Geographic Information System

Vector Data – Part I

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Photo credit: ChatGPT

Outline

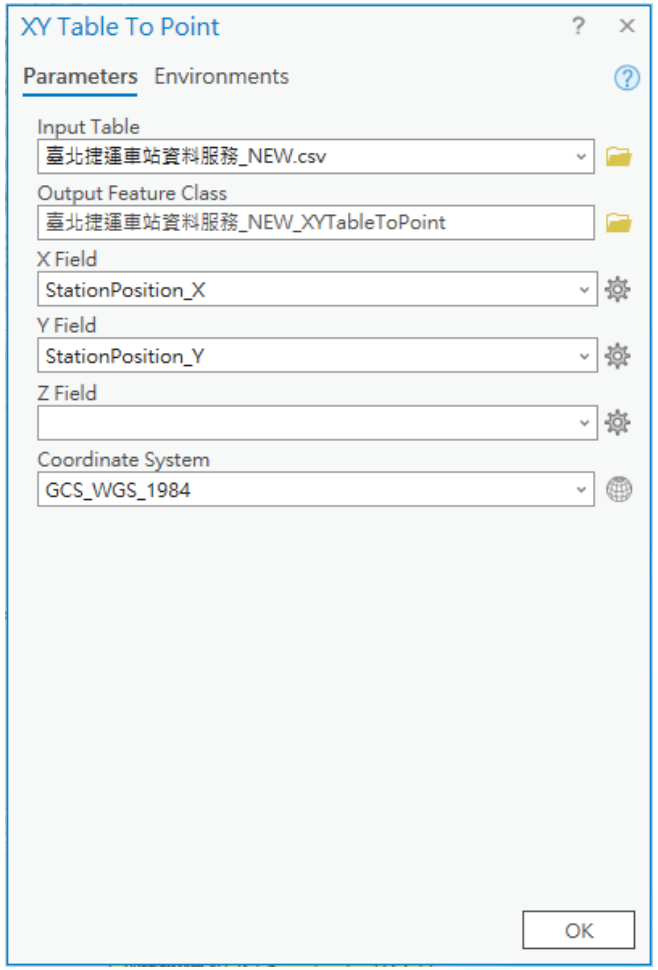
- Display XY
- Join & Spatial Join
- Add Field & Data Types
- Select by Attribute
- Select by Location
- Calculate Geometry
- Calculate Field
- Symbology

Procedure

- Today, we would like to demonstrate a case:
  - Show the relationship between population density and YouBike 2.0 rental data in Taipei City
- You will learn:
  1) Data integration: join and spatial join
  2) Calculation: calculate field and calculate geometry
  3) Data selection
  4) Symbology

