# Micro-module A: Online Urban Data Gathering

## A6- Accessibility of Amenities Evaluation Based on Urbano

Former studies have indicated that one of the significant qualities of a walkable city is access to varied amenities within walking distance, which has been linked to socioeconomic growth and quality of life.

Urbano is an urban analytics toolset that enables an automated workflow for analysing the accessibility of facilities, as well as how the distribution of amenities affects people walking in a neighbourhood. It uses multi-source open data to import contextual GIS, OpenStreetMap, and Google Places data into Grasshopper to create an urban mobility model.

In this micromodule, the tutorial will introduce the whole process of creating the urban mobility model via Urbano, including data collecting, pre-processing, inputting and final result outcomes.

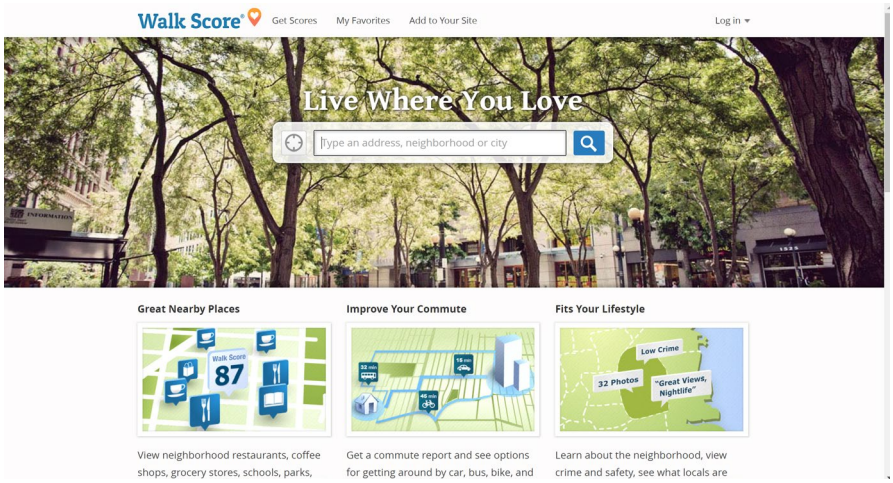
### 1. Introduction of Walkable Neighbourhood Evaluation and Urbano Toolkit

#### 1.1 Walkable Neighbourhood

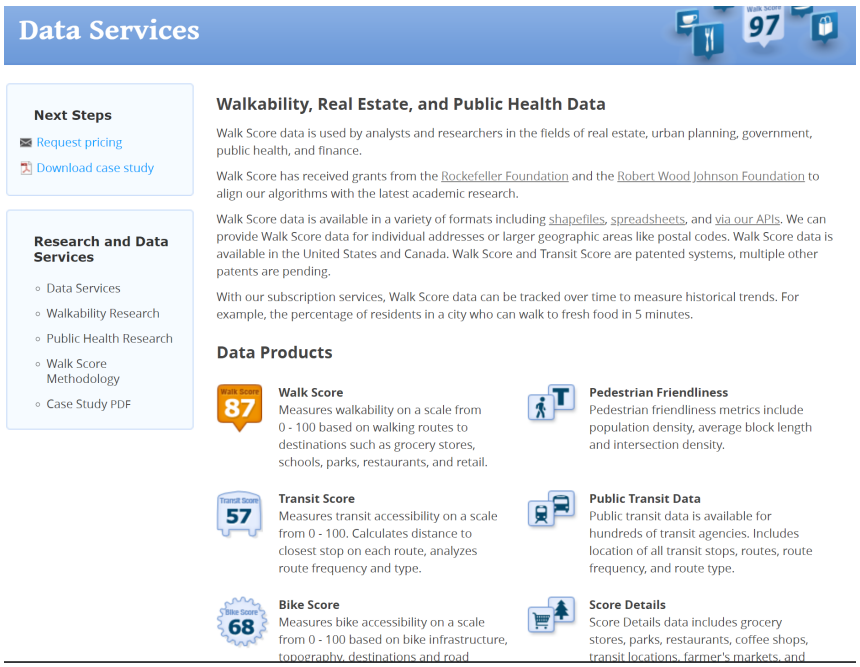
The idea of walkability has evolved into a critical theoretical and operational function. Walkable communities have been derived from studies to considerably reduce traffic-related pollution and the risk of chronic illnesses (Frank et al. 2006; Lee and Buchner 2008), promote economic growth and prosperity (Claris and Scopelliti 2016), as well as encourage growth in social capital and political involvement (Leyden, 2003). One of the most significant components of a walkable city is walkable amenities, which have been linked to socioeconomic growth and quality of life.

#### 1.2 Walkscore

The fundamental cause and motivation to promote walking activity is generally accepted to be proximity to and availability of facilities (Clark et al., n.d.). To assess cities' walkability, efforts have been undertaken to rank them based on a shortest-distance study between various Points of interest (POIs). These walkability ratings, known colloquially as Walkscores (Brewster et al. 2009; ESRI 2019; Walkscore 2019), are calculated on a one-to-one scale and include criteria such as access to services and facilities such as grocery stores, doctors, parks, schools, hospitals, and public transit.



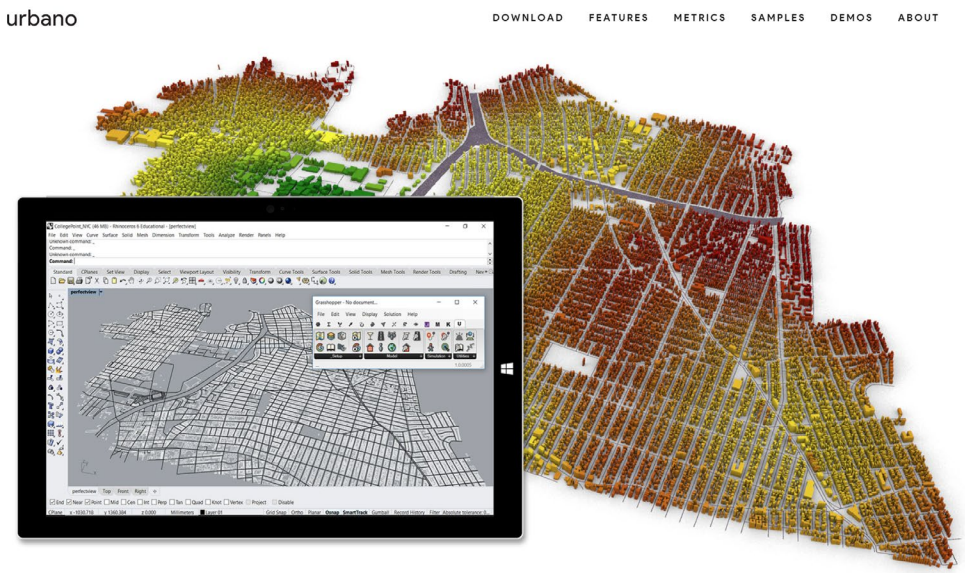

https://www.walkscore.com/




https://www.walkscore.com/professional/research.php

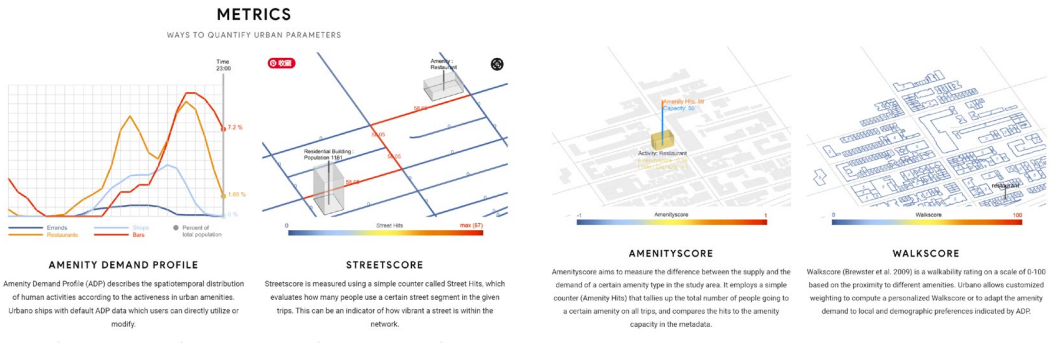
## 1.3 Introduction of Urbano

Urbano is an urban analytic toolset that promotes a completely automated workflow for analyzing the accessibility of facilities as well as how the distribution of amenities affects people walking in a neighborhood (Yang, Samaranayake, et al., 2020). It used multi-source open data to import contextual GIS, OpenStreetMap, and Google Places data into Grasshopper to create an urban mobility model (Dogan et al., 2018). A series of test studies confirmed the potential and usefulness of the new modeling framework, which incorporates trip-sending logic as well as three innovative urban design metrics: Streetscore, Amenityscore, and an upgraded Walkscore.




https://www.urbano.io/

## 1.4 Metrics in Urbano




The Walkscore in Urbano is based on a shortest-distance study between various places of interest (POIs) using OpenStreetMap and the Google Place API, of which categories consist of Walkscore amenities.

