

# "Project" Greenprint Model

## Model Criteria July 31, 2017

Goal	Goal Weights	Criteria	Criteria Weights	Methodology	Data (Description, Date, Resolution)	Data Source
<b>Connect</b>	<b>20%</b>					
		Improve Access to Public Transit	19%	This model identifies areas near public transit where connections could be made. One mile walking distance areas from rapid transit stations, and healthline stations were computed. Quarter mile walking distances from existing bicycle routes and trails were computed. Census block groups that are within one mile of public transit but not within a quarter mile of bike facilities were used as the starting points to find the shortest route to a public transit station. The identified routes were buffered by 100 feet and assigned high priority (4). Routes that overlap with currently planned or proposed trails were given very high priority (5).	Health Line Stations Fixed Transit Stations Bike Network Access Points Priority Bikeway Network Trails Leadership Network Existing Trails  Cleveland City parks 2017 Block Groups	NOACA (Northeast Ohio Areawide Coordinating Agency) online data portal      The Trust for Public Land ESRI business analyst 2015
		Create connections to parks and green space	19%	This model identifies areas where connections can be made from existing and proposed trails to parks. Routes are computed from each park to the three closest existing and three closest proposed trails. Larger parks have multiple starting points within them. Routes to proposed trails are given high priority (4) and routes to existing trails are given very high priority (5), both are buffered by 100 feet.	Existing and Proposed Trails  Cleveland City parks 2017  Streets	NOACA  TPL Park Score  Cuyahoga County
		Fill gaps in active transportation network	14%	This model identifies routes that will best increase connectivity in the existing active transportation network. Non-connected trail endpoints were routed to the 5 nearest trails. Planned and proposed active transit facilities were also incorporated. All routes were buffered by 100 feet. Areas where computed routes and planned/proposed trails overlap were assigned as very high priority (5), areas where there is just a route or planned trail were assigned high priority (4).	PriorityBikewayNetwork TrailsLeadershipNetwork	Cuyahoga County
		Connect low-income communities to job-rich districts	14%	This model identifies possible alternative transit connections between low income communities and job rich areas. Low income areas are derived from the results of criteria EQ02: Low Income Households. Job rich areas are derived using a density analysis on number of employees in the businesses data. Routes are analyzed from each low income point to the nearest job rich point. Routes are then overlaid to compute how many individual routes were found on each street segment. Areas are ranked based on how many computed routes overlap. A natural breaks classification is used to split the overlap values between 3 and 5 to assign priority scores.	Businesses, 2015  Priority Bikeway Network Streets	ESRI business analyst 2015 (Businesses)  Cuyahoga County
		Safe Routes to Schools	19%	This model identifies the safe routes to schools priority routes that were identified by the City of Cleveland planning department. This data shows priority corridors to CMSD schools taken by students walking and biking as well as associated direction and time needed to cover corridor. Safe routes were buffered by 150 feet and given a high priority (5).	Safe Routes To Schools Priority Corridors, 2016 Priority routes for students attending CMSD schools, data collected in 2015 and 2016 by CPC and CMSD, collected via walking audit.	Cleveland City Planning
		Enhance bicyclist and pedestrian safety	14%	This model identifies areas where there is a high concentration of accidents between automobiles and bikes or pedestrians. A hot spot analysis is done to find regions of highest crash spatial concentration. Two kernel density analyses are run on crash points inside and outside the hot spots using a 250 foot radius and using a weighting of Fatal = 3, Injury = 2 and Property Damage = 1. Crash density outputs from the two kernel density analyses are classified from 0-5 using natural breaks and then overlaid, taking the maximum value to get the final results.	Fatal Crashes 2010-2014 Injury Crashes 2010-2014 Property Damage Crashes 2010-2014	NOACA

