**Detroit Solar Map Tool**

**Parcel Dataset Methodology**

Data Driven Detroit (D3) used a spatialized parcel dataset from the 2014 Motor City Mapping (MCM) project to act as base layer/table. MCM originally worked with parcel boundaries from the Assessor’s Office and aggregated parcels together when necessary to create survey parcel boundaries. Survey parcel boundaries were assigned their own ID, as well as City’s parcel ID.This parcel dataset (referred to as the MCM Base Table) was the base table to which all other project datasets were joined.

**Demolitions**

* Demolitions were downloaded from the City’s Open Data Portal (ODP), spatialized as points using latitude and longitude values, and then spatially joined to the MCM base table to get the corresponding survey parcel ID.

**Neighborhood**

* Neighborhood boundaries were downloaded from the City’s ODP and spatially joined to the MCM base table, thus assigning every parcel its corresponding neighborhood name. Neighborhood names and boundaries were defined by the City of Detroit’s Department of Neighborhoods.

**City Historic District**

* [Historical District boundaries were acquired from the City of Detroit and spatially joined to parcel boundaries in the MCM base table. A new field was created in the base table to flag every parcel within a historical district. This field when applicable will contain the name of the parcel’s Historical District.]

**National Historic District**

* Historical District boundaries were acquired from the City of Detroit and spatially joined to parcel boundaries in the MCM base table. A new field was created in the base table to flag every parcel within a historical district. This field when applicable will contain the name of the parcel’s Historical District.

**Opportunity Zone**

* Opportunity Zone boundaries were downloaded from the City’s ODP and spatially joined to parcels in the MCM base table. This join assigned a flag to any parcel within an Opportunity Zone.

**Affordable Property**

* The affordable property dataset was acquired from the City of Detroit and spatially joined to parcels in the MCM base table. This join assigned a flag to any parcel that has affordable housing units.

**Brownfields**

* D3 acquired the brownfields dataset from Michigan’s Department of Environmental Quality in July 2018. Brownfields were spatialized using a combination of geocoding and provided latitude and longitude values. These points where then spatially joined to parcels in the MCM base table.

**City-Owned School**

* City-Owned School data was provided by the City of Detroit as a PDF. D3 converted the PDF to a spreadsheet and geocoded the school addresses. Once geocoded the school points were spatially joined to parcels in the MCM base table. A new field was created and when applicable the parcel would be assigned the name of a City-Owned School.

**Detroit Land Bank Authority Property**

* Detroit Land Bank Authority (DLBA) Properties were downloaded from the City’s ODP and spatially joined to parcels in the MCM base table.

**Cooling Center**

* Cooling Center addresses were provided by the City of Detroit in a tabular format. These addresses were then geocoded and assigned a parcel ID that matched with the MCM base table parcels.

**Zone**

* Zone designations were downloaded from the City’s ODP and spatially joined to the MCM base table, thus assigning every parcel its corresponding zone.

**Building Use Category**

* Similar to the vacant parcel dataset, building use was obtained from the originally 2014 MCM base table. MCM collected data on building use for any existing structure on the surveyed parcel. Parcels use data was included for parcels that have a structure and with a parcel use of residential, commercial, mixed, industrial, institutional, or unknown.

**City-Owned Parcel**

* City-Owned property datawas acquired from the City of Detroit, and geocoded, and joined to the MCM base table.

**Vacant Parcel**

* MCM base table parcels were flagged as vacant through a series of filters and queries. During the creation of the original MCM base table (in 2014) a parcel survey was completed, including the collect of information on any existing structures and the intended use of the parcel. In order to identify vacant parcels for the current project, a query was created to flag parcels were there were no reported structures and no reported parks, gardens, and/or parking lots, as well as the parcel use including private, unknown, or public. These flagged parcels in conjunction with the demolition dataset allowed D3 to have an updated vacant parcel dataset.

**Solar Energy for Vacant Parcels**

Estimated Distributed Photovoltaic Generation in Vacant Parcels
Provided by the National Renewable Energy Laboratory (NREL).