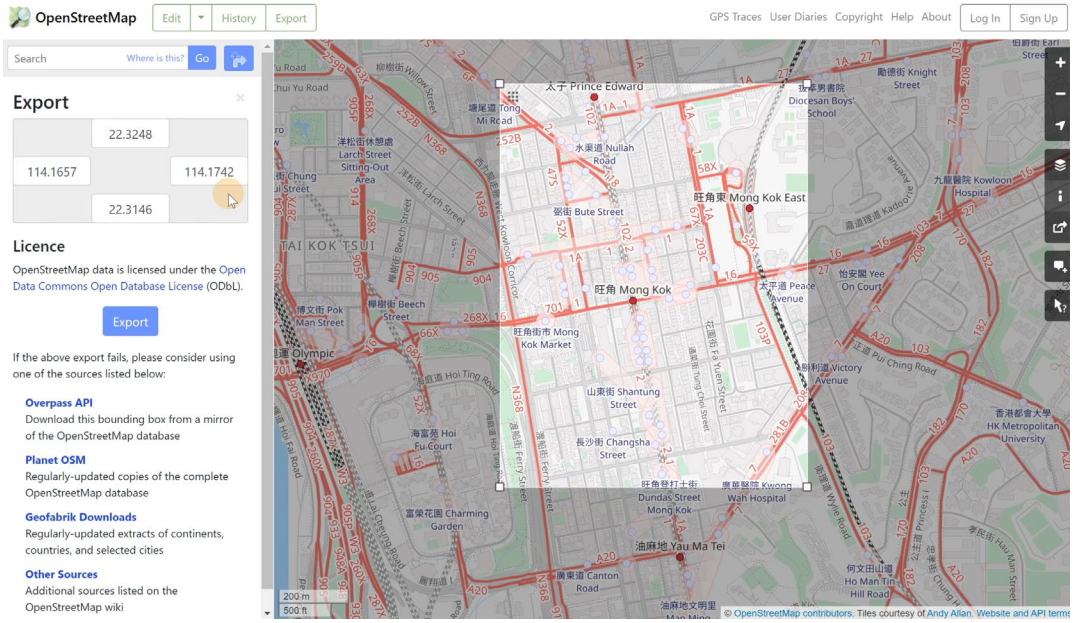
Streetscore determines how many people utilize a specific street section. This could be used to determine how lively a street is in the network overall or at a certain time of interest.

Amenity Hits represent pedestrian hits that an amenity received during a simulated round. Street Hits measures how many people utilize a certain street section on all visits, which may be used to show the Street Score simulation outcome.

In the following part, this tutorial will take Mong Kok as a case study to show the whole process for creating a mobility model in Urbano.

## 2. Data Collection

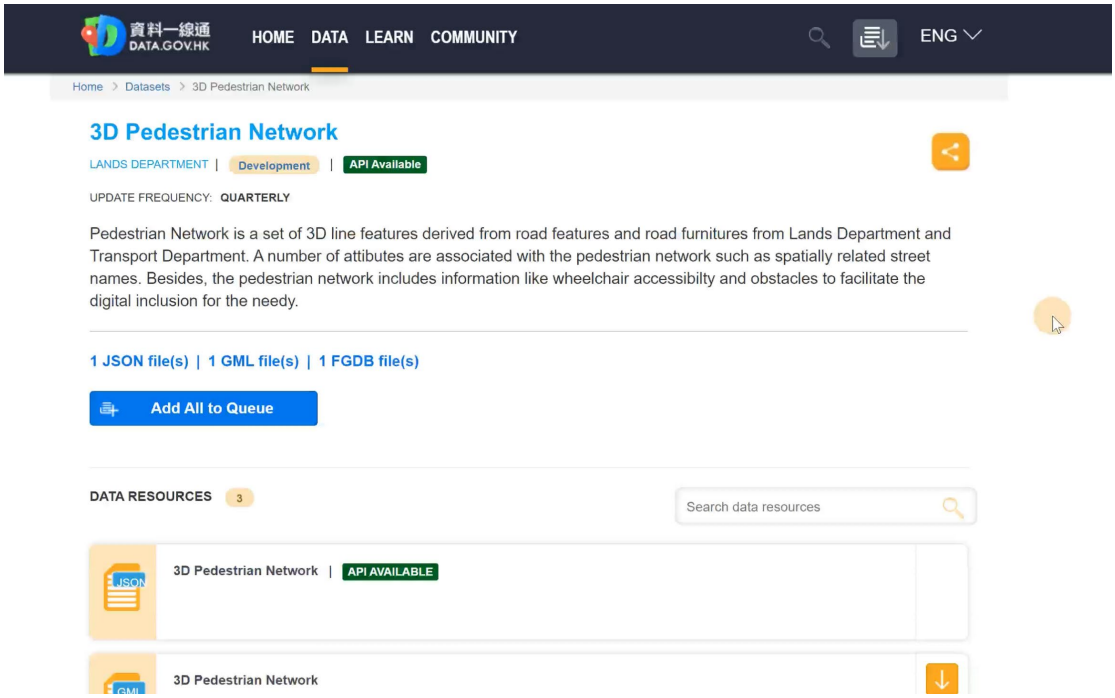
### 2.1 To obtain osm data of the research area



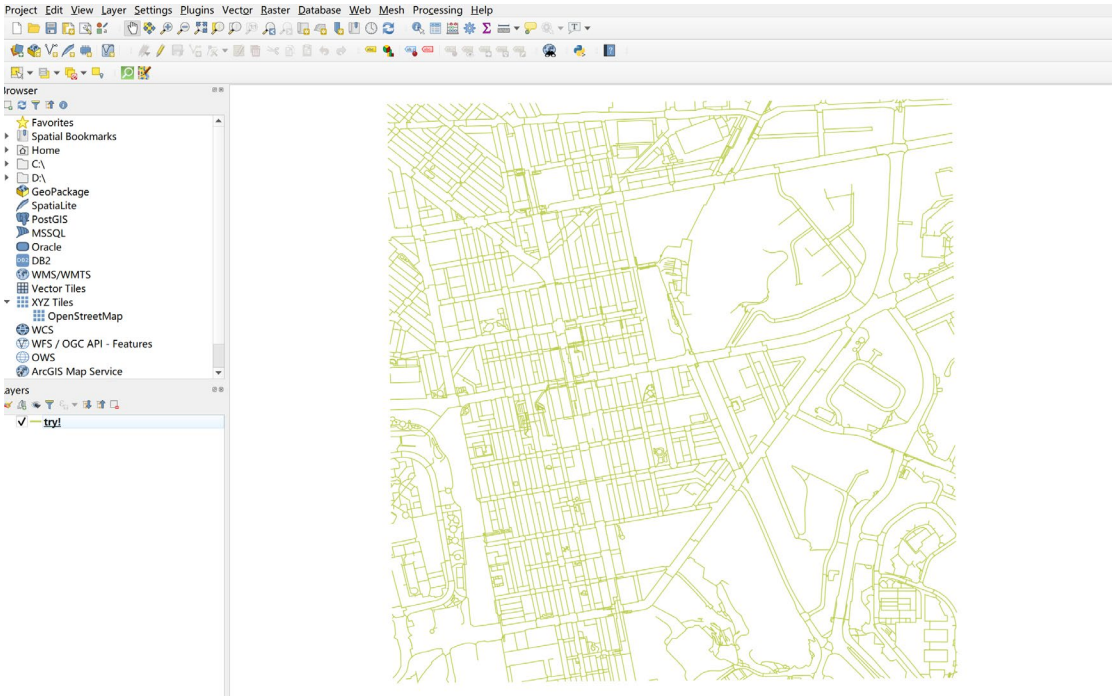

When entering the website of OpenStreetMap, drag the window to find our research area, and click ‘Export’, we need to choose ‘Manually Select a different area’, and set the boundary we want, in the following part we also need to input the longitude and latitude of the .osm, so we need to mark the four numbers on the left. And click blue button to download the document.

