

GIS Lab using QGIS

數位人文概論

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Please download and install QGIS now.

It takes a little while.

<https://qgis.org/zh-Hant/site/forusers/download.html>

If the download progress is too slow,
you may also copy the **.exe file** from the USB here!

長期維護釋出檔案庫 (最穩定的) :



QGIS 獨立安裝程式版本 3.10 (64 位元)

sha256



QGIS 獨立安裝程式版本 3.10 (32 位元)

sha256

Outline

- Intro. to basic GIS concepts
- GIS Lab
 - ▶ Software: QGIS

By the end of this class, you will be able to...

- ✓ Handling GIS data
- ✓ Visualizing GIS data
- ✓ Making professional GIS maps
- ✓ Spatial calculation with GIS data
- ✓ Basic spatial analysis skills

Software for GIS and Spatial Analysis



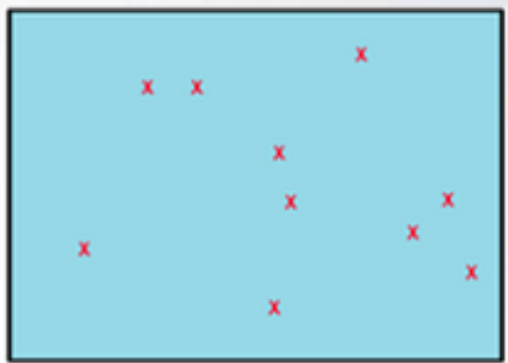
- ✓ No coding required
- ✓ FREE!



...

Vector and Raster data

Vector data



Point features

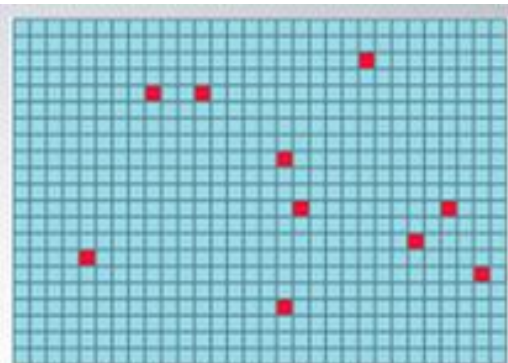


Line features

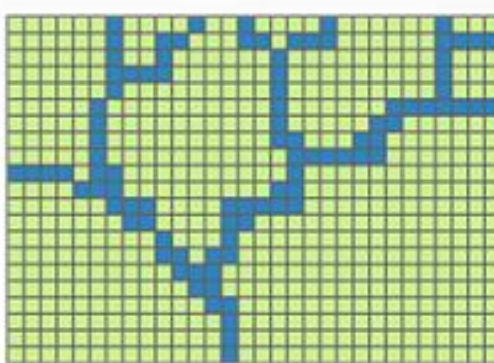


Polygon features

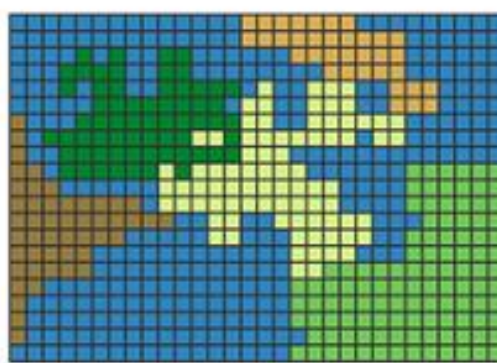
Raster data



Raster point features



Raster line features



Raster polygon features

Data format:

■ Shapefile

■ ...

名稱

Flooding.cpg

Flooding.dbf

Flooding.prj

Flooding.shp

Flooding.shx

■ Tiff

■ JPG

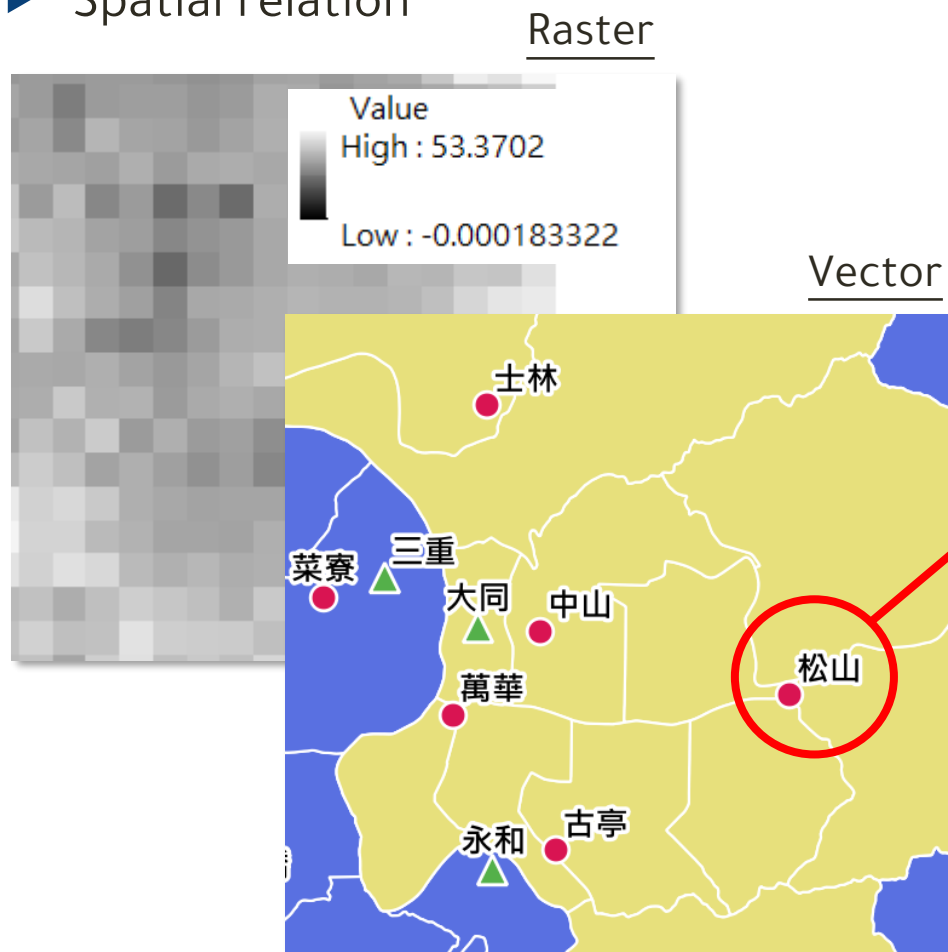
■ PNG

■ ...

GIS data

1. Spatial geometry

► Spatial relation



2. Attribute table

空氣品質監測站 :: Features Total: 76, Filtered: 76, Selected: 0

| | SiteName | SiteEngNam | AreaName | County | Township | SiteAddress |
|----|----------|------------|----------|--------|----------|-------------|
| 61 | 沙鹿 | Shalu | 中部空品區 | 臺中市 | 沙鹿區 | 臺中市沙鹿區英... |
| 62 | 大里 | Dali | 中部空品區 | 臺中市 | 大里區 | 臺中市大里區大... |
| 63 | 萬華 | Wanhua | 北部空品區 | 臺北市 | 萬華區 | 臺北市萬華區中... |
| 64 | 陽明 | Yangming | 北部空品區 | 臺北市 | 北投區 | 臺北市北投區竹... |
| 65 | 松山 | Songshan | 北部空品區 | 臺北市 | 松山區 | 臺北市松山區八... |
| 66 | 中山 | Zhongshan | 北部空品區 | 臺北市 | 中山區 | 臺北市中山區林... |
| 67 | 古亭 | Guting | 北部空品區 | 臺北市 | 大安區 | 臺北市大安區羅... |
| 68 | 士林 | Shilin | 北部空品區 | 臺北市 | 北投區 | 臺北市北投區文... |
| 69 | 大同 | Datong | 北部空品區 | 臺北市 | 大同區 | 臺北市大同區重... |
| 70 | 關山 | Guanshan | 花東空品區 | 臺東縣 | 關山鎮 | 臺東縣關山鎮自... |
| 71 | 臺東 | Taitung | 花東空品區 | 臺東縣 | 臺東市 | 臺東市中山路27... |
| 72 | 臺南 | Tainan | 雲嘉南空品區 | 臺南市 | 中西區 | 臺南市中西區南... |
| 73 | 新營 | Xinying | 雲嘉南空品區 | 臺南市 | 新營區 | 臺南市新營區中... |
| 74 | 善化 | Shanhua | 雲嘉南空品區 | 臺南市 | 善化區 | 臺南市善化區益... |
| 75 | 安南 | Annan | 雲嘉南空品區 | 臺南市 | 安南區 | 臺南市安南區安... |
| 76 | 馬公 | Magong | 其他 | 澎湖縣 | 馬公市 | 澎湖縣馬公市中... |

Show All Features

Download QGIS

- <https://qgis.org/zh-Hant/site/forusers/download.html>

最新的版本 (功能特點最豐富的) :



QGIS 獨立安裝程式版本 3.12 (64 位元)

sha256



QGIS 獨立安裝程式版本 3.12 (32 位元)

sha256

Recommended!

長期維護釋出檔案案庫 (最穩定的) :



QGIS 獨立安裝程式版本 3.10 (64 位元)

sha256



QGIS 獨立安裝程式版本 3.10 (32 位元)

sha256

Today's QGIS Lab

Today's Lab:

◉ Lab 1: Intro. to GIS data

- ▶ Point, line and polygon
- ▶ Attribute table
- ▶ Symbology (categorical data)

◉ Lab 2: Calculation with GIS data

- ▶ Geometric and field calculation
- ▶ Symbology (continuous data)

