ESG^P Scoring Methods

Introduction

The ESG^P tool provides place-based metrics that can be directly tied to corporate Environmental, Social, and Governance (ESG) strategies and initiatives. Northeast Ohio aims to provide companies with data and analysis that can be linked to their ESG goals. The ESG^P tool analyzes sites in Northeast Ohio based on metrics of Access to Talent, Racial Equity and Commuter Emissions. A user may enter up to 5 site addresses and the tool shows the scores of the sites in the context of all the scores in Northeast Ohio.

This document provides a technical explanation of the data and methods used to provide scores on these factors for each site. The counties[1] covered in the tool are shown in the map below.

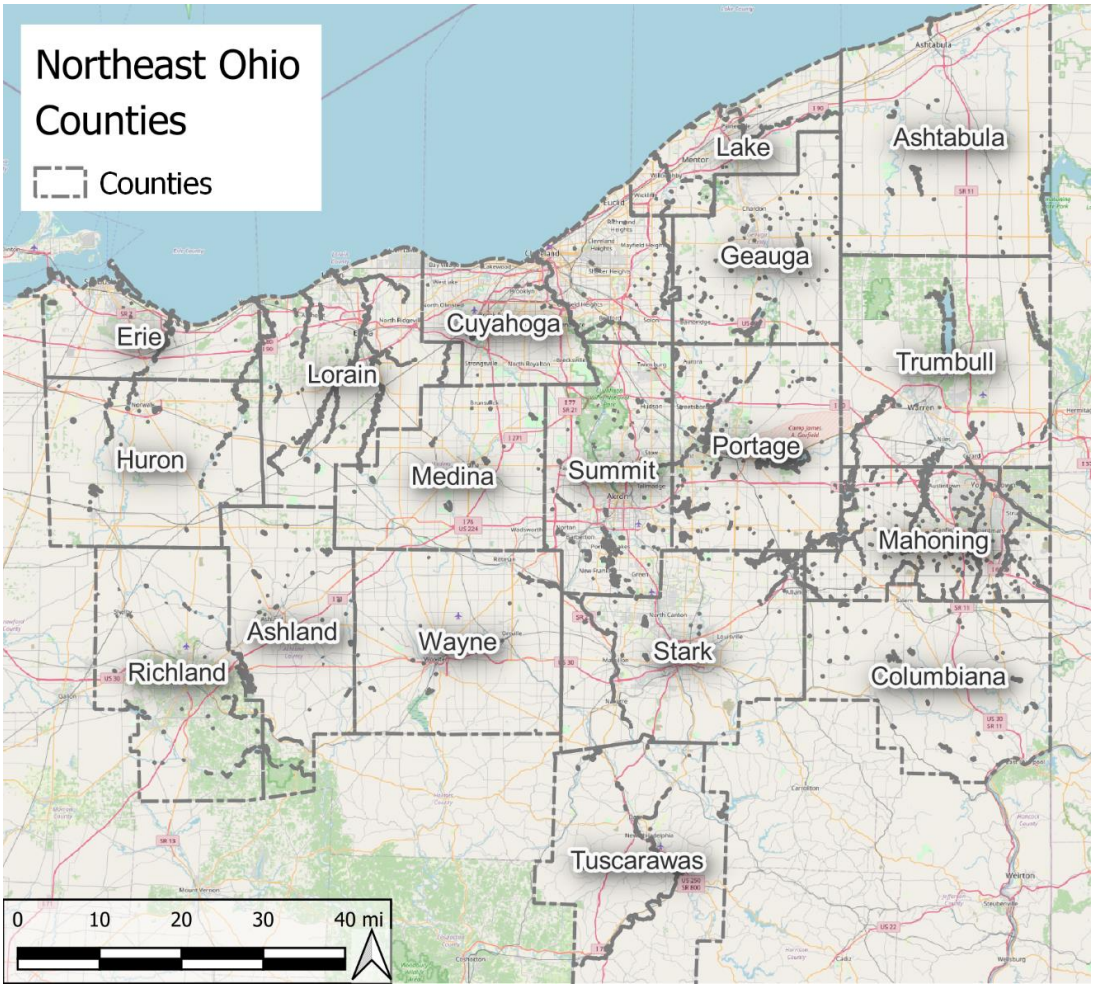

Figure 1: Counties Included

[1] Ashland, Ashtabula, Columbiana, Cuyahoga, Erie, Geauga, Huron, Lake, Lorain, Mahoning, Medina, Portage, Richland, Stark, Summit, Trumbull, Tuscarawas, Wayne