## 2.2 To obtain 3D pedestrian data of the research area

Download the GDB file of 3D pedestrian network dataset of the whole Kong Kong, after downloading, we need to roughly clip the shapefile with the larger research area boundary, we could amend the boundary after input into Urbano.



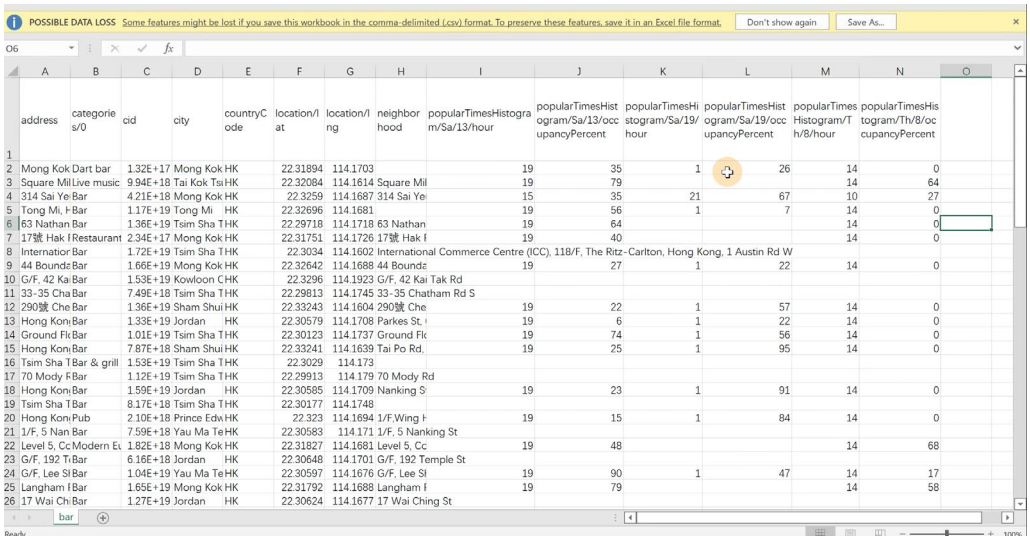

https://data.gov.hk/en-data/dataset/hk-landsd-openmap-3d-pedestrian-network




## 2.3 To pre-processing Amenity Demand Profile (ADP)

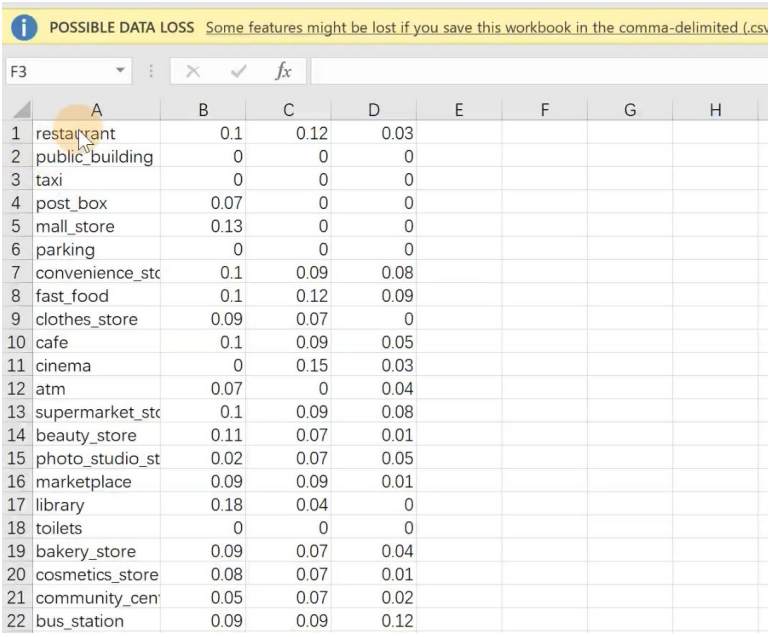
Following by the tutorial of A5, we could obtain different types of amenities (POIs) via APIFY, including the popular time of different times, in this case, we need 3 time point of popular time, 13:00 and 19:00 on Saturday and 8:00 on Thursday. After we download all

types of amenities, we need to pre-process the data first- get the average amenity demand of different times of amenities.



| | address | categories/0 | cid | city | countryCode | location/lat | location/lng | neighborhood | popularTimesHistogram/Sa/13/hour | popularTimesHistogram/Sa/13/occupancyPercent | popularTimesHistogram/Sa/19/hour | popularTimesHistogram/Sa/19/occupancyPercent | popularTimesHistogram/Th/8/hour | popularTimesHistogram/Th/8/occupancyPercent |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Mong Kok | Dart bar | 1.32E+17 | Mong Kok | HK | 22.31894 | 114.1703 | | 19 | 35 | 1 | 26 | 14 | 0 |
| 3 | Square Mil | Live music | 9.94E+18 | Tai Kok Tsi | HK | 22.32084 | 114.1614 | Square Mil | 19 | 79 | | | 14 | 64 |
| 4 | 314 Sai Ye | Bar | 4.21E+18 | Mong Kok | HK | 22.3259 | 114.1687 | 314 Sai Ye | 15 | 35 | 21 | 67 | 10 | 27 |
| 5 | Tong Mi, H | Bar | 1.17E+19 | Tong Mi | HK | 22.32696 | 114.1681 | | 19 | 56 | 1 | 7 | 14 | 0 |
| 6 | 63 Nathan | Bar | 1.36E+19 | Tsim Sha T | HK | 22.29718 | 114.1718 | 63 Nathan | 19 | 64 | | | 14 | 0 |
| 7 | 17號 Hak I | Restaurant | 2.34E+17 | Mong Kok | HK | 22.31751 | 114.1726 | 17號 Hak I | 19 | 40 | | | 14 | 0 |
| 8 | Internatior | Bar | 1.72E+19 | Tsim Sha T | HK | 22.3034 | 114.1602 | International Commerce Centre (ICC), 118/F, The Ritz-Carlton, Hong Kong, 1 Austin Rd W | | | | | | |
| 9 | 44 Bounda | Bar | 1.66E+19 | Mong Kok | HK | 22.32642 | 114.1688 | 44 Bounda | 19 | 27 | 1 | 22 | 14 | 0 |
| 10 | G/F, 42 Kai | Bar | 1.53E+19 | Kowloon C | HK | 22.3296 | 114.1923 | G/F, 42 Kai Tak Rd | | | | | | |
| 11 | 33-35 Cha | Bar | 7.49E+18 | Tsim Sha T | HK | 22.29813 | 114.1745 | 33-35 Chatham Rd S | | | | | | |
| 12 | 290號 Che | Bar | 1.36E+19 | Sham Shui | HK | 22.33243 | 114.1604 | 290號 Che | 19 | 22 | 1 | 57 | 14 | 0 |
| 13 | Hong Kon | Bar | 1.33E+19 | Jordan | HK | 22.30579 | 114.1708 | Parkes St, | 19 | 6 | 1 | 22 | 14 | 0 |
| 14 | Ground Flo | Bar | 1.01E+19 | Tsim Sha T | HK | 22.30123 | 114.1737 | Ground Flo | 19 | 74 | 1 | 56 | 14 | 0 |
| 15 | Hong Kon | Bar | 7.87E+18 | Sham Shui | HK | 22.33241 | 114.1639 | Tai Po Rd, | 19 | 25 | 1 | 95 | 14 | 0 |
| 16 | Tsim Sha T | Bar & grill | 1.53E+19 | Tsim Sha T | HK | 22.3029 | 114.173 | | | | | | | |
| 17 | 70 Mody R | Bar | 1.12E+19 | Tsim Sha T | HK | 22.29913 | 114.179 | 70 Mody Rd | | | | | | |
| 18 | Hong Kon | Bar | 1.59E+19 | Jordan | HK | 22.30585 | 114.1709 | Nanking S | 19 | 23 | 1 | 91 | 14 | 0 |
| 19 | Tsim Sha T | Bar | 8.17E+18 | Tsim Sha T | HK | 22.30177 | 114.1748 | | | | | | | |
| 20 | Hong Kon | Pub | 2.10E+18 | Prince Edw | HK | 22.323 | 114.1694 | 1/F,Wing H | 19 | 15 | 1 | 84 | 14 | 0 |
| 21 | 1/F, 5 Nan | Bar | 7.59E+18 | Yau Ma Te | HK | 22.30583 | 114.171 | 1/F, 5 Nanking St | | | | | | |
| 22 | Level 5, Cc | Modern Eu | 1.82E+18 | Mong Kok | HK | 22.31827 | 114.1681 | Level 5, Cc | 19 | 48 | | | 14 | 68 |
| 23 | G/F, 192 T | Bar | 6.16E+18 | Jordan | HK | 22.30648 | 114.1701 | G/F, 192 Temple St | | | | | | |
| 24 | G/F, Lee Sl | Bar | 1.04E+19 | Yau Ma Te | HK | 22.30597 | 114.1676 | G/F, Lee Sl | 19 | 90 | 1 | 47 | 14 | 17 |
| 25 | Langham I | Bar | 1.65E+19 | Mong Kok | HK | 22.31792 | 114.1688 | Langham I | 19 | 79 | | | 14 | 58 |
| 26 | 17 Wai Chi | Bar | 1.27E+19 | Jordan | HK | 22.30624 | 114.1677 | 17 Wai Ching St | | | | | | |

