



# **110-2 地圖與地理資訊系統**

## **LAB 03**

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# 今日實習

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主題圖製作

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# 實習使用圖資

- **臺灣縣市界** : COUNTY\_MOI\_1090820.shp
  - **景點** : Scenic\_spot\_C\_f.shp
  - **110各縣市男女人口** : 110各縣市男女人口.csv
  - **捷運路線** : MRT\_1100406.shp
  - **捷運站點** : MARK\_捷運車站\_1090410.shp
- 台北捷運圖檔** : Metro\_Taipei\_(Logo\_Only).svg

# 主題圖製作

## 單一主題變數

以景點為例

- 個體主題圖
- 分級主題圖(景點總數&密度面量圖)  
以縣市為單位的「景點密度」
- 分級符號圖
- 點子圖 / 點密度圖

## 多個主題變數

以人口比例、成長 為例

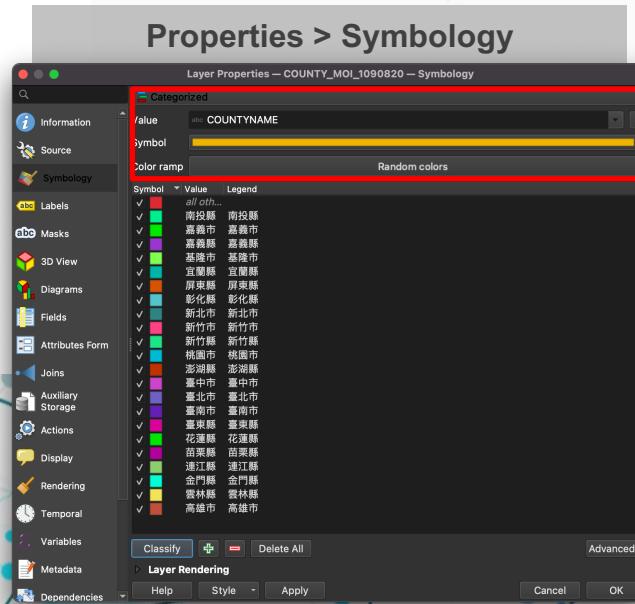
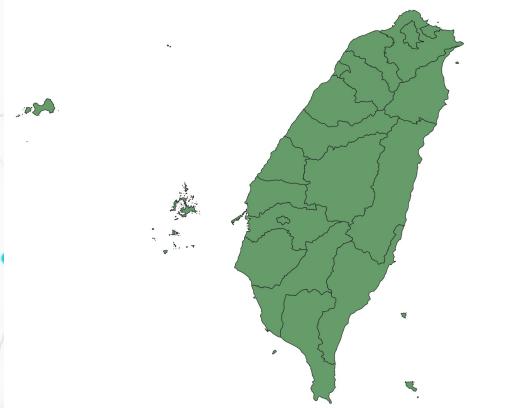
- 圓餅圖
- 長條圖
- 熱區圖 (Heatmap)

# 主題圖（一）

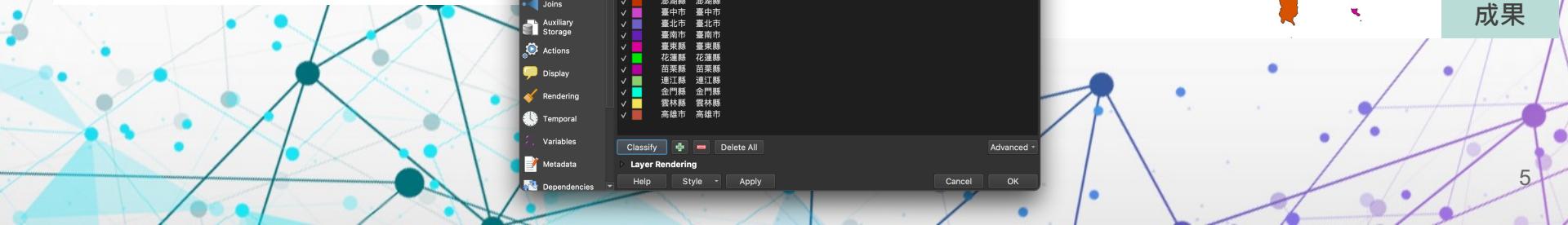
分類主題圖、分級主題圖

# 分類主題圖 – 汇入圖層&調整圖例

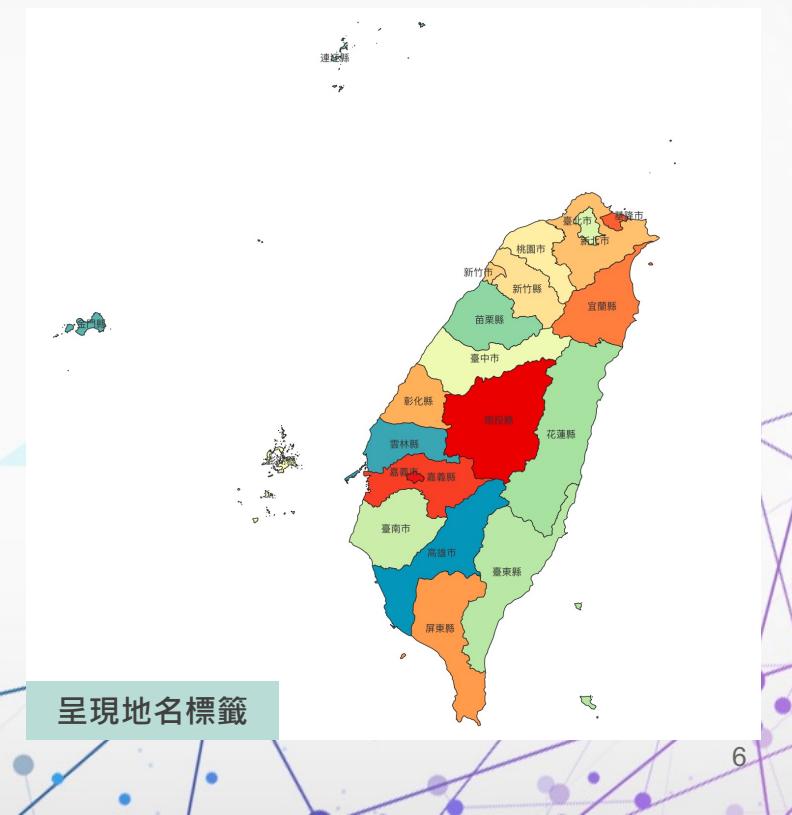
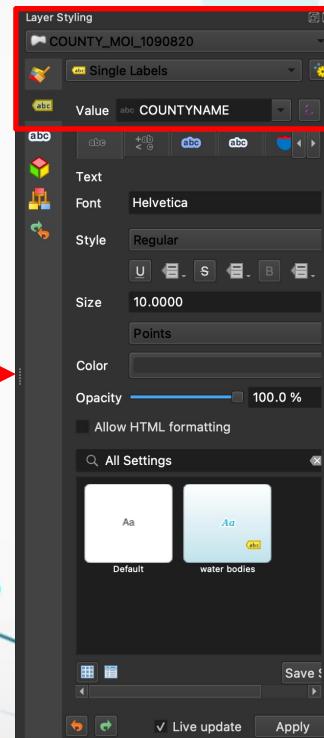
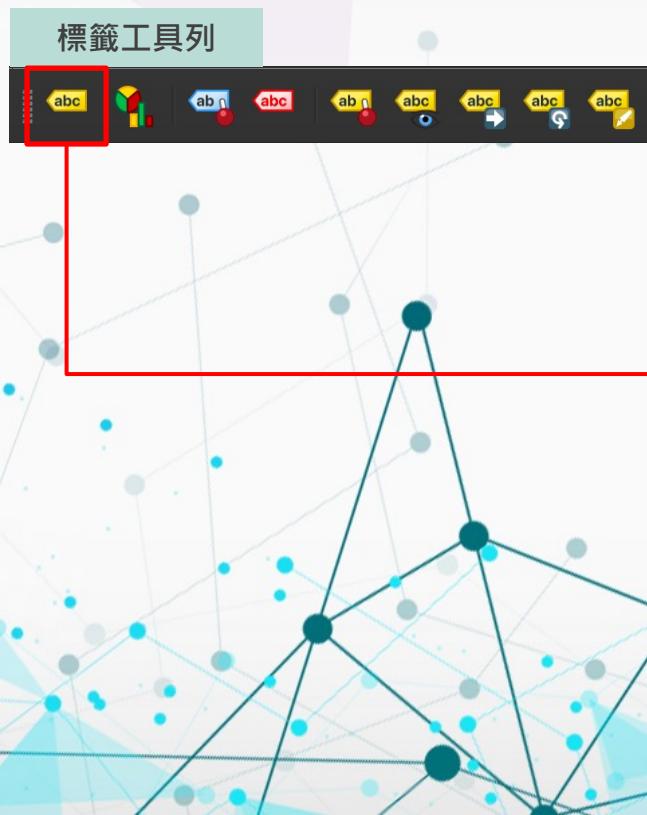
匯入台灣縣市界圖層  
COUNTY\_MOI\_1090820.shp



成果



# 分類主題圖 – 圖層標籤顯示



# 景點總數面量圖 & 景點密度面量圖 步驟說明

- **匯入圖層：** COUNTY\_MOI\_1090820.shp, Scenic\_spot\_C\_f.shp
- **Spatial Join :** 將各縣市內的景點資料加總，並加入欄位
- **製作景點面量圖 / 景點密度面量圖**
- **新增欄位及欄位計算**

# 景點總數面量圖 - 汇入圖層&Spatial Join

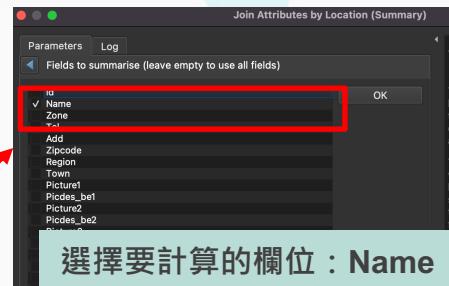
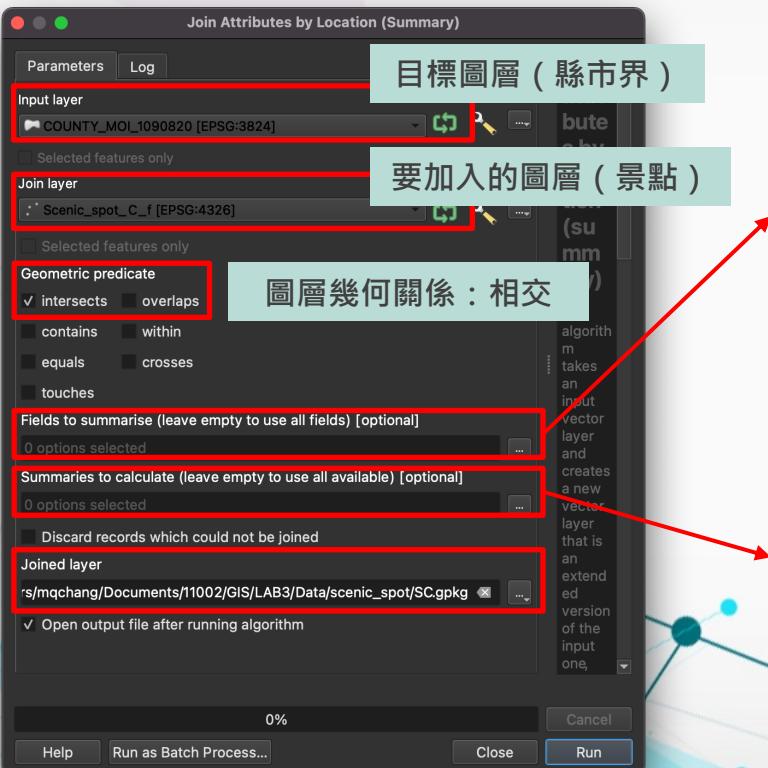
The image shows a QGIS interface with two maps of Taiwan. The left map displays a point layer named "Scenic spot\_C\_f" (highlighted with a red box) and a polygon layer named "COUNTY\_MOI\_1090820". The right map shows the same data. At the bottom left, there is a network graph visualization. On the right, the Processing Toolbox is open, showing various geoprocessing tools under the "Vector general" category. The tool "Join attributes by location (summary)" is highlighted with a red box.

