

# 「Using ：人口地圖繪製」工作坊

主辦單位：國立台灣大學人口與性別研究中心  
國立台灣大學地理環境資源學系

教學網址：[http://wenlab.geog.ntu.edu.tw/qgis\\_carto/](http://wenlab.geog.ntu.edu.tw/qgis_carto/)

授課教師：溫在弘 Professor, NTU Geography

實習助教：陳威全 Ph.D. Candidate, NTU Geography

郭飛鷹 Ph.D. Student, NTU Geography

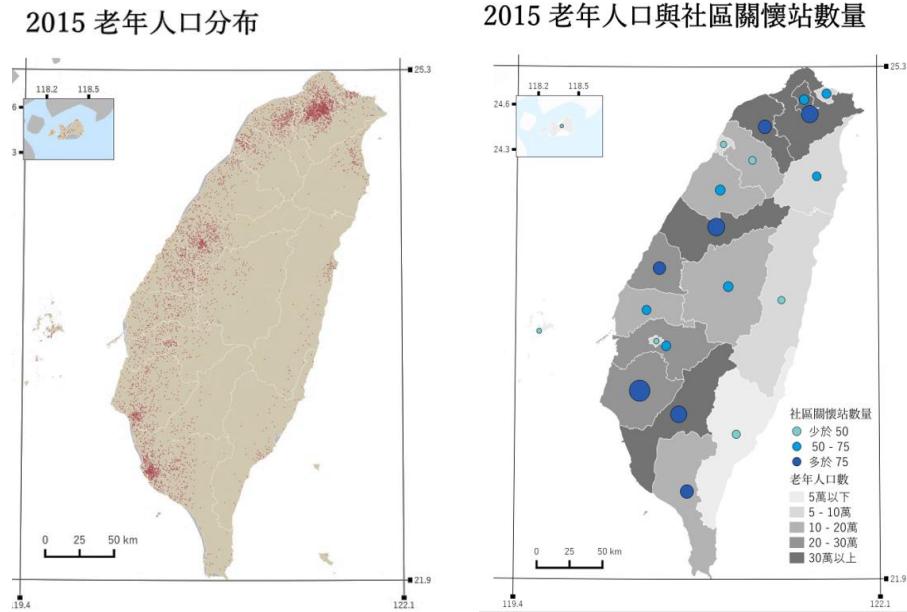
# 課程內容概述

1/15 :

- 上午 (10:00am-12:00pm, 2 hours)
- 1. QGIS 基本環境介紹
- 2. 地圖的基本原則與要素。(投影與座標系統、比例尺設定與圖例設計)
- 3. 地圖實作：第一次繪製的台灣地圖 (北方一定在地圖的上方嗎?)



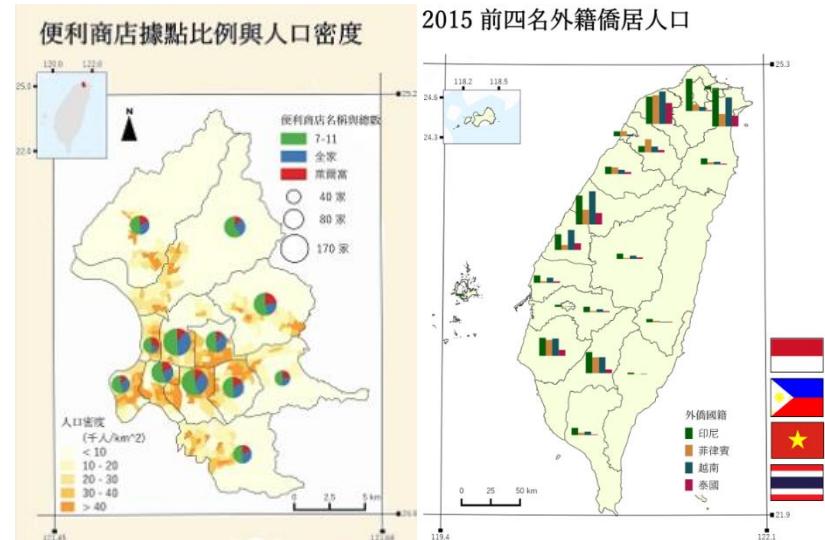
- 下午 (1:00pm-4:00pm, 3 hours)
- 1. 描述人口地理分布的基本原則
- 2. 地圖實作：
  - (a) 點子圖 Dot Map
  - (b) 面量圖 Shaded Map
  - (c) 泡泡圖 Bubble Map



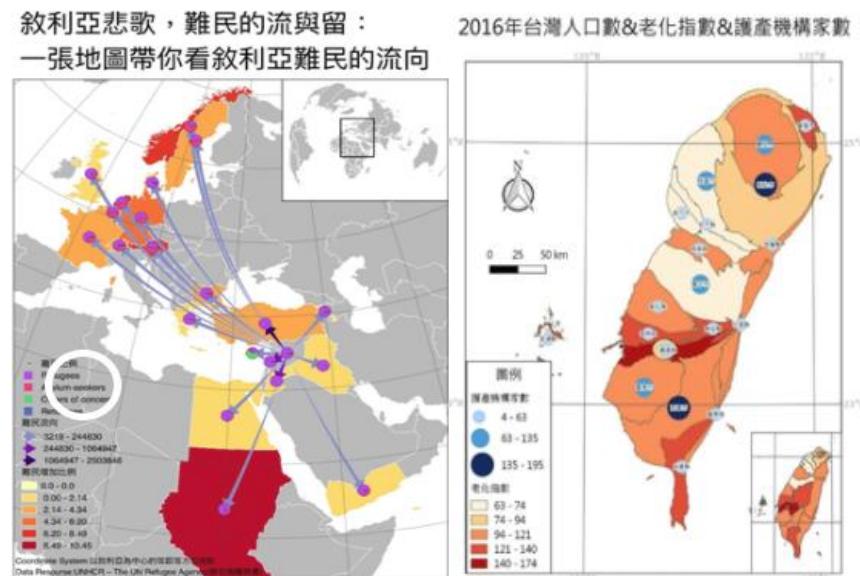
# 課程內容概述

1/16 :

- 上午 (10:00am-12:00pm, 2 hours)
  - 1. 人口統計地圖呈現原則
  - 2. 地圖實作：圓餅地圖 (Pie Chart Map)  
長條地圖 (Bar Chart Map)



- 下午 (1:00pm-4:00pm, 3 hours)
  - 1. 如何描述人口遷徙的空間分布
  - 2. 地圖實作：流動地圖 Flow Map
  - 3. 非傳統的地圖呈現：  
面積變形圖 Cartogram