The final format we need to input into Urbano is the CSV data, including categories of amenities and the amenities demands of the 3 time points.



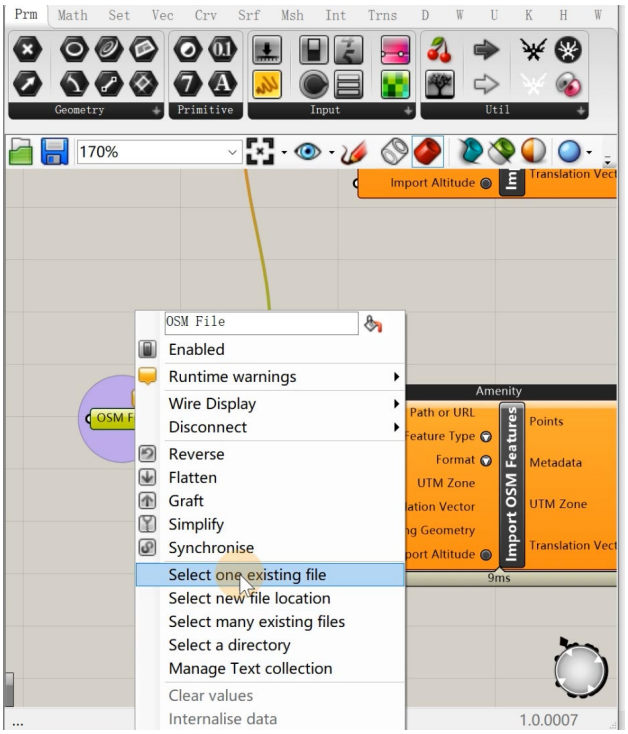
| | A | B | C | D |
|---|---|---|---|---|
| 1 | restaurant | 0.1 | 0.12 | 0.03 |
| 2 | public_building | 0 | 0 | 0 |
| 3 | taxi | 0 | 0 | 0 |
| 4 | post_box | 0.07 | 0 | 0 |
| 5 | mall_store | 0.13 | 0 | 0 |
| 6 | parking | 0 | 0 | 0 |
| 7 | convenience_sto | 0.1 | 0.09 | 0.08 |
| 8 | fast_food | 0.1 | 0.12 | 0.09 |
| 9 | clothes_store | 0.09 | 0.07 | 0 |
| 10 | cafe | 0.1 | 0.09 | 0.05 |
| 11 | cinema | 0 | 0.15 | 0.03 |
| 12 | atm | 0.07 | 0 | 0.04 |
| 13 | supermarket_sto | 0.1 | 0.09 | 0.08 |
| 14 | beauty_store | 0.11 | 0.07 | 0.01 |
| 15 | photo_studio_st | 0.02 | 0.07 | 0.05 |
| 16 | marketplace | 0.09 | 0.09 | 0.01 |
| 17 | library | 0.18 | 0.04 | 0 |
| 18 | toilets | 0 | 0 | 0 |
| 19 | bakery_store | 0.09 | 0.07 | 0.04 |
| 20 | cosmetics_store | 0.08 | 0.07 | 0.01 |
| 21 | community_cen | 0.05 | 0.07 | 0.02 |
| 22 | bus_station | 0.09 | 0.09 | 0.12 |

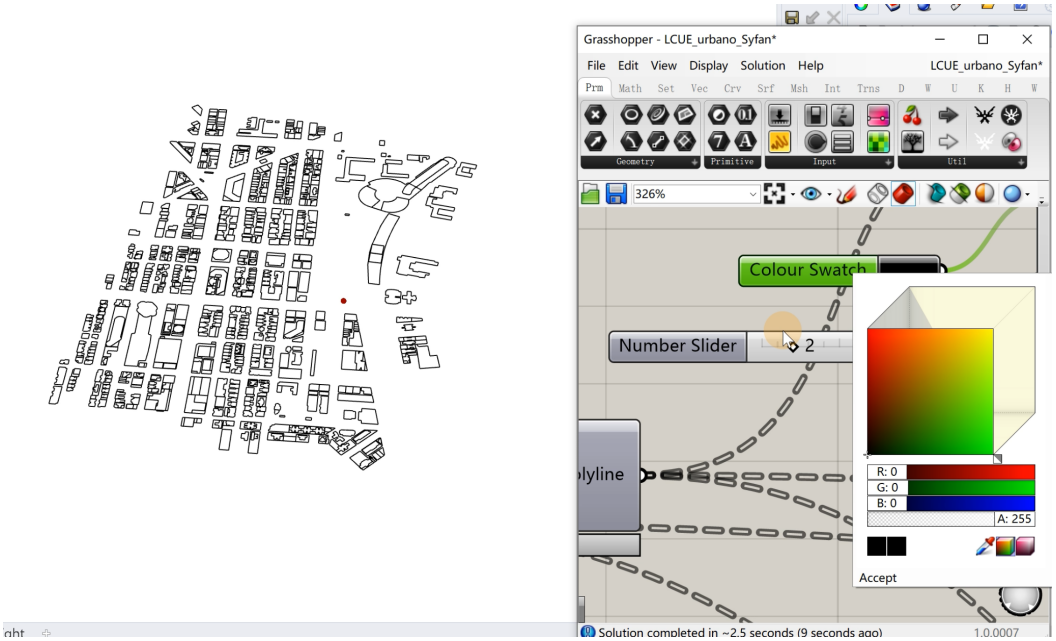
## 3. Data Inputting

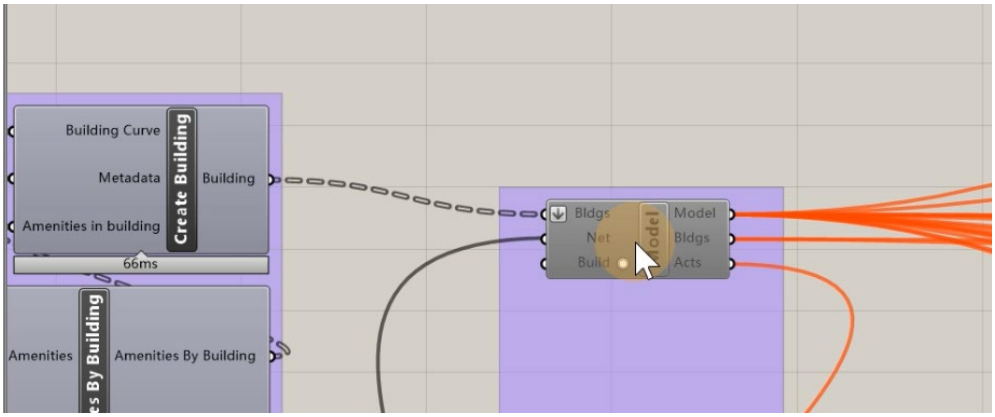
### 3.1 Inputting osm data to generate the building outline