**匯入圖層**

**Toolbox**

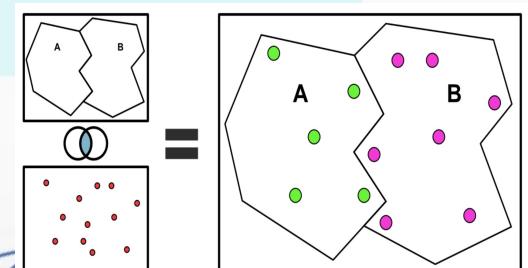
**Vector general > Join attributes by location (summary)**

# 景點總數面量圖 – Spatial Join

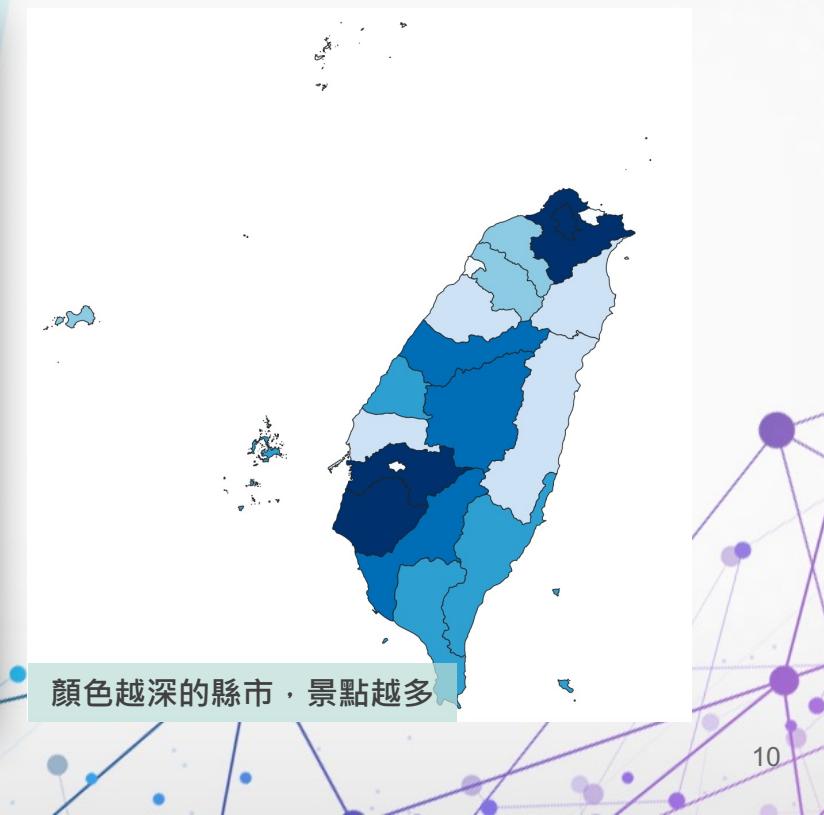
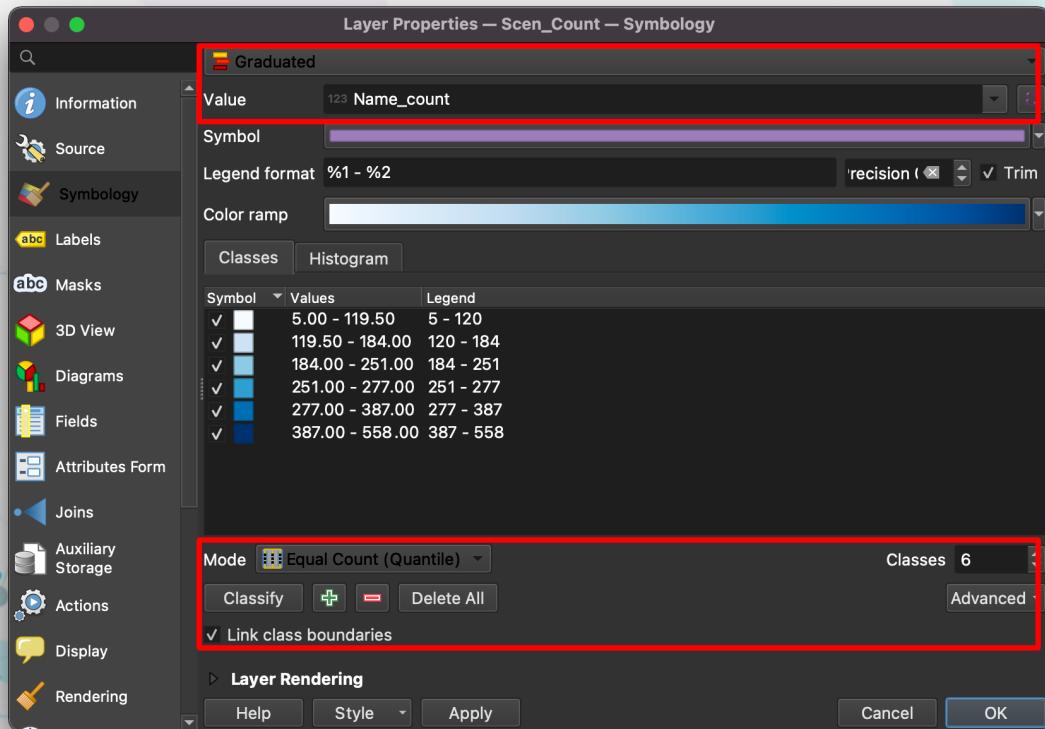


**計算完成的欄位 : 各縣市景點數量**

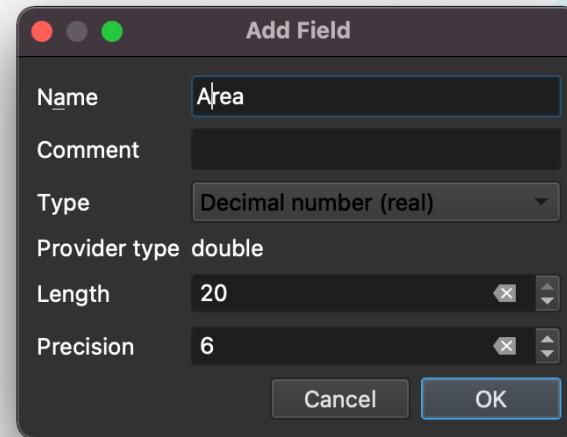
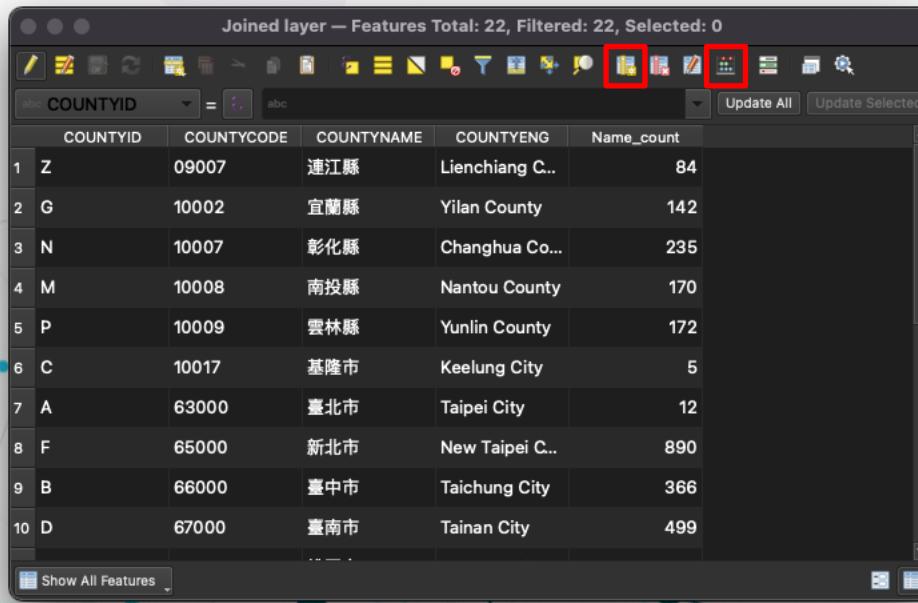
County	Name_count
Z	84
G	146
N	271
M	280
P	173
C	5
A	402
F	558
B	376



# 景點總數面量圖- 面量圖製作

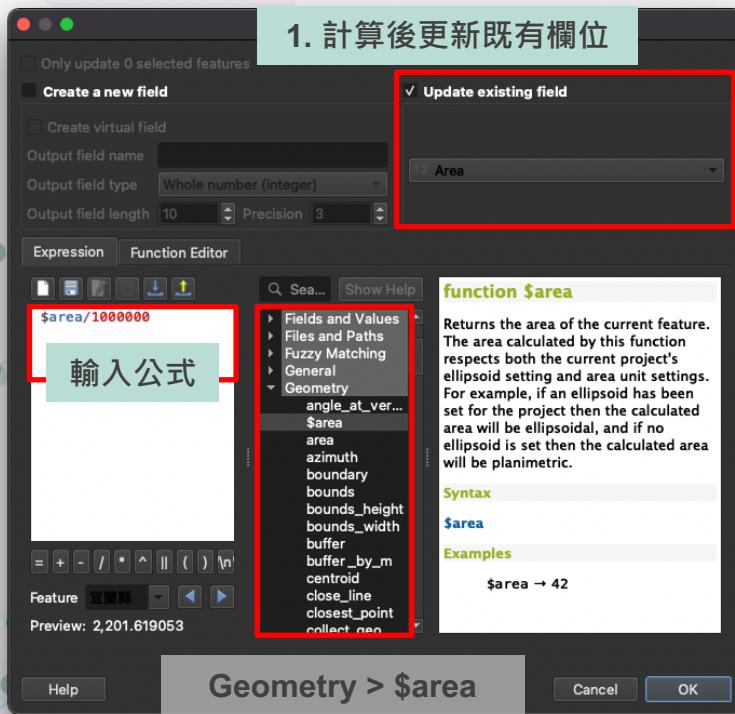


# 景點密度面量圖 - 新增欄位



Open Attribute Table > Add Field / Open field calculators

# 景點密度面量圖 - 欄位計算

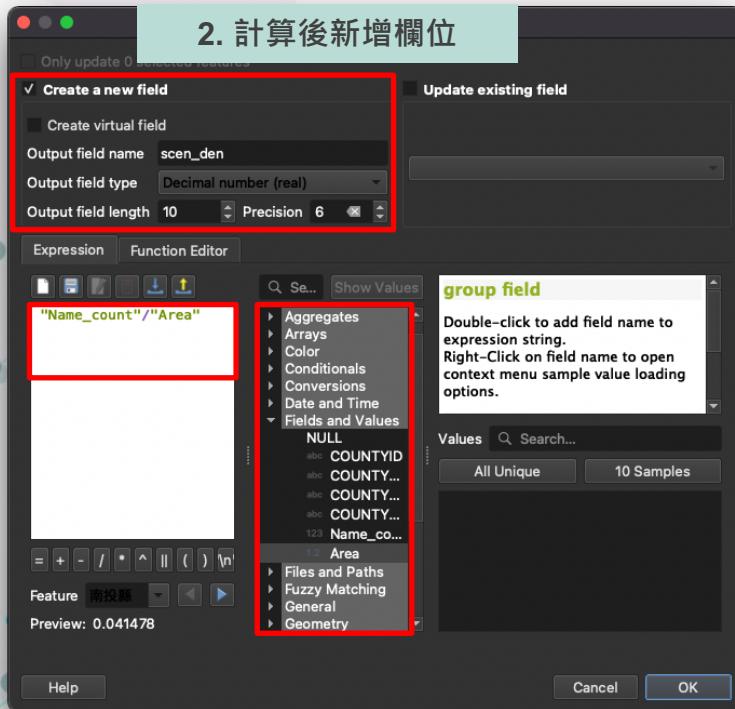


Joined layer – Features Total: 22, Filtered: 22, Selected: 0

COUNTYID	COUNTYCODE	COUNTYNAME	COUNTYENG	Name_count	Area
1	10020	嘉義市	Chiayi City	50	59.729408
2	10015	花蓮縣	Hualien County	145	4,606.046292
3	10008	南投縣	Nantou County	170	4,098.542972
4	10014	臺東縣	Taitung County	262	3,582.892229
5	09007	連江縣	Lienchiang C...	84	29.734035
6	63000	臺北市	Taipei City	12	269.880439
7	64000	高雄市	Kaohsiung City	273	2,998.934636
8	10013	屏東縣	Pingtung Cou...	270	2,805.502212
9	67000	臺南市	Tainan City	499	2,258.989769
10	66000	臺中市	Taichung City	366	2,240.188940
11	10002	宜蘭縣	Yilan County	142	2,201.619053
12	65000	新北市	New Taipei C...	890	2,066.476948
13	09020	金門縣	Kinmen County	204	184.744002

欄位計算成果：面積（平方公里）

# 景點密度面量圖 - 欄位計算



Joined layer — Features Total: 22, Filtered: 22, Selected: 0

The screenshot shows the QGIS attribute table for a joined layer. A red box highlights the 'scen\_den' column, which contains the calculated point density values for each county. The table includes columns for COUNTYID, COUNTYCODE, COUNTYNAME, COUNTYENG, Name\_count, Area, and the newly calculated column.

	COUNTYID	COUNTYCODE	COUNTYNAME	COUNTYENG	Name_count	Area	scen_den
1	I	10020	嘉義市	Chiayi City	50	59.729408	0.837109
2	U	10015	花蓮縣	Hualien County	145	4,606.046292	0.03148
3	M	10008	南投縣	Nantou County	170	4,098.542972	0.041478
4	V	10014	臺東縣	Taitung County	262	3,582.892229	0.073125
5	Z	09007	連江縣	Lienchiang C...	84	29.734035	2.825045
6	A	63000	臺北市	Taipei City	12	269.880439	0.044464
7	E	64000	高雄市	Kaohsiung City	273	2,998.934636	0.091032
8	T	10013	屏東縣	Pingtung Cou...	270	2,805.502212	0.096239
9	D	67000	臺南市	Tainan City	499	2,258.989769	0.220895
10	B	66000	臺中市	Taichung City	366	2,240.188940	0.163379
11	G	10002	宜蘭縣	Yilan County	142	2,201.619053	0.064498
12	F	65000	新北市	New Taipei C...	890	2,066.476948	0.430685
13	W	09020	金門縣	Kinmen County	204	184.744002	1.104231

欄位計算成果：景點密度 (個/平方公里)

# 景點分級符號圖 步驟說明

利用符號的大小代表數值的高低

- 建立各縣市polygon中心點(centroids)
- 依據該縣市的景點總數多寡，來決定symbol的大小

# 景點分級符號圖 – 產生質心圖層

The screenshot shows the QGIS Processing Toolbox interface. On the left, a tree view lists various geoprocessing algorithms under categories like Network analysis, Raster analysis, etc. A red box highlights the 'Vector geometry' category, which contains several tools. The 'Centroids' tool is specifically highlighted with a blue selection bar at the bottom of its list item.