Commute Sheds

Given that the ESG^P tool is driven by who can access a given site and how they will commute to that location, the first step is to define the area that can be accessed in a fixed time by various modes of transportation. These areas, or "commute sheds," have been developed for the center point of the 3,532 Census Block Groups in the 18 northeastern Ohio counties. The commute time used is 30 minutes. Zoom Prospector's API was used to estimate the driving, walking and biking commute and the Center for Neighborhood Technology's (CNT's) AllTransit database's transit commute shed was used for the transit mode.

Driving

Zoom Prospector, a tool developed by GIS Planning, generates a commute shed for a site location for driving through an API (application programming interface) that returns a GIS shape as GeoJSON. This API was applied to the centroid of each block group for a morning commute time (specifically October 1st, 2021, at 8:00 am[2]). As an example, the following map shows the driving commute shed for Census Block Group 390351077011 in downtown Cleveland, containing Public Square, Tower City etc. This geographic shape is different for every location in the region and the tool uses location-specific information in its analysis.

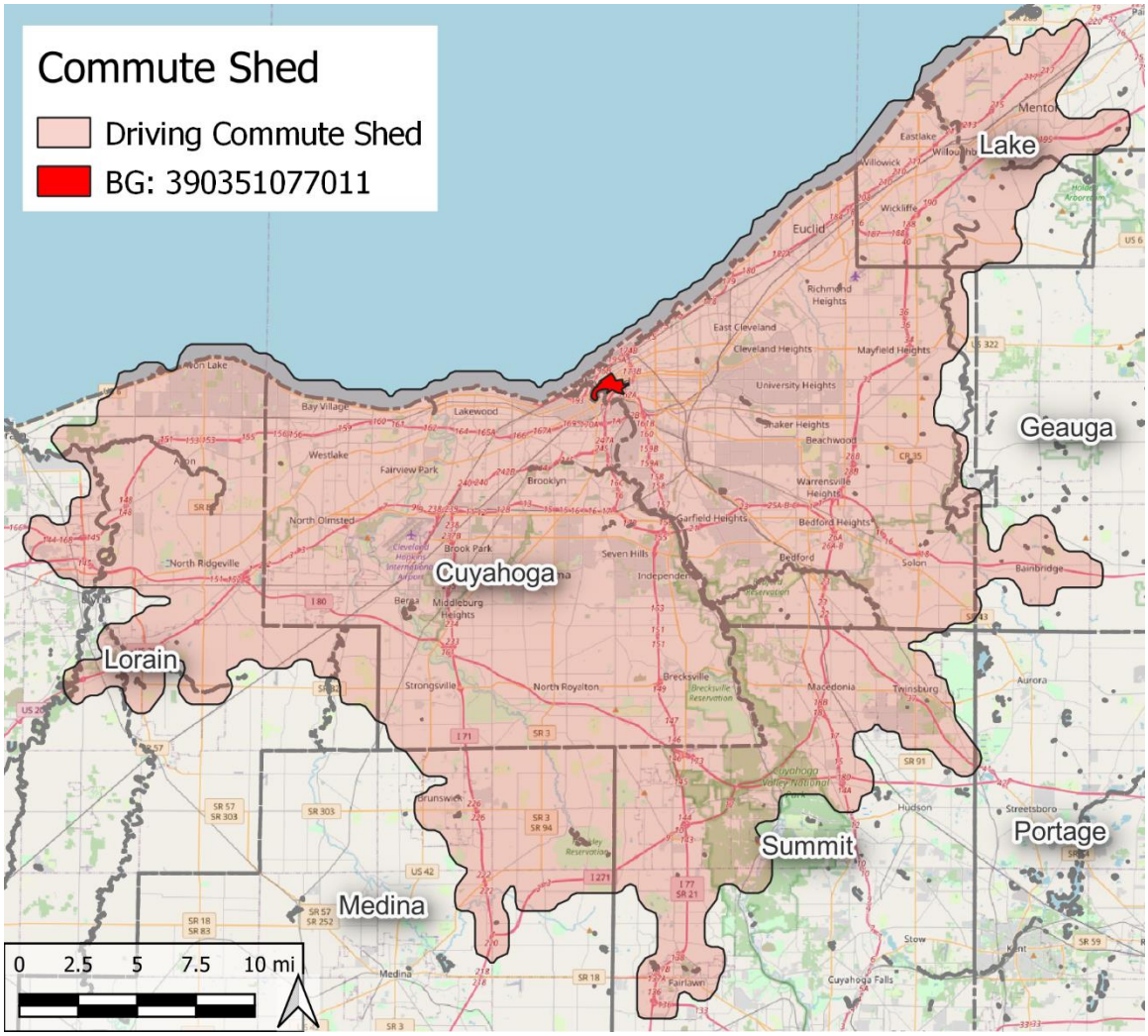

Figure 2: Driving Commute Shed Example

[2] The API call used for the centroid's latitude and longitude (lat/long) for the car commute: "https://properties.zoomprospector.com/api/report/country/1/report-type/2/drivetime/30/"+str(lat)+"/"+str(long)+"?dtClient=3&dtMode=car&dtDirection=destination&dtDepartureTime=Fri Oct 01 2021 08:30:30 GMT-0500 (Eastern Daylight Time)"

Walking

Using the same API but changing the mode from “car” to “pedestrian” gives the walking commute shed. Note that this commute shed avoids limited access highways and other unsafe walking environments. The following map shows the walking commute shed for the same Census Block Group in downtown Cleveland.