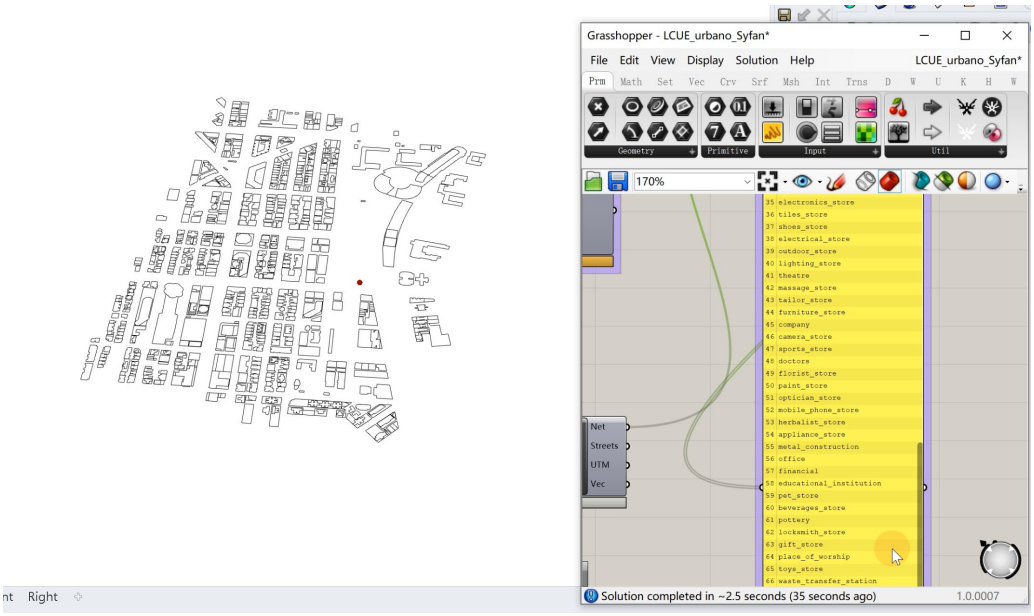
First, right click the ‘OSM File’ battery, and click ‘Set one existing file’, choose the file we have downloaded before. You could see the auto-generated building massing, amend the ‘Color Swatch’ and ‘Number Slide’ on the right to change the color and line width of the building outline.

Second, right click the ‘Model’ battery to enable it, the followed file shows the types of amenities in the research area. Right click and copy the data only, we could paste the document to create the csv file that contain the amenities amend like we mentioned before.


Prm
Math
Set
Vec
Crv
Srf
Msh
Int
Trns
Geometry
Primitive
Input
Util
170%
Import Altitude
OSM File
Enabled
Runtime warnings
Wire Display
Disconnect
Reverse
Flatten
Graft
Simplify
Synchronise
Select one existing file
Select new file location
Select many existing files
Select a directory
Manage Text collection
Clear values
Internalise data
Amenity
Path or URL
Feature Type
Format
UTM Zone
Import OSM Features
Points
Metadata
UTM Zone
Translation Vect
9ms
1.0.0007

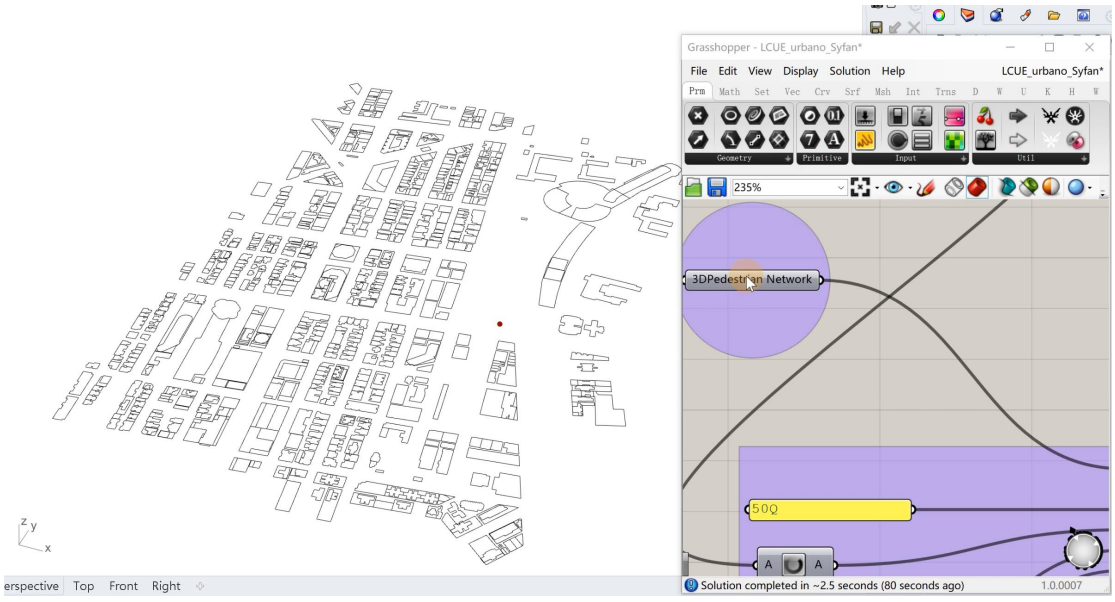

Grasshopper - LCUE_urbano_Syfan*
File
Edit
View
Display
Solution
Help
LCUE_urbano_Syfan*
326%
Colour Swatch
Number Slider
2
R: 0
G: 0
B: 0
A: 255
Accept
Solution completed in ~2.5 seconds (9 seconds ago)
1.0.0007

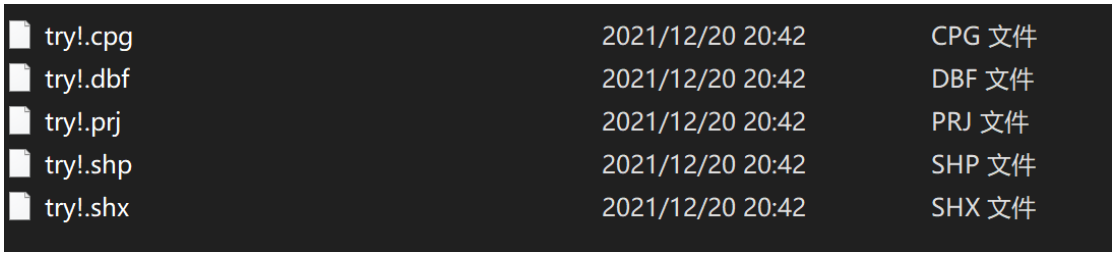

Building Curve
Metadata
Amenities in building
Create Building
Building
66ms
Amenities
Amenities By Building
Bldgs
Net
Build
Model
Model
Bldgs
Acts