◉ Lab 3: Intro. to spatial analysis

- ▶ Overlay
- ▶ Buffer
- ▶ Spatial query

Lab 1: Intro. to GIS data

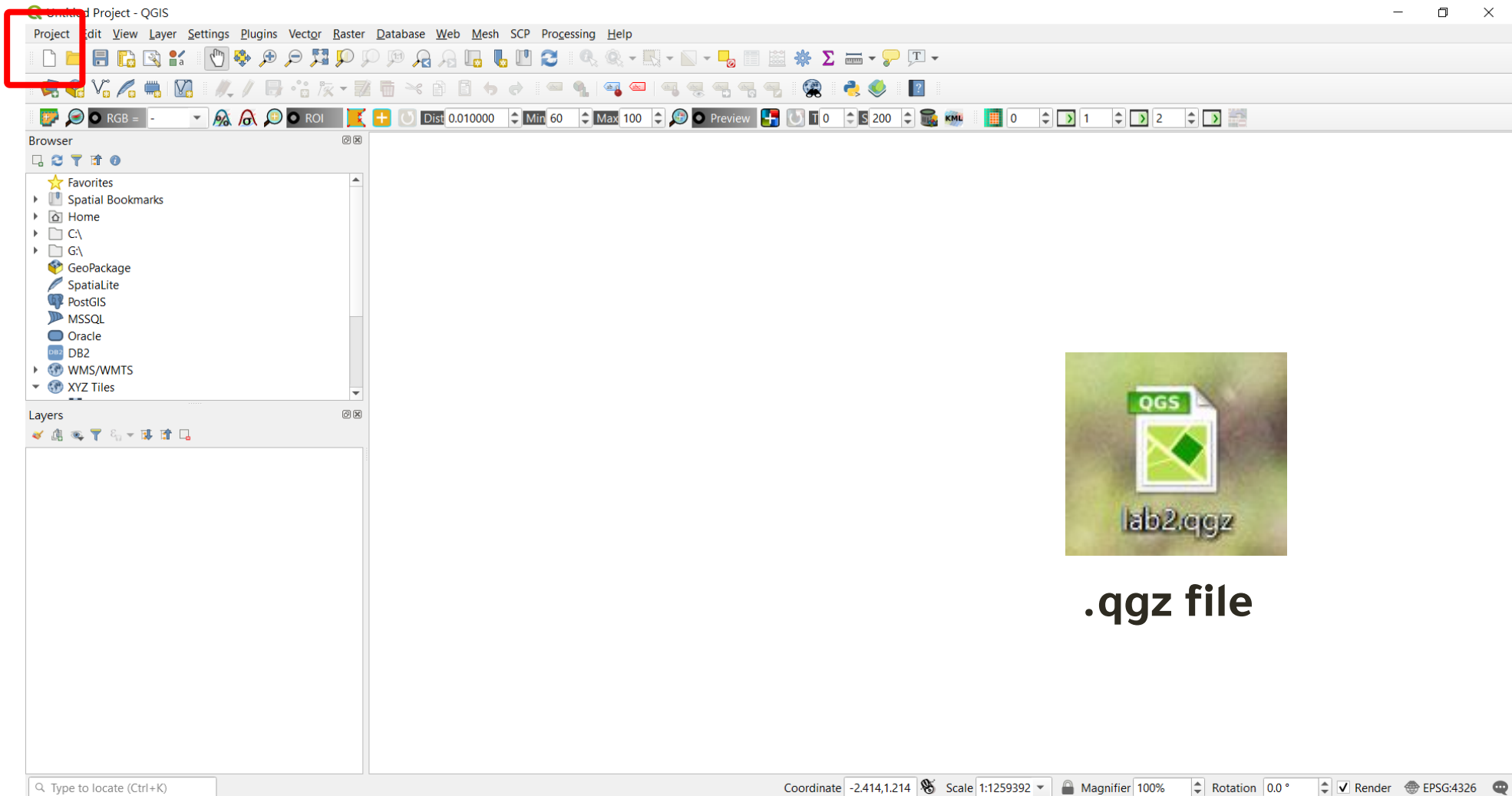


台北市環保署空氣品質測站分布

Data:

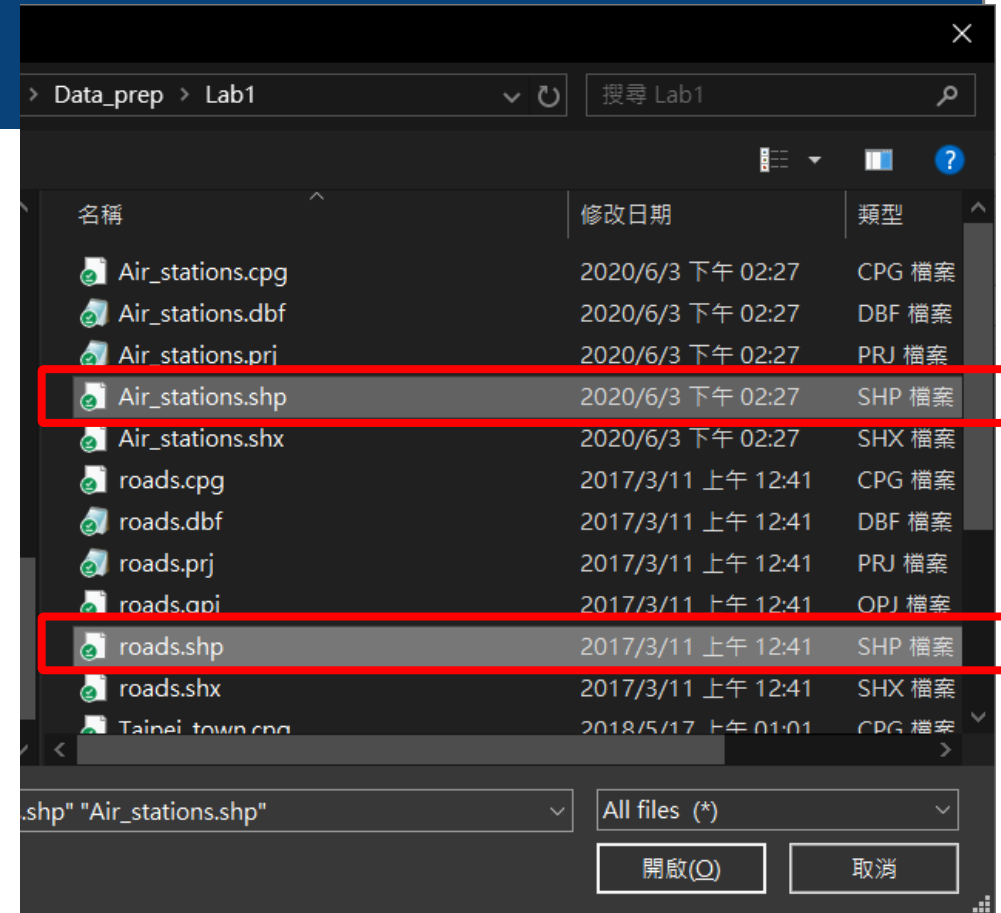
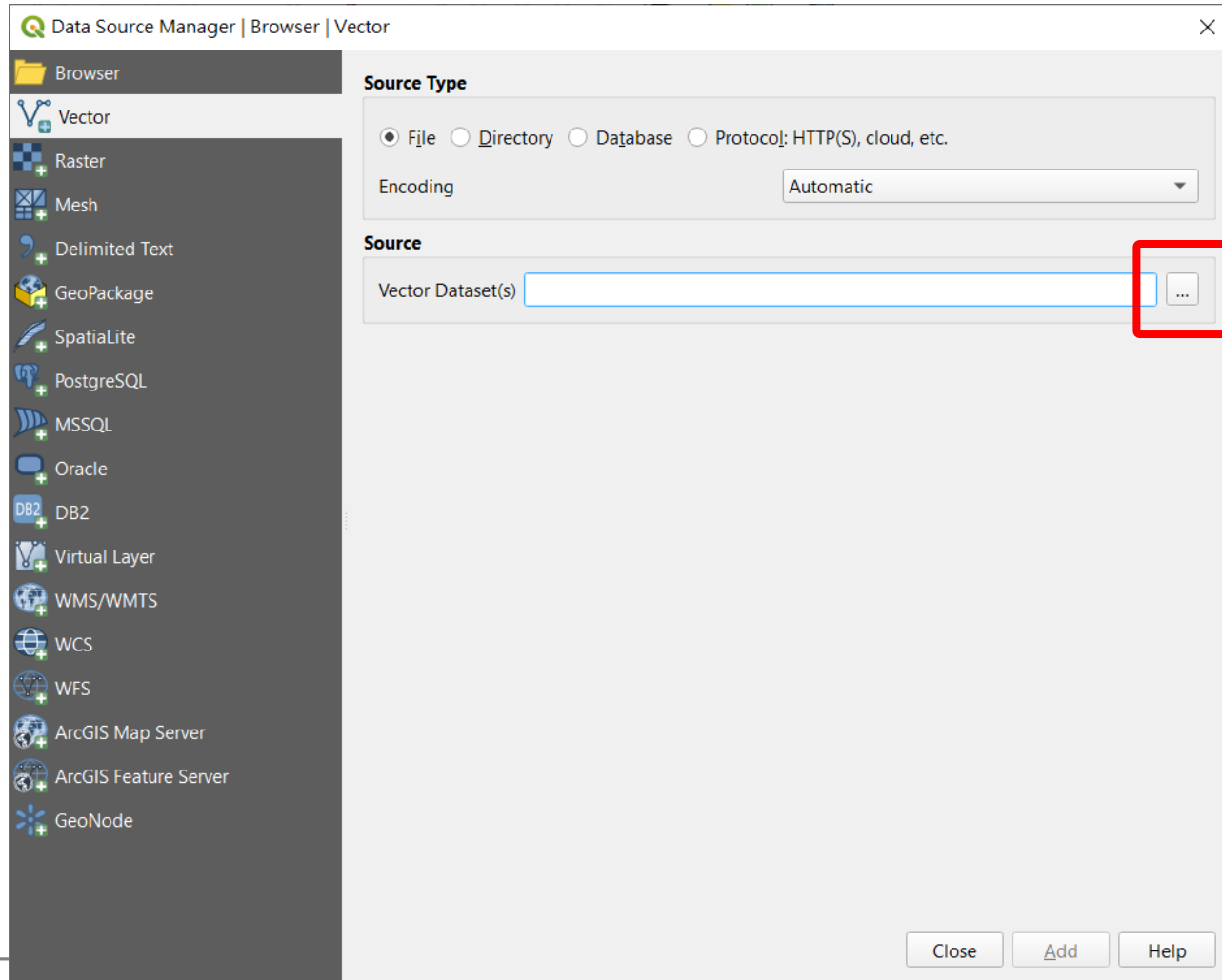
- ◆ *Taipei_town.shp*
- ◆ *roads.shp*
- ◆ *Air_stations.shp*