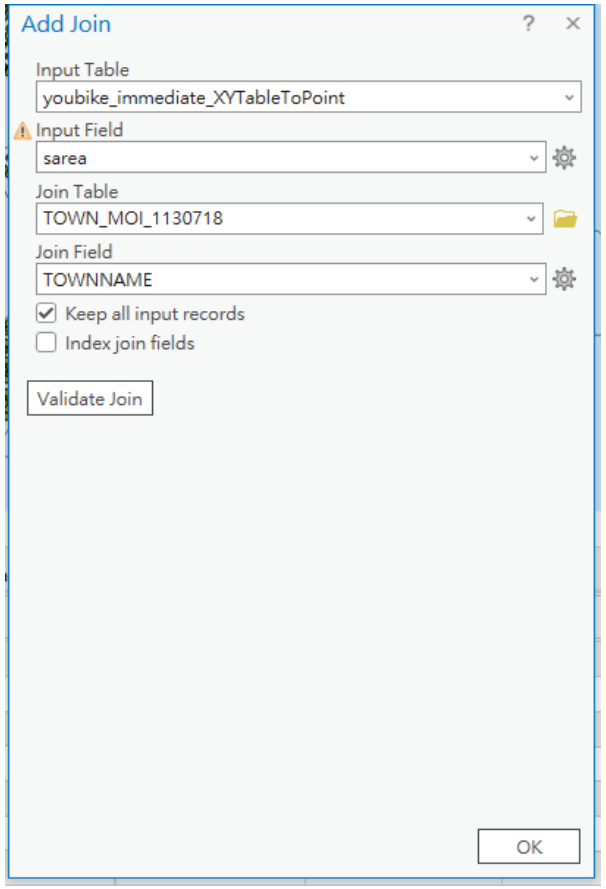
Display XY

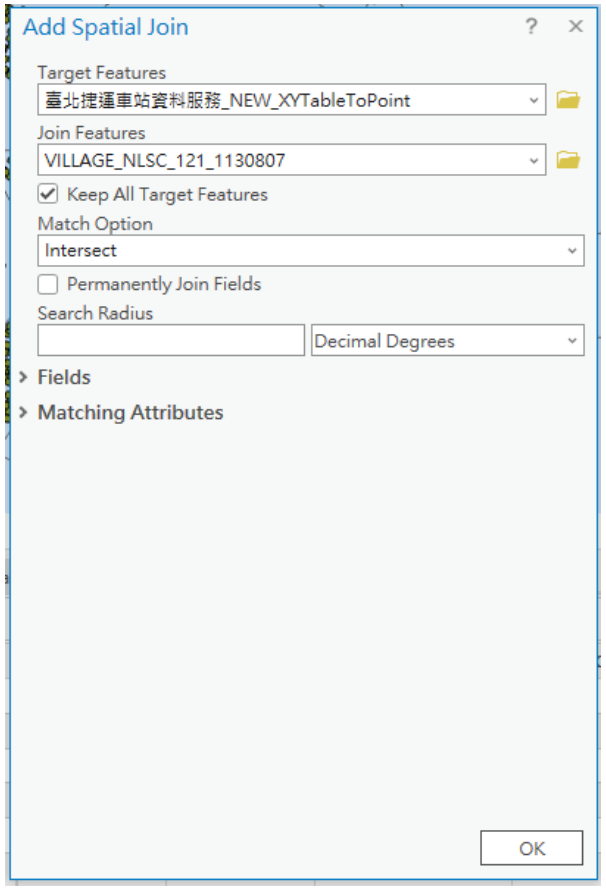
- **Display XY** is a technique to plot point data on the map.
- First of all, you need to define the X and Y column for geometry settings.



Join & Spatial Join

- **Join** is to merge two datasets together based on the **same value**.
- **Spatial join** is to merge two datasets based on the **same location**.