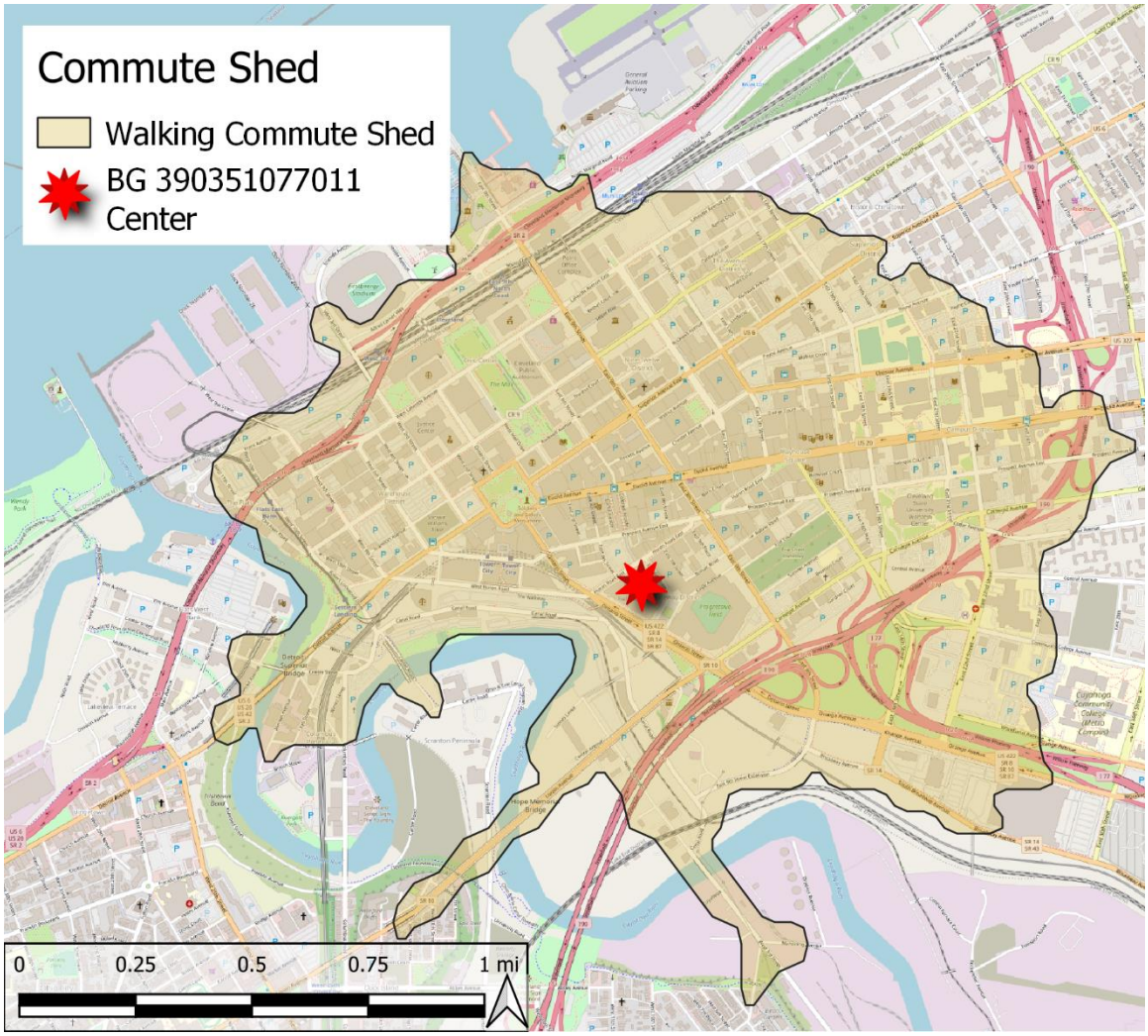

Figure 3: Walking Commute Shed Example

Biking

There is not a biking mode available for the API and since bike commuters, like walking commuters, cannot use limited access highways etc., a biking commute shed was estimated by using a longer walking commute shed. Given that walking speed is approximately 3 miles per hour, and a typical biking speed is 12 miles per hour, the API "drivetime" (really walking time but that is what the API calls it) was changed to 120 minutes (2 hours) for an effective biking commute time of 30 minutes. The following map shows the biking commute shed for the same Census Block Group in downtown Cleveland.