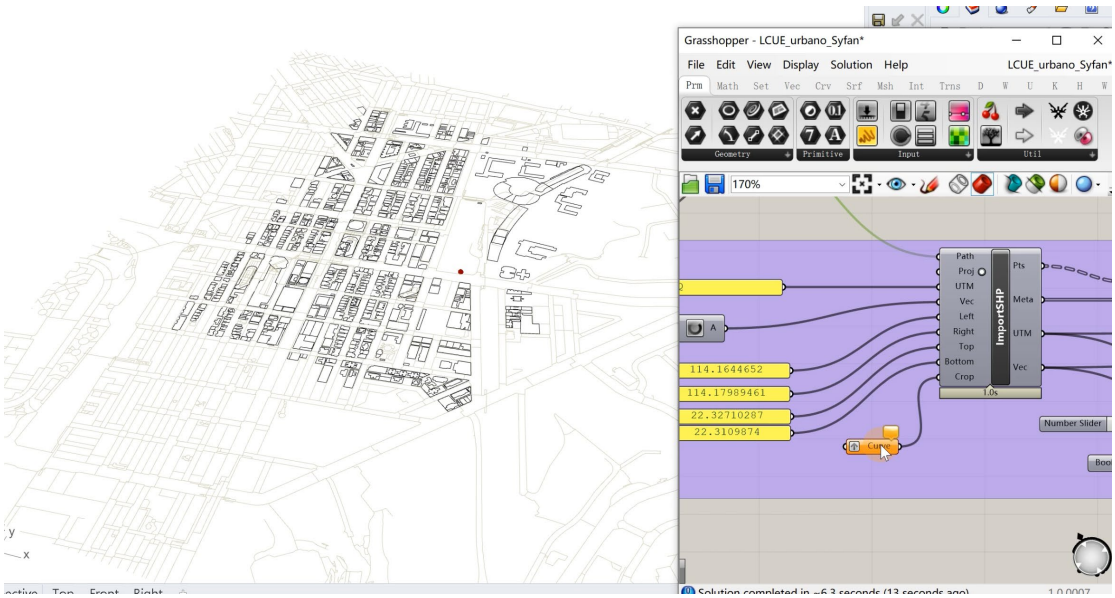

## 3.2 Inputting 3D pedestrian network

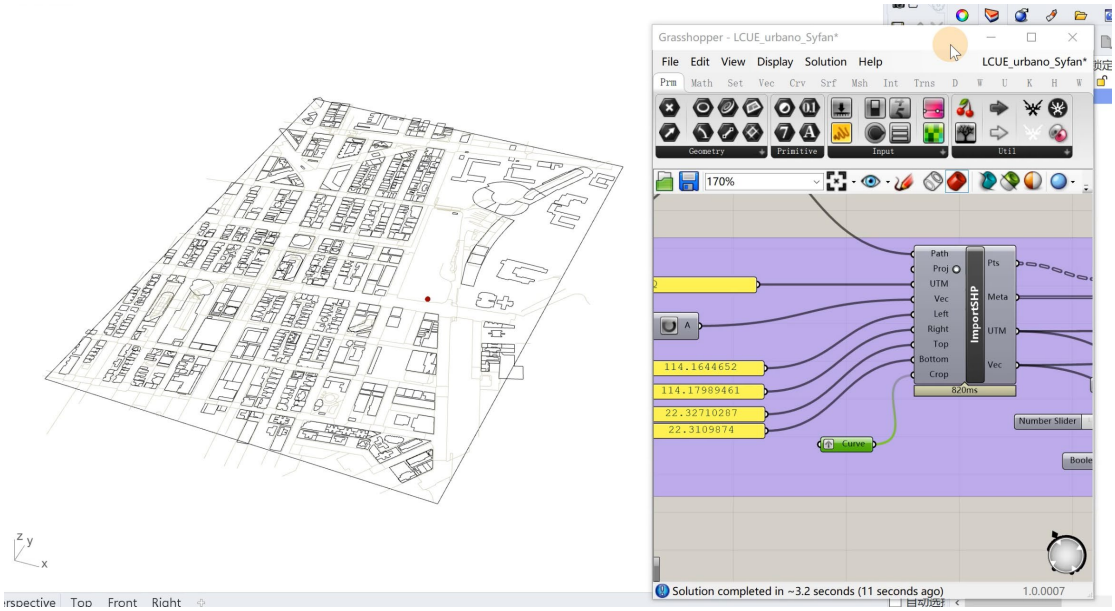
First, right click the '3D Pedestrian Network' battery, and click 'Set one existing file', choose the file we have downloaded and clipped before. Be careful that other format of documents when exporting the shapefile need to be put in the same folder.



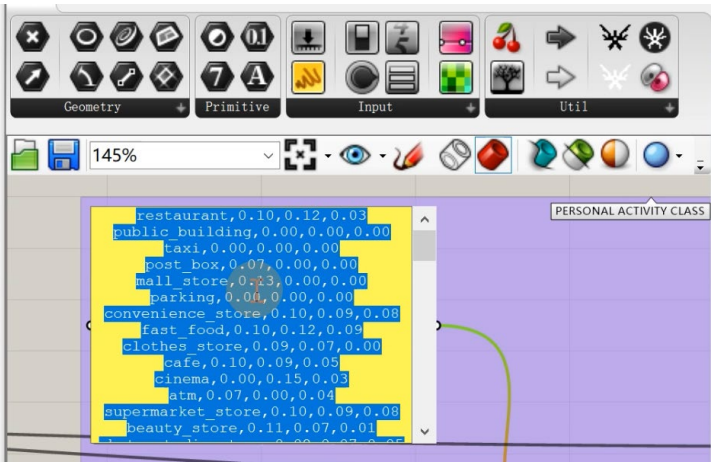

We also should set the longitude and latitude of the file to give geo-reference for auto-calibration. Draw a closed polyline in Rhino, and set the curve to clip the pedestrian network.




## 3.3 Inputting Amenity Demands Profiles

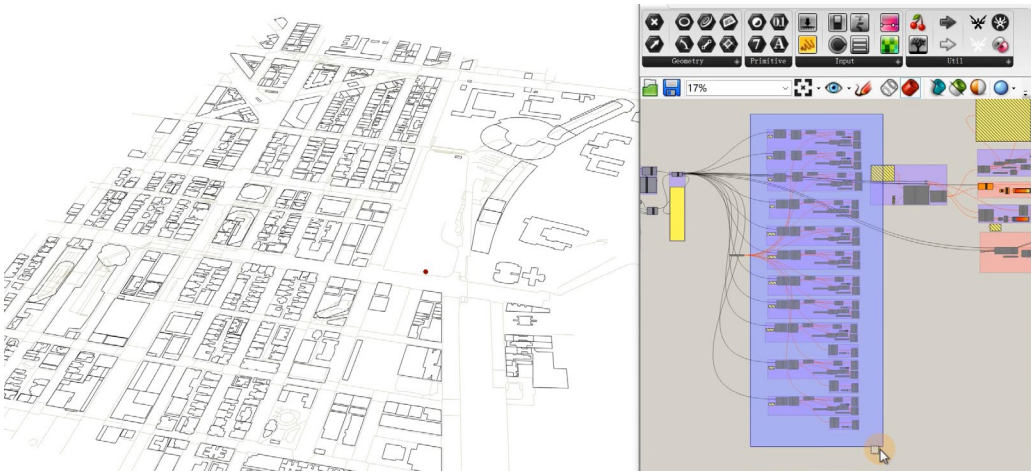
Copy the content file, double click and paste the Amenity Demands Profiles in it.