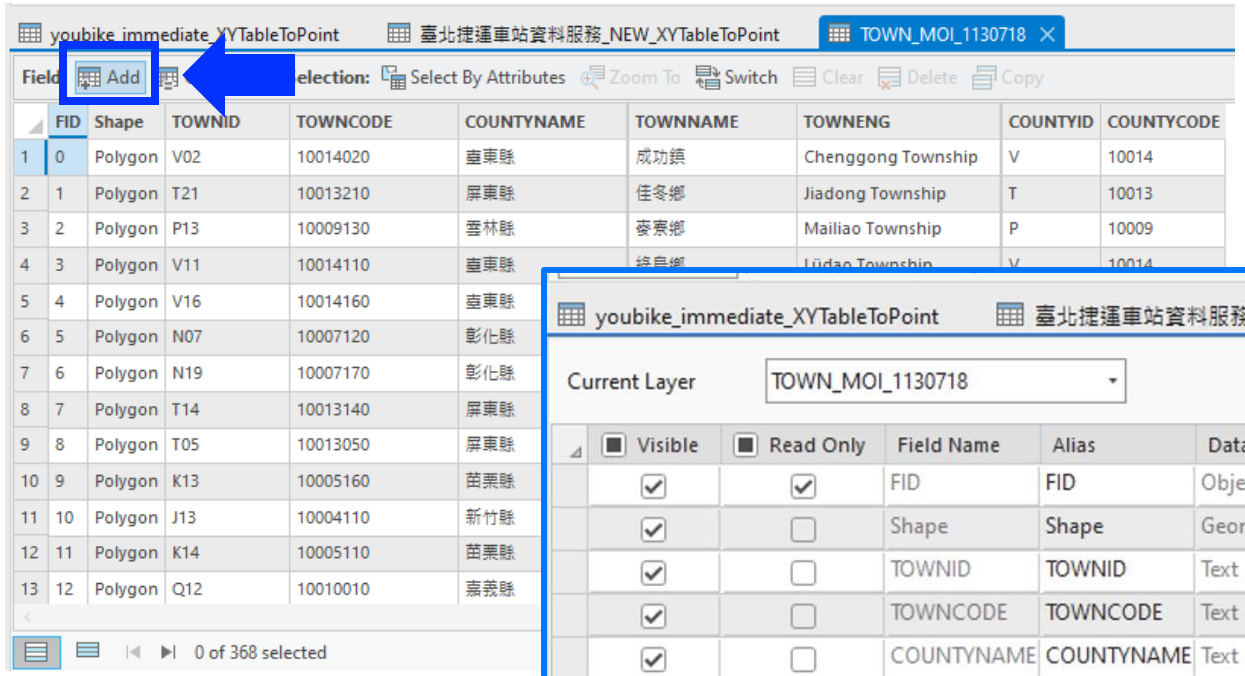


Add Field & Data Types

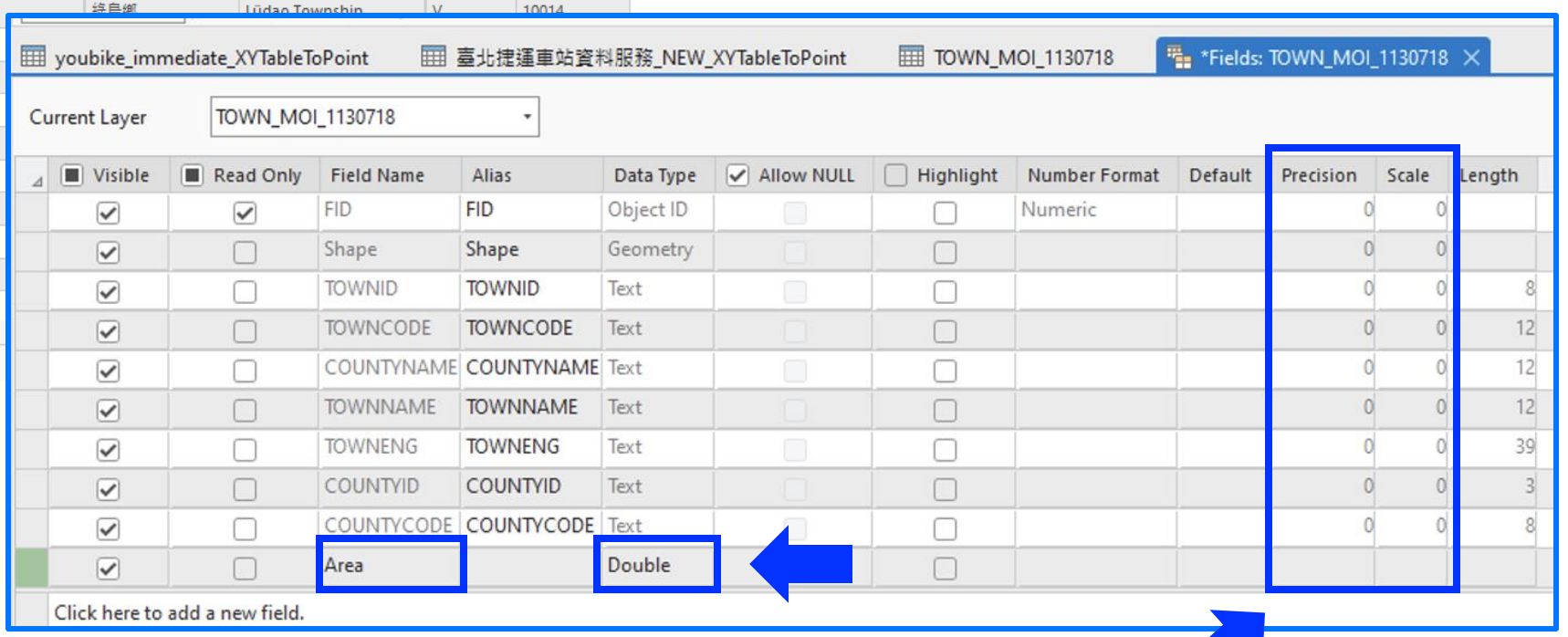
- Sometime, you want to calculate some indicators by combining two or more column value with a specific mathematical formula.
- Or you want to change the data type of the specific column.
- ➔ You may use ”add field” and do “calculate field.”