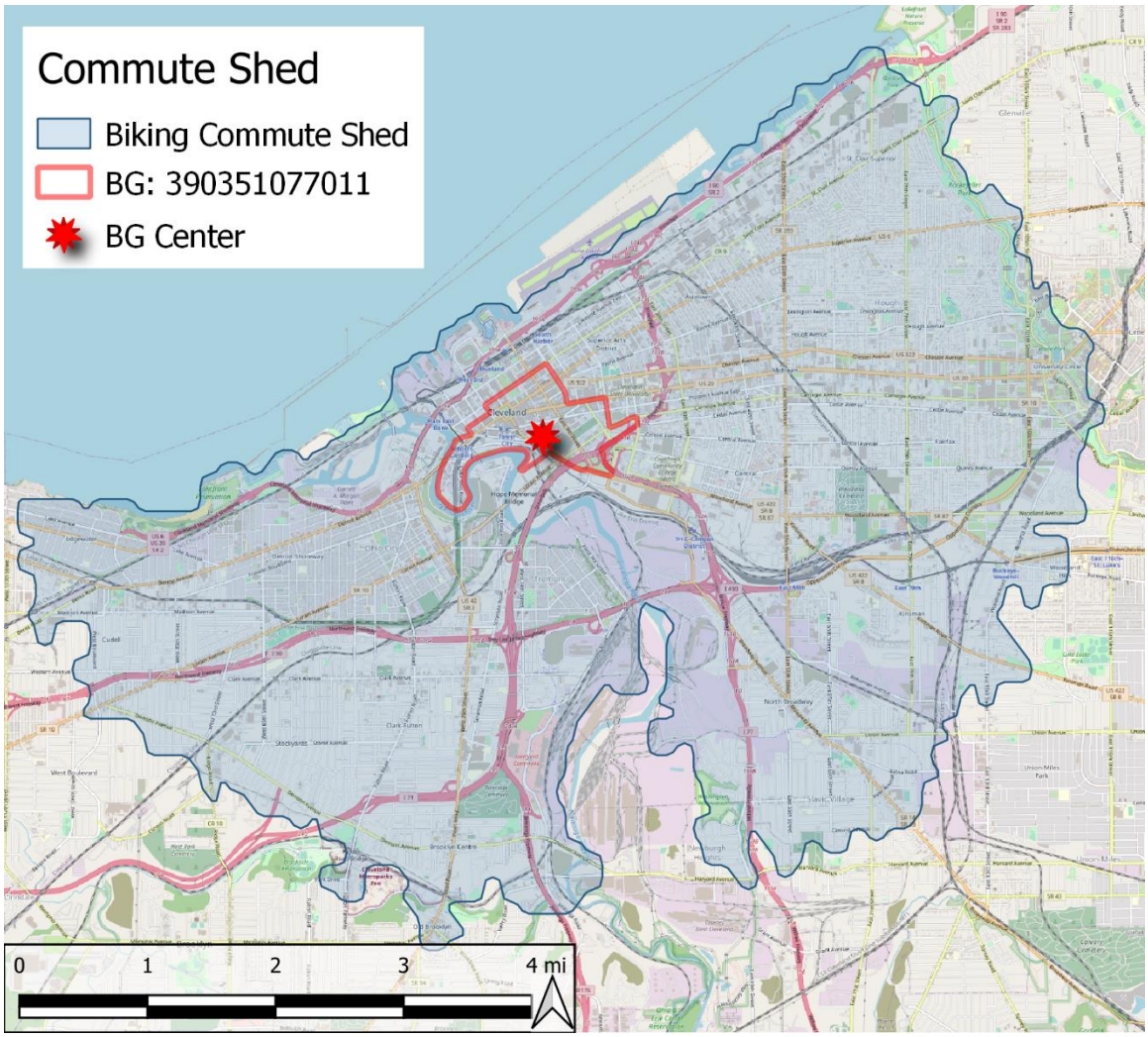

Figure 4: Biking Commute Shed Example

Transit

The AllTransit database has GTFS (General Transit Feed Specification) data for transit agencies throughout the U.S. These data allow for developing 30-minute transit sheds (with one transfer) for a given location. This is then used as the transit commute shed. The following map shows the transit commute shed for the same Census Block Group in downtown Cleveland.