**Toolbox**

- Network analysis
- Plots
- Raster analysis
- Raster creation
- Raster terrain analysis
- Raster tools
- Vector analysis
- Vector creation
- Vector general
- Vector geometry**
  - Add geometry attributes
  - Affine transform
  - Aggregate
  - Boundary
  - Bounding boxes
  - Buffer
  - Centroids**
  - Check validity
  - Collect geometries
  - Concave hull (alpha shapes)
  - Concave hull (k-nearest neighbor)
  - Convert geometry type
  - Convert to curved geometries
  - Convex hull
  - Create layer from extent
  - Create layer from point
  - Create wedge buffers
  - Delimited polygonization

**Vector geometry > Centroids**

**Centroids**

**Parameters** | Log

**Input layer:** Scen\_Count [EPSG:3824]

Selected features only

Create centroid for each part

**Centroids:** /Users/mqchang/Documents/11002/GIS/LAB3/Data/Scen\_Centroid.gpkg

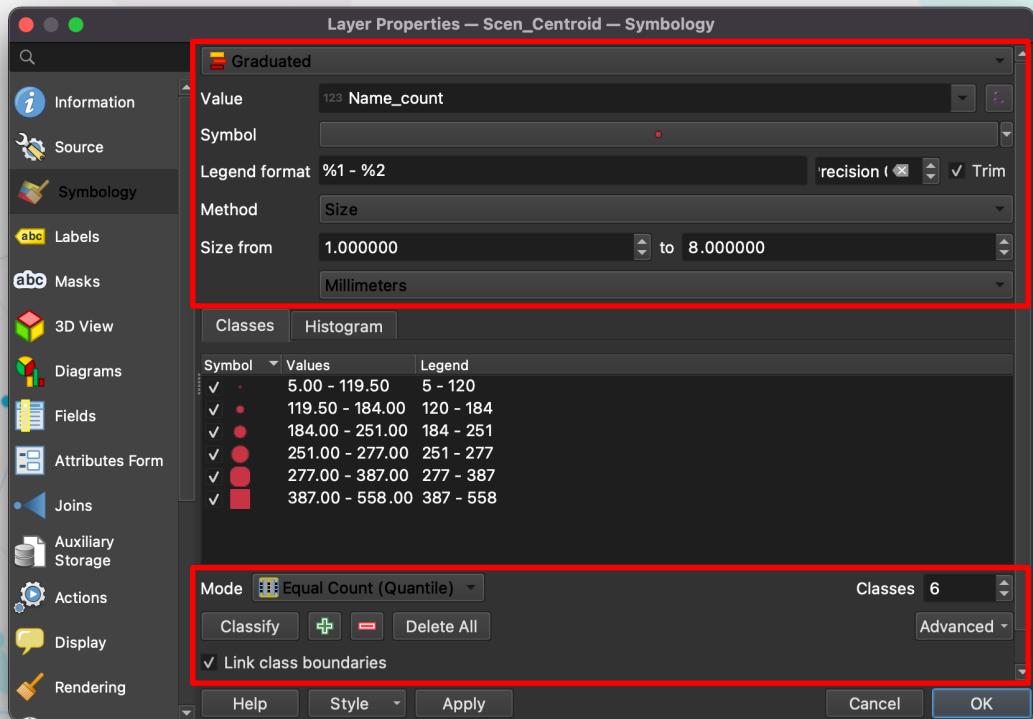
Open output file after running algorithm

This algorithm creates a new point layer, with points representing the centroid of the geometries in an input layer.  
The attributes associated to each point in the output layer are the same ones associated to the original features.

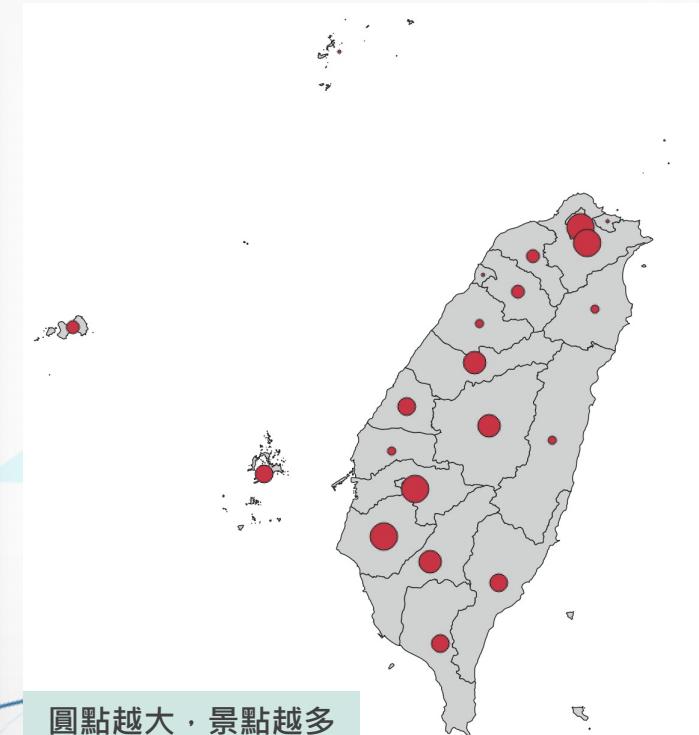
0%

Help

# 景點分級符號圖 – 依據景點數量調整圖例大小



Properties > Symbology > Graduated



# 主題圖（二）

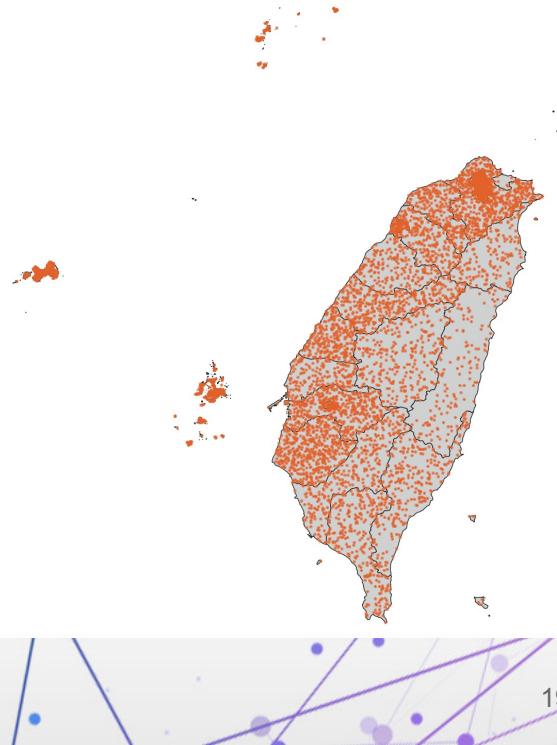
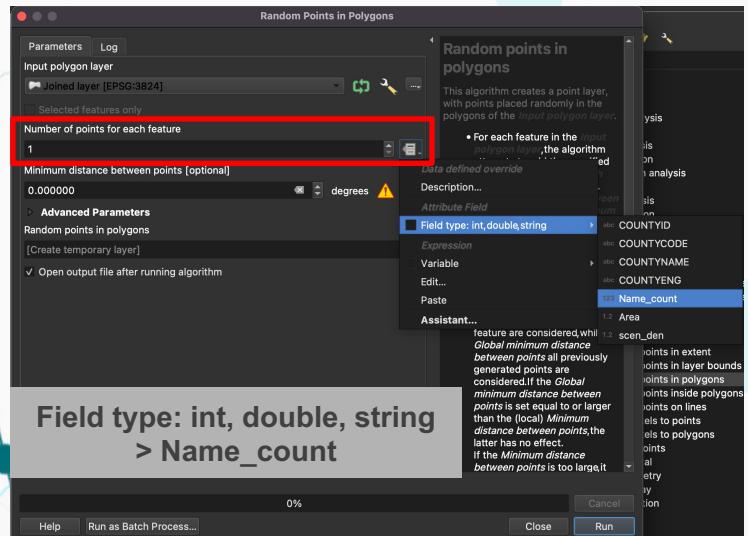
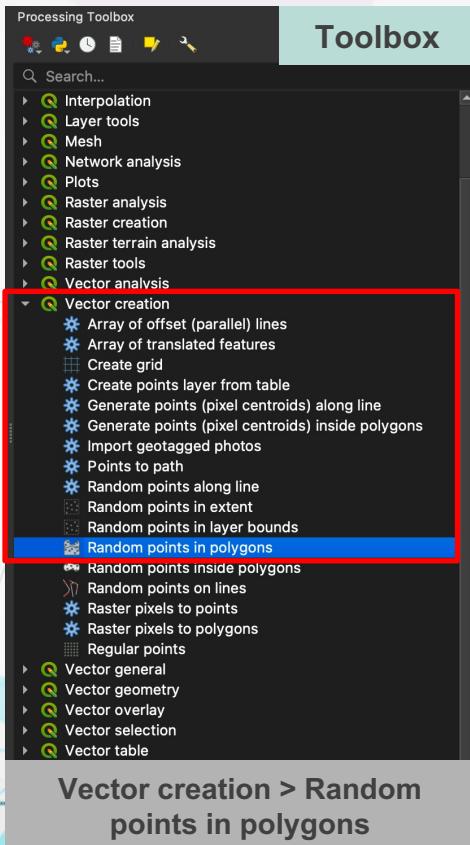
點子圖/點密度圖、熱區圖、長條圖、圓餅圖

# 點子圖 / 點密度圖 步驟說明

可用點的多寡和密集程度看出現象的分布

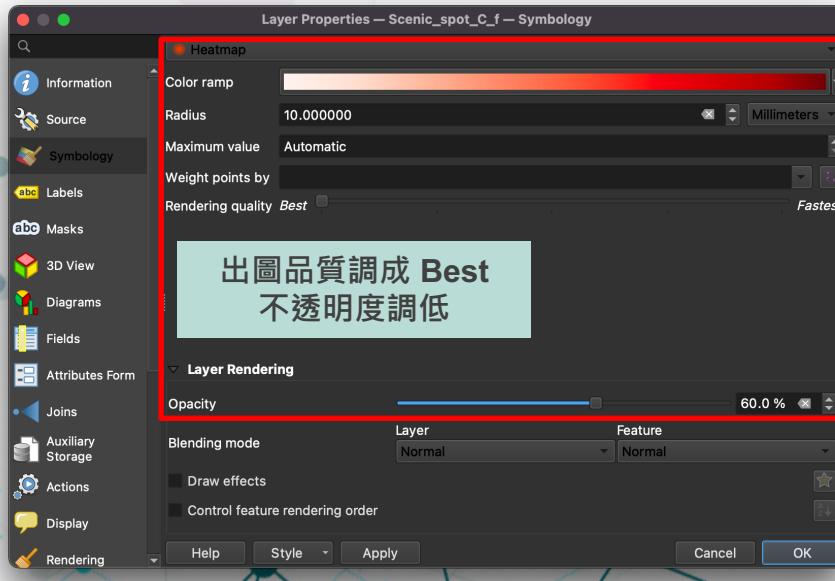
- 根據景點總數，依比例建立各polygon中的隨機點
- 調整每個點的大小和數量範圍，讓地圖能夠傳達空間意涵，同時具有良好的視覺效果