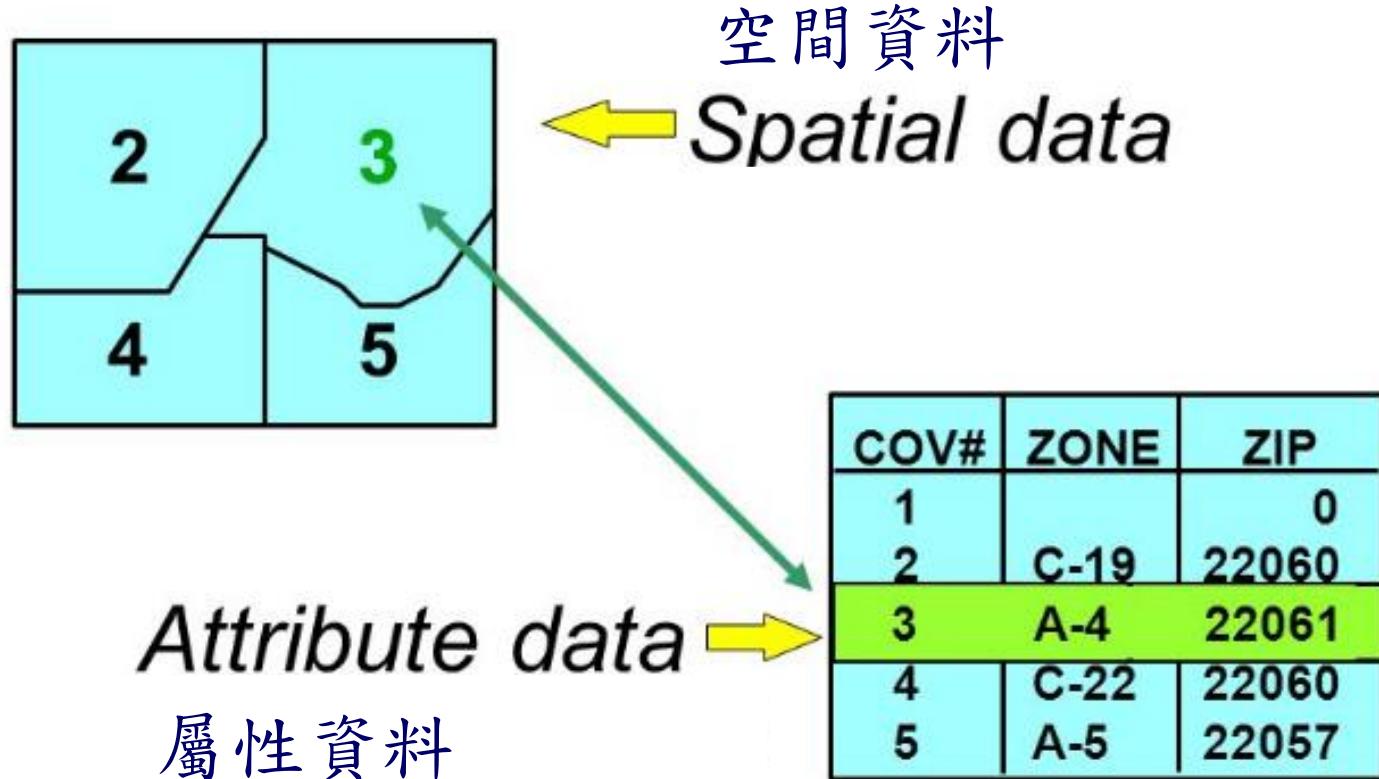
# 課程提供的資料

- twn\_population.shp 台灣鄉鎮人口統計
- taiwan\_county.shp 台灣縣市邊界
- nursing\_institute.shp 台灣縣市產護機構統計
- foreign\_marriage.csv 台灣縣市外籍配偶統計
- CrudeFlow2015.xlsx 國際原油交易
- country.shp 世界國家邊界

台灣人口相關的圖資來源：

國土資訊系統 社會經濟資料服務平台 <https://segis.moi.gov.tw/>

# GIS 圖資檔案的概念



# GIS 圖資檔案 (ESRI Shapefile 格式)

-  **taiwan\_county.cpg** → (optional) code page, 屬性字元編碼
-  **taiwan\_county.dbf** → (required) 屬性資料表
-  **taiwan\_county.prj** → (optional) 投影座標檔
-  **taiwan\_county.qpj** → (optional) 投影座標檔 (for QGIS)
-  **taiwan\_county.shp** → (required) 空間資料檔
-  **taiwan\_county.shx** → (required) 幾何索引檔

<https://zh.wikipedia.org/wiki/Shapefile>

# 人口資料來源

社會經濟資料服務平台

<https://segis.moi.gov.tw/>

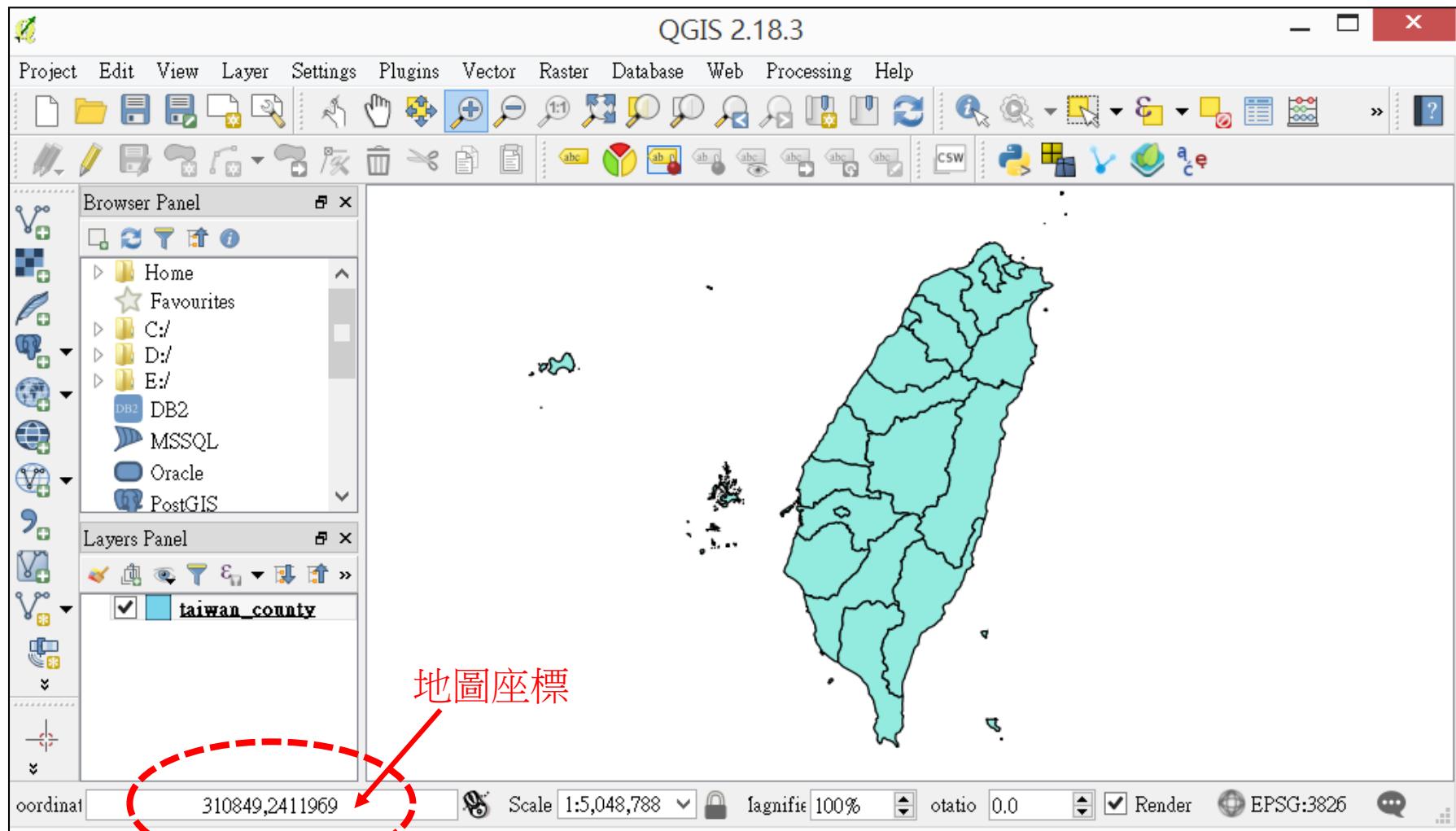
The screenshot shows the homepage of the Social Economic Data Service Platform (SEGIS). The top navigation bar includes links for '會員登入' (Member Login), '首頁' (Home), '最新消息' (Latest News), '產品公告' (Product Announcement), '統計資料網路服務' (Statistical Data Network Service), and '統計地圖' (Statistical Map). Below the navigation is a breadcrumb trail: '現在位置 : 首頁' (Current Location: Home). The main content area features a circular chart titled '各類產品數及熱門產品' (Number of Various Products and Popular Products) with a total count of 63,161. To the left, there are two vertical columns of service icons: '資料與服務專區' (Data and Service Special Zone) and '統計地圖專區' (Statistical Map Special Zone). The '資料與服務專區' column includes '產品與服務查詢' (Product and Service Inquiry), '最新消息' (Latest News), '產品公告' (Product Announcement), and '統計資料網路服務' (Statistical Data Network Service). The '統計地圖專區' column includes '開放產品合併下載' (Open Product Merge Download), '統計區比對服務' (Statistical Area Comparison Service), '統計地圖圖台' (Statistical Map Platform), '社會經濟統計地理資訊網' (Social Economic Statistical Geographic Information Network), '統計地圖API範例網站' (Statistical Map API Example Website), '社會經濟小常識' (Social Economic Small Knowledge), '主題圖集' (Theme Map Collection), and '統計區應用案例' (Statistical Area Application Case).