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Cool	20%					
		Impervious surfaces	30%	Impervious cover is known to be a major driver of the urban heat island effect. Using detailed land cover information, impervious surfaces not shaded by tree canopy were selected and reclassified as value 2; impervious surfaces that do have canopy cover were reclassified to a value of 1; all other values were reclassified to 0. A focal sum neighborhood analysis was done for 1/8 mile around each 10 foot cell. Resulting values were sliced into 5 classes using natural breaks.	Cuyahoga County 1-foot raster image from the Urban Tree Canopy Assessment (UTC), 2011	Cuyahoga County
		Urban Heat Islands (Day)	50%	This model identifies urban heat islands within the Cleveland study area with elevated daytime land surface temperature (LST) averaging at least 1.25 degrees Fahrenheit above the mean daily temperature for 9 different days between late June and August of 2016.  The model results were derived from MODIS/Aqua MYDA2 satellite data, which provides a 1km (0.6 mi) gridded average land surface temperature over 8 day periods derived using a slit-window algorithm. This broad time span helps to alleviate issues relating to short-term temperature fluctuations and absence of satellite data in specific areas due to cloud cover or other issues.	MODIS (Moderate Resolution Imaging Spectro radiometer) MYD11A2 Land Surface Temperature & Emissivity 8-Day L3 Global 1km SIN, 2016	USGS 2016 MODIS (Moderate Resolution Imaging Spectro radiometer) MYD11A2 Land Surface Temperature & Emissivity ( <a href="https://earthexplorer.usgs.gov/">https://earthexplorer.usgs.gov/</a> )
		Urban Heat Islands (Night)	20%	This model identifies urban heat islands within the Cleveland study area with elevated nighttime land surface temperature (LST) averaging at least 1.25 degrees Fahrenheit above the mean daily temperature for 9 different days between late June and August of 2016.  The model results were derived from MODIS/Aqua MYDA2 satellite data, which provides a 1km (0.6 mi) gridded average land surface temperature over 8 day periods derived using a slit-window algorithm. This broad time span helps to alleviate issues relating to short-term temperature fluctuations and absence of satellite data in specific areas due to cloud cover or other issues.	MODIS (Moderate Resolution Imaging Spectro radiometer) MYD11A2 Land Surface Temperature & Emissivity 8-Day L3 Global 1km SIN, 2016	USGS 2016 MODIS (Moderate Resolution Imaging Spectro radiometer) MYD11A2 Land Surface Temperature & Emissivity ( <a href="https://earthexplorer.usgs.gov/">https://earthexplorer.usgs.gov/</a> )

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<b>Absorb</b>	<b>20%</b>					
		Flood risk	25%	This model assigns coastal and inland flooding risk priorities based on FEMA National Flood Hazard layers (NFHL) and OH DNR flood risk data.  Priority was assigned as follows: - Very high priority (5) is assigned to NFHL areas designated as 100-yr flood zones (Zones A or VE) - High priority (4) is assigned to areas designated as 500-yr flood zones (Zone X) or areas between 100 year and 500 year (coastal data) - Moderate priority (3) is assigned to OH DNR "Other Flood Hardard Areas" - The Maximum value was applied where overlap between the datasets occur.	FEMA Natl Flood Hazard Layer, April 2017  FEMA Coastal_FP_Polygons, June 2016  Other Flood Hazard Areas  Cuyahoga Land Use	FEMA Natl Flood Hazard Layer (downloaded April 2017)  FEMA Risk Assessment, Mapping, and Planning Partners  OH Dept of Natural Resources (dated 2001)  Cuyahoga County GIS
		Impaired waters	5%	The model assigns priorities to impaired waters and point locataions based on OH EPA'S Integrated Assessment Event points and EPA 303d reaches. Assessment event points were assigned priority 3 where "Attainment" = 'Partial' and priority 5 where "Attainment" = 'Non'. EPA 303-d stream reaches were assessed by the total number of different pollutants contributing to each reach, sliced into 3 categories using natural breaks. Output values are 3-5 (moderate to high priority).	OH EPA Data Assessment Summary (LRAUs and Lake Erie AUs): The Assessment Unit Score is the proportion of monitored miles (LRAUs) or sites (Lake Erie AUs) in full attainment of the designated aquatic life use.  EPA 303d impaired streams by reach code	Ohio EPA "Integrated WQ Report" for LRAU's (Large River Assessment Units).  U.S. EPA 303-d (reaches (w/no TMDL's) with Attains table to calculate the total number of pollutants per reach.
		AB03 Wetland and stream buffers	25%	This model prioritizes areas where wetlands currently occur. Model Methodology - buffers wetland polygons 100' and combines them with riparian buffers from the Greenprint project, which were retained if under 100 feet or reduced to 100 feet if they were greater. Resulting vuffers were assigned a priority of 5.	FWS Wetlands, 2016  Cuyahoga Wetlands, 2017  Cuyahoga GreenPrint Riparian Buffers	OH Fish & Wildlife Service (12/7/2016) ( <a href="https://www.fws.gov/wetlands/Data/State-Downloads.html">https://www.fws.gov/wetlands/Data/State-Downloads.html</a> )  Cuyahoga Soil & Water Conservation District Open Data. (3/9/2017)  2015 Cuyahoga Greenprint
		Sinks	5%	This model identifies low lying areas which are not classified as lakes, ponds or river systems.  Model Methodology - Using a LiDAR-derived elevation raster, sinks are filled, then the result is subtracted from the original DEM raster, leaving (elev) values below zero which represent areas of sinks. GIS polygon lakes and streams are removed, leaving all other low-lying areas. Values are sliced by natural breaks into 5 classes. Priority values are 3-5 (medium to high priority) representing the lowest elevations.	Lasd2raster_ground_clp cm_cuyahoga_hydro_polygon  nhdwaterbody  S_FLD_HAZ_AR_2	Cuyahoga County GIS: LiDAR at 7" point spacing and hydro polygons.  USGS / EPA National hydrography data site  FEMA National Flood Hazard Layer site
		Aging infrastructure	5%	This model buffers lines with a legitimate YEARINSTALLED field value by 100', slices the year values into 5 classes by quantiles, prioritizing from most recent year installed 1 (lowest priority) to the the oldest year installed 5 (highest priority)..	CSI District Sewer Pipes	Ohio NEORS Open Data Portal