# 點子圖 - 依據點的數量，按比例建立隨機點



Vector creation > Random points in polygons

# 熱區圖 - 調整色彩參數



Properties > Symbology > Heatmap



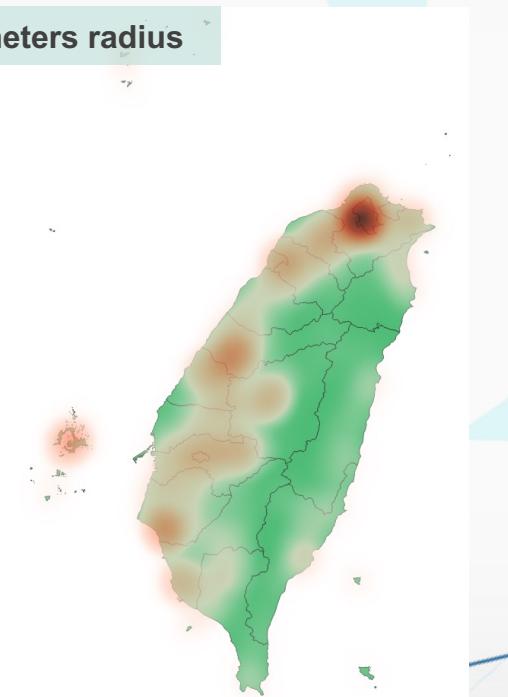
將Color 1調成透明

# 熱區圖 – 視覺化景點空間分佈

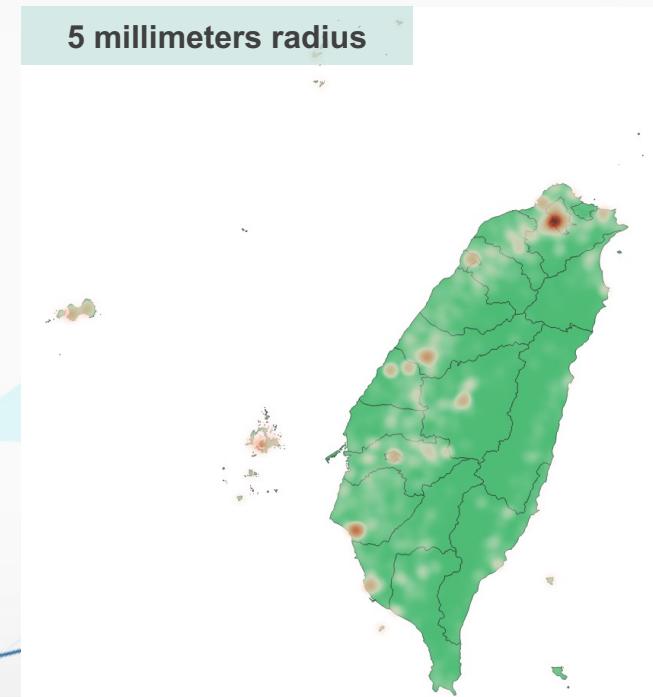
原圖



15 millimeters radius



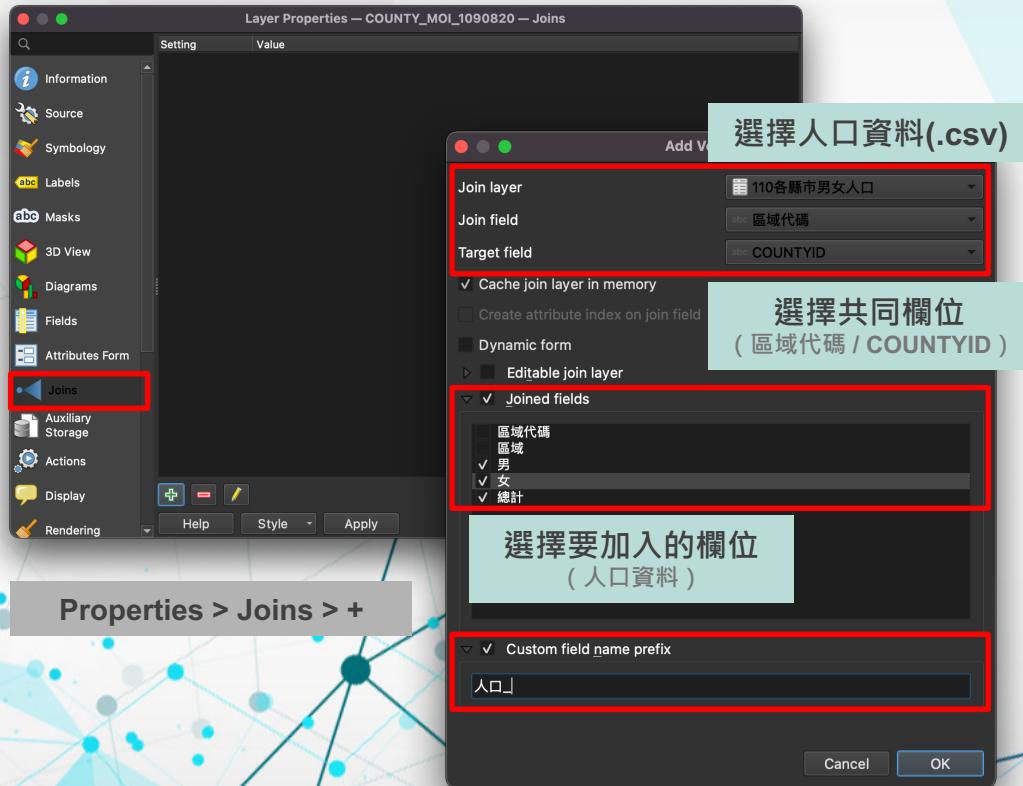
5 millimeters radius



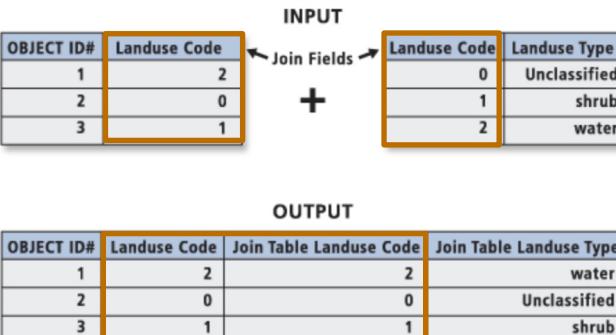
# 步驟說明

- 汇入圖層及人口資料
- Field join：將2021男女人口數與台灣縣市界線，依據相同欄位進行連結
- 用連結之人口資料，設定樣式並繪製統計圖表

# 圓餅圖 – Field join : 依據相同欄位進行連結



	COUNTYID	COUNTYCODE	COUNTYNAME	COUNTYENG	人口_男	人口_女	人口_總計
1	A	63000	臺北市	Taipei City	1201966	1322427	2524393
2	B	66000	臺中市	Taichung City	1381117	1432373	2813490
3	C	10017	基隆市	Keeling City	181479	182498	363977
4	D	67000	臺南市	Tainan City	927158	934901	1862059
5	E	64000	高雄市	Kaohsiung City	1352711	1391980	2744691
6	F	65000	新北市	New Taipei C...	1957337	2050776	4008113
7	G	10002	宜蘭縣	Yilan County	226986	223706	450692
8	H	68000	桃園市	Taoyuan City	1125130	1147361	2272391
9	I	10020	嘉義市	Chiayi City	127842	130845	258727



圖片來源：<https://desktop.arcgis.com/en/arcmap/10.4/tools/data-management-toolbox/add-join.htm>

# 圓餅圖 - 設定作圖依據與樣式

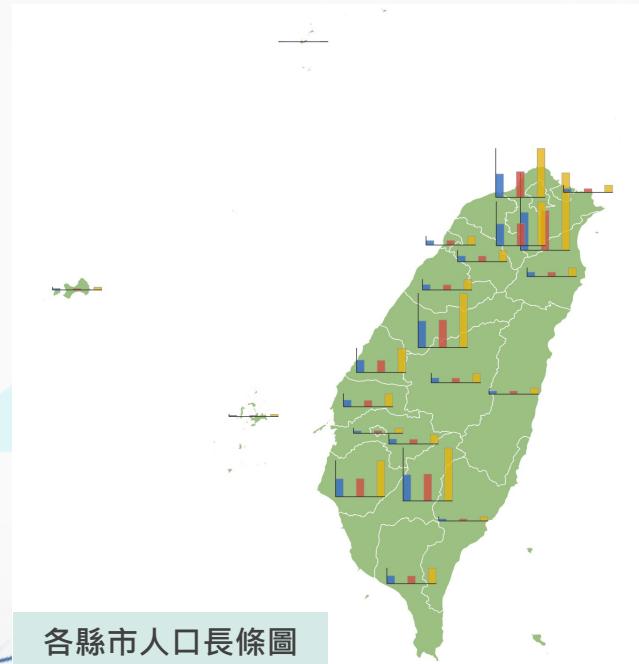
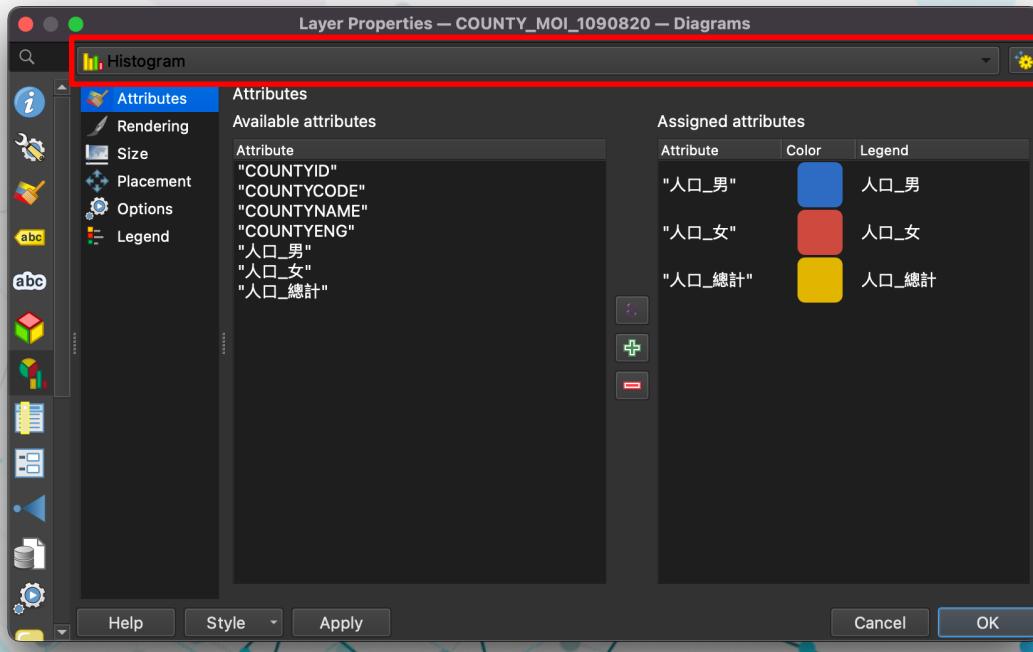
Properties > Diagrams > Pie Chart

各縣市男女比例圓餅圖

依據人口總計為原餅圖大小



# 長條圖 – 設定作圖依據與樣式



Properties > Diagrams > Histogram

# 樣式設定

圖資：MRT\_1100406.shp、MARK\_捷運車站\_1090410.shp、  
Metro\_Taipei\_(Logo\_Only).svg

# 樣式設定 – 依類別設定

在 ArcGIS 中，我們可以根據捷運線的類別來設定圖層的樣式。這裡以「MRTCODE」作為分類依據。

在「Layer Properties — mrt — Symbology」對話框中，選取「Categorized」並設置「Value」為「abc MRTCODE」。

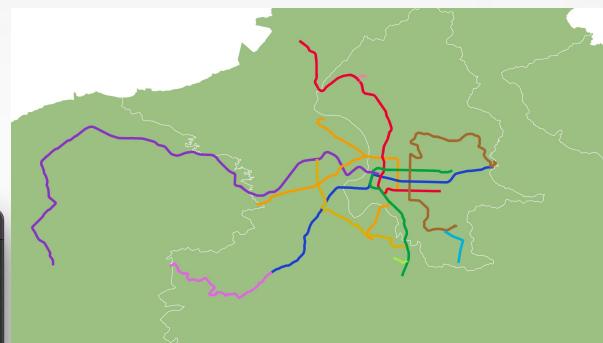
在下方的「Symbol」清單中，可以看到捷運線被分成了多個顏色區塊：

- 三鶯線 (深藍)
- 中和... (黃)
- 小碧... (綠)
- 文湖線 (紫)
- 新北... (紅)
- 松山... (深綠)
- 板南線 (藍)
- 機場... (深藍)
- 淡水... (紅)
- 環狀線 (黃)
- 貓空... (藍)
- all oth... (深藍)

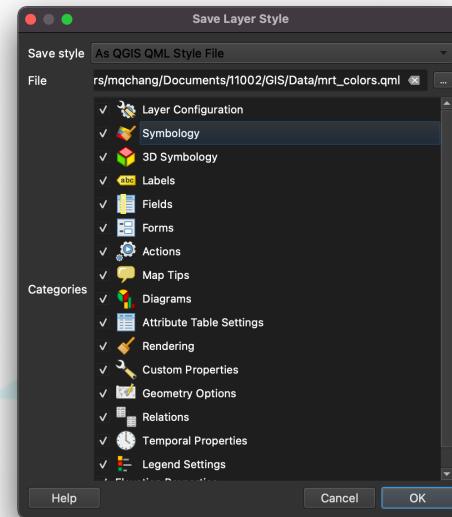
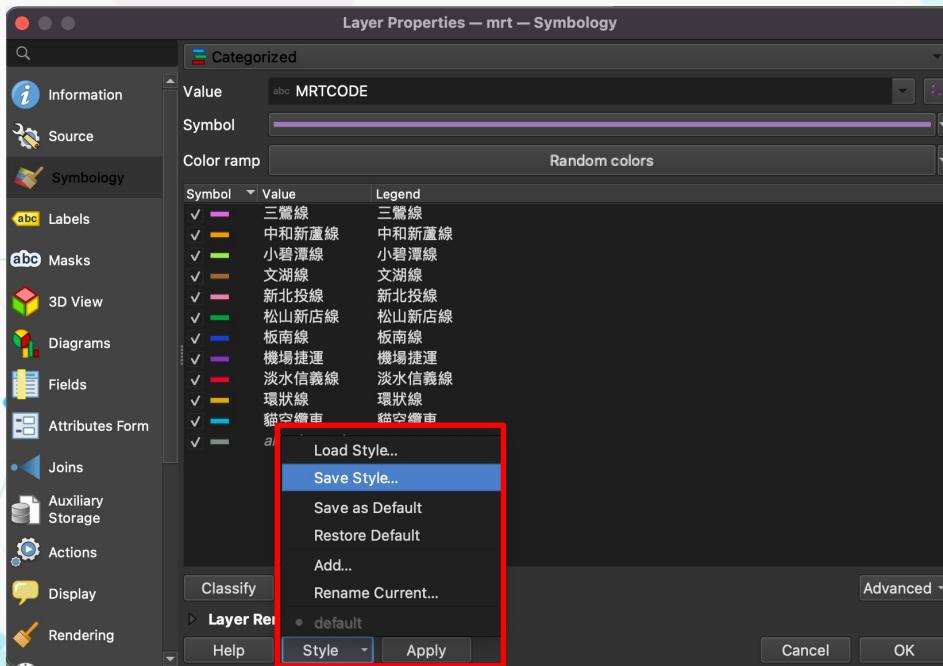
顯示效果：捷運線根據其 MRTCODE 分類，使用了不同的顏色。