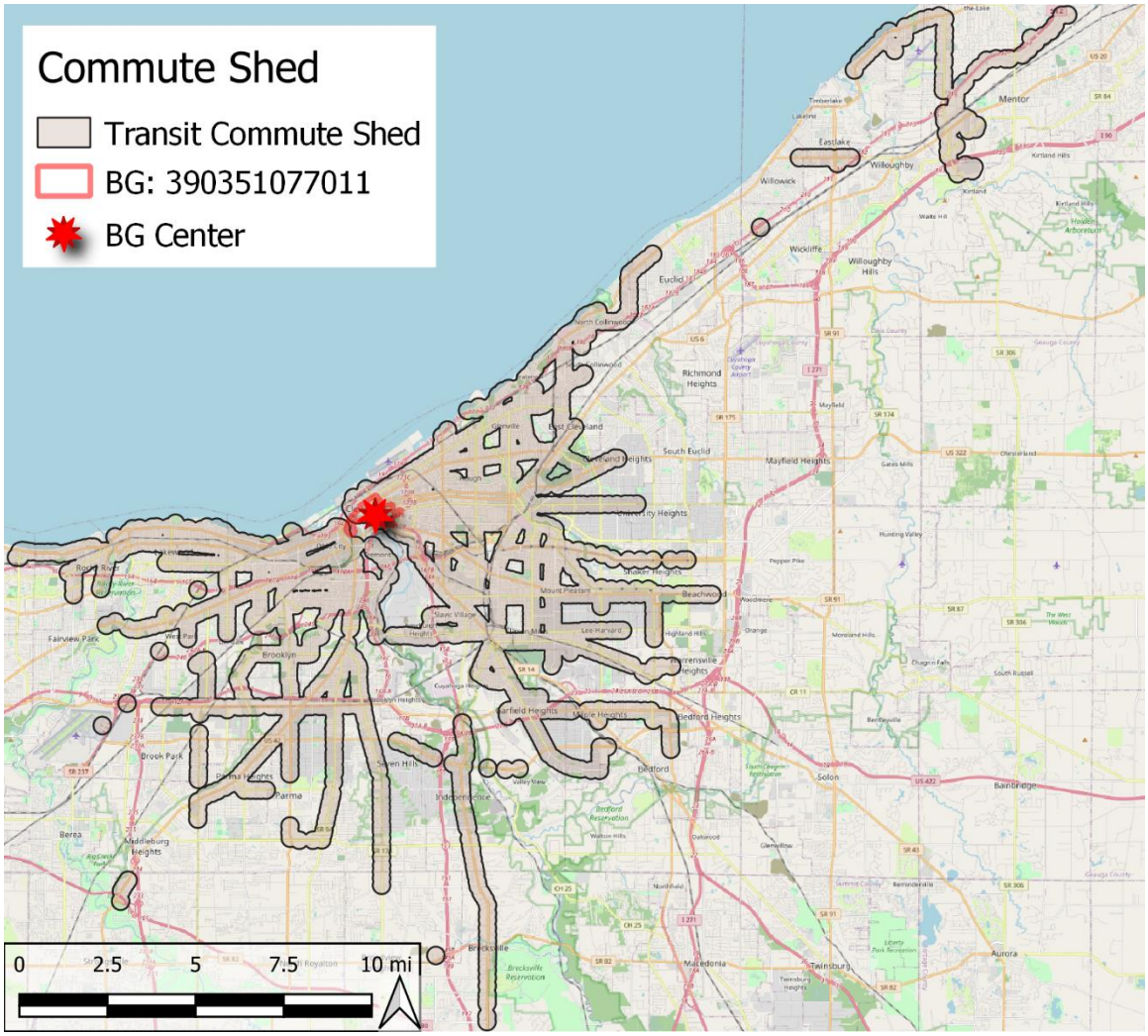

Figure 5: Transit Commute Shed Example

Variables

Information from the US Census American Community Survey (ACS) and other sources were collected at the Census Block Group (BG) level. These data are then aggregated to the commute shed for each BG centroid. This aggregation is simply a proportional sum of the various indicators listed below. The proportional sum uses the part of all the BGs that intersect the commute shed times the value of the indicator. For average and fractions/percentage this part is used as the weight for the weighted average.

ACS Data

The following table lists all the ACS variables that were collected to develop the various metrics used to compare locations. All data used in this tool were from the 2019 5-year estimates.

Table 1: ACS Variables

Variable (ACS title)	ACS Code	Description
population	B01003	Total population
Hispanic or Latino origin by race	B03002	These data are used for the Racial Equity Score. Latinx is not a race but since we want to use this as an indicator for people of color, Latinx workers are counted separately. The rest of the races are counted only for people who identify as non-Latinx. This is used to calculate the Black, Indigenous and people of color (BIPOC) population.
sex by work status in the past 12 months by usual hours worked per week in the past 12 months by weeks worked in the past 12 months for the population 16 to 64 years	B23022	These data are used for all the scores in calculating the number of working aged people. Using the total gives the population to only those of working age (16-64 years old). In the descriptions of the scores below (see Table 3, Table 4 and Table 5 below) where “Working-Age Population” is listed.
means of transportation to work	B08301	These data are used for all the scores in calculating the means of transportation of the workers who commute. The modes used are auto, transit, bicycle, and walking.