# 人口資料來源

內政資料開放平台

<http://data.moi.gov.tw/moiod/default/Index.aspx>

The screenshot shows the Moiod Open Data Platform interface. On the left, there is a sidebar with various filters: 分類 (Category) with 統計資料 (246), 婚姻 (1); 單位 (Unit) with 統計處 (247) circled in red; 格式 (Format) with CSV (217), JSON (27), XML (27), SHP (3); 資料類別 (Data Category) with Raw Data (219). At the top right, there is a search bar with the placeholder "搜尋資料集" and a search icon, followed by a message "找到 247 個資料集". Below the search bar, there is a unit filter set to "統計處" and a sorting dropdown set to "最後更新時間". The main content area displays two dataset cards. The first card is titled "統計區15歲以上人口教育程度統計" with a browse count of 569, a "統計處" link, and a last update time of 2018/1/11 下午 03:29:06. It also has JSON and XML download links. The second card is titled "統計區人口統計" with a browse count of 1575, a "統計處" link, and a last update time of 2018/1/11 上午 10:45:10. It also has JSON and XML download links.



# 台灣的座標系統 TWD97-TM2

## Taiwan Datum (TWD) 台灣的大地基準

Datum: Taiwan Datum 1997



### Geodetic Datum used in Taiwan

Taiwan Datum 1997 is a geodetic datum first defined in 1997 and is suitable for use in Taiwan, Republic of China - onshore and offshore - Taiwan Island, Penghu (Pescadores) Islands.. Taiwan Datum 1997 references the GRS 1980 ellipsoid and the Greenwich prime meridian. Taiwan Datum 1997 origin is ITRF94 at epoch 1997.0 Taiwan Datum 1997 is a geodetic datum for Geodetic survey, GIS, topographic mapping, engineering survey. It was defined by information from National Land Surveying and Mapping Center (NLSC), <http://www.nlsc.gov.tw> Adopted in 1998.

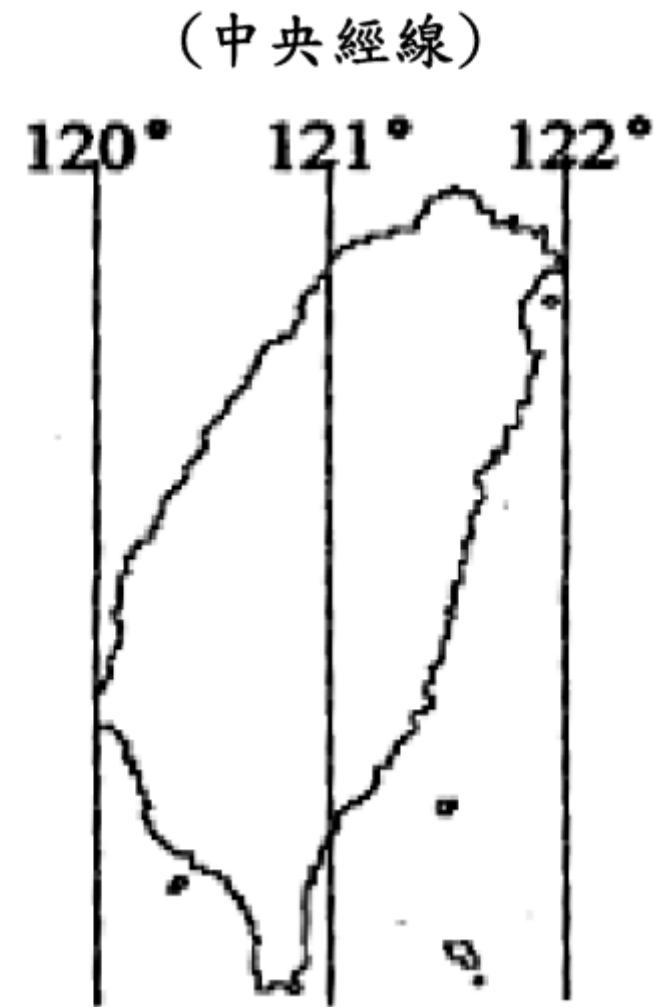
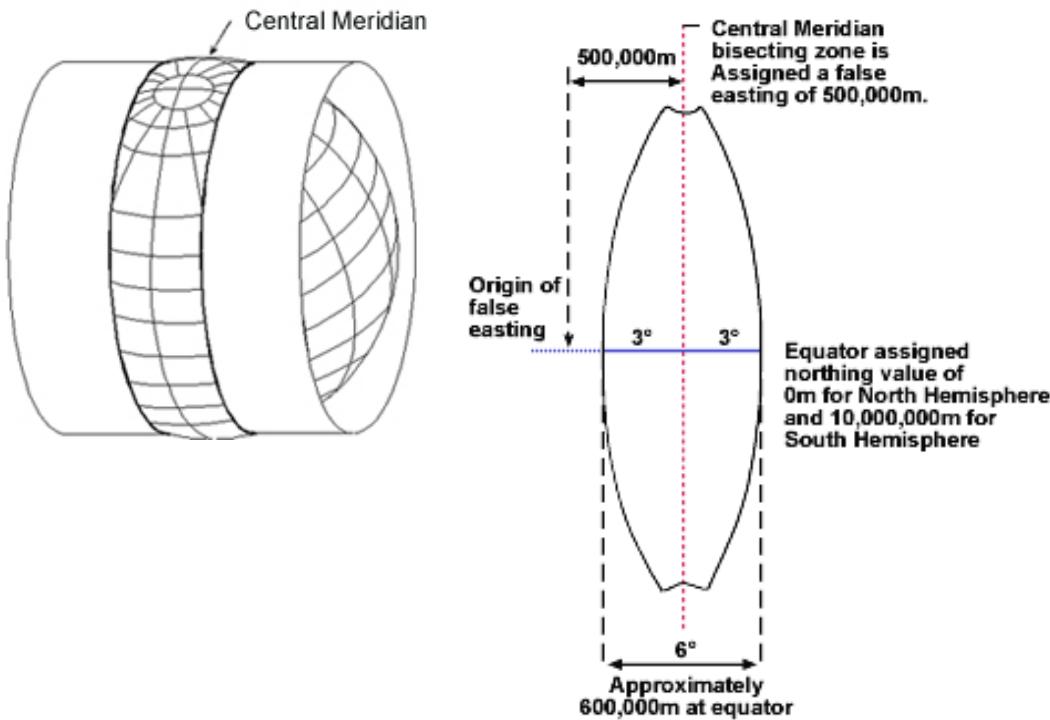
Datum Details	
DATUM NAME:	Taiwan Datum 1997
CODE:	1026
AREA OF USE:	<a href="#">Taiwan</a>
SCOPE:	Geodetic survey, GIS, topographic mapping, engineering survey.
TYPE:	geodetic
REALIZATION EPOCH:	1997
ORIGIN:	ITRF94 at epoch 1997.0
ELLIPSOID:	<a href="#">GRS 1980</a>
PRIME MERIDIAN:	<a href="#">Greenwich</a>
APPLICABLE CRS-S:	本初子午線 The following CRS are based on this dat <a href="#">[TWD97]</a> <a href="#">[TWD97]</a> <a href="#">[TWD97]</a>