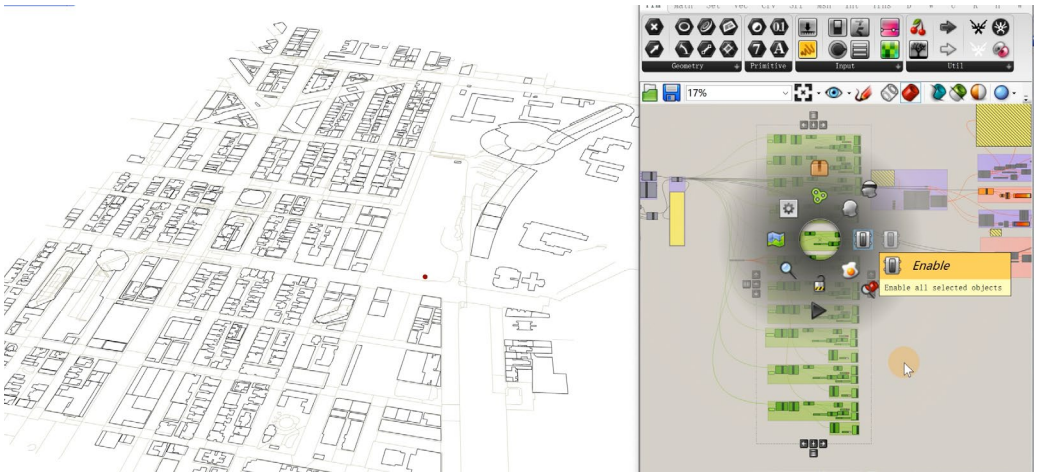


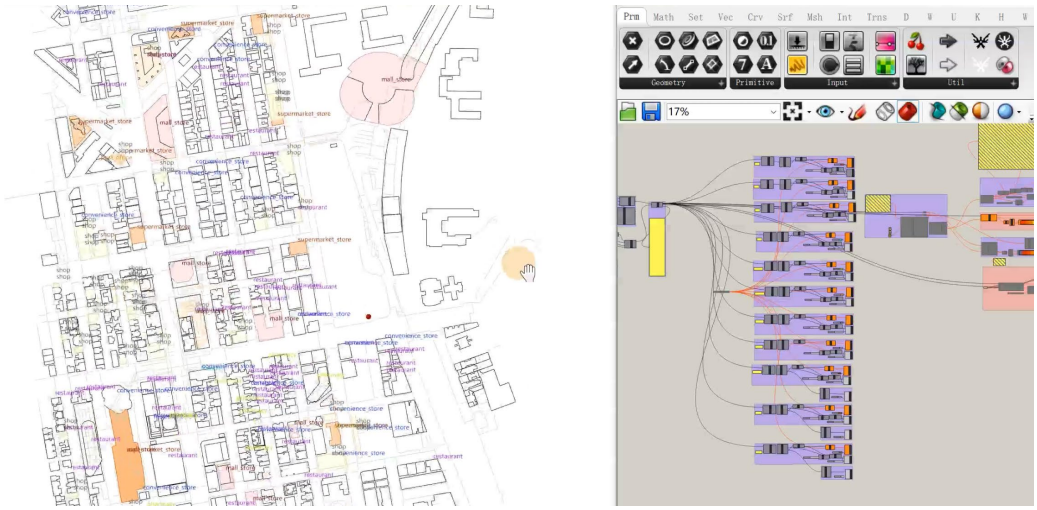
# 4. Result Visualization

## 4.1 Distribution of Amenities

This group is to visualize the distribution of amenities, we could choose to preview the certain types of amenities by typing different texts, enable the batteries, you could see the distribution of different amenities, you could change the text size and colors.

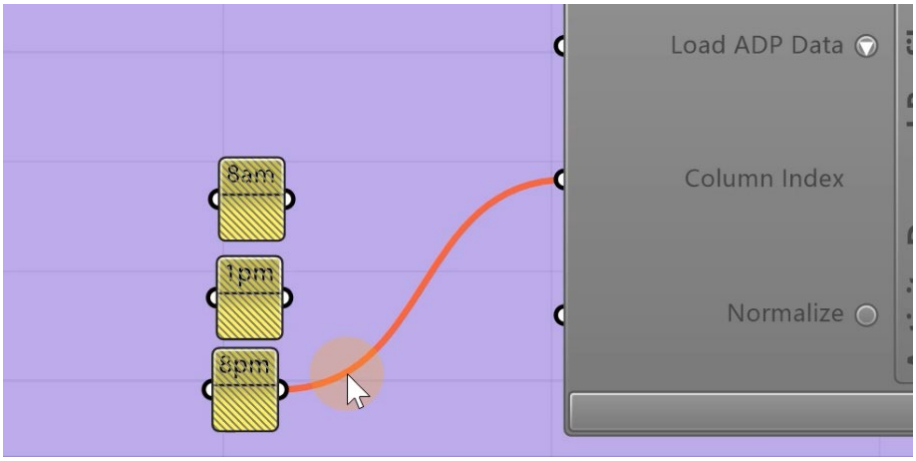


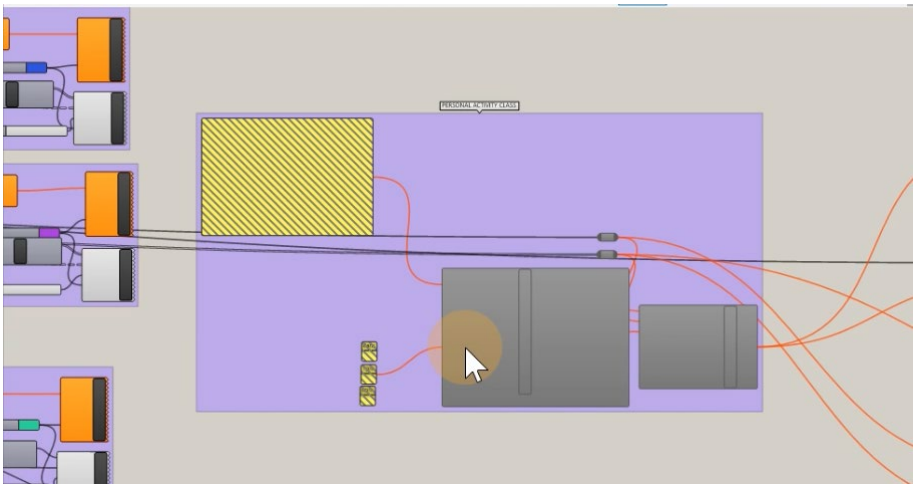


## 4.2 Generating the mobility model

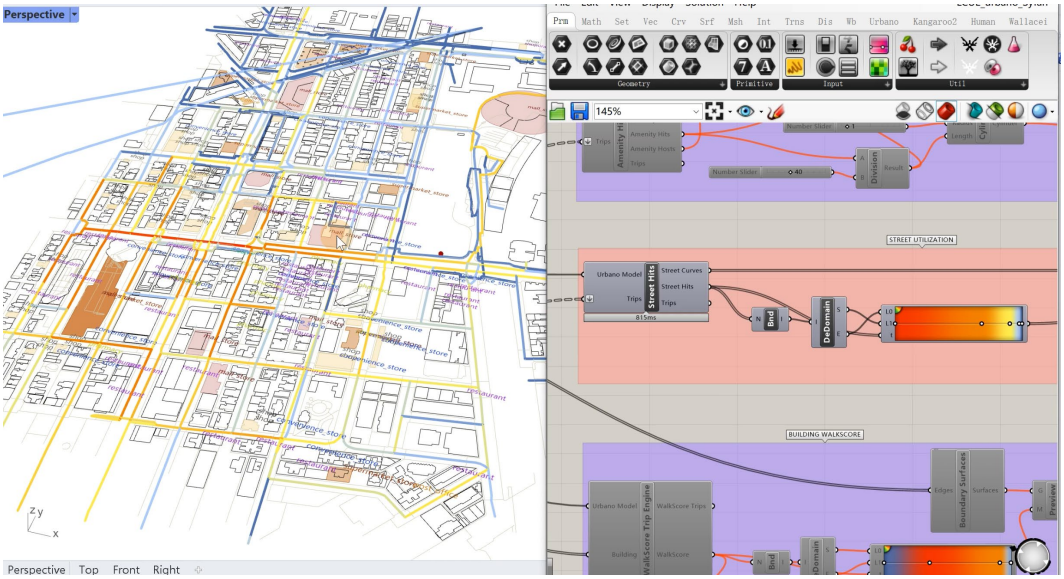
Before we enable the batteries, we should choose the certain time we want to simulate, in this case, we change the time from 8 pm to 1 am, and select the group ‘Personal Activity Class’, and enable it, it may takes a long time to load.