同一捷運線同顏色

MRTID	MRTSYS	MRTCODE	MRTTYPE	MDATE	SOURCE	DEFINITION
1	A0000000001	臺北捷運		3 201311	0	1
2	A0000000002	臺北捷運		3 201311	0	1
3	A0000000003	臺北捷運		3 201311	0	1
4	A0000000004	臺北捷運		3 201311	0	1
5	A0000000005	臺北捷運		3 201311	0	1
6	A0000000006	臺北捷運		3 201311	0	1
7	A0000000009	臺北捷運		文湖線		
8	A0000000010	臺北捷運		文湖線		
9	A0000000021	臺北捷運		板南線		
10	A0000000022	臺北捷運		板南線		
11	A0000000023	臺北捷運		板南線		
12	A0000000024	臺北捷運		板南線		
13	A0000000025	臺北捷運		板南線		
14	A0000000030	臺北捷運		淡水信義線		
15	A0000000031	臺北捷運		淡水信義線		



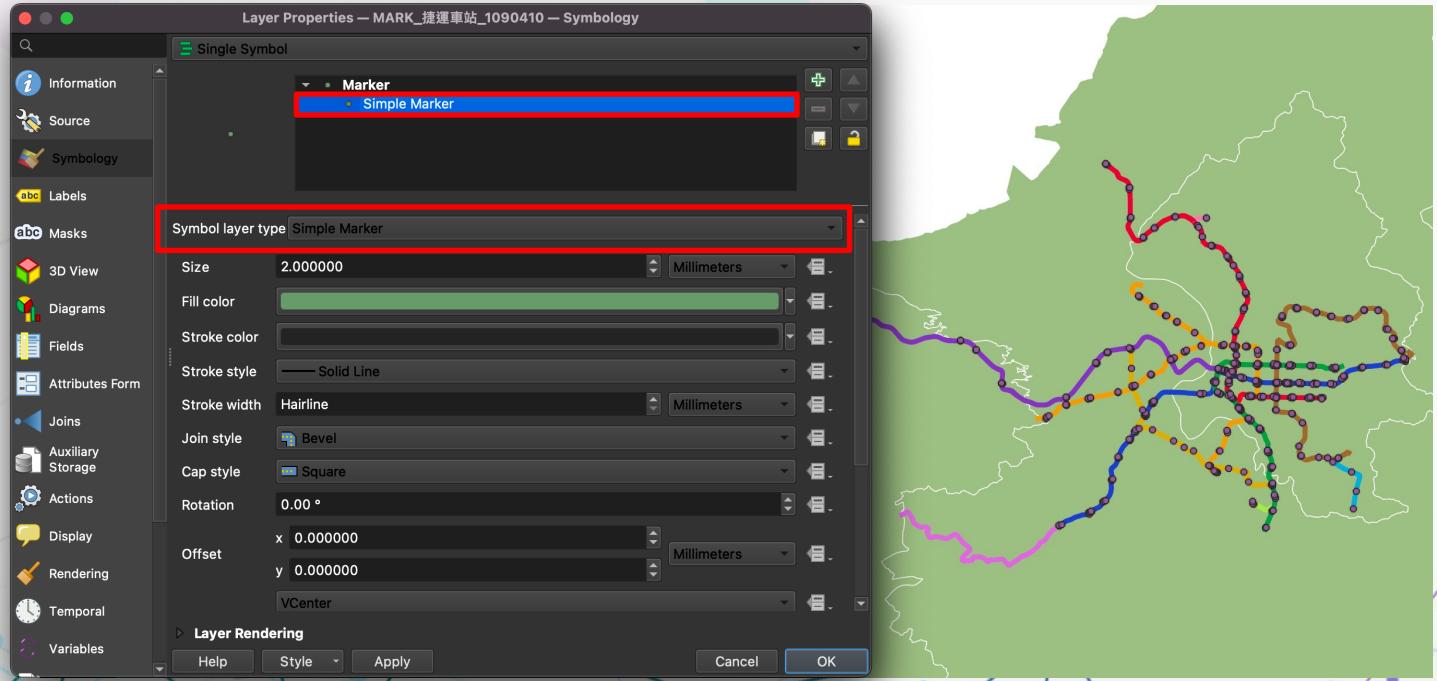
# 樣式設定 – 儲存自訂樣式



樣式設定亦可存檔，日後需要再匯入  
(.qml，僅限QGIS使用)

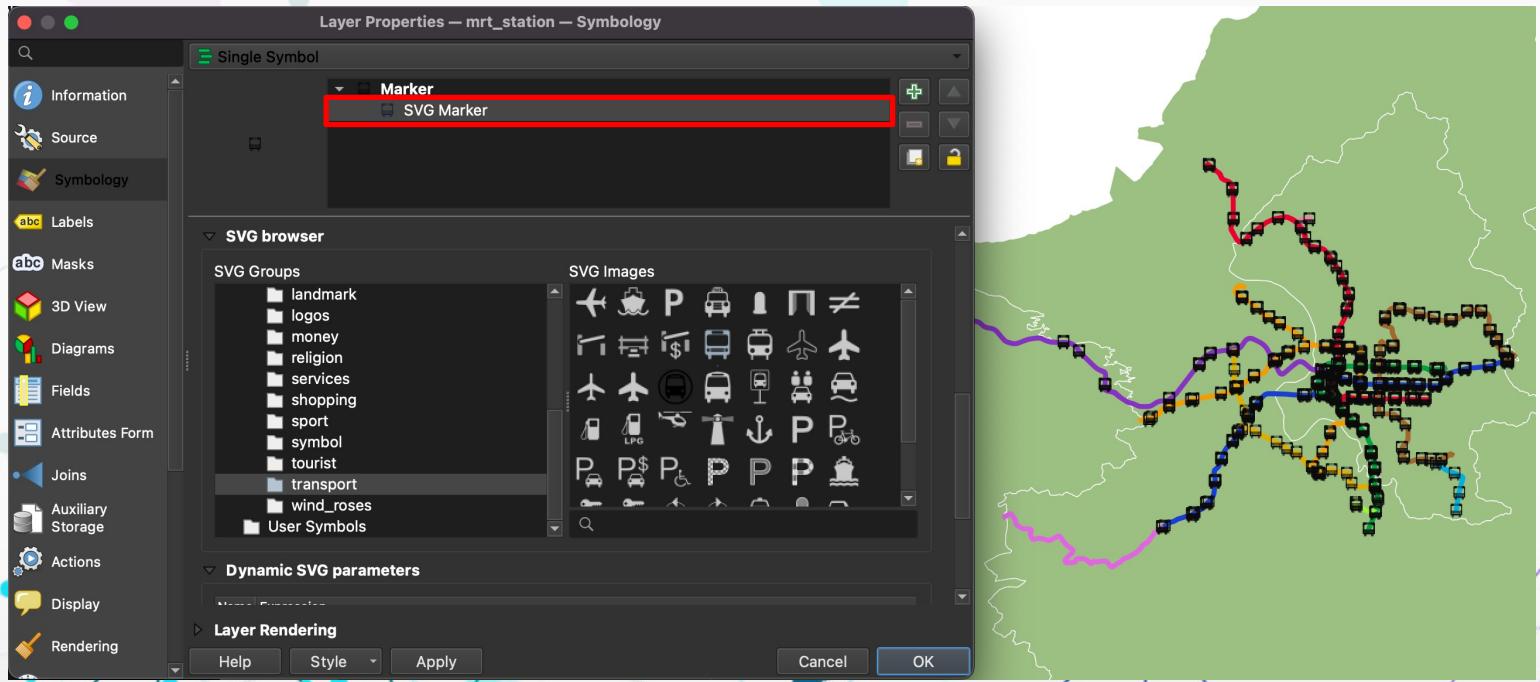
# 樣式設定 - 自訂圖徵 (點)

Single Marker



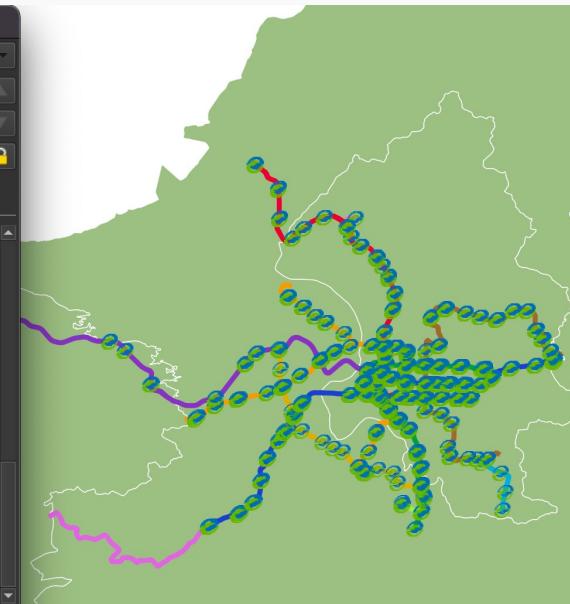
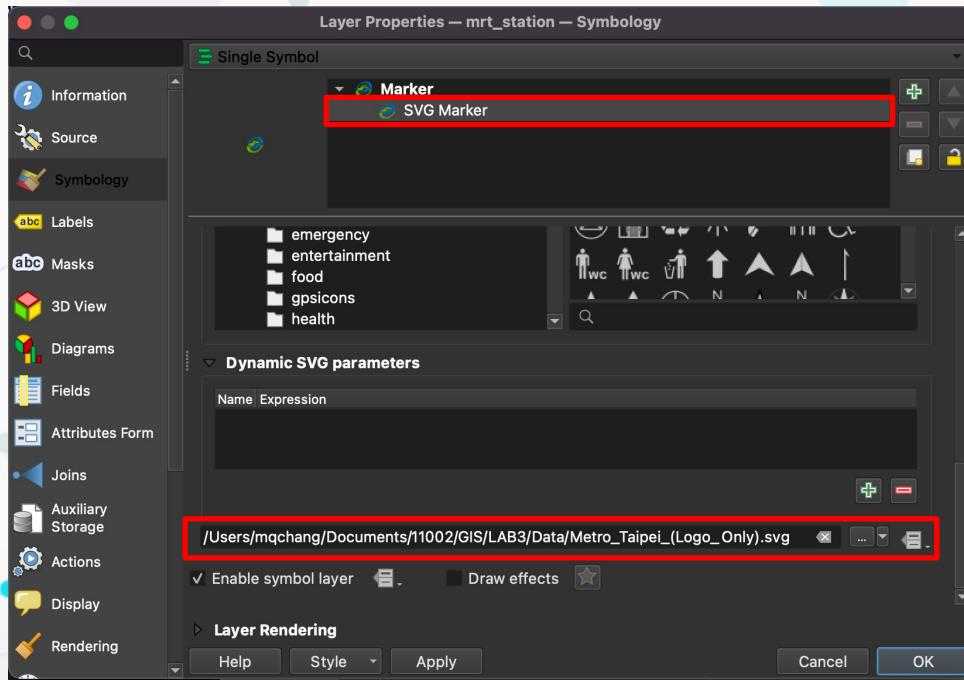
# 樣式設定 - 自訂圖徵 (點)