國際地球參考框架（ International Terrestrial Reference Frame，簡稱為 ITRF ）。  
ITRF 為利用全球測站網之觀測資料成果推算所得之地心坐標系統。

[http://georepository.com/datum\\_1026/Taiwan-Datum-1997.html](http://georepository.com/datum_1026/Taiwan-Datum-1997.html)

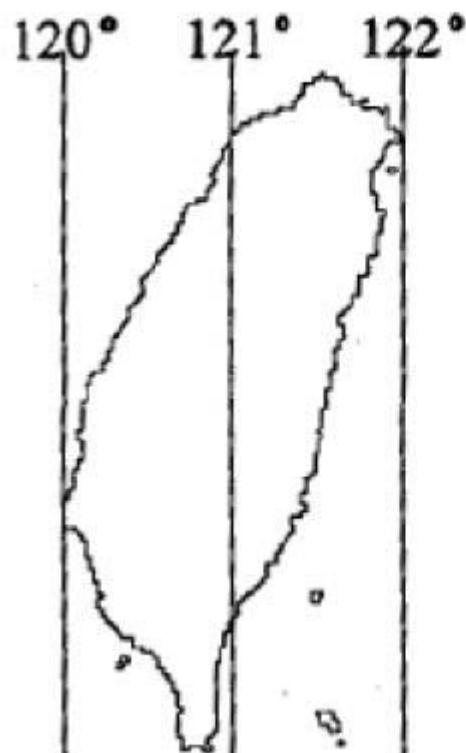
# 台灣的二度分帶座標 TM2

## The Secant case of the Transverse Mercator (TM)

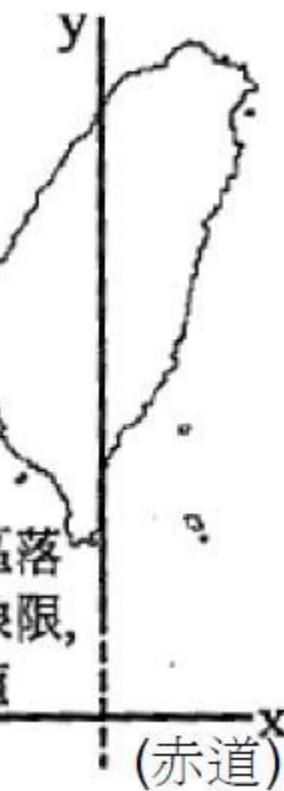


# 台灣的二度分帶座標 TM2

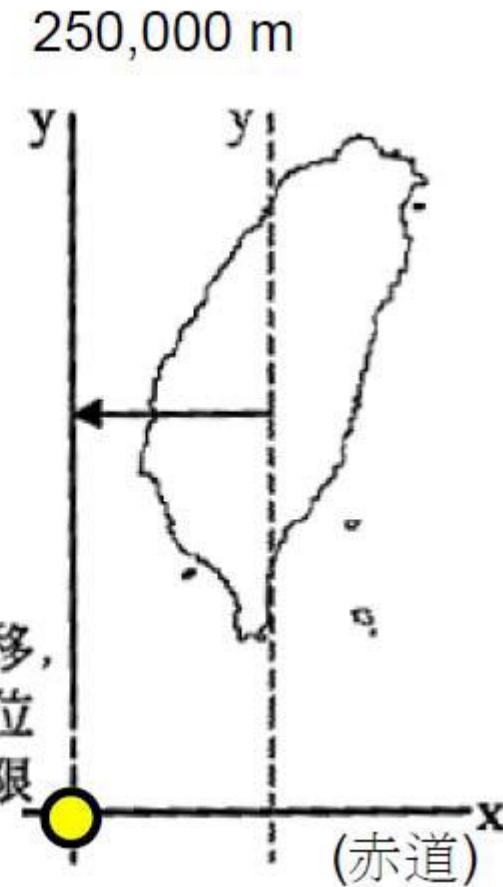
(中央經線)