Type	Value	Meanings
short	-32768 to 32767	16-bit integer
long	-2147483648 to 2147483647	32-bit integer
float	-3.4E38 to 1.2E38	32-bit float
double	-2.2E308 to 1.8E308	64-bit float
text	string or characters	
date	datetime	

Add Field & Data Types

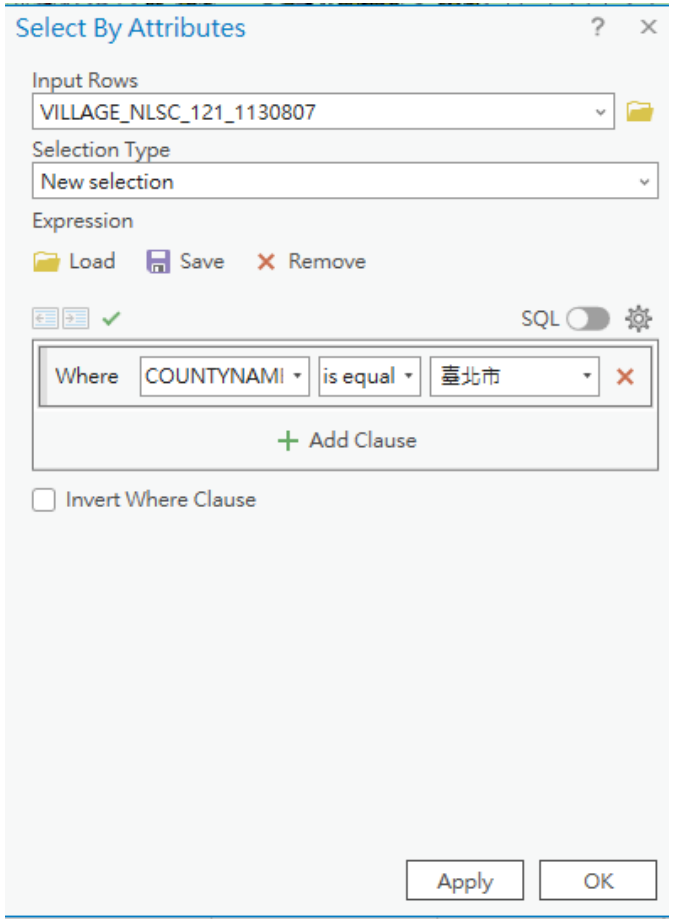


Precision is the number of digits in a number.
Scale is the number of digits to the right of the decimal point in a number.
Example: 124.82 ➔ Precision: ? Scale: ?



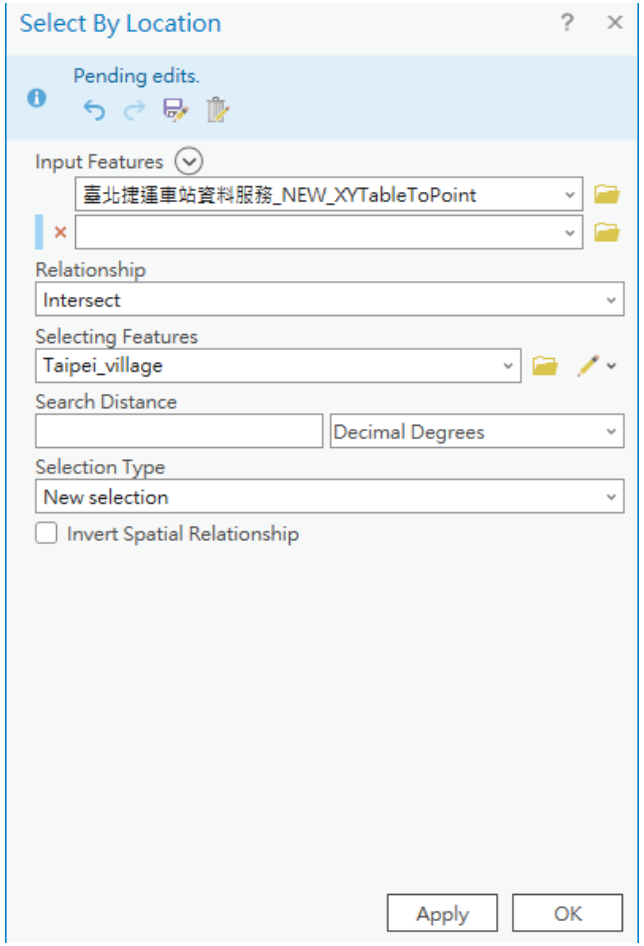
Select by Attribute

- The functionality of “select by attribute” could be regarded as a filter by using conditions, which are based on column values.
- For example, you want to select all villages of Taipei cities from a village shapefile of the enitre Taiwan.