New a QGIS project



Open data

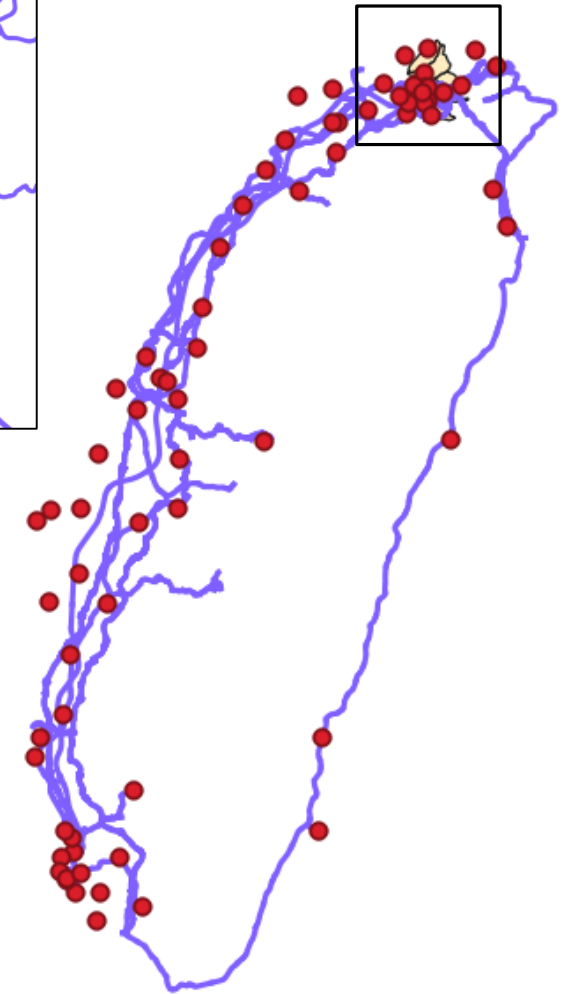
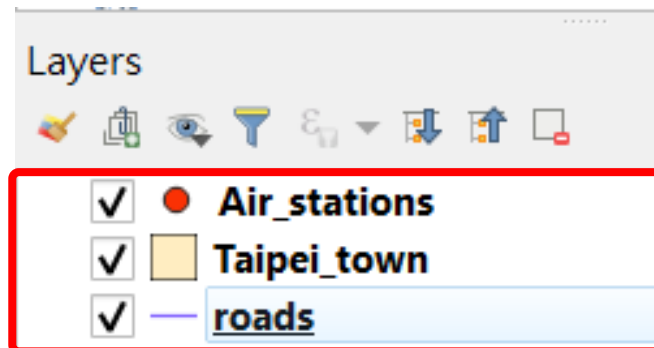
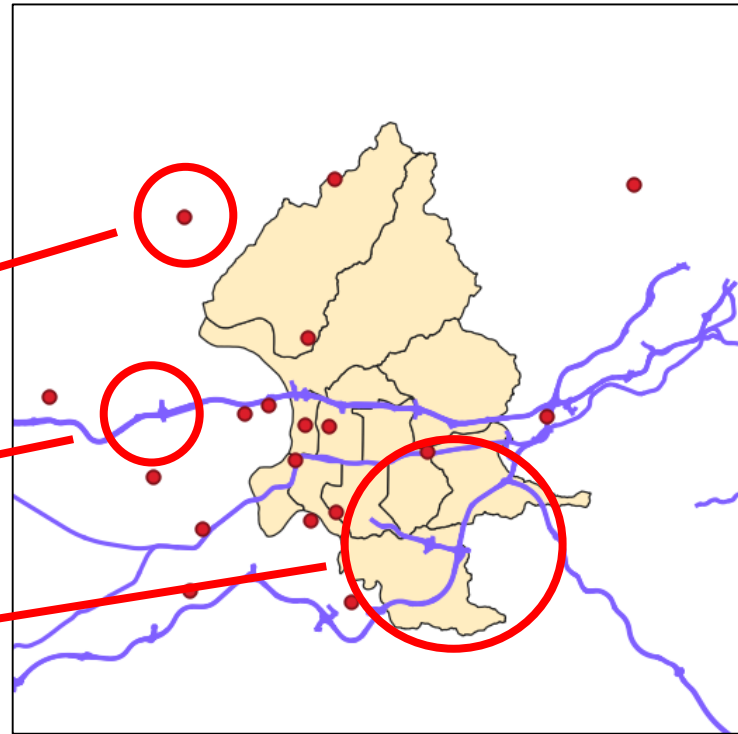
Shapefile



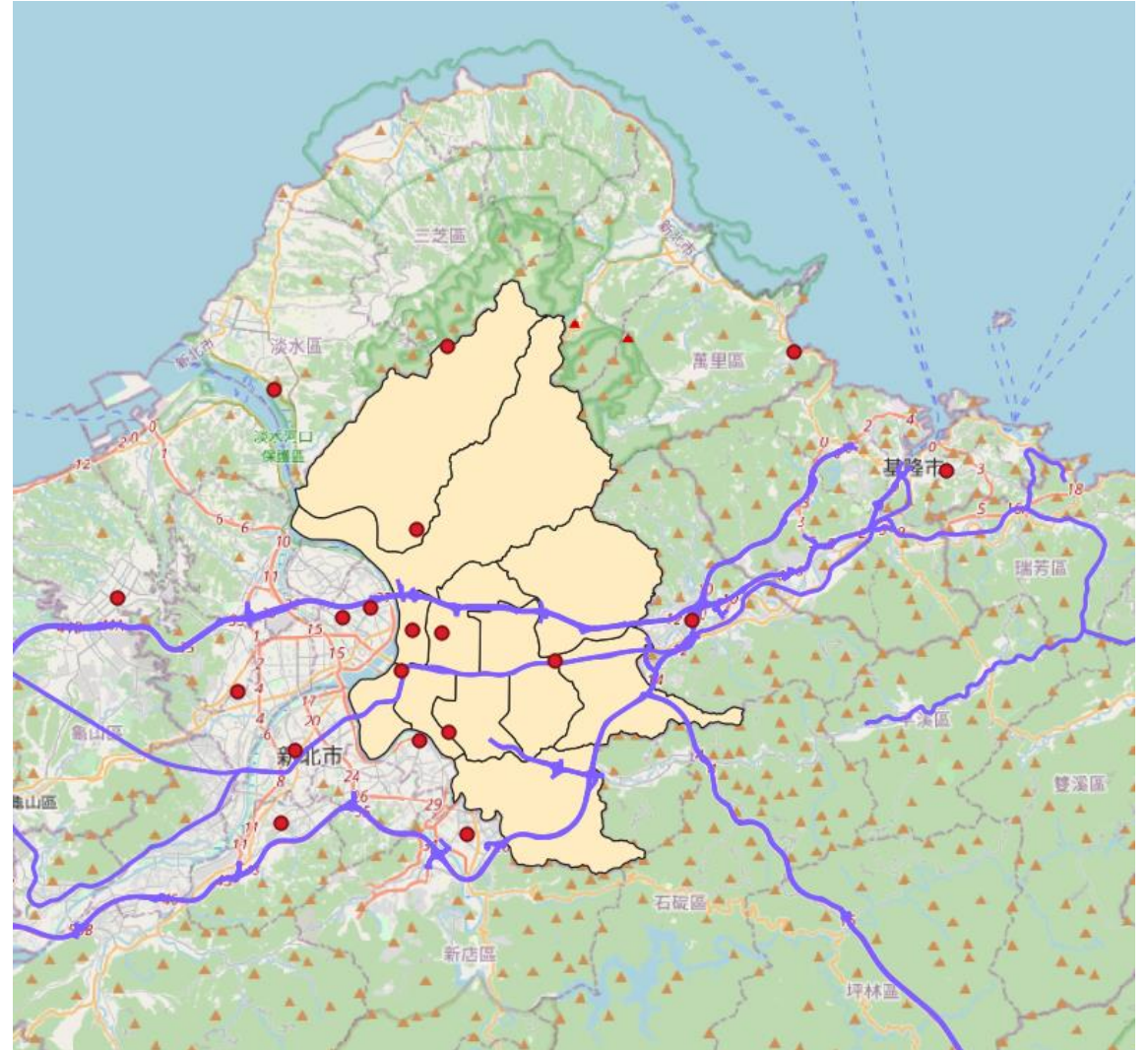
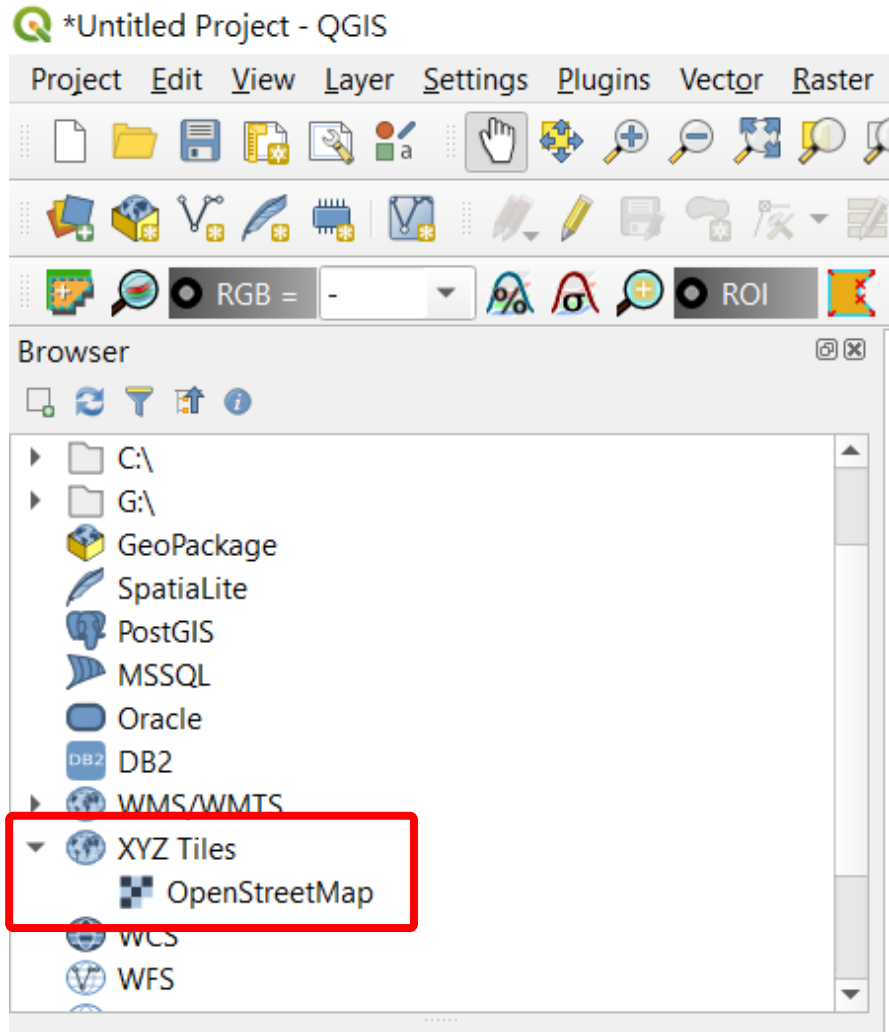
► Select .shp file