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		Estimated runoff potential	35%	This model identifies those areas where there is high potential for runoff and estimates runoff volume for a 1" storm event using the NRCS Curve Number methodology, calculated for various soil characteristics and land uses/cover. Cuyahoga county Land use categories were cross-walked to LThia land use codes where curve numbers have been determined. Runoff (Q) values were calculated, then a 100' focal neighborhood analysis summed values for each raster cell and classified them into 5 classes by natural breaks. Priority values are 3-5 (medium to high priority), representing approx. .2" - .78" of runoff.	Cuyahoga 10 Class Land Cover, 2011 SSURGO Soils, 2014  Curve Number Lookup Table	Cuyahoga County GIS  USDA Natural Resource Conservation Service (NRCS) Arcgis online  curve number table from the NRCS (formerly Soil Conservation Service)

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<b>Equity</b>	<b>20%</b>					
		Connecting people to parks	25%	This model identifies gaps in TPL's ParkServe 10-minute walk service areas. All areas outside the service areas are considered gaps representing neighborhoods outside of a 10-minute walk to a park. Large airport parcels were removed from the output. Additional parks from County parcels were included for park acreage per service area statistics. Gap areas are given a priority 5 (High).  Overlay output: Cleveland_parkservice_areas_diss2017_wParkAcs - includes statistics for Park acreage and percentage within each service area.	Cleveland_City_parks_clip_2017 Cleveland_parkserviceareas_diss2017 CCFO_parcel_2013 CCFO_parcel_sel_airports	Trust for Public Land 2015 ParkScore® Cleveland: 10 minute walk analysis service areas, representing where parcels exist within a .5 mile of a park.
		Low Income Households	25%	This model identifies the percent of households within a block group where the household income is less than or equal to twice the federal "poverty level." The percentage of households with incomes less than or equal to twice the federal "poverty level" were sliced into 0 to 5 priority classes using a natural breaks classification. The break points for the moderate to very high priority classes were as follows:  INSERT BREAKS	EJScreen 2016 Field LOWINCPCT: Pct. Low Income (<2x poverty level)	EPA EJSCREEN - Demographic Factors, U.S. Census Bureau 2010-2014 American Community Survey (ACS) 5-year Summary datasets. ACS counts vouchers as well.
		Communities of color	25%	This model identifies socially vulnerable populations based on the percent of individuals within a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. The percentage of individuals identifying as a person of color were sliced into 0 to 5 priority classes using a natural breaks classification. The break points for the moderate to very high priority classes were as follows:  INSERT BREAKS	EJScreen 2016  Field P_MINORPCT: The percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. (non-whites)	EPA EJSCREEN - Demographic Factors Source Census Bureau's 2010-2014 American Community Survey (ACS) 5-year Summary datasets.
		Renters	5%	This model identifies socially vulnerable populations based on the percent of households renting in a block group as a ratio of the total block group population, sliced into priority classes from 0 to 5 using a natural breaks slice classification. The break points for the moderate to very high priority classes were as follows:  INSERT BREAKS	2010-2014 five-year estimates  Field [ACSRENTER] = number of ACS Renter households per block group Field(ACSTOTPOP) = total population in the block group	Esri 2015 Business Analyst, US Census Bureau American Community Survey
		Age under 5	10%	This model identifies socially vulnerable populations based on the percent of people in a block group under the age of 5, sliced into priority classes from 0 to 5 using a natural breaks slice classification. The break points for the moderate to very high priority classes were as follows:  INSERT BREAKS	EJScreen 2016 Field UNDER5PCT: Pct. Under Age 5	EPA EJSCREEN - Demographic Factors Source Census Bureau's 2010-2014 American Community Survey (ACS) 5-year Summary datasets.
		Age over 64	10%	This model identifies socially vulnerable populations based on the percent of people in a block group over the age of 64, sliced into priority classes from 0 to 5 using a natural breaks slice classification. The break points for the moderate to very high priority classes were as follows:  INSERT BREAKS	EJScreen 2016 Field OVER64PCT: Pct. Over Age 64	EPA EJSCREEN - Demographic Factors Source Census Bureau's 2010-2014 American Community Survey (ACS) 5-year Summary datasets.