Select by Location

- However, ”select by attribute” cannot always fulfill your objectives, since the shapefile does not have the specific column that could be used as a filter.
- In this case, you may try “select by location” to select your data by using other shapefile.



Calculate Geometry

- As a GIS software, it may also calculate several geometric attributes.

•**Area**—An attribute will be added to store the area of each polygon feature.
•**Area (geodesic)**—An attribute will be added to store the shape-preserving geodesic area of each polygon feature.
•**Centroid x/y/z-coordinate**—An attribute will be added to store the centroid x/y/z-coordinate of each feature.
•**Centroid m-value**—An attribute will be added to store the centroid m-value of each feature.
•**Central point x/y/z-coordinate**—An attribute will be added to store the x/y/z-coordinate of a central point inside or on each feature. This point is the same as the centroid if the centroid is inside the feature; otherwise, it is an inner label point.
•**Central point m-value**—An attribute will be added to store the m-value of a central point inside or on each feature. This point is the same as the centroid if the centroid is inside the feature; otherwise, it is an inner label point.
•**Number of curves**—An attribute will be added to store the number of curves in each feature. Curves include elliptical arcs, circular arcs, and Bezier curves.
•**Number of holes**—An attribute will be added to store the number of interior holes within each polygon feature.
•**Minimum x/y/z-coordinate**—An attribute will be added to store the minimum x/y/z-coordinate of each feature's extent.
•**Maximum x/y/z-coordinate**—An attribute will be added to store the maximum x/y/z-coordinate of each feature's extent.
•**Length**—An attribute will be added to store the length of each line feature.
•**Length (geodesic)**—An attribute will be added to store the shape-preserving geodesic length of each line feature.
•**Length (3D)**—An attribute will be added to store the 3D length of each line feature.
•**Line bearing**—An attribute will be added to store the start-to-end bearing of each line feature. Values range from 0 to 360, with 0 meaning north, 90 east, 180 south, 270 west, and so on.
•**Line start x/y/z-coordinate**—An attribute will be added to store the x/y/z-coordinate of the start point of each line feature.
•**Line start m-value**—An attribute will be added to store the m-value of the start point of each line feature.
•**Line end x/y/z-coordinate**—An attribute will be added to store the x/y/z-coordinate of the end point of each line feature.
•**Line end m-value**—An attribute will be added to store the m-value of the end point of each line feature.
•**Number of parts**—An attribute will be added to store the number of parts composing each feature.
•**Number of vertices**—An attribute will be added to store the number of points or vertices composing each feature.
•**Perimeter length**—An attribute will be added to store the length of the perimeter or border of each polygon feature.
•**Perimeter length (geodesic)**—An attribute will be added to store the shape-preserving geodesic length of the perimeter or border of each polygon feature.
•**Point x/y/z-coordinate**—An attribute will be added to store the x/y/z-coordinate of each point feature.
•**Point m-value**—An attribute will be added to store the m-value of each point feature.
•**Point x- and y-coordinate notation**—An attribute will be added to store the x- and y-coordinate of each point feature formatted as a specified coordinate notation.

Calculate Geometry

- But, ...