Data types

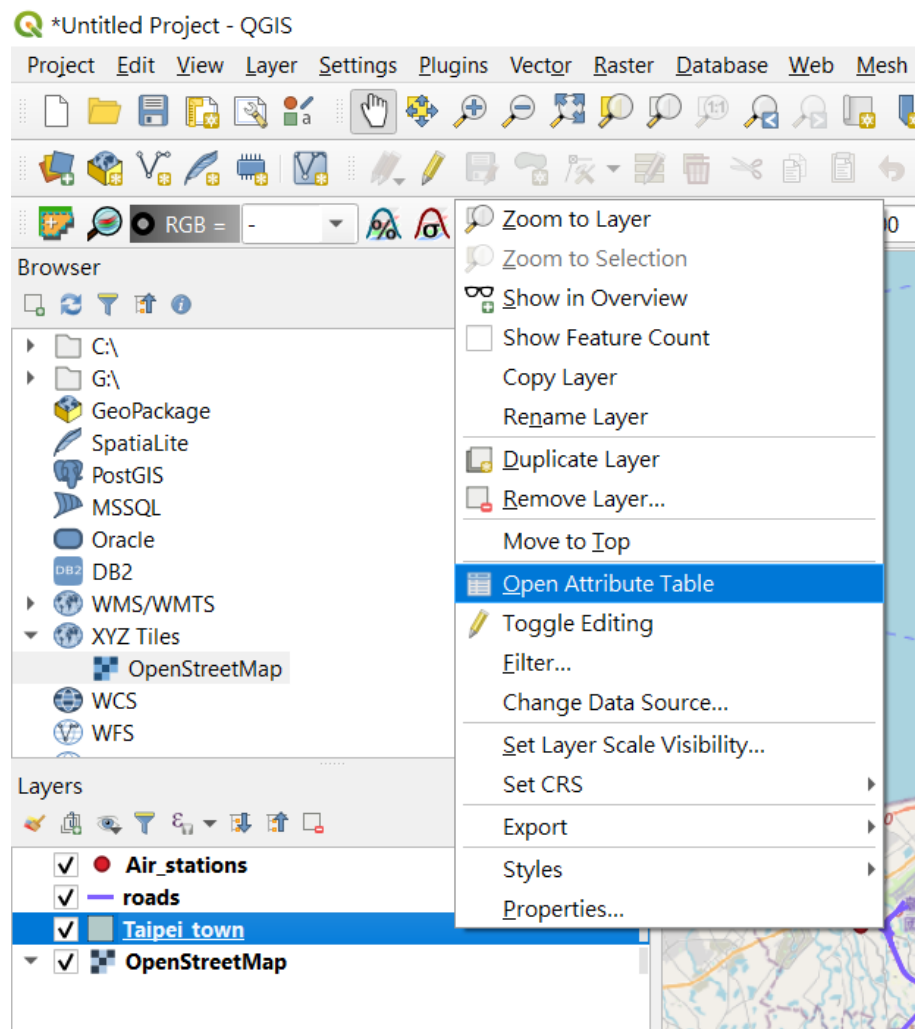
- Point
- Line
- Polygon



(Add OpenStreetMap as basemap)



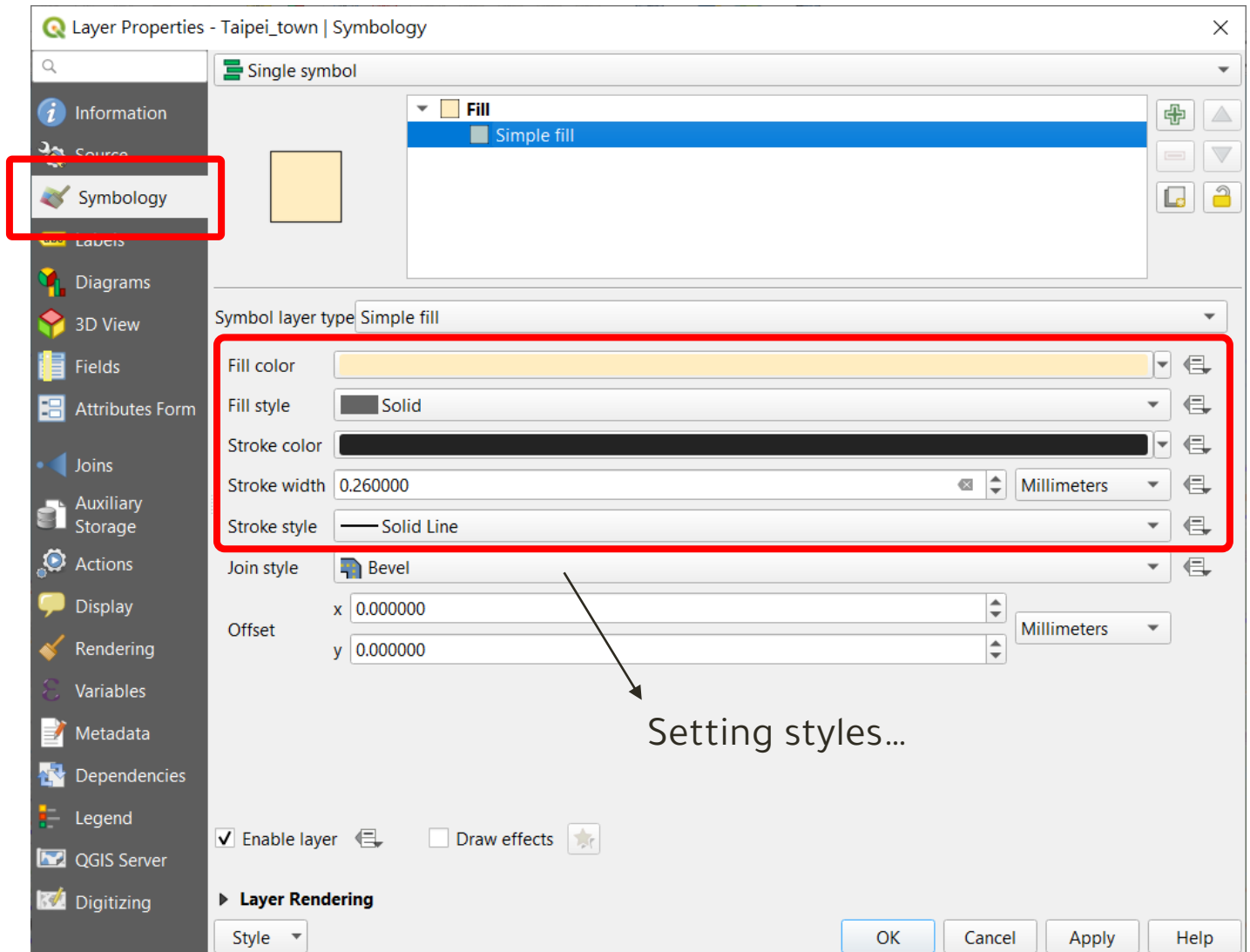
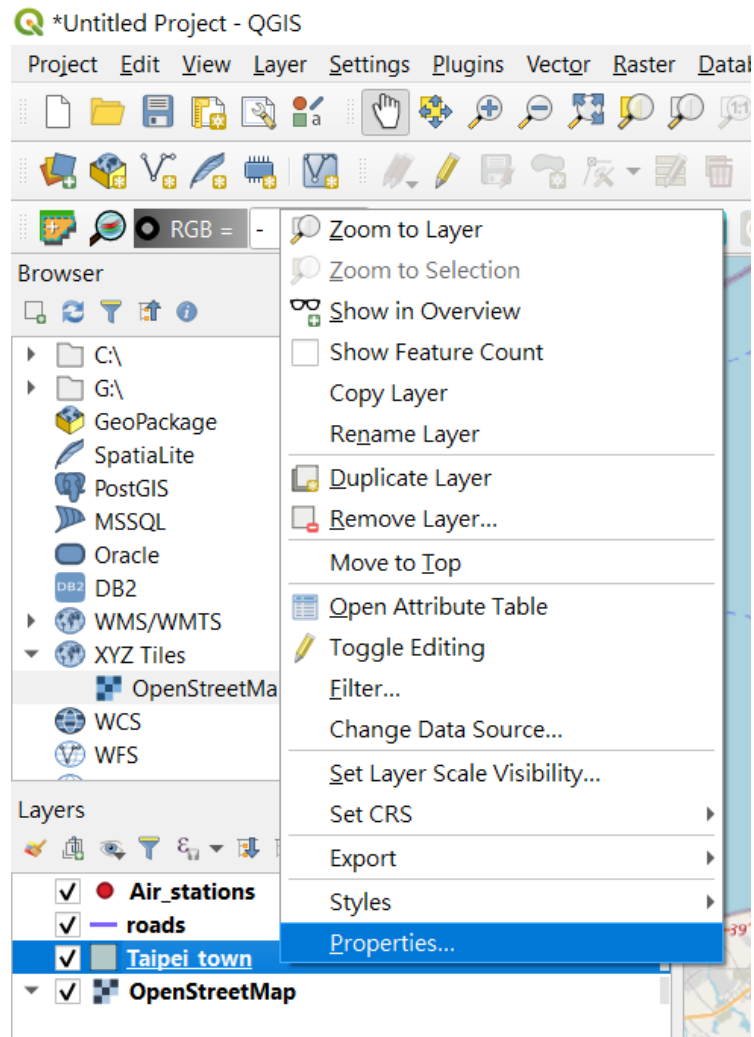
Open attribute table



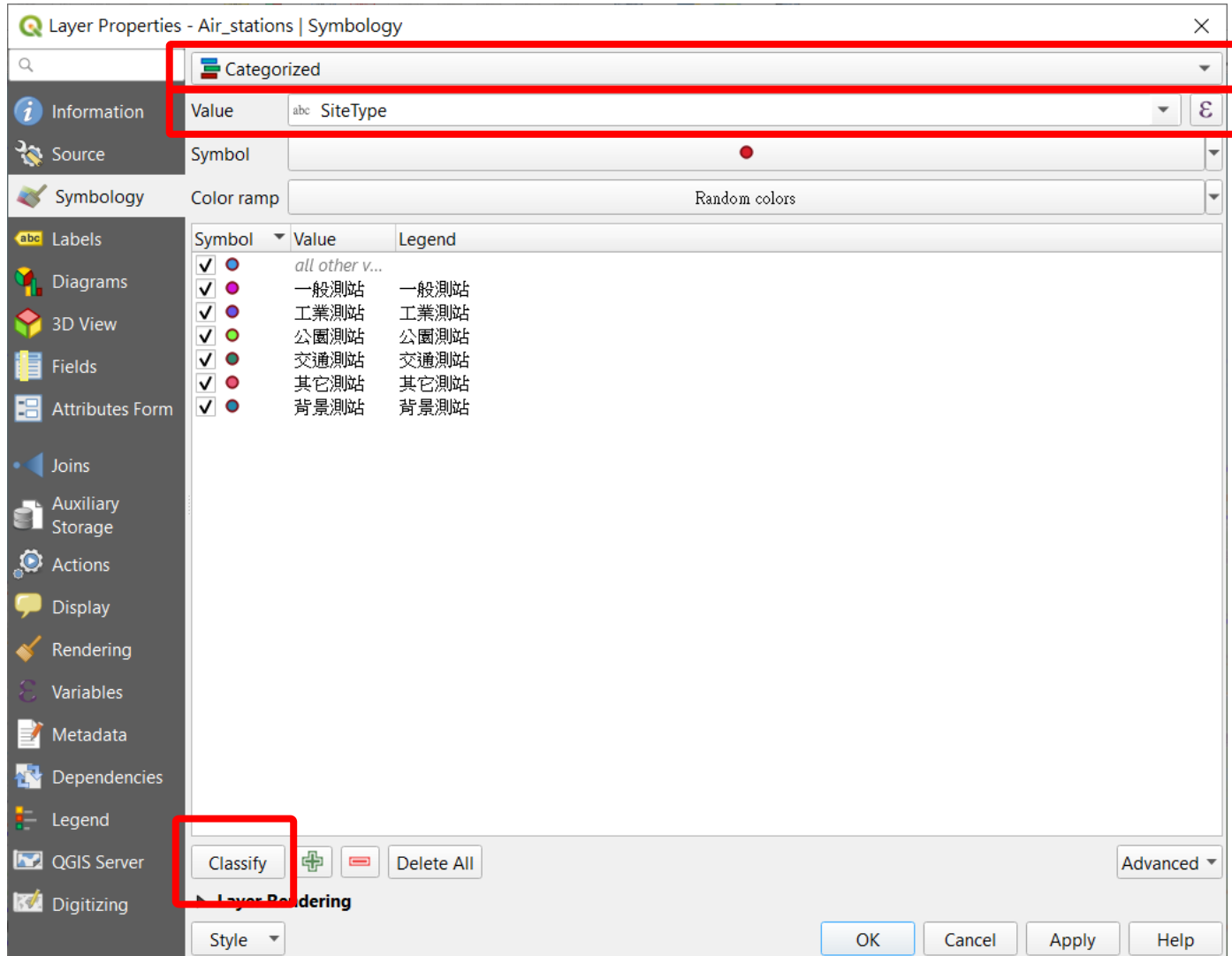
The screenshot shows the 'Open Attribute Table' window, which displays a table of data for the 'Taipei town' layer. The table has 7 columns: 'FID_1', 'FULLTOWN', 'MALE', 'FEMALE', 'CENSUS', 'tax_unit', and 'total_tax'. The data is organized into 11 rows, each representing a different district in Taipei. The 'FID_1' column contains numerical values, and the 'FULLTOWN' column contains the names of the districts in Chinese. The other columns contain numerical data representing various attributes for each district.