部分地區落  
於第三象限,  
X 為負值



將 Y 軸平移,  
則全區均位  
於第一象限

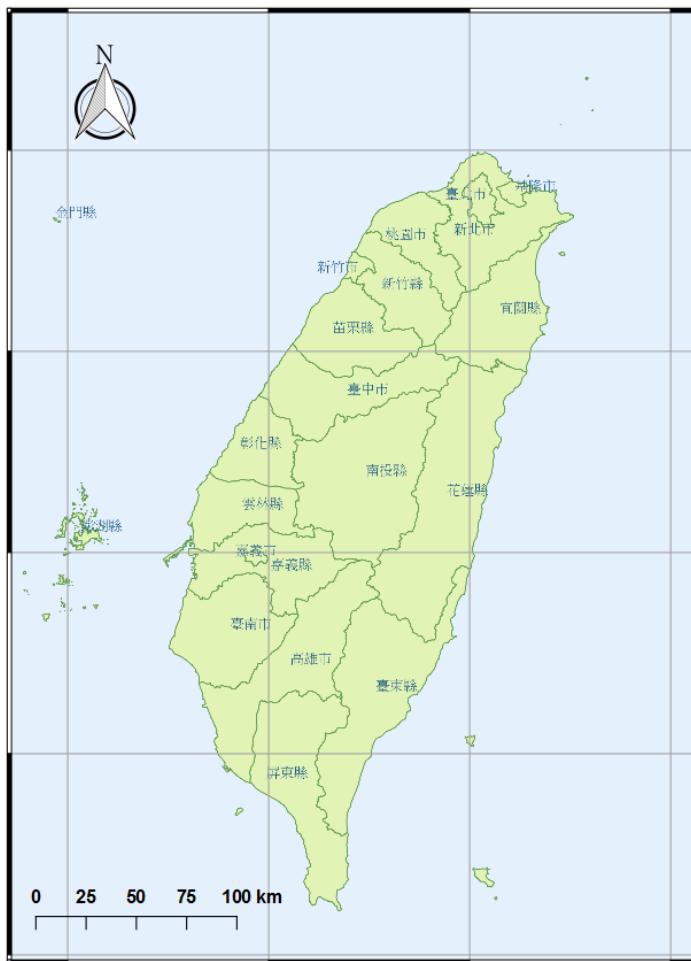


# 台灣的二度分帶座標 TM2：投影參數

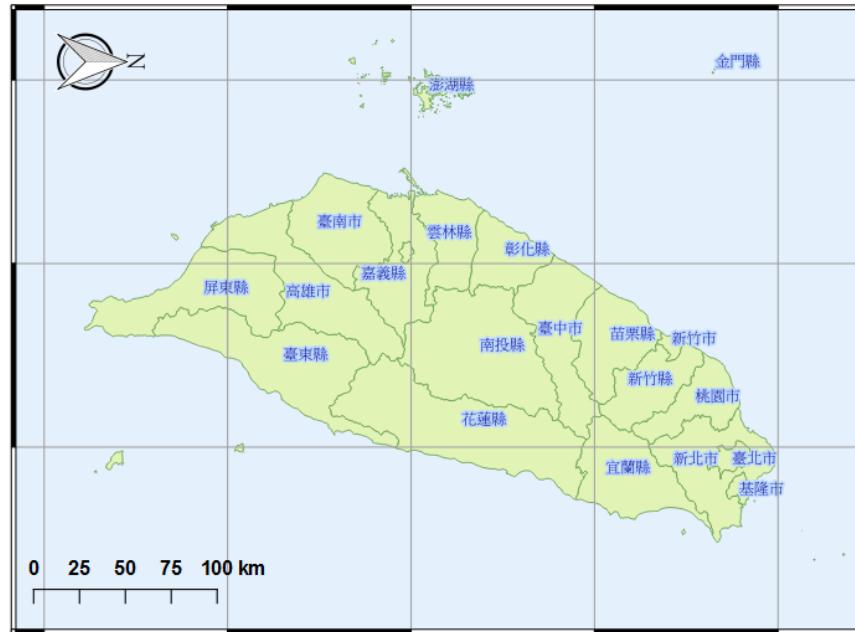
- Latitude origin: 0 degree
- Central meridian
  - 121 degrees E (台灣本島, 東引)
  - 119 degrees E (澎湖, 金門, 馬祖)
- Scale factor: 0.9999
- False easting: 250,000 meters
- False northing: 0 meter