•**Area (geodesic)**—An attribute will be added to store the shape-preserving geodesic area of each polygon feature.
•**Centroid x/y/z-coordinate**—An attribute will be added to store the centroid x/y/z-coordinate of each feature.
•**Central point x/y/z-coordinate**—An attribute will be added to store the x/y/z-coordinate of a central point inside or on each feature. This point is the same as the centroid if the centroid is inside the feature; otherwise, it is an inner label point.
•**Minimum x/y/z-coordinate**—An attribute will be added to store the minimum x/y/z-coordinate of each feature's extent.
•**Maximum x/y/z-coordinate**—An attribute will be added to store the maximum x/y/z-coordinate of each feature's extent.
•**Length (geodesic)**—An attribute will be added to store the shape-preserving geodesic length of each line feature.
•**Line bearing**—An attribute will be added to store the start-to-end bearing of each line feature. Values range from 0 to 360, with 0 meaning north, 90 east, 180 south, 270 west, and so on.
•**Line start x/y/z-coordinate**—An attribute will be added to store the x/y/z-coordinate of the start point of each line feature.
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•**Number of parts**—An attribute will be added to store the number of parts composing each feature.
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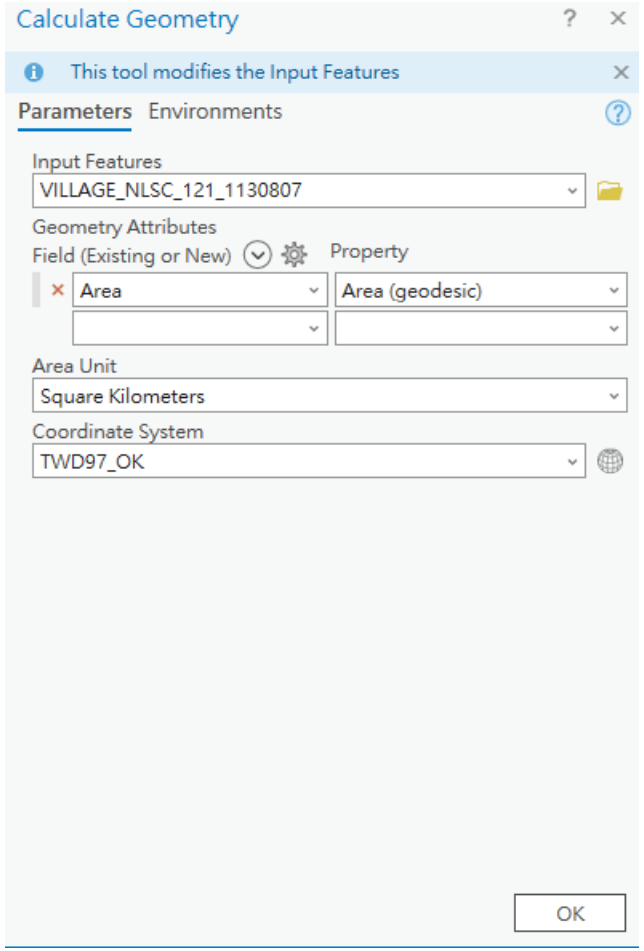
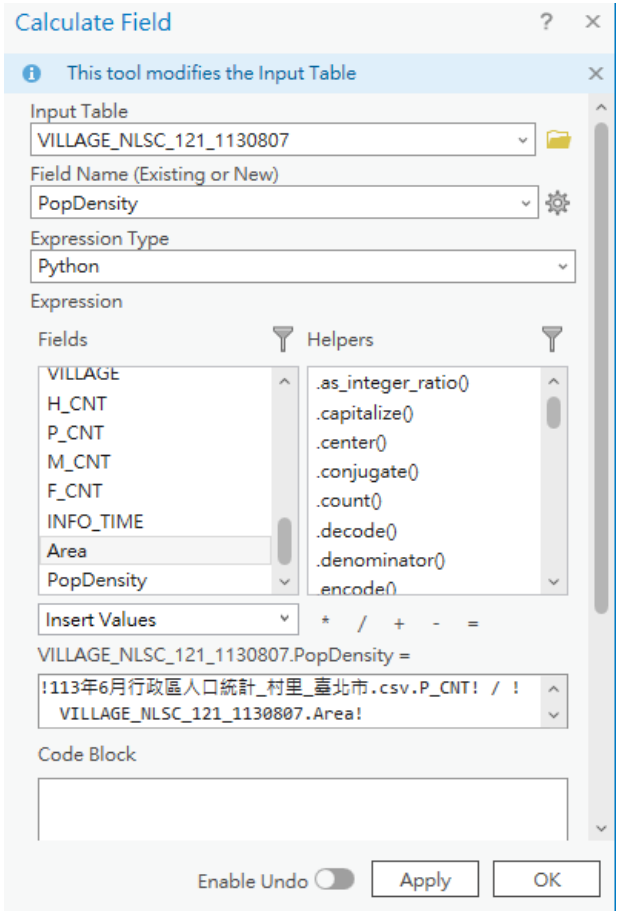
•**Perimeter length (geodesic)**—An attribute will be added to store the shape-preserving geodesic length of the perimeter or border of each polygon feature.
•**Point x/y/z-coordinate**—An attribute will be added to store the x/y/z-coordinate of each point feature.
•**Point x- and y-coordinate notation**—An attribute will be added to store the x- and y-coordinate of each point feature formatted as a specified coordinate notation.