內建 SVG Marker



# 樣式設定 - 自訂圖徵 (點)

自訂 SVG Marker



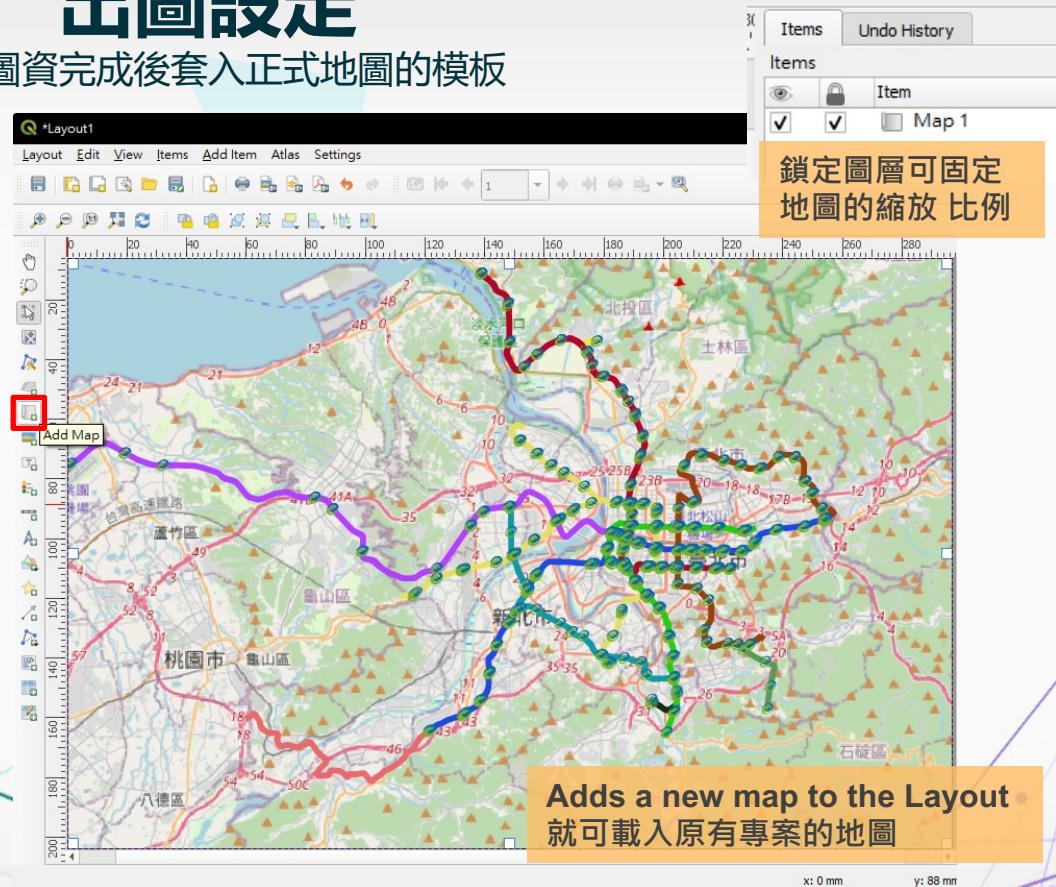
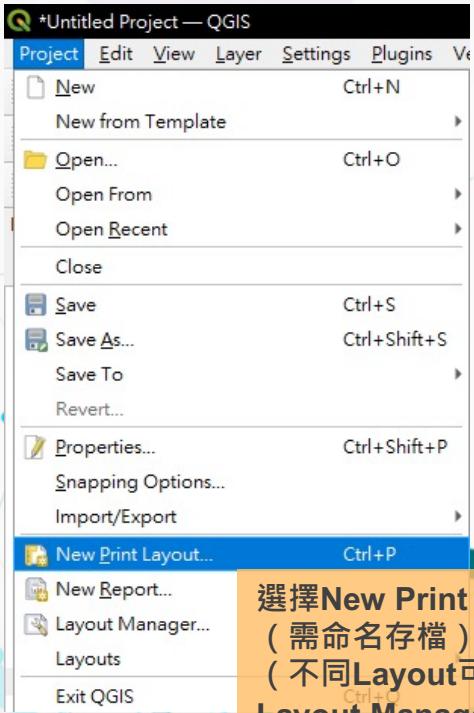
限制：只支援.svg檔 (圖片向量檔)

# 出圖設定

圖資：MRT\_1100406.shp

# 出圖設定

編輯圖資完成後套入正式地圖的模板

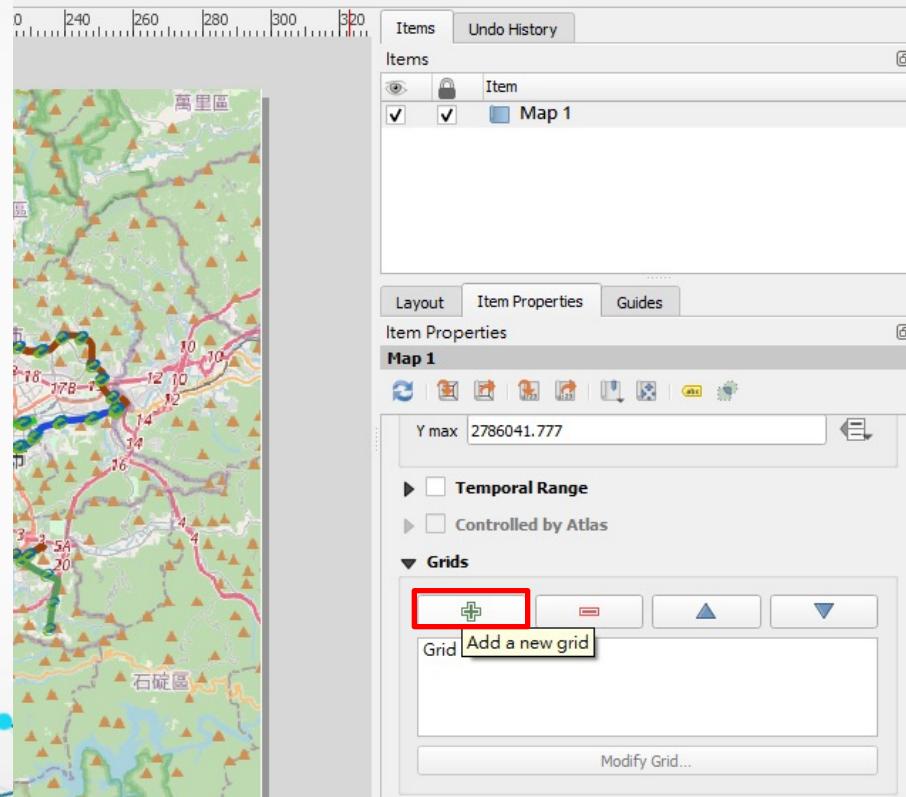


# 出圖設定

## 經緯度、格線 ( grid )

右邊第二欄 Item Properties  
選擇Grid→Add a new grid→Modify Grid

記得注意投影方式關係到單位！



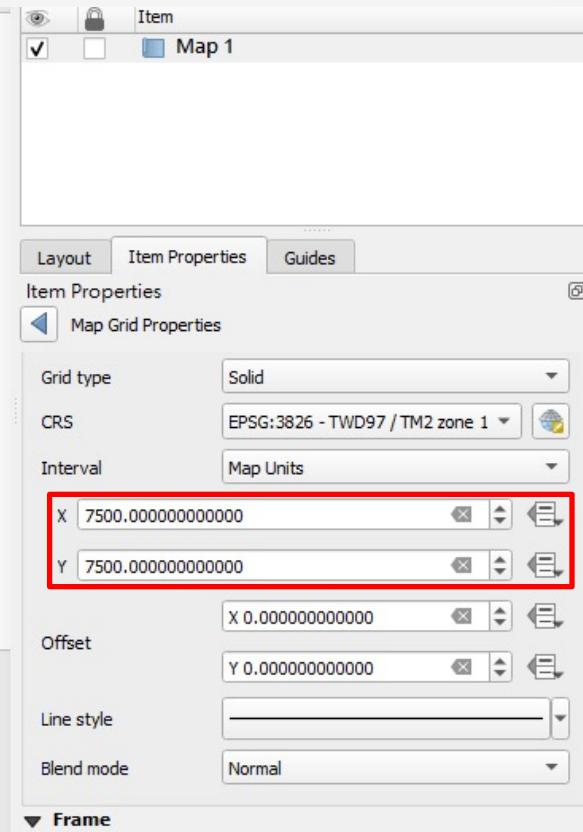
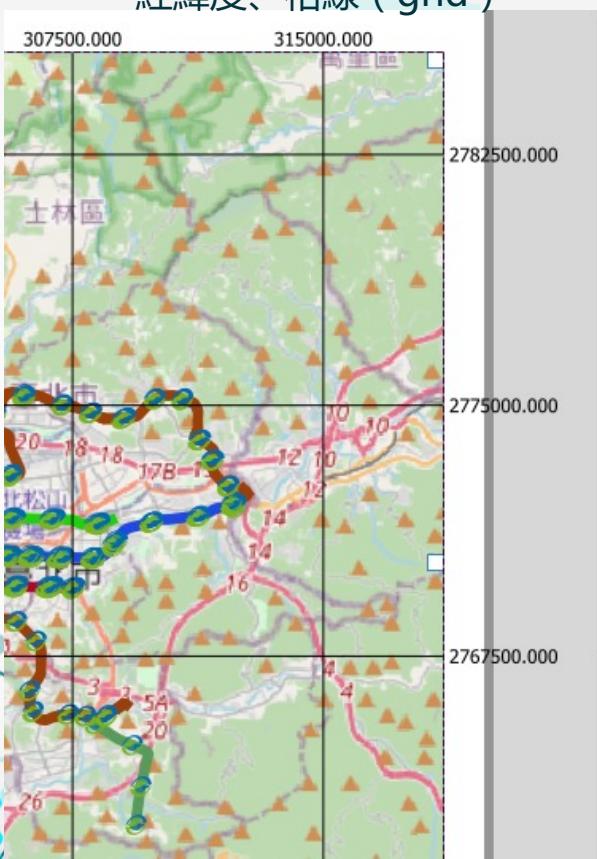
# 出圖設定

## 經緯度、格線 (grid)

CRS與地圖資料一致  
設定XY區間→經緯線的間隔

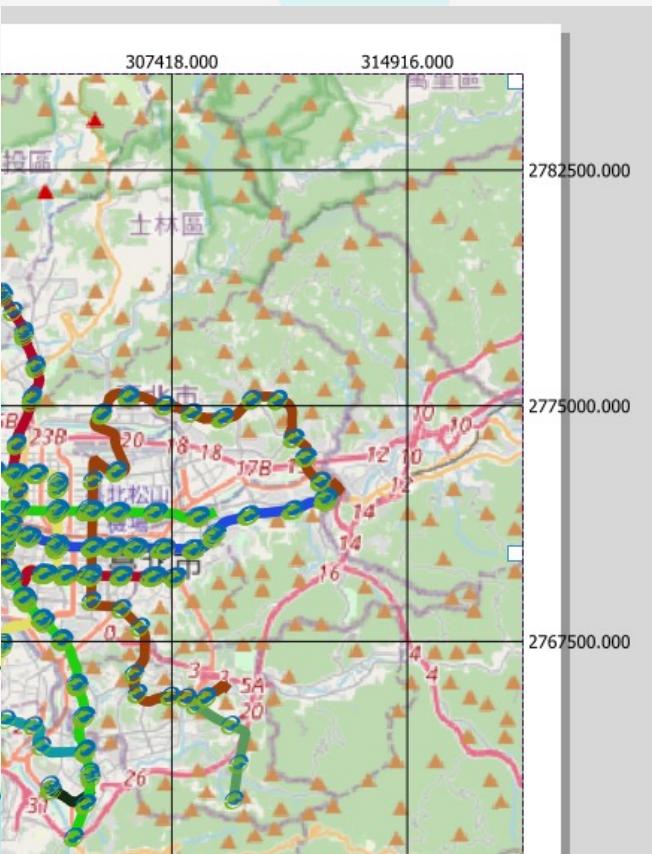
下方樣式、字形、大小可設定

※Map Unit: TWD67/97的單位為公尺  
設定XY區間時須留意



# 出圖設定

經緯度、格線 (grid)



Items

Item

Map 1

Layout Item Properties Guides

Map Grid Properties

Margin from map corner: 0.00 mm

Draw Coordinates

Format: Decimal

Left: Show All, Outside Frame, Horizontal

Right: Show All, Outside Frame, Horizontal

Top: Show All, Outside Frame, Horizontal

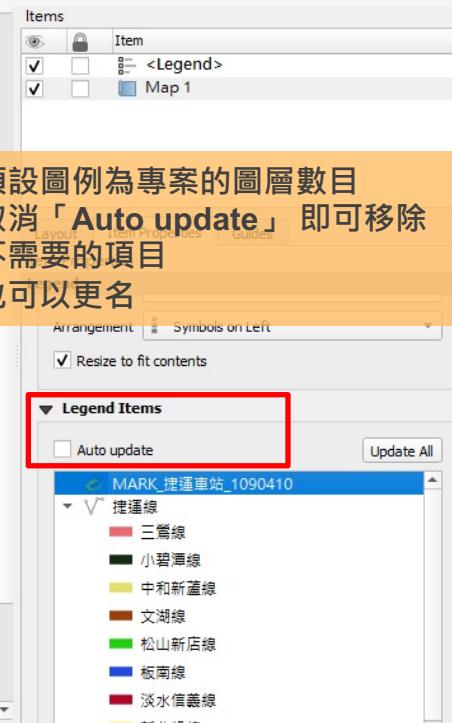
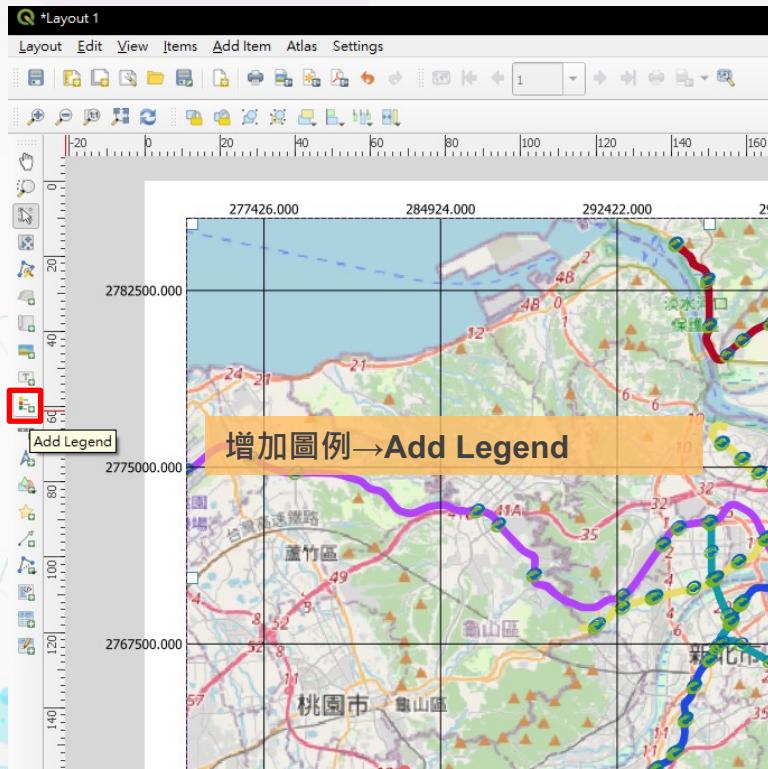
Bottom: Show All, Outside Frame, Horizontal

36

This figure shows the "Map Grid Properties" panel of a software application. It includes a list of items (Map 1), layout options, and specific settings for the map grid. The "Draw Coordinates" checkbox is checked and highlighted with a red border. The "Format" dropdown is set to "Decimal". For the "Left" side, "Show All", "Outside Frame", and "Horizontal" are selected. For the "Right" and "Top" sides, "Show All", "Outside Frame", and "Horizontal" are also selected. The bottom section is partially visible with the number "36".