Table 1 above lists the various populations used to calculate the number of commuters by race/ethnicity and mode of commute, and since these are not given for working-age populations, the values were scaled by the number of working-age populations and the total population. To aggregate the data from the commute shed for the various working-age populations, the following equation was used:

$$T = \sum_{i=1}^{n} \frac{(f_i \times W_i \times D_i)}{Pop_i}$$

Equation 1: Proportional Sum of Working-age Population,

Scaled by Fraction of Population in each Demographic Cohort

Where T is the total for a given BG with the corresponding commute shed, n is the number of BGs intersecting the commute shed, f_i is the fraction of the BG in the commute shed, W_i is the number of

working-age people in the BG, D_i is the population in the demographic segment, and Pop_i is the total population in the BG. Note that for the "Access to Talent" score D_i is equal to Pop_i.

Other Variables

The various indicators used in developing the scores, that are not from the 2019 5-year average ACS data, are listed below:

Table 2: Other Variables

Variable	Description
Commute Cost	The commute costs calculation uses the IRS (Internal Revenue Service) 2021 standard of $0.56/mile for the auto commute and the cost of a local monthly transit pass where that is available. If the local transit provider does not have a monthly pass available, the one-way fare is used. When neither are available an established value of $3.17 /day is used for transit cost.
Walkscore	Walkscore is a statistic that has been calculated nationwide and is available through an API – see https://www.walkscore.com/ for details.
Bikescore	Bikescore is another statistic the is generated by the Walkscore.
Commuter Emissions--Auto	The commuter emissions calculation uses 0.39 kg carbon dioxide equivalent (CO_2e) per vehicle mile for personal vehicles (direct tailpipe greenhouse gas emissions only). See U.S. EPA (Environmental Protection Agency) for more information https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references
Commuter Emissions—Transit	The commuter emissions calculation uses 0.34 kg CO_2e per passenger mile for transit riders. This is equivalent to the emissions rate per passenger mile of the Greater Cleveland Regional Transit Authority in 2018 (greenhouse gas direct tailpipe and electricity generation emissions only). See https://www.trb.org/Main/Blurbs/181941.aspx

The number of workers by occupations (SOC) code, was not used in the scoring system, but is included on the ESG^P tool. The occupational data sourced from Emsi Burning Glass, 2021, and aggregated from U.S. Census Tracts to a 5-, 10- and 20-mile radius buffer of a site location by means of proportional sum (in this case the proportional sum is not scaled by population unlike in Equation 1 above) is calculated using the following equation:

$$T_o = \sum_{i=1}^{n} (f_i \times O_i)$$

Equation 2: Proportional Sum

Where T_o is the total of employees of each occupation type aggregated to a given location, n is the number of BGs intersecting the buffer, f_i is the fraction of each BG intersecting the buffer, O_i is the number of employees of each occupation type in the intersecting BGs.

Scoring

The scoring system is based upon relative scores of a set of variables. These relative scores are translated into a percentile for each variable. Then these percentiles are averaged for a given set of variables to develop the component scores (Access to Talent, Racial Equity and Commuter Emissions). A weighted average of these component scores is calculated to form the combined score. In summary the scores:

- Use a suite of indicators to characterize each Census Block Group.
- Use a limited set of indicators to keep the model simple.
- Use percentiles to assign scores for each of the indicators in every Census Block Group.
- Use a scoring system in which the percentiles are averaged for the set of indicators in each of the components.