# 地圖實作(預期成果)：台灣縣市圖

台灣縣市圖



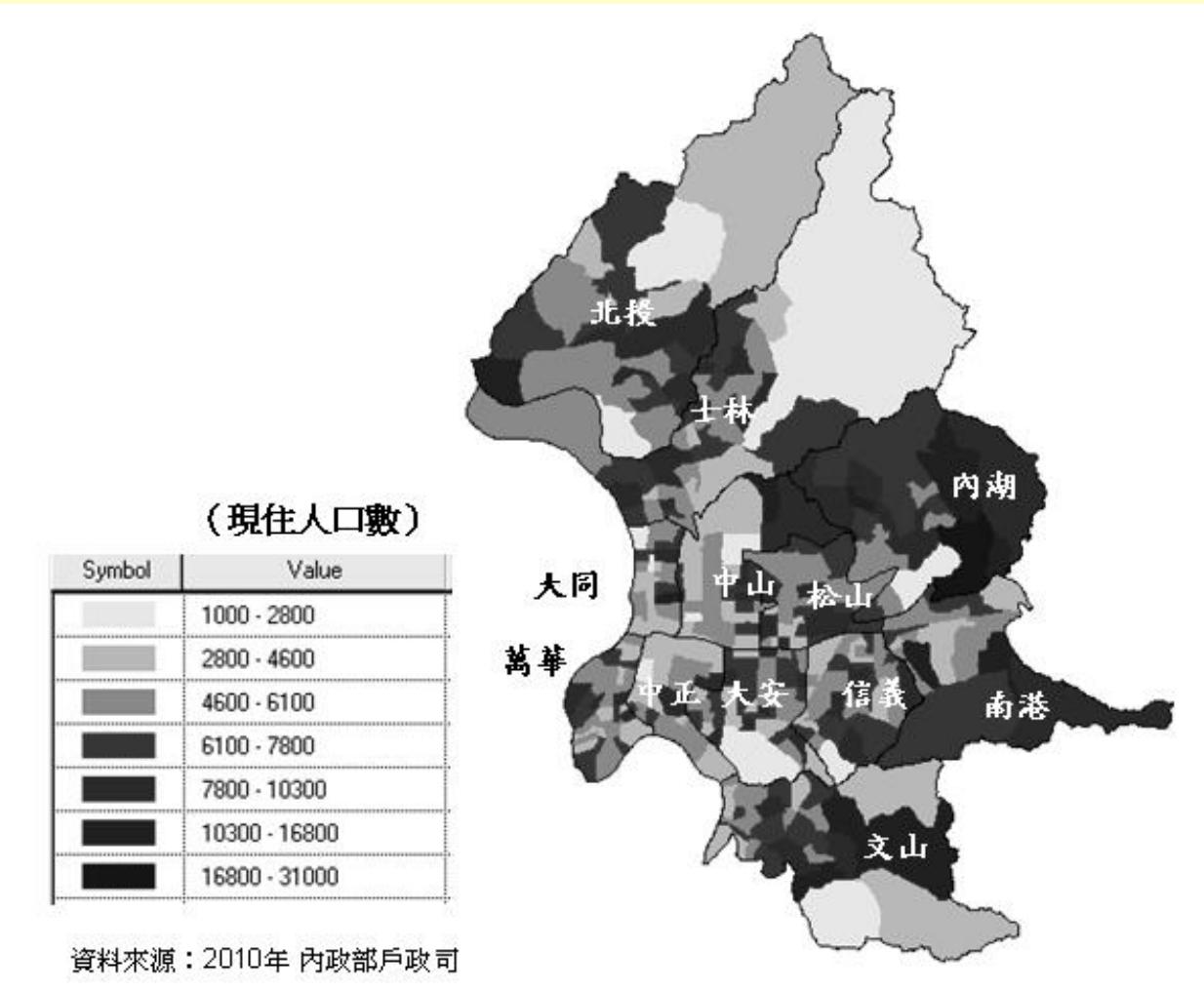
台灣縣市圖



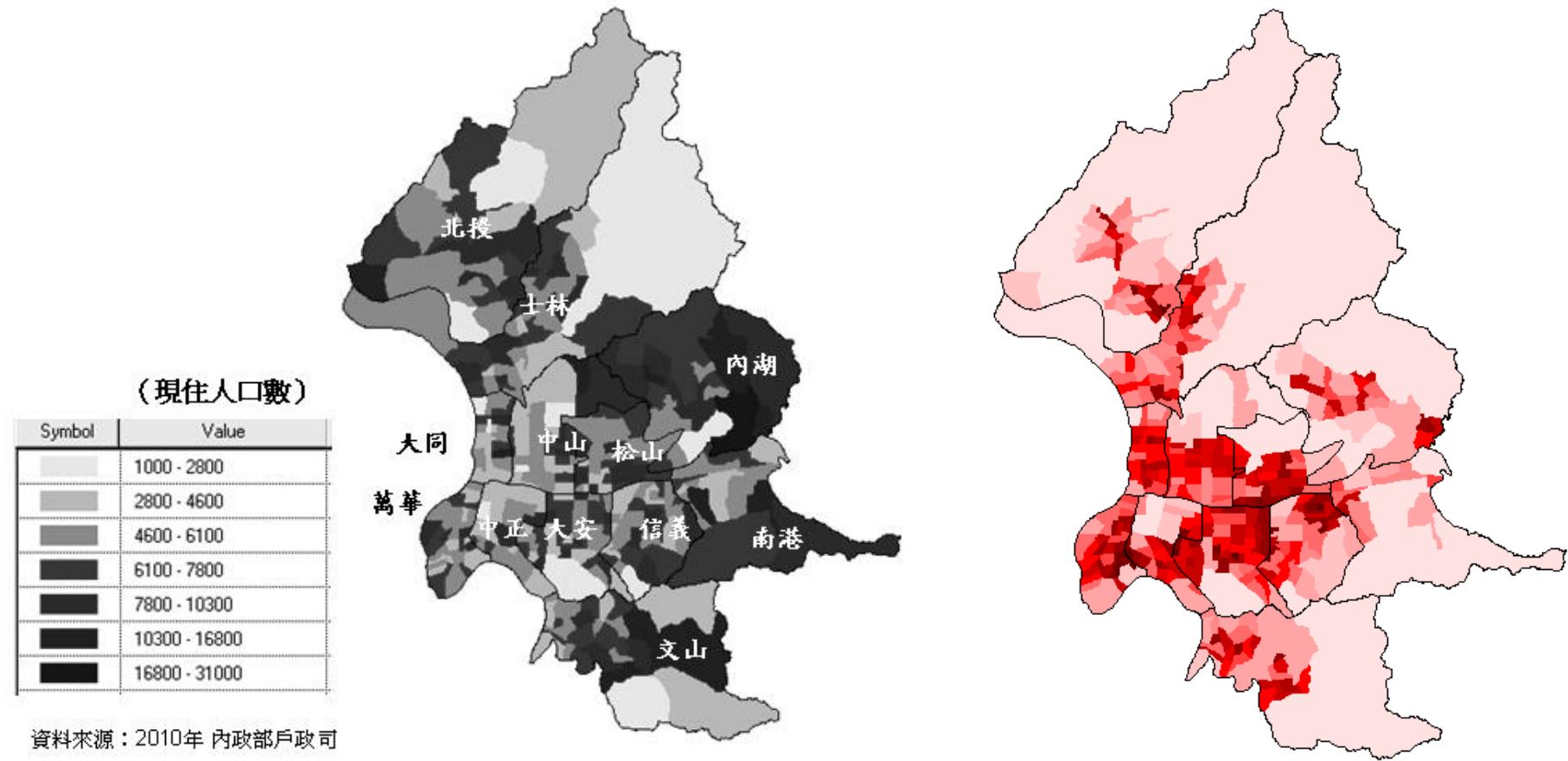
# 2/15 下午課程

## Mapping: where is the most?

台北市人口  
哪裡最多？

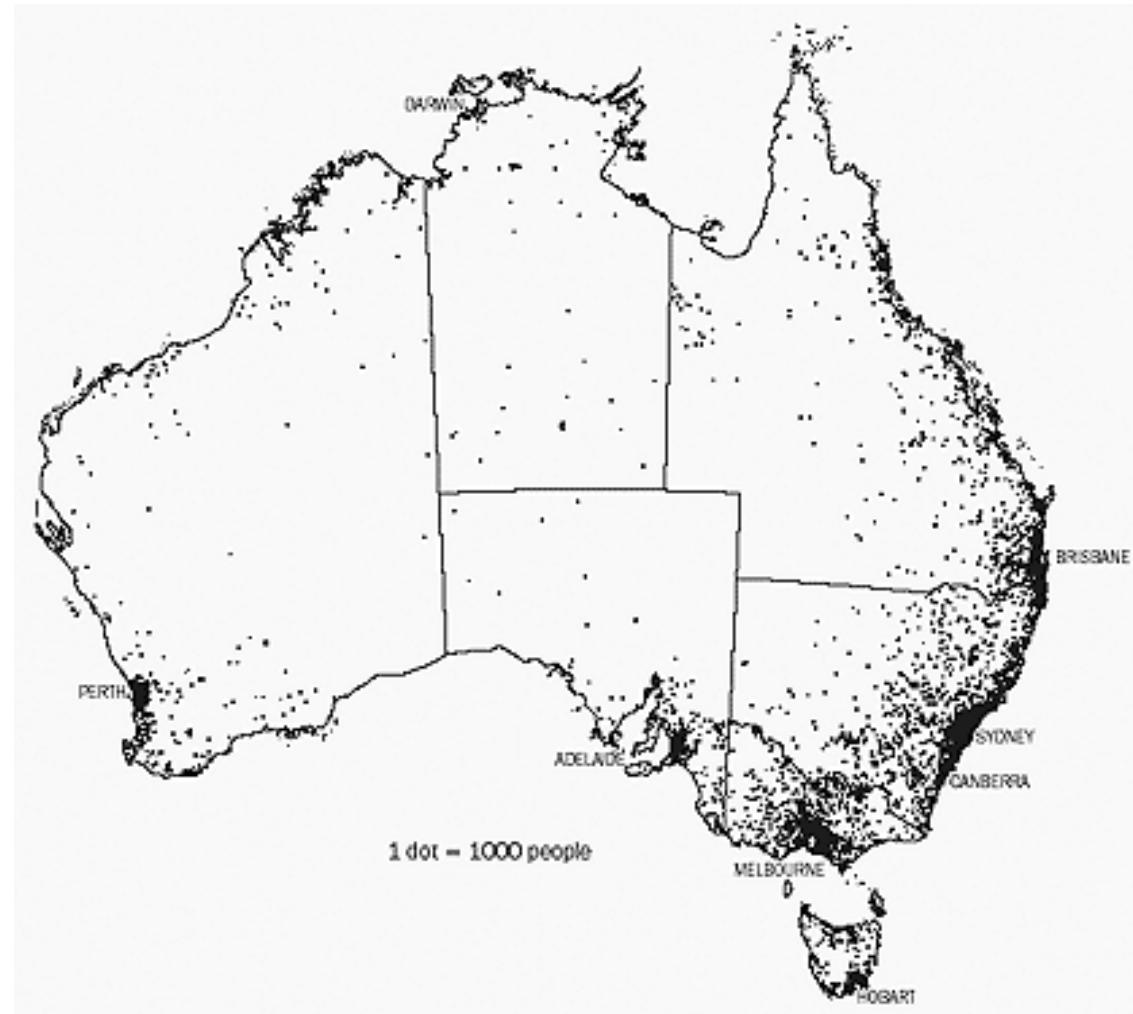