# 出圖設定

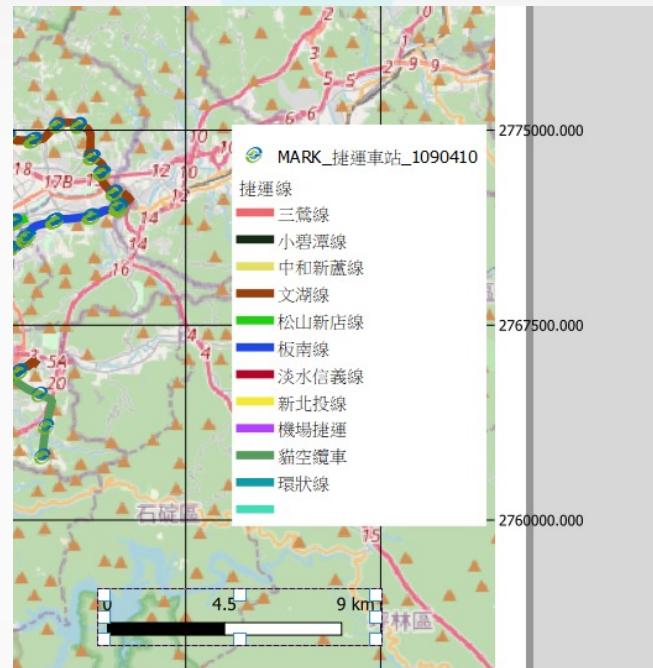
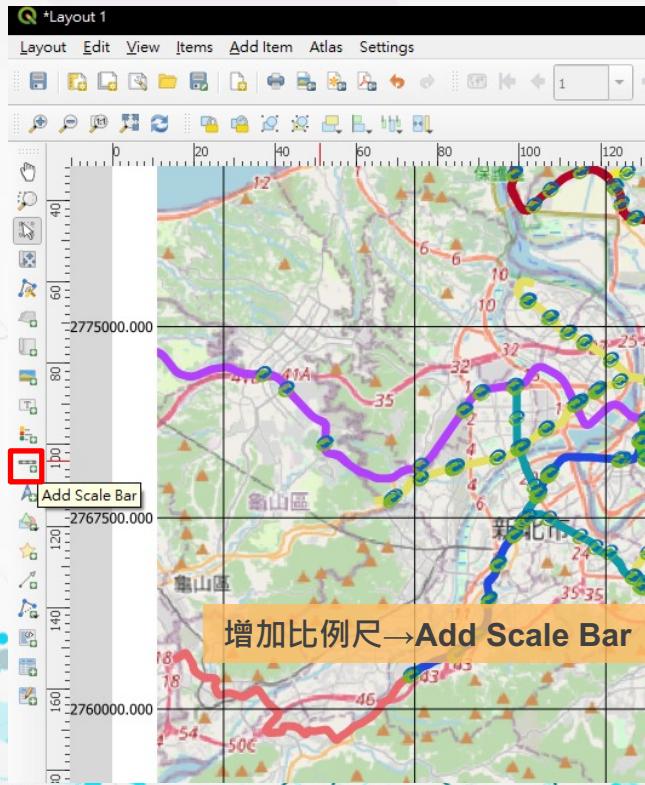
## 圖例 ( Legend )



其餘顯示設定參數請自行摸索

# 出圖設定

## 指北針 ( North Arrow ) 、比例尺 ( Scale Bar )



Segments left 0  
right 2

Fixed width 4.500000 units

比例尺單位設定須注意

# 出圖設定

## 指北針 ( North Arrow ) 、比例尺 ( Scale Bar )

**Add North Arrow**

**增加指北針 → Add North Arrow**

**更改指北針樣式&顏色**

**North Arrow**

**<Scalebar>**

**<Legend>**

**Map 1**

**Layout Item Properties Guides**

**Picture**

- arrows
- backgrounds
- components
- crosses
- emergency
- entertainment
- food
- gpsicons
- health
- landmark
- money

**SVG Parameters**

Fill color: Blue

Stroke color: Black

# 出圖設定

## 全覽圖 (Overviews)

The screenshot shows the ArcGIS Pro interface with a map document open. On the left is a small map preview titled "MARK\_捷運車站\_1090410" showing a green area with various rail lines and station icons. The main workspace shows a larger map of the same area with a legend on the right listing rail lines: 三鶯線 (Red), 小碧潭線 (Black), 中和新蘆線 (Yellow), 文湖線 (Brown), 松山新店線 (Green), 板南線 (Blue), 淡水信義線 (Dark Red), 新北投線 (Yellow), 機場捷運 (Purple), 畫空捷運 (Dark Green), and 環狀線 (Teal). A north arrow and scale bar are visible at the bottom of the main map. To the right of the map are several panels: "Item" (checkboxes for North Arrow, Scalebar, Legend, and Map 1), "Layout" (button tabs for Layout, Item Properties, and Guides), "Item Properties" (button tabs for Item Properties and Guides), and "Main Properties" (Scale set to 194959, Map resolution 0.00°, and a note in orange: "(重要!) 原本地圖的properties內勾選“Lock layers”即可固定地圖顯示的內容"). The "Main Properties" panel also includes checkboxes for Follow map theme (unchecked), Lock layers (checked with a red border), and Lock styles for layers (unchecked).

(重要!)  
原本地圖的properties內  
勾選“Lock layers”  
即可固定地圖顯示的內容

Follow map theme (none)

Lock layers

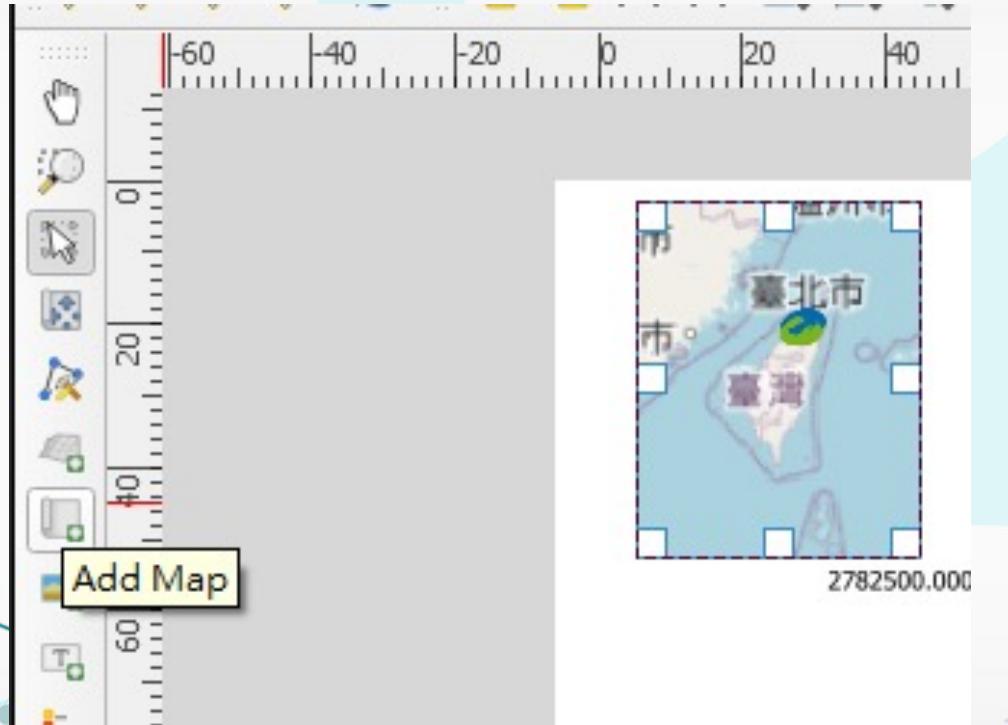
Lock styles for layers

# 出圖設定

全覽圖 ( Overviews )

再度Add a new map ( 地圖二 )  
加入一張較小的地圖  
縮放至整個台灣本島的尺度

在地圖二的 Item properties內找  
到「Overviews」，並且新增一個



# 出圖設定

## 全覽圖 (Overviews)

地圖二即出現地圖一的區域顯示

Layout Item Properties Guides

Item Properties

Map 2

Overview 1

設定：圖框選擇主題的地圖（地圖一）並選擇顯眼的顏色及透明度

Draw "Overview 1" overview

Map frame: Map 1

Frame style: Blue

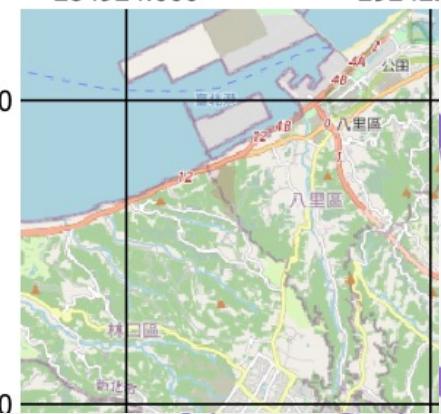
Blending mode: Normal

Invert overview

Center on overview



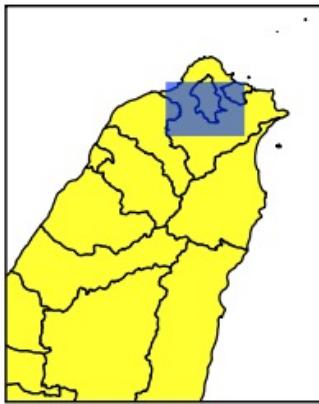
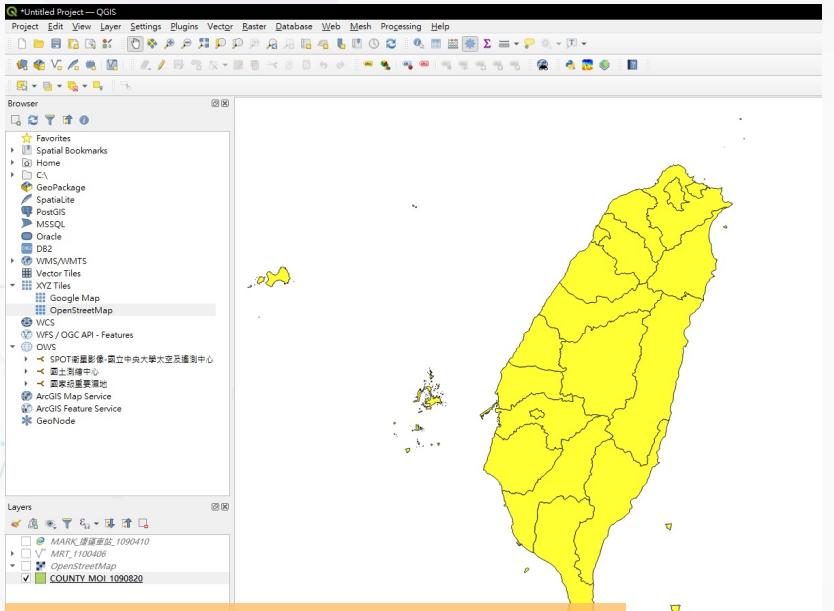
284924.000 29242.  
2782500.000