| FID_1 | FULLTOWN | MALE | FEMALE | CENSUS | tax_unit | total_tax |
|-------|----------|-------------|-------------|-------------|----------|-----------|
| 3 | 中山區 | 104395.0000 | 111648.0000 | 216043.0000 | 77544 | 106474571 |
| 2 | 大安區 | 152234.0000 | 163584.0000 | 315818.0000 | 108116 | 190275097 |
| 9 | 信義區 | 118291.0000 | 119239.0000 | 237530.0000 | 73976 | 98598465 |
| 8 | 松山區 | 99090.0000 | 105941.0000 | 205031.0000 | 70899 | 105083113 |
| 6 | 文山區 | 125990.0000 | 127930.0000 | 253920.0000 | 84072 | 100053077 |
| 11 | 萬華區 | 104017.0000 | 100007.0000 | 204024.0000 | 52970 | 46452903 |
| 1 | 大同區 | 66032.0000 | 65311.0000 | 131343.0000 | 39758 | 40555607 |
| 4 | 中正區 | 79935.0000 | 81700.0000 | 161635.0000 | 51724 | 77121801 |
| 7 | 北投區 | 122752.0000 | 125152.0000 | 247904.0000 | 78176 | 88799898 |
| 0 | 士林區 | 144425.0000 | 147671.0000 | 292096.0000 | 90266 | 118918018 |
| 5 | 內湖區 | 125593.0000 | 128928.0000 | 254521.0000 | 90608 | 113005501 |
| 10 | 南港區 | 57425.0000 | 56512.0000 | 113937.0000 | 37421 | 38050114 |

Visualization - Symbology



Different styles with categorical data



Based on **which column** in the attribute table

Brief summary of Lab 1.



台北市環保署空氣品質測站分布

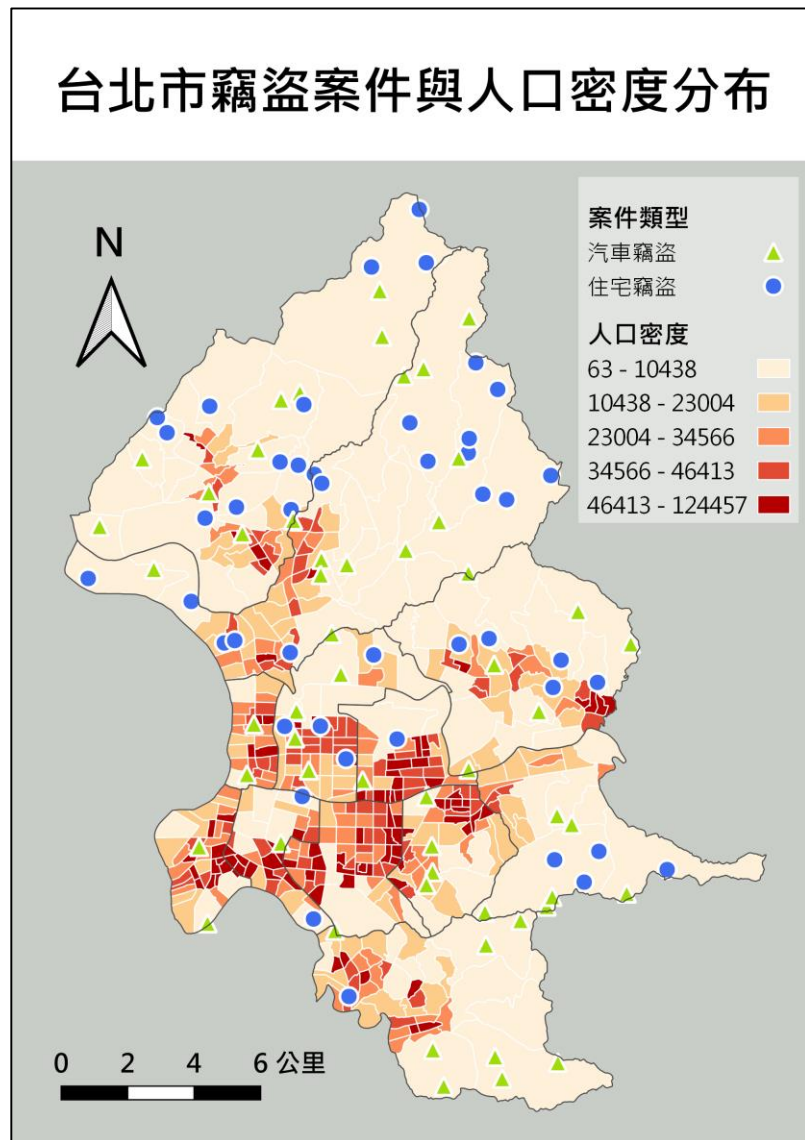
Data:

- ◆ *Taipei_town.shp*
- ◆ *roads.shp*
- ◆ *Air_stations.shp*

Take home skills:

- ✓ New a QGIS project
- ✓ Symbology (categorical data)
- ✓ Add OpenStreetMap as basemap

Lab 2: Calculation with GIS data



台北市竊盜案件與人口密度分布

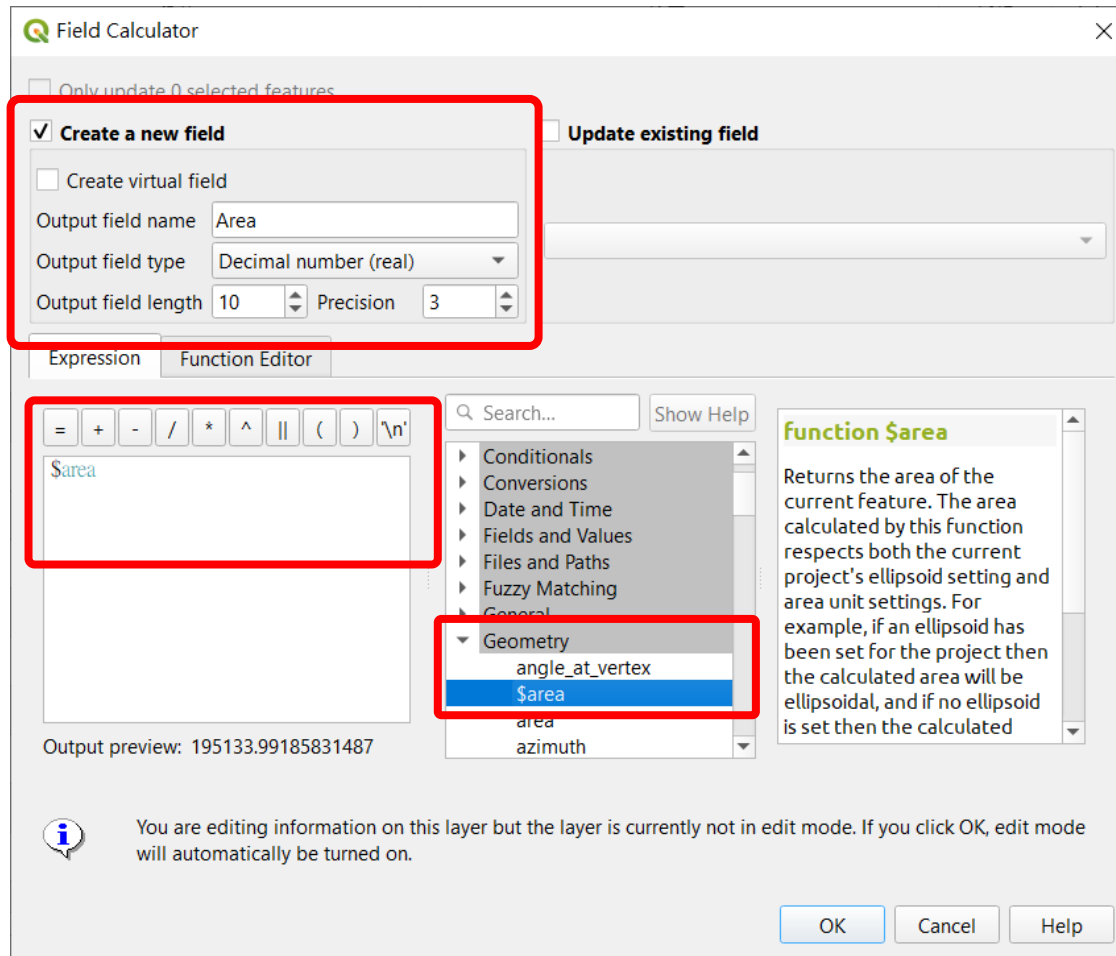
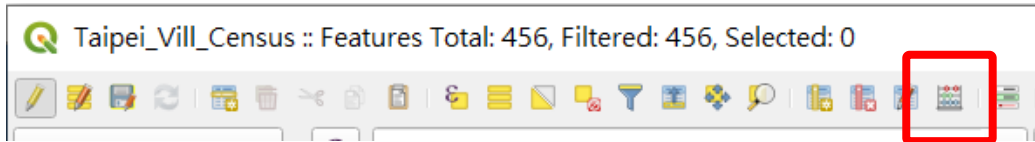
► Data:

- ◆ *Taipei_Vill_Census.shp*
- ◆ *TaipeiCrime.shp*

► Correlations of two factors

► Comparing spatial distributions between two factors

Calculation - Geometry



, Selected: 0

| TOWNCODE | CENSUS | Area |
|----------|--------|-------------|
| 63000120 | 11914 | 1687598.910 |
| 63000100 | 11902 | 297094.955 |
| 63000010 | 11294 | 227422.226 |
| 63000050 | 11288 | 241031.790 |
| 63000020 | 11133 | 500881.869 |
| 63000010 | 10918 | 352058.719 |
| 63000100 | 10498 | 808427.420 |
| 63000080 | 10487 | 318220.170 |
| 63000060 | 10442 | 210292.274 |
| 63000030 | 10389 | 173461.776 |
| 63000050 | 10316 | 156172.642 |
| 63000040 | 10266 | 654877.019 |
| 63000010 | 10254 | 156124.832 |

Results

Calculation - with columns

Field Calculator

☐ Only update 0 selected features

☒ **Create a new field** ☐ Update existing field

☐ Create virtual field

Output field name: POP_den

Output field type: Decimal number (real)

Output field length: 10 Precision: 3

Expression: $"CENSUS" / ("Area" * 1000000)$

Function Editor

Search...