* *Developable Area:* The estimated total developable area within the parcel in meters squared.
* *Capacity (kW):* The estimated maximum capacity that could be installed in kilowatts. Calculated as *Developable Area* \* 0.40 (ground area ratio) \* 0.16 (panel efficiency)
* *Generation (kWh):* The estimated average annual generation that would be generated from the maximum capacity in kilowatt hours. Calculated as *Capacity* \* 8760 (hours in a year) \* 0.126 (estimate of average capacity factor)

**Methodological Notes**

* A parcel was determined to be vacant if it did not have a building within it. To avoid excluding parcels where a small sliver of a building from an adjacent parcel intersects, parcels were only excluded if they were more than 2% covered by building. This threshold was based off of inspection of the building coverage histogram and visual inspection of sampled parcels with low building coverage.
* Based off the elevate energy methodology for Cook county, viable area was only counted if the contiguous area was large enough for a 300kW installment. Based off an assumption of 0.40 groundcover ratio and panel efficiency of 16%, a minimum cutoff of 4,700 contiguous square meters was chosen for consideration.
* Due to the presence of foliage on most vacant lots in Detroit, most identified lots are precleared lots that contain things like parking lots, recreation fields, and lots that appear to have been used for industrial storage. If the assumption is that clearing foliage is unwanted or too expensive this makes sense. If lots that could be viable with cleared foliage is desired, a more in-depth analysis of raw LiDAR data would be required to remove trees from the elevation data used while keeping more permanent obstacles to development.
* A global adjustment to the Capacity and Generation was made to bring the maximal numbers generated by NREL into line with calculations made for several, real-world installations test sites. Values were multiplied by 0.8639. This applies to the neighborhood aggregates as well

**Rooftop Dataset Methodology**

Estimated Distributed Photovoltaic Generation on Rooftops
Provided by the National Renewable Energy Laboratory (NREL).

* Most of the building polygons were generated with HSIP (Homeland Security Infrastructure Program) in conjunction with the LiDAR data (Light Detection and Ranging), for the east portion of the city where not HSIP lidar data was available, the SEMCOG (The Southeast Michigan Council of Governments) buildings outlines were used.
* *Developable Area*: The estimated total developable area on the rooftop in meters squared. Note that this is the area of the plane, not the area of the bird’s-eye footprint. Buildings with sloped roofs could theoretically have a larger developable area than the building footprint.
* *Capacity (kW)*: The estimated maximum capacity that could be installed in kilowatts.
* For flat rooftop planes: calculated as *Developable Area* \* 0.7 (rooftop area ratio) \* 0.16 (panel efficiency)
* For sloped rooftop planes: calculated as *Developable Area* \* 0.98 (rooftop area ratio) \* 0.16 (panel efficiency)
* *Generation (kWh)*: The estimated average annual generation that would be generated from the maximum capacity in kilowatt hours.
* For flat roofs: calculated as *Capacity* \* 8760 (hours in a year) \* 0.118 (conservative estimate of average capacity factor)
* For East and West facing planes with pitches of 40 degrees and above: calculated as calculated as *Capacity* \* 8760 (hours in a year) \* 0.9 (conservative estimate of average capacity factor)
* For all other sloped planes: calculated as calculated as *Capacity* \* 8760 (hours in a year) \* 0.11 (conservative estimate of average capacity factor)

**Methodological Notes**

* In order to not include spurious intersections due to slight overlaps in geometries, instances where less than 5% of the building intersected with a parcel were not included.
* All building outlines run through the model are included, a tot\_area of 0 means no suitable area was found.
* Buildings connected by walkways were manually split and the new shapes were recalculated. Walkways were removed.
* A global adjustment to the Capacity and Generation was made to bring the maximal numbers generated by NREL into line with calculations made for several, real-world installations test sites. Values were multiplied by 0.8639. This applies to the neighborhood aggregates as well

**Solar Energy Capacity Breakpoints**

The breakpoints were chosen to correspond to the different DTE Energy interconnection categories. More information: <https://www.newlook.dteenergy.com/wps/wcm/connect/dte-web/home/service-request/common/electric/gmop/interconnection-process>

* “Category 1" means an inverter-based project of 20 kW or less
<https://www.michigan.gov/documents/mpsc/cat_1_int_nm_app_406424_7.pdf>
* “Category 2" means a project of greater than 20 kW and not more than 150 kW.
<https://www.michigan.gov/documents/mpsc/cat_2_int_nm_app_406430_7.pdf>
* “Category 3" means a project of greater than 150 kW and not more than 550 kW.
“Category 4" means a project of greater than 550 kW and not more than 2 MW.
“Category 5" means a project of greater than 2 MW.

[https://www.michigan.gov/mpsc/0,4639,7-159-16393\_48212---,00.html](https://www.michigan.gov/mpsc/0%2C4639%2C7-159-16393_48212---%2C00.html)