Calculate Field

- ArcGIS Pro not only can calculate the geometric metrics, but also can calculate several mathematical indictors.
- For example, you may use ”population” and “area” to calculate the “population density.”

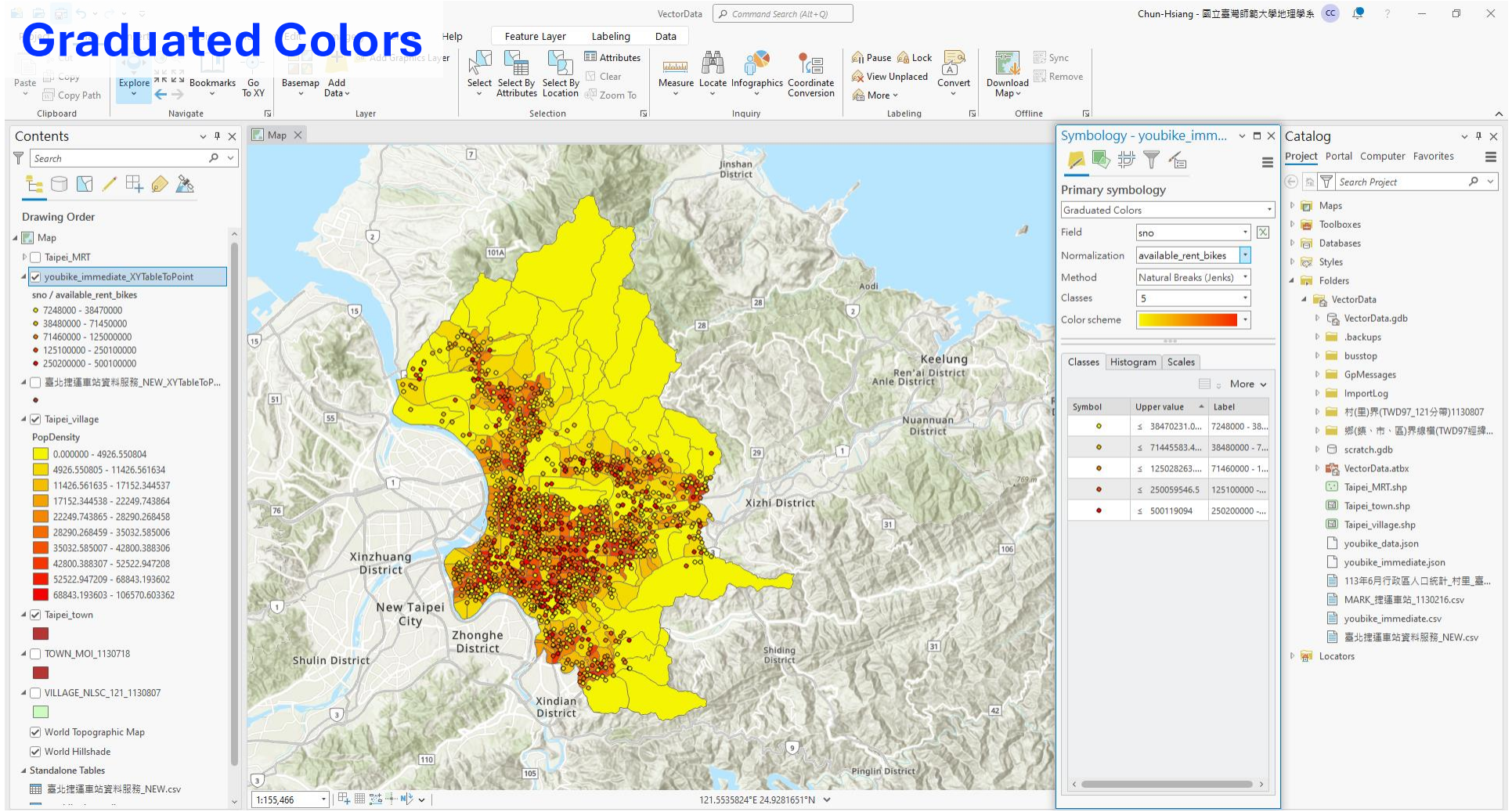


Symbology

- Geographic visualization is an important approach to demonstrate the distribution of a specific feature in space domain.
- In ArcGIS Pro, it allows various combination of visualization methods.
- Due to the time limitation, we only introduce the single and graduated illustration.