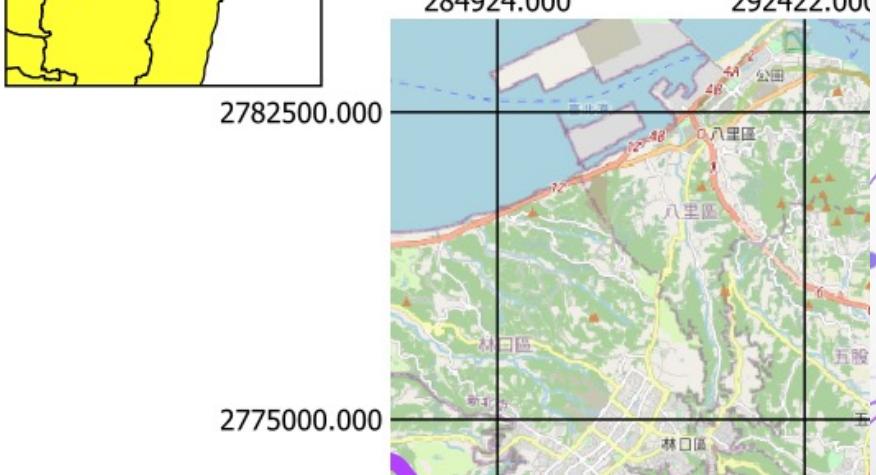
2775000.000

# 出圖設定

## 全覽圖 (Overviews)



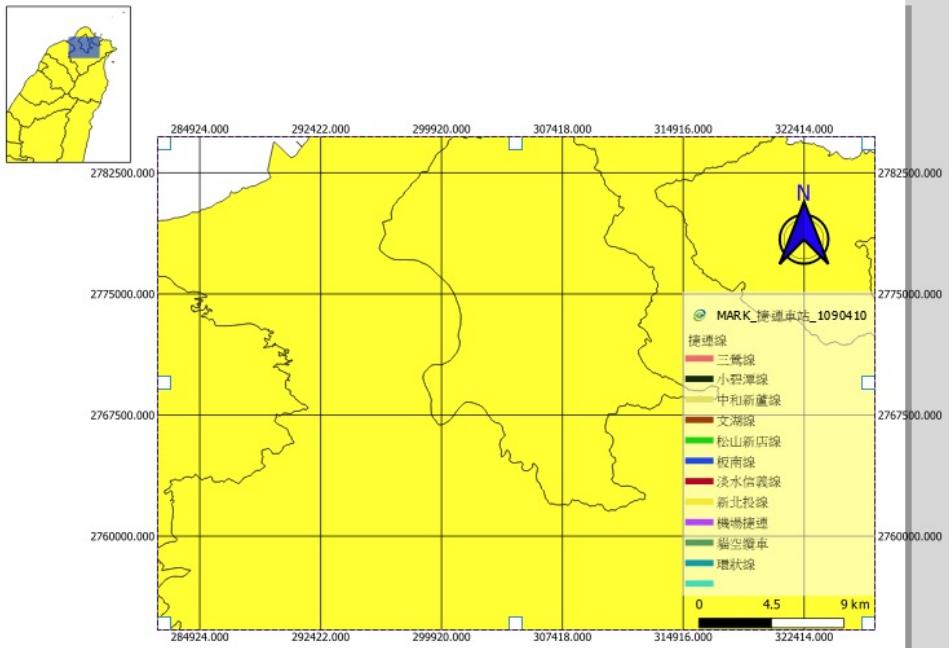
開啟Layout，拖曳地圖二後會發現畫面同步



# 出圖設定

## 全覽圖 (Overviews)

如果前四頁的時候沒有先把地圖一的圖層鎖定.....



Items

<input checked="" type="checkbox"/>	Item
<input type="checkbox"/>	Map 2
<input checked="" type="checkbox"/>	North Arrow
<input type="checkbox"/>	<Scalebar>
<input checked="" type="checkbox"/>	<Legend>
<input checked="" type="checkbox"/>	Map 1

Layout Item Properties Guides

Item Properties

Map 1

兩張地圖內容皆會同步消失  
這時須回到專案將圖層顯示重新開啟  
重複前1~4步驟

Layers

Follow map theme (none)

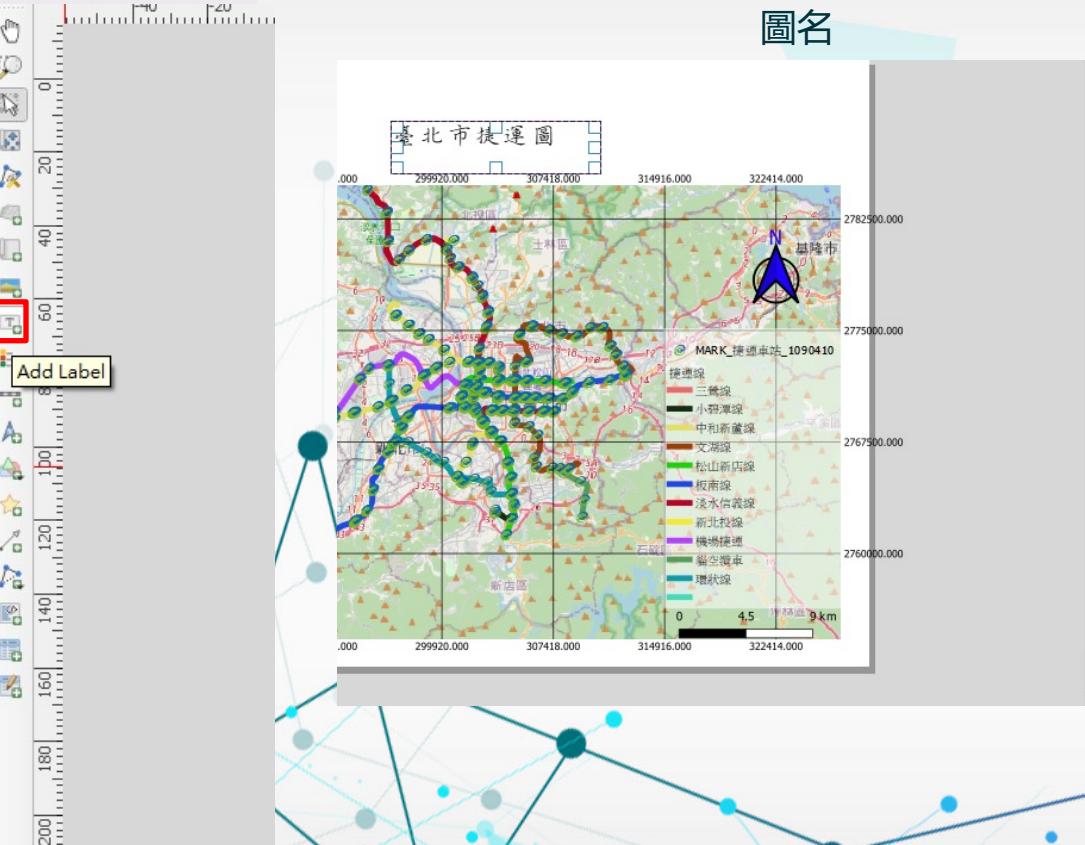
Lock layers

Lock styles for layers

Extents

# 出圖設定

圖名



臺北市捷運圖

Map 2  
North Arrow  
<Scalebar>  
<Legend>  
Map 1

Layout Item Properties Guides

Item Properties

Label

臺北市捷運圖

Render as HTML

Insert or Edit an Expression...

調整字體和大小

Font

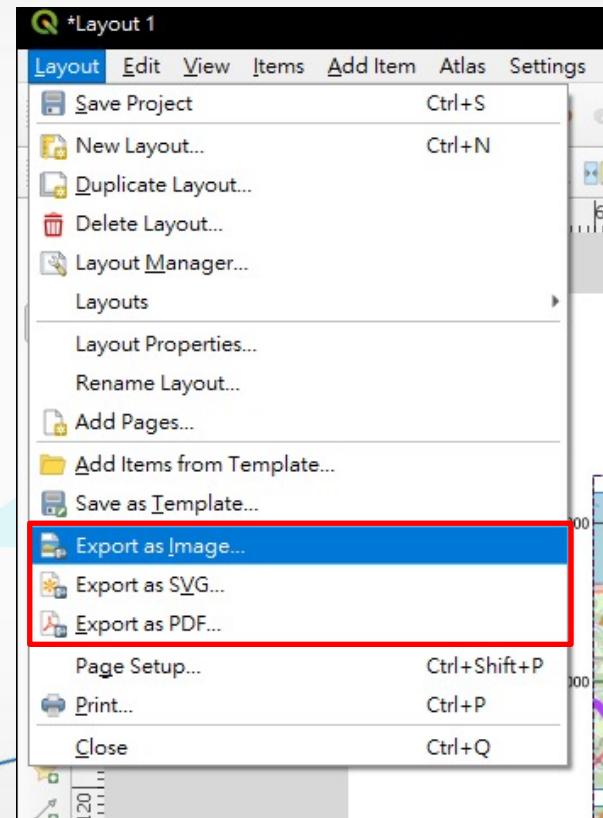
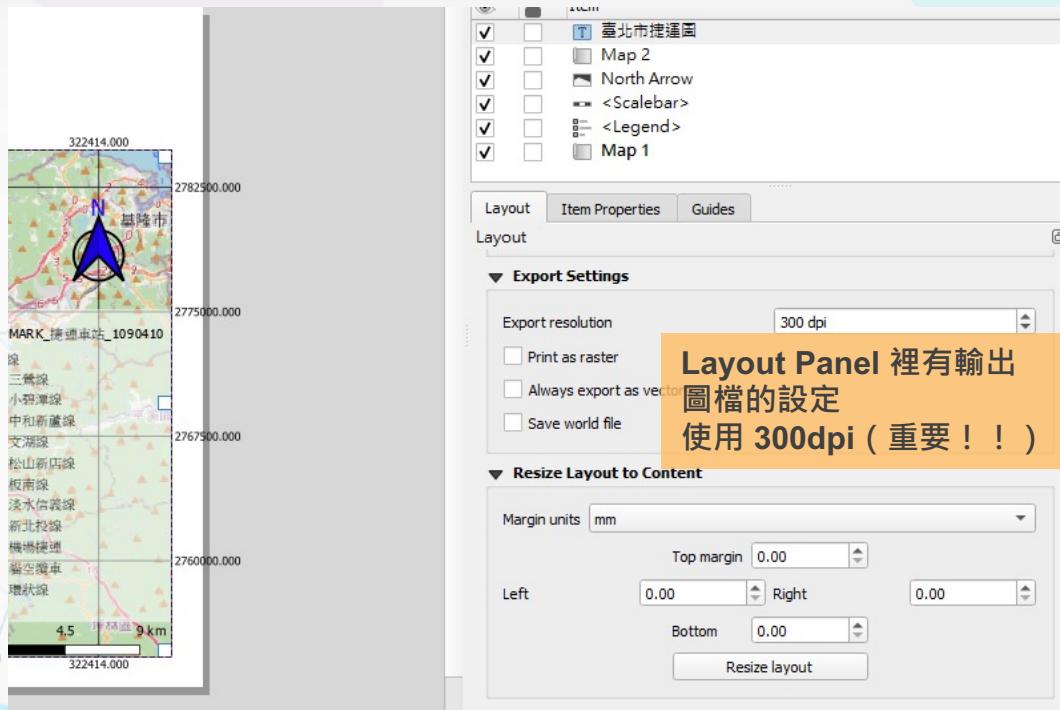
Font color: black

Horizontal margin: 0.00 mm

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# 出圖設定

## 匯出 (Export)

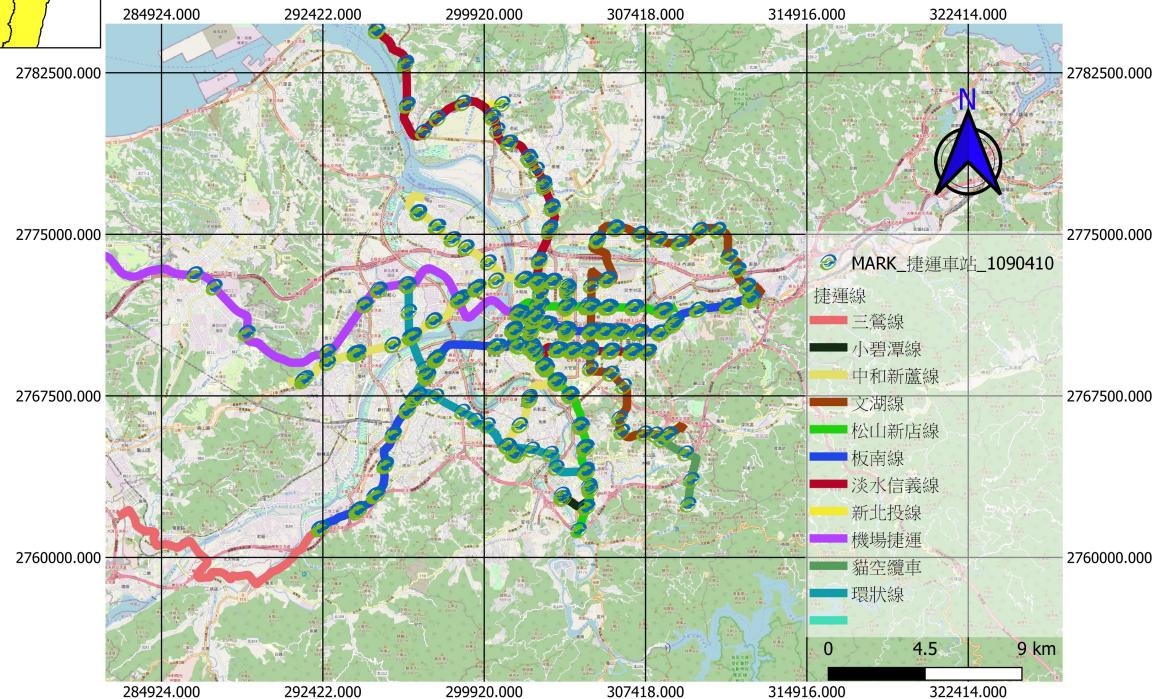


# 出圖設定

## 匯出圖檔



臺北市捷運圖



1. 圖名
2. 圖例
3. 指北針
4. 比例尺
5. 全覽圖