# 人口地圖：台北市的人口哪裡最多？



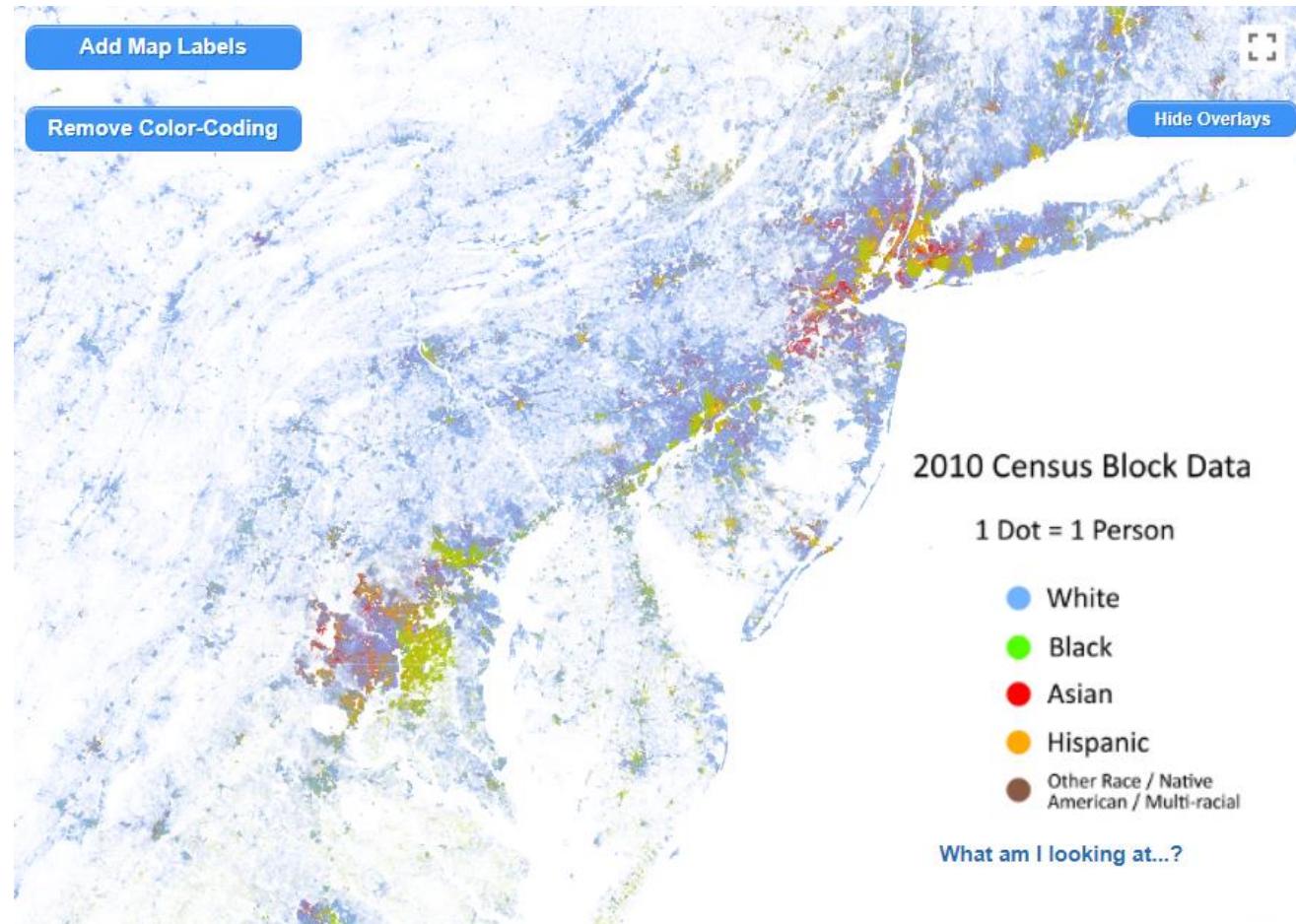
# 人口地圖常見的表現方式 1

點子圖 Dot Map



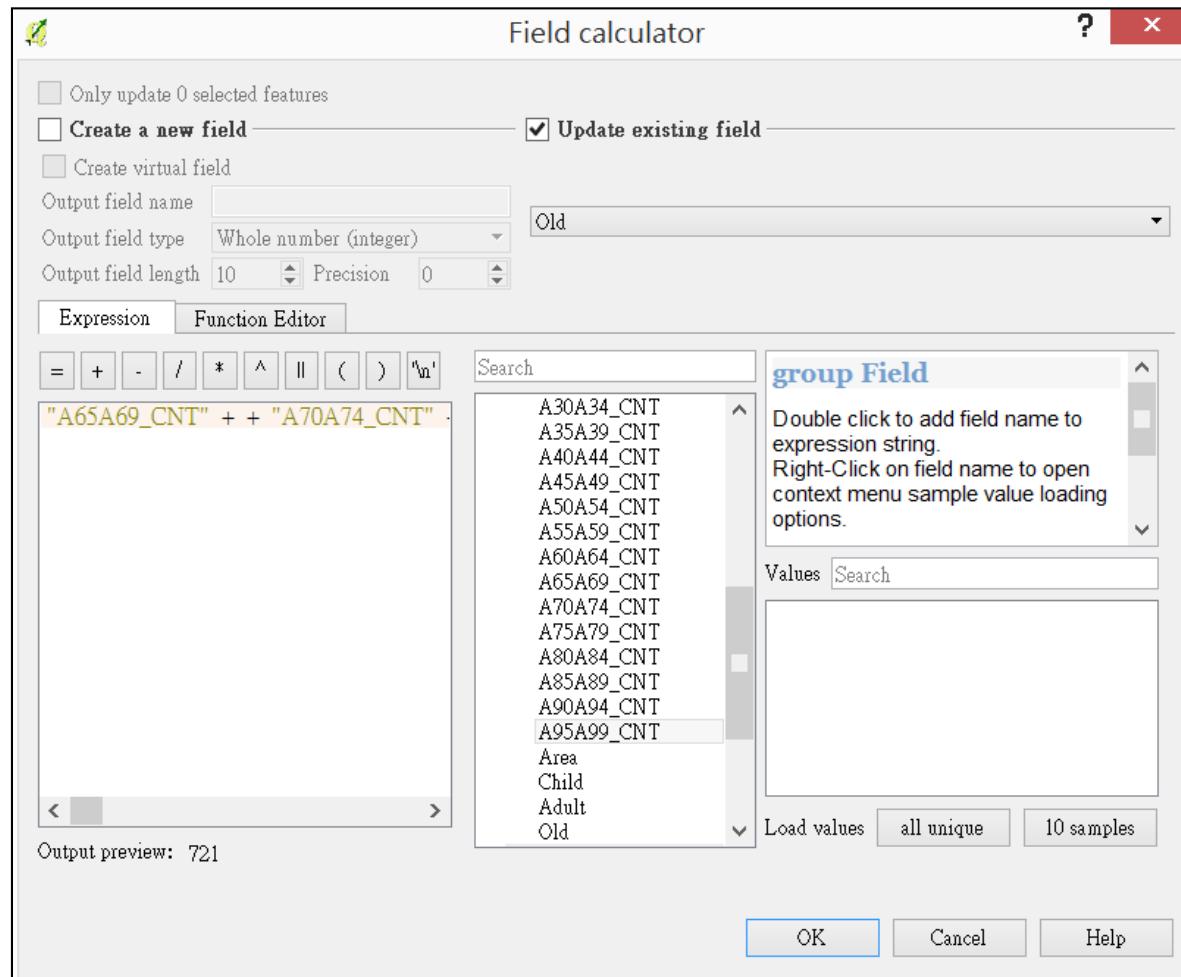
# The Racial Dot Map: One Dot Per Person for the U.S.