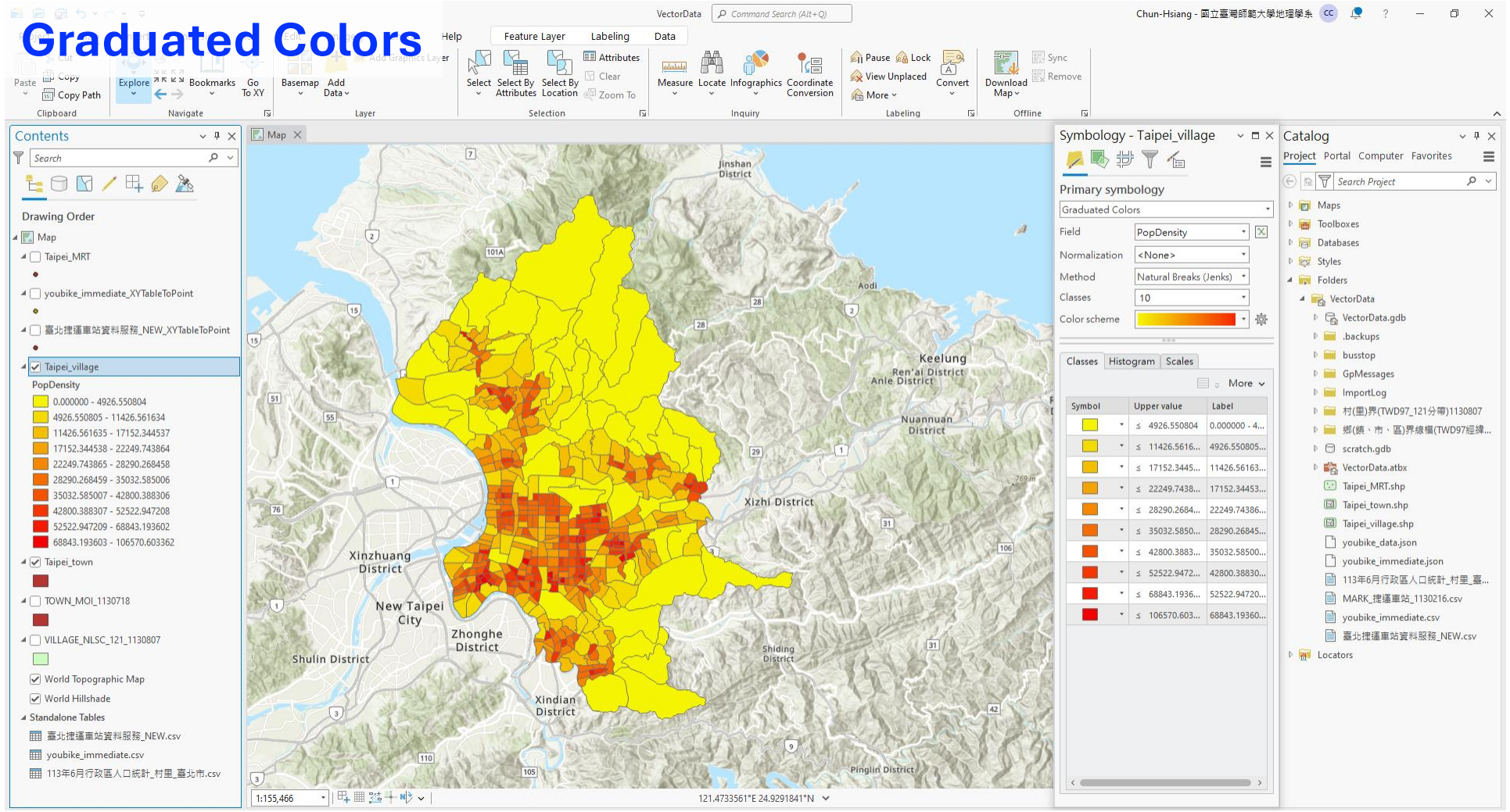
Symbology

Graduated Colors



Symbology

Graduated Colors



The End

Thank you for your attention!

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