores. Since the climate risk data was provided in CSV format, we assigned XY coordinates to each point and performed a Spatial Join to link each climate risk point to its corresponding parcel number. We then extracted all parcels with a climate risk factor higher than 3, filtering out those with minimal risk impact. Next, we prepared additional data layers, including the Community Need Index (CNI) layer, which identified Pittsburgh neighborhoods with a moderate to high "need" score. We also developed a schools buffer layer by removing Pittsburgh public schools that were planned for closure and creating a 0.5-mile buffer around each remaining school, as this distance represents a reasonable walking threshold. Additionally, we generated a Parcel Tree Potential Layer to assess the potential for tree planting across all parcels in Pittsburgh, regardless of property classification. We made sure to join the parcel layers to the Council District layers to ensure that each parcel record has a corresponding Council District identification.

Identifying the Tree Impact Zones parcels by Council District: Once all layers were prepared, we identified the different Tree Impact Zones categories. Tree Impact Zone 1 included parcels that met all the conditions: high heat risk, high pluvial flood risk, location within the 0.5-mile school buffer, and placement in a high-need CNI area. These parcels were identified using the Intersect tool, which overlaid and highlighted all the intersect parcels from the different datasets.

Tree Impact Zone 2 was identified using the same process as Tree Impact Zone 1 but without the school buffer layer. To ensure distinct categorization, all parcels that fell within Tree Impact Zone 1 were removed from Tree Impact Zone 2 using the Erase tool.

Tree Impact Zone 3 includes parcels that are exposed to high heat risk and high pluvial flood risk. However, any parcels that were already classified under Tree Impact Zone 1 or Tree Impact Zone 2 were excluded from this category.

Tree Impact Zone 4 was created by identifying parcels that had high heat risk OR high pluvial flood risk. All parcels previously classified under Tree Impact Zone 1, Tree Impact Zone 2, and Tree Impact Zone 3 were removed from Tree Impact Zone 4 to avoid duplication.

Tree Impact Zone 5 was identified by using the First Street flood data, focusing solely on parcels within a high riverine flooding risk zone. To ensure accuracy, all parcels associated with other climate risk factors were removed, retaining only those classified under high flood risk.

Tree Impact Zone 6 represents all remaining parcels that do not fall under Tree Impact Zone 1 to 5. To identify these parcels, all six Tree Impact Zone layers were merged into a single layer and then removed from the City of Pittsburgh parcel layer, leaving only the “everything else” parcels that were not classified under any previous Tree Impact Zone categories.

Data Aggregation in Microsoft Access: After visually identifying the locations of all Tree Impact Zones by Council District, we imported each Tree Impact Zone layer into Microsoft Access for precise data organization. By applying coding formulas, we accurately determined the number of Tree Impact Zones by Council District and property classification. This allowed us to categorize parcels by type—Residential, Industrial, Commercial, and Government—within each zone and Council District. Additionally, we integrated the Tree Potential data into the table, providing insight into the planting capacity for each property classification.