The map displays **308,745,538 dots**, one for each person residing in the United States at the location they were counted during the 2010 Census.

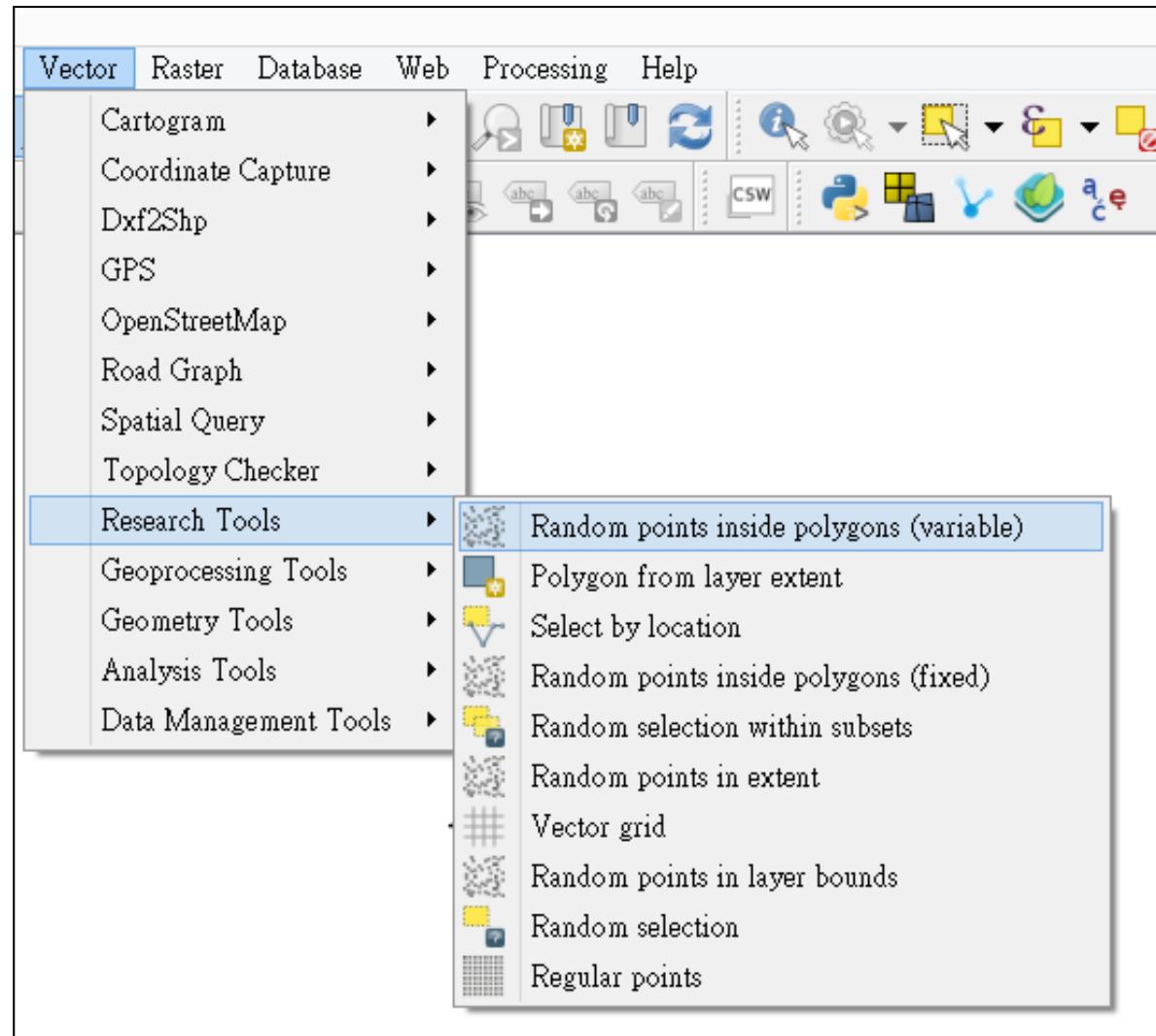


<https://demographics.virginia.edu/DotMap/>

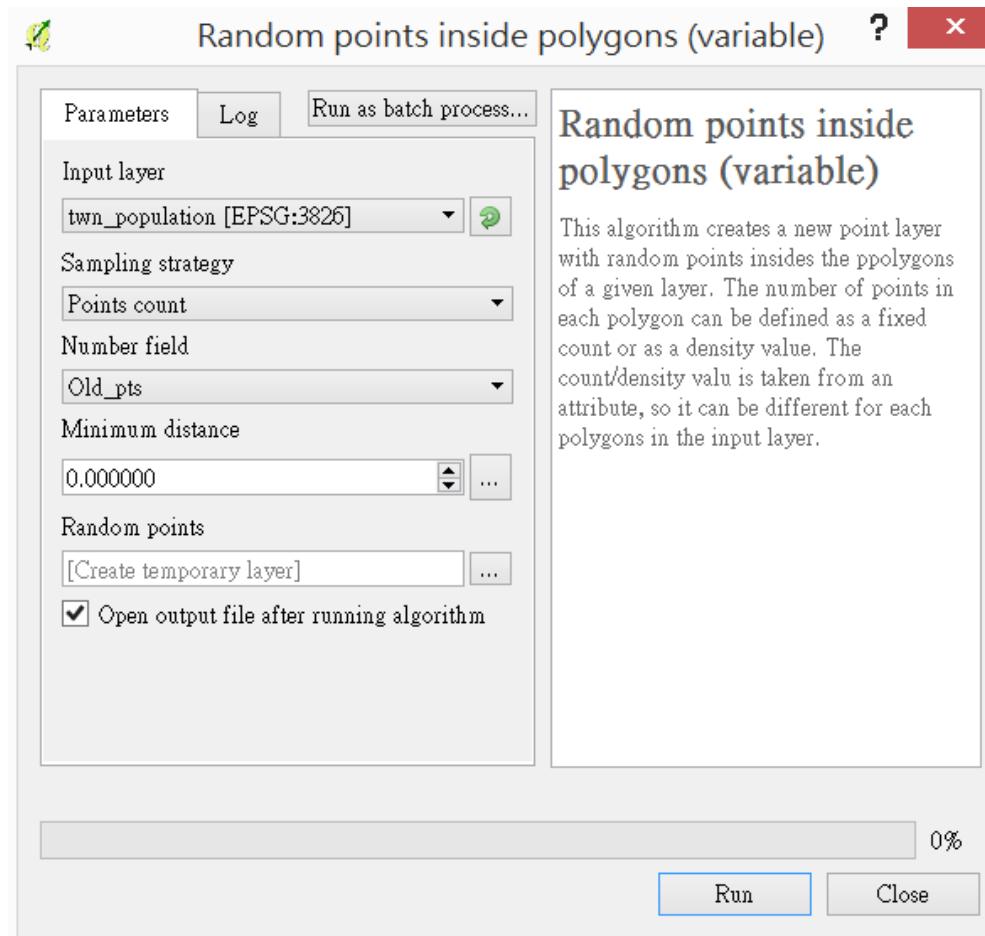
# 計算老年人口數 (age > 65)



# 產生隨機點