Conversions

Date and Time

Fields and Values

- NULL
- 123 Join_Count
- 123 TARGET_FID
- abc VILLCODE
- abc COUNTYNAME
- abc TOWNNAME
- abc VILLNAME
- abc VILLENG
- abc COUNTYID
- abc COUNTYCODE
- abc TOWNID
- abc TOWNCODE
- 123 CENSUS
- 1.2 Area

group field

Double-click to add field name to expression string. Right-click on field name to open context menu sample value loading options.

Values: Search...

All Unique 10 Samples

Output preview: 3.055336458242498e-08

OK Cancel Help

Select columns that you want to put in the equation

Equation

| CENSUS | Area | POP_den |
|--------|-------------|-----------|
| 5134 | 51471.138 | 99745.220 |
| 6301 | 640473.907 | 9838.028 |
| 6412 | 653034.187 | 9818.782 |
| 1351 | 1377571.280 | 980.712 |
| 3202 | 327653.007 | 9772.534 |
| 5454 | 559379.287 | 9750.093 |
| 5541 | 57046.861 | 97130.673 |
| 3092 | 321025.357 | 9631.638 |
| 6806 | 7179472.182 | 947.981 |
| 4696 | 509991.105 | 9208.004 |
| 8240 | 90045.147 | 91509.651 |
| 2676 | 293243.786 | 9125.513 |
| 4596 | 505786.712 | 9086.834 |

Results

Different styles with continuous data

Layer Properties - Taipei_Vill_Census | Symbology

Value: 1.2 POP_den

Legend format: %1 - %2 Precision 0 Trim

Color ramp

| Symbol | Values | Legend |
|--------|----------------------|----------------|
| ✓ | 63.34 - 10438.40 | 63 - 10438 |
| ✓ | 10438.40 - 23003.55 | 10438 - 23004 |
| ✓ | 23003.55 - 34566.14 | 23004 - 34566 |
| ✓ | 34566.14 - 46413.32 | 34566 - 46413 |
| ✓ | 46413.32 - 124457.20 | 46413 - 124457 |

Mode: Equal Count (Quantile) Classes: 5

Classify + - Delete All

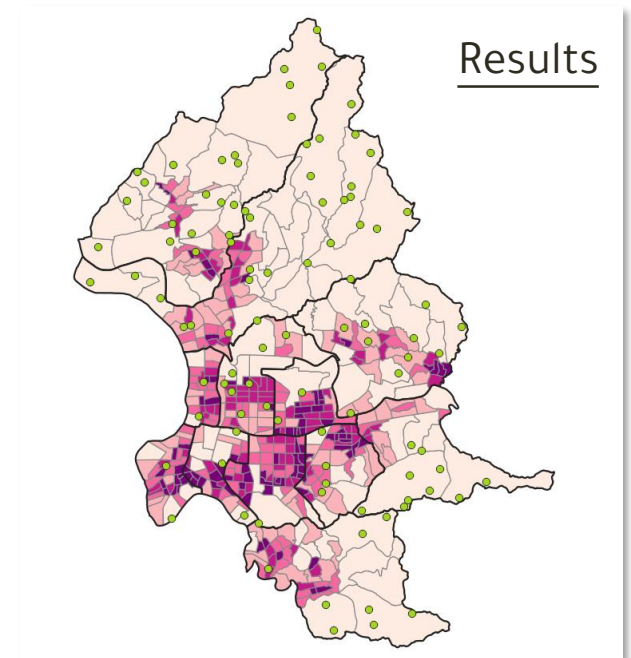
☒ Link class boundaries

Layer Rendering

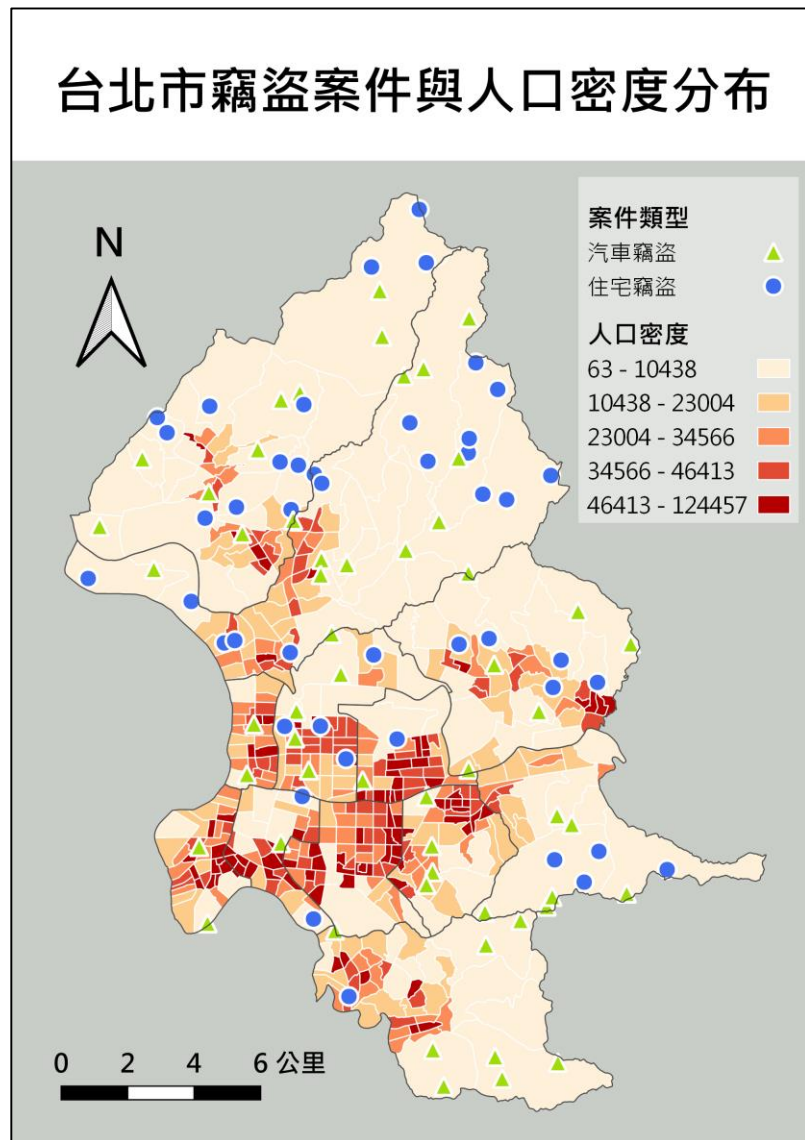
Style

OK Cancel Apply Help

- Based on **which column** in the attribute table
- Choose different color palettes



Brief summary of Lab 2.



● 台北市竊盜案件與人口密度分布

► Data:

- ◆ *Taipei_Vill_Census.shp*
- ◆ *TaipeiCrime.shp*

► Correlations of two factors

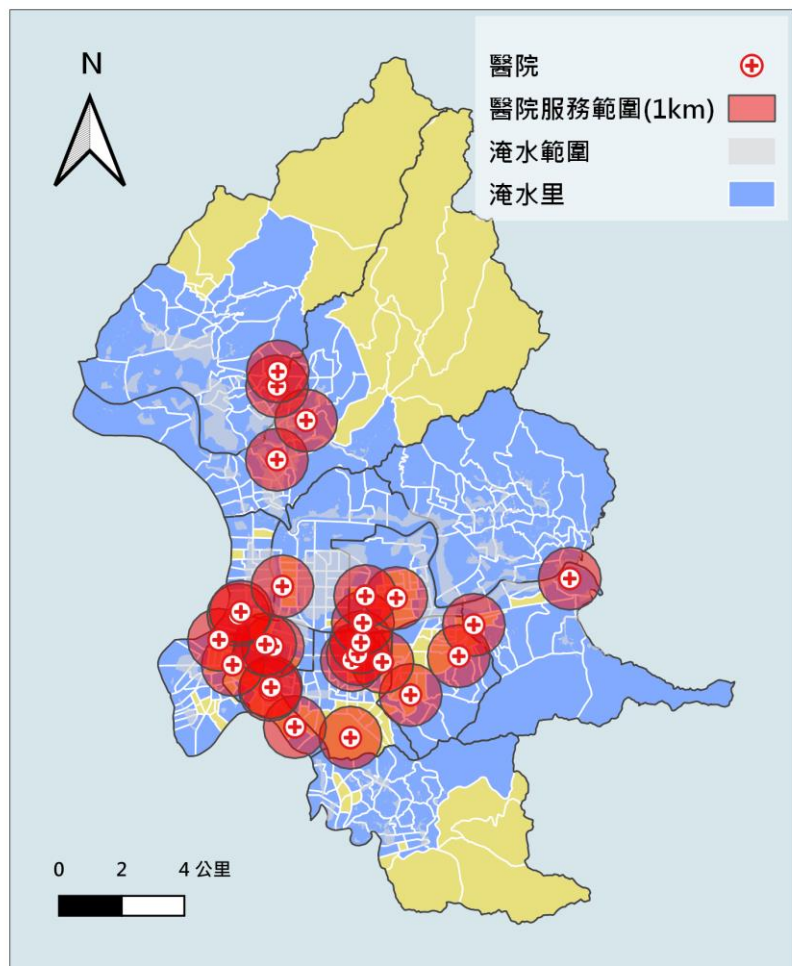
► Comparing spatial distributions between two factors

Take home skills:

- ✓ Geometric and field calculation
- ✓ Symbolology (continuous data)

Lab 3: Intro. to spatial analysis

台北市淹水災害醫療資源評估



台北市淹水災害醫療資源評估

► Data:

- ◆ *Taipei_hospital.shp*
- ◆ *Flooding.shp*

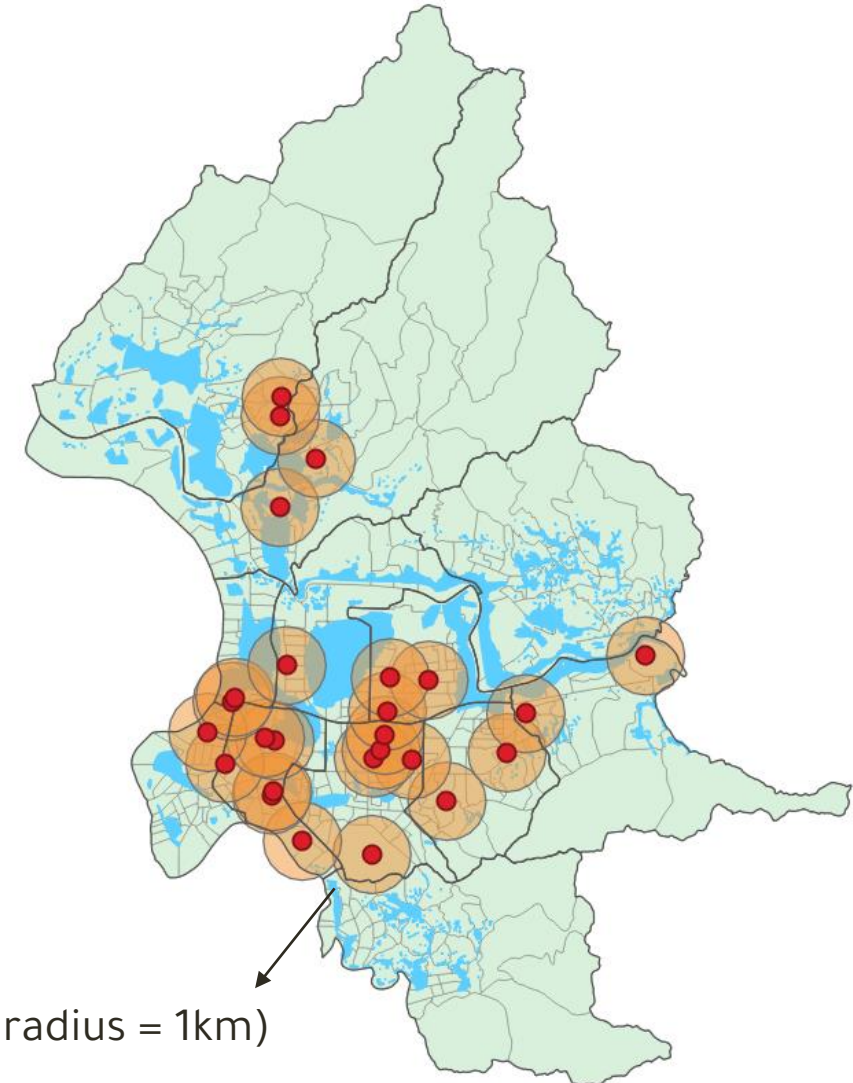
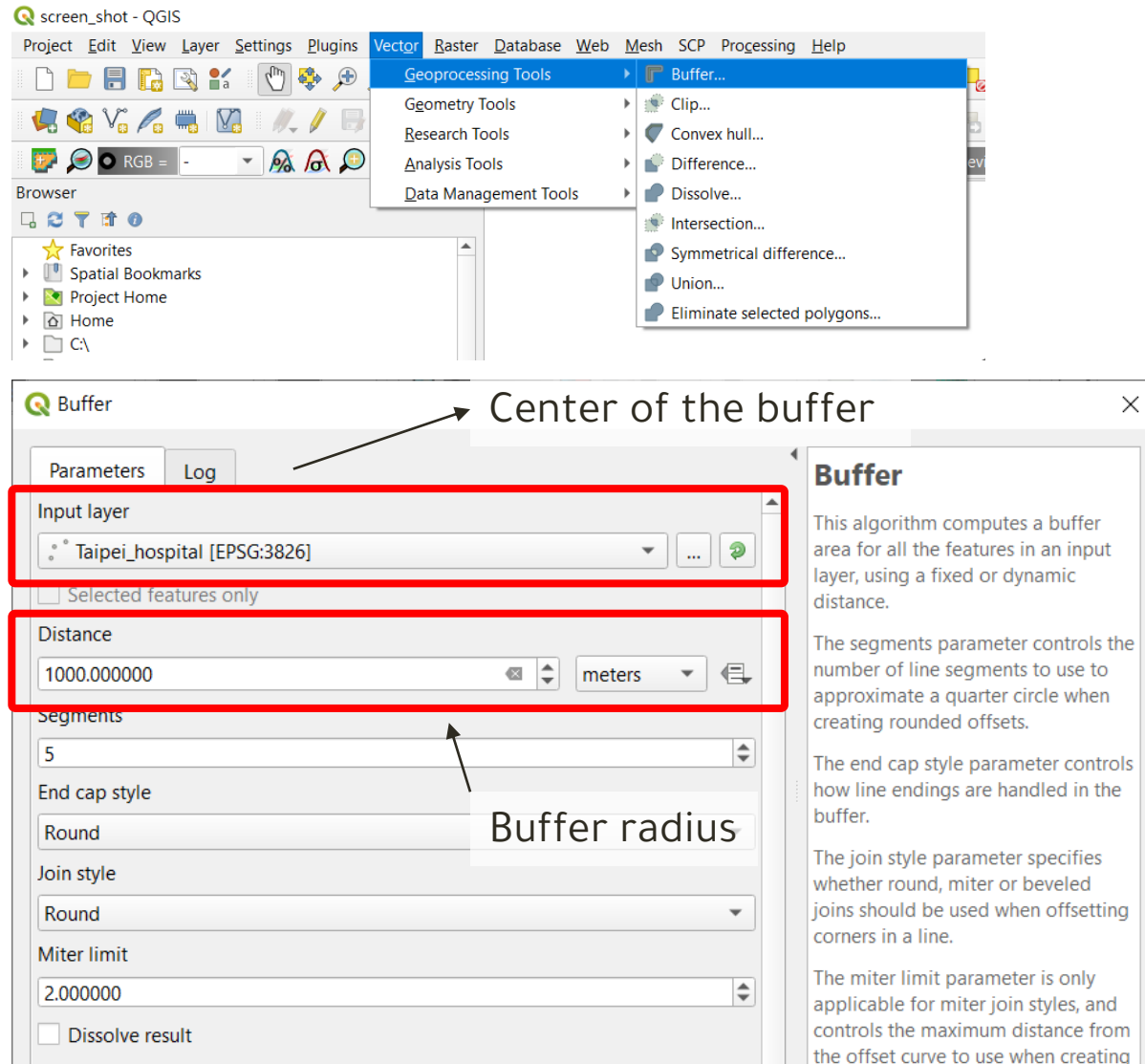
► Overlay analysis