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Public Health	20%					
		Diabetes	12%	The USGCRP Climate & Health Assessment identifies health conditions that are exacerbated by climate change, including diabetes. This model identifies public health risk based on the percentage of a block group estimated to have diabetes based on the CDC's 500 Cities Project, sliced into priority classes from 0 to 5. The break points for the moderate to very high priority classes were as follows:  INSERT BREAKS	CDC 500cities Block Group Estimates 2013, 2014  The purpose of the 500 Cities project is to provide city- and census tract-level small area estimates for chronic disease risk factors, health outcomes, and clinical preventive service use for the largest 500 cities in the United States. All "Crude Prevalence" fields were used for these analyses (others are hi or low CF values)	Center for Disease Control 500 Cities Project
		Asthma	20%	The USGCRP Climate & Health Assessment identifies health conditions that are exacerbated by climate change, including respiratory illness. This model identifies public health risk based on the percentage of a block group estimated to have asthma based on the CDC's 500 Cities Project, sliced into priority classes from 0 to 5. The break points for the moderate to very high priority classes were as follows:  INSERT BREAKS	CDC 500cities Block Group Estimates 2013, 2014  The purpose of the 500 Cities project is to provide city- and census tract-level small area estimates for chronic disease risk factors, health outcomes, and clinical preventive service use for the largest 500 cities in the United States. All "Crude Prevalence" fields were used for these analyses (others are hi or low CF values)	Center for Disease Control 500 Cities Project
		Obesity	12%	The USGCRP Climate & Health Assessment identifies health conditions that are exacerbated by climate change, including obesity. This model identifies public health risk based on the percentage of a block group estimated to have obesity based on the CDC's 500 Cities Project, sliced into priority classes from 0 to 5. The break points for the moderate to very high priority classes were as follows:  INSERT BREAKS	CDC 500cities Block Group Estimates 2013, 2014  The purpose of the 500 Cities project is to provide city- and census tract-level small area estimates for chronic disease risk factors, health outcomes, and clinical preventive service use for the largest 500 cities in the United States. All "Crude Prevalence" fields were used for these analyses (others are hi or low CF values)	Center for Disease Control 500 Cities Project
		PH04 Kidney disease	12%	The USGCRP Climate & Health Assessment identifies health conditions that are exacerbated by climate change, including kidney disease. This model identifies public health risk based on the percentage of a block group estimated to have kidney disease based on the CDC's 500 Cities Project, sliced into priority classes from 0 to 5. The break points for the moderate to very high priority classes were as follows:  INSERT BREAKS	CDC 500cities Block Group Estimates 2013, 2014  The purpose of the 500 Cities project is to provide city- and census tract-level small area estimates for chronic disease risk factors, health outcomes, and clinical preventive service use for the largest 500 cities in the United States. All "Crude Prevalence" fields were used for these analyses (others are hi or low CF values)	Center for Disease Control 500 Cities Project

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Goal	Goal Weights	Criteria	Criteria Weights	Methodology	Data (Description, Date, Resolution)	Data Source
		Stroke	12%	The USGCRP Climate & Health Assessment identifies health conditions that are exacerbated by climate change, including stroke. This model identifies public health risk based on the percentage of a block group estimated to have stroke based on the CDC's 500 Cities Project, sliced into priority classes from 0 to 5. The break points for the moderate to very high priority classes were as follows:  INSERT BREAKS	CDC 500cities Block Group Estimates 2013, 2014  The purpose of the 500 Cities project is to provide city- and census tract-level small area estimates for chronic disease risk factors, health outcomes, and clinical preventive service use for the largest 500 cities in the United States. All "Crude Prevalence" fields were used for these analyses (others are hi or low CF values)	Center for Disease Control 500 Cities Project
		Coronary heart disease	12%	The USGCRP Climate & Health Assessment identifies health conditions that are exacerbated by climate change, including heart disease. This model identifies public health risk based on the percentage of a block group estimated to have heart disease based on the CDC's 500 Cities Project, sliced into priority classes from 0 to 5. The break points for the moderate to very high priority classes were as follows:  INSERT BREAKS	CDC 500cities Block Group Estimates 2013, 2014  The purpose of the 500 Cities project is to provide city- and census tract-level small area estimates for chronic disease risk factors, health outcomes, and clinical preventive service use for the largest 500 cities in the United States. All "Crude Prevalence" fields were used for these analyses (others are hi or low CF values)	Center for Disease Control 500 Cities Project
		Lead levels	20%	In tracts where testing was done, the numbers of occurrences in all 8 level ranges were totaled, then divided by the total number of people tested per tract to obtain a ratio. These values were sliced into 5 classes using natural breaks.	Lead Levels by Tract 2014  Census Tracts	Cuyahoga County Board of Health 2014 OH State data by 2010 census tracts.  US Census Bureau ACS