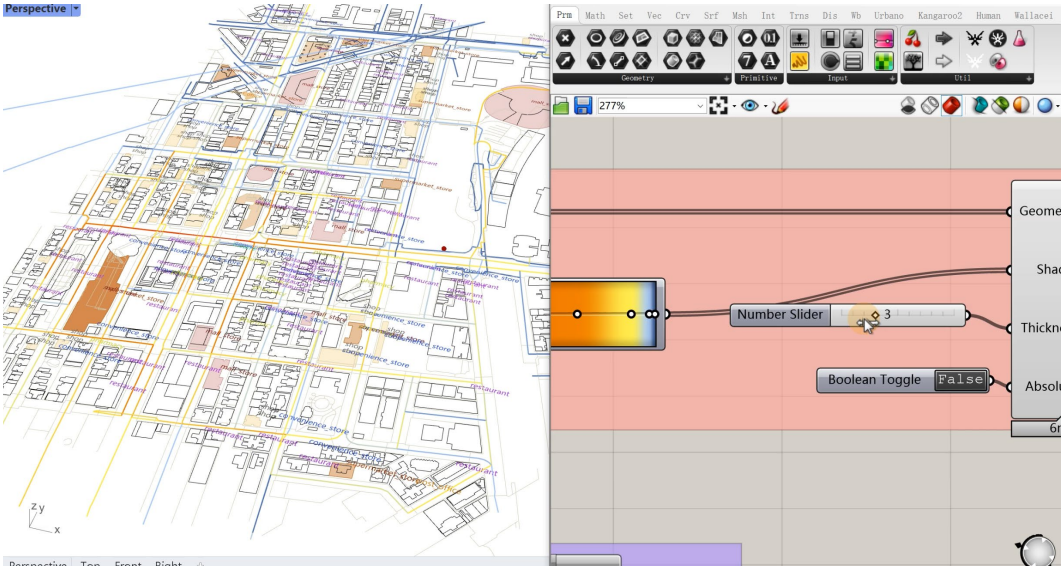



## 4.3 Visualizing Street Hits

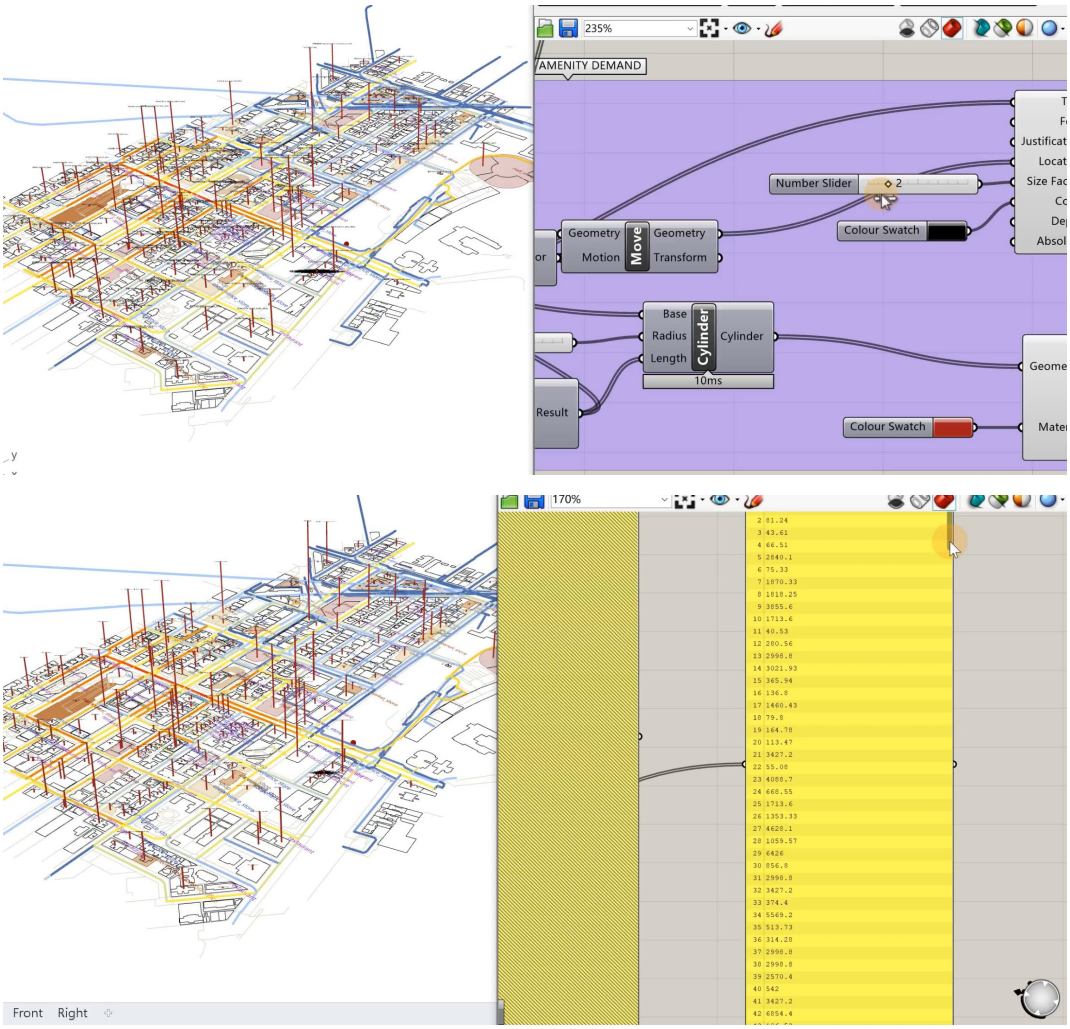
Enable the group ‘STREET UTILIZATION’, you could see the visual result of Street Hits, you could change the color ramp and line width.



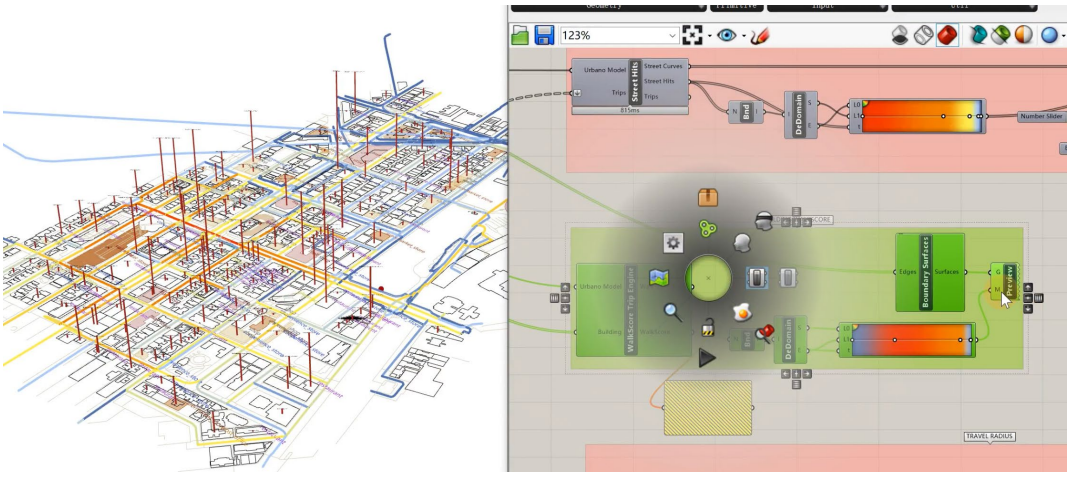

## 4.4 Visualizing Amenity Hits

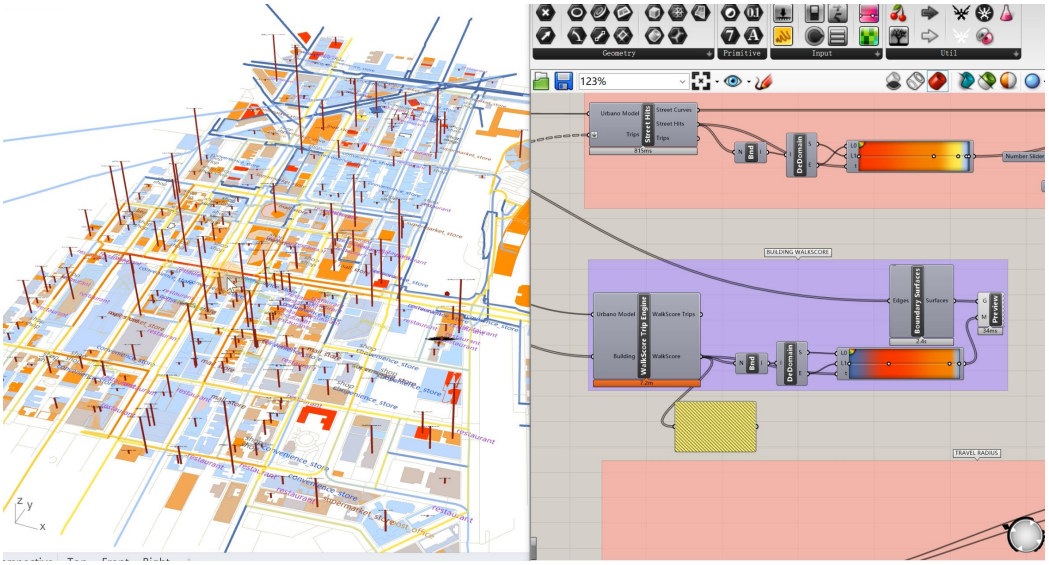
Enable the group ‘AMENITY DEMAND’, you could see the visual result of Street Hits, you could change the color and line width, as well as the height of the columns. Also, enable the panel, you could output the Amenity Hits at the building level, right click the panel, and choose ‘copy data only’.




## 4.5 Visualizing Walkscore

Enable the group ‘BUILDING WALKSCORE’, you could see the visual result of Walkscore at building level, you could change the color ramp. Also, enable the panel, you could output the Walkscore at the building level, right click the panel, and choose ‘copy data only’.






WalkScore Trip Engine
WalkScore Trips
WalkScore
7.2m
773 38.926398
774 39.076962
775 39.167741
776 39.167741
777 39.076962
778 39.076962