Access to Talent

The variables used in the Access to Talent score are listed below:

Table 3: Variables used in Access to Talent Score

Variable	Range	Mean	Median	Standard Deviation
Driving Commute Shed Total Working-age Population	112 – 1,150,521	515,964	506,852	304,274
Transit Commute Shed Total Working-age Population	0 – 322,137	38,525	107,673	48,993
Walking Commute Shed Total Working-age Population	0 – 15,651	2,897	1,812	3,127
Bike Commute Shed Total Working-age Population	106 – 265,143	95,208	71,814	78,719
Commute Cost (one way)	$1 - $30	$17	$17	$3

The estimate the total commute cost (per commuter) is broken out by car and transit costs and then a weighted average is used to combine the two, with the weights being the number of car commuters in the car commute shed, and the number of transit commuters in the transit commute shed. See the equation below:

$$C = \frac{D_{cost} \times N_{car} + T_{cost} \times N_{transit}}{N_{car} + N_{transit}}$$

Equation 3: Estimate Commute Cost Calculation

Where C is the estimated total commute cost, D_{cost} is the driving commute cost, N_{car} is the number of car commuters in the driving commute shed, T_{cost} is the transit commute cost, $N_{transit}$ is the number of transit commuters in the transit commute shed.

Racial Equity

The variables used in the Racial Equity score are listed below:

Table 4: Variables used in Racial Equity Score

Variable	Range	Mean	Median	Standard Deviation
BIPOC working-age population in Driving Commute Shed	8 – 408,875	155,722	104,713	130,652
BIPOC working-age population in Transit Commute Shed	0 – 171,716	31,480	18,607	33,125
BIPOC working-age population in Walking Commute Shed	0 – 9,959	1,291	256	2,060
BIPOC working-age population in Bike Commute Shed	5 – 172,829	38,504	15,955	48,551
Percent of BIPOC working-age population in Driving Commute Shed	4% - 49%	25%	20%	11%
Percent of BIPOC working-age population in Transit Commute Shed	0% – 88%	27%	27%	26%
Percent of BIPOC working-age population in Walking Commute Shed	0% – 99%	27%	14%	28%
Percent of BIPOC working-age population in Bike Commute Shed	1% - 74%	27%	22%	20%

Commuter Emissions

The variables used in the Commuter Emissions score are listed below:

Table 5: Variables used in Commuter Emission Score

Variable	Range	Mean	Median	Standard Deviation
Estimated average driving distance (miles) for all Census Block Groups in driving commute shed (Note that a high score counts against the overall average)	6 - 18	11	11	2
Percent of Working-age people using transit as their mode to get to work in Transit Commute Shed	0% – 2.74%	0.34%	0.09%	1.05%
Percent of Working-age people using walk as their mode to get to work in Walking Commute Shed	0% - 1.81%	0.02%	0.004%	0.06%
Percent of Working-age people using bike as their mode to get to work in Bike Commute Shed	0% - 2.60%	0.06%	0.03	0.20%
Average Walkscore in Walking Commute Shed	0 – 84	31	34	22
Average Bikescore in Bike Commute Shed	0 – 56	36	37	10

To estimate the effective greenhouse gas emissions (GHGs) for the daily commute to the given location the following formula were used:

$$GHG_{Auto} = Distance_{Car\ Commute} \times 2 \times 0.39\ kg\ CO_2e$$

Equation 4: GHG From Auto Commuting Calculation

And

$$GHG_{Transit} = Distance_{Transit\ Commute} \times 2 \times 0.34\ kg\ CO_2e$$

Equation 4: GHG From Transit Commuting Calculation

The factor of 2 is from the fact that the workers will have to travel both ways – to and from work, the emission factors or 0.39 and 0.34 were used (see table 2 for sources).

Combined Score

A weighted average of the component scores is calculated and mapped on the tool. The relative weighting of each in this weighted average is adjustable, to a degree, by the user. Initially all weights are set to two – each component score is equally weighted. The user can drop any of these scores if they want by unchecking the component score's checkbox. The user can also lower the relative score to one by sliding the slider to the "less" position or raise it to three by choosing the "more" position. The map automatically adjusts to this combination as does the Combined Score value for each chosen location.

For example, if the user wants to focus on Racial Equity, the user can change the settings in the "Scoring Criteria" box below the map by unchecking the other two components so only Racial Equity is shown on the map. Alternatively, the user could keep all three components checked, but use the sliders to focus less on Access to Talent and Commuter Emissions and more on Racial Equity.

More Information

For more information, contact:

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