- ◆ Spatial relation
- ◆ Change detection

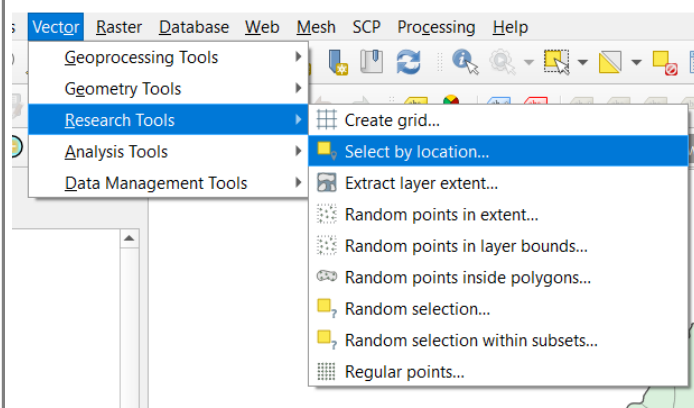
► Buffer analysis

- ◆ Affected areas
- ◆ Neighboring

Making buffers

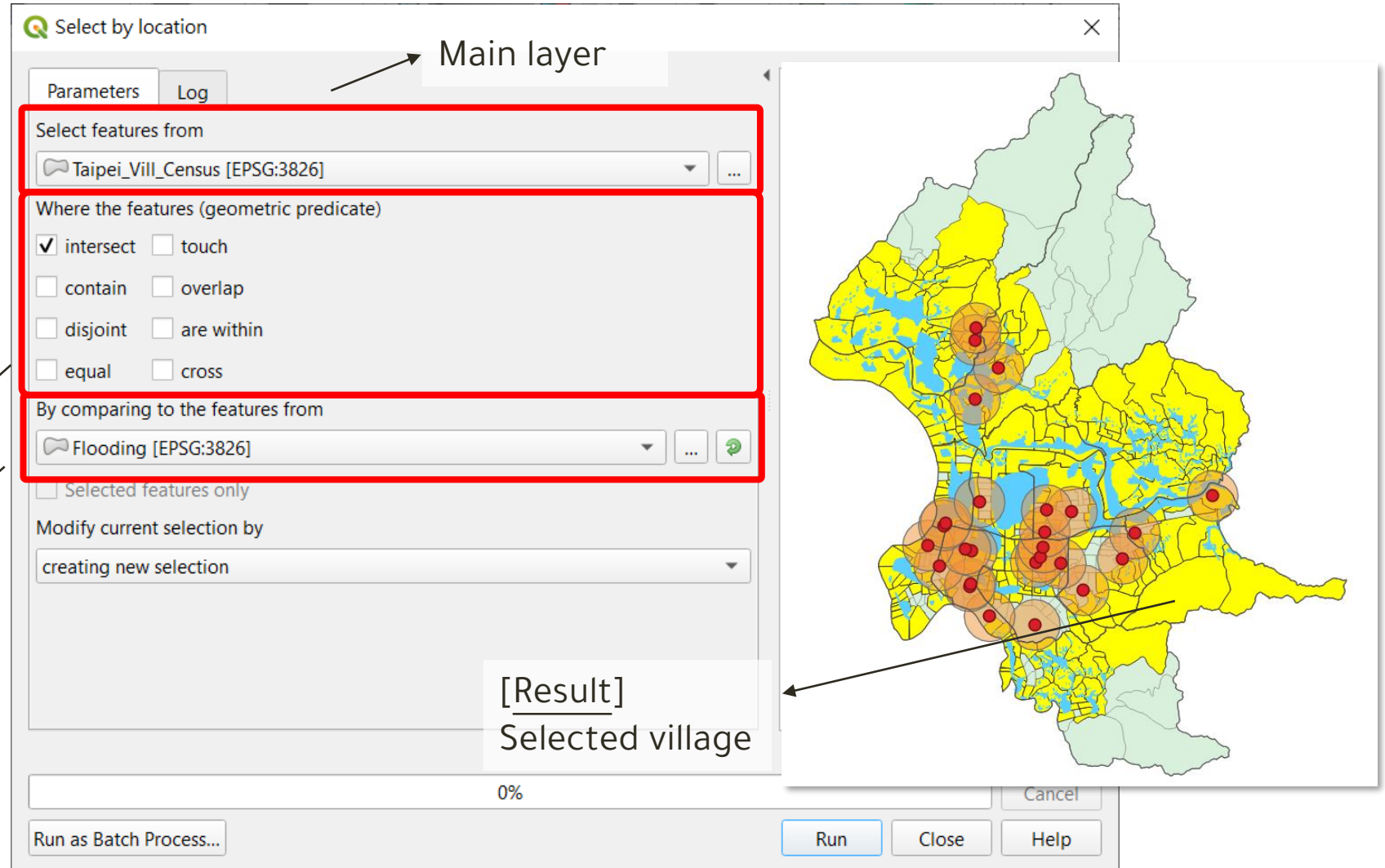


Select by Location



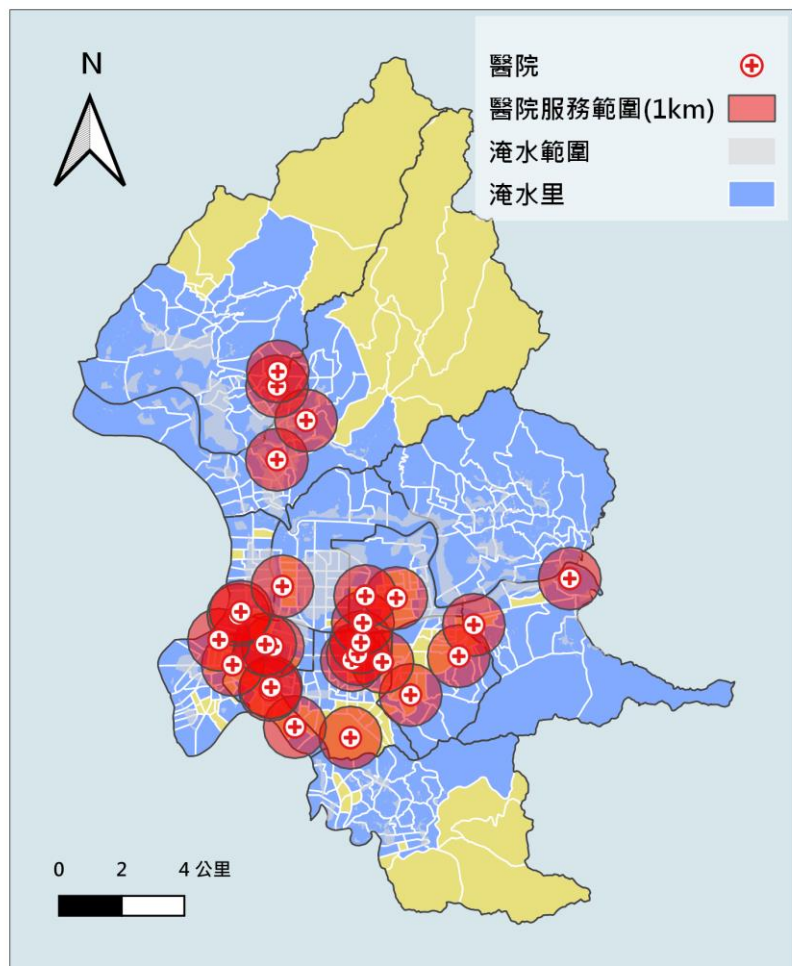
Select rule

Referenced layer



Brief summary of Lab 3.

台北市淹水災害醫療資源評估



台北市淹水災害醫療資源評估

► Data:

- ◆ *Taipei_hospital.shp*
- ◆ *Flooding.shp*

► Overlay analysis

- ◆ Spatial relation
- ◆ Change detection

► Buffer analysis

- ◆ Affected areas
- ◆ Neighboring

Take home skills:

- ✓ Making buffers
- ✓ Spatial query (Select by location)

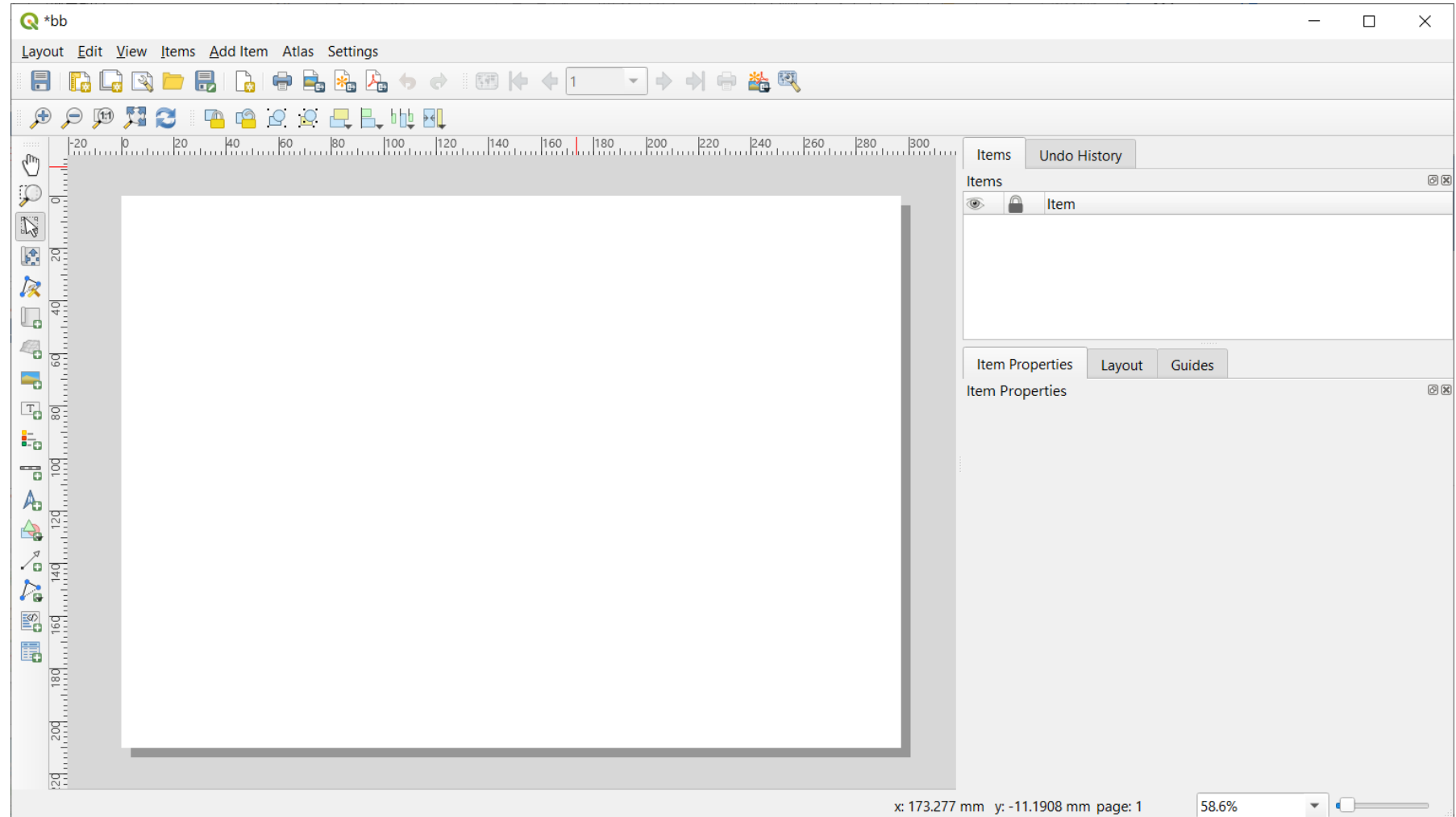
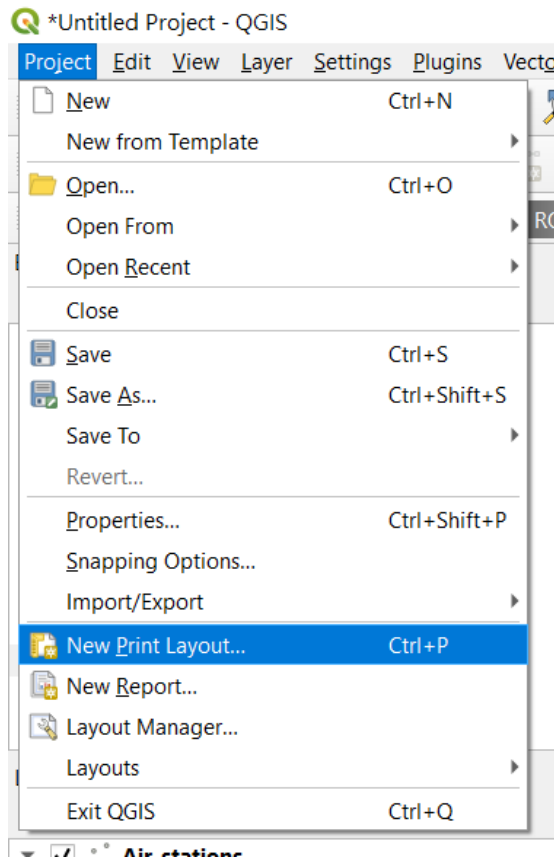
Self-practice

- 近年來，台北市醫療資源有明顯提升，每家醫院的服務範圍能達3km。
然而，當淹水災害發生時，哪些受災里仍缺乏醫療資源？

Supplement materials

1. Make professional GIS maps
2. How and where to find GIS data

Make your first map – New a layout



Layout Edit View Items Add Item Atlas Settings

1

Items Undo History

Items

| Item |
|---|
| <input checked="" type="checkbox"/> Add text... |
| <input checked="" type="checkbox"/> North Arrow |
| <input checked="" type="checkbox"/> <Scalebar> |
| <input checked="" type="checkbox"/> <Legend> |
| <input checked="" type="checkbox"/> Add a new title |
| <input checked="" type="checkbox"/> Map 1 |

Item Properties Layout Guides

Item Properties

Label

▼ Main Properties

Settings...

It's interactive when selecting items on the layout!

☐ Render as HTML

Insert an Expression...

▼ Appearance

Font

Font color

Horizontal margin 0.00 mm

Vertical margin 0.00 mm

Horizontal alignment

☐ Left ☐ Center ☐ Right ☒ Justify

0 2.5 5 km

Air_stations

- 一般測站
- 工業測站
- 公園測站
- 交通測站
- 其它測站
- 背景測站

roads

- 0
- HU
- HW
- Taipei_town
- OpenStreetMap

新北市

三芝區

淡水區

萬里區

石碇區

1 item selected

x: 267 mm y: 0 mm page: 1 77.0%

31

How and Where to find GIS open data?

Google ← The most convenient way!

- ▶ E.g. OOXX 圖資、OOXX open data、OOXX 資料...



台灣縣市界 圖資

全部 圖片 地圖 新聞 影片 更多

約有 24,200,000 項結果 (搜尋時間 : 0.52 秒)

data.gov.tw > dataset

縣市界線(TWD97經緯度) - 政府資料開放平台

Open data platforms

- ▶ TGOS 地理資訊圖資雲服務平台：圖資查詢
 - ◆ https://www.tgos.tw/TGOS/Web/TGOS_Home.aspx
- ▶ 社會經濟資料服務平台：產品與服務查詢
 - ◆ https://segis.moi.gov.tw/STAT/Web/Portal/STAT_PortalHome.aspx
- ▶ GIS-T 交通網路地理資訊倉儲系統：圖資供應
 - ◆ <https://gist.motc.gov.tw/#>
- ▶ 各縣市政府、政府單位的Open data

Thank you!

If you have any question, please feel free to ask 😊

廖皓宇

yuandyu0226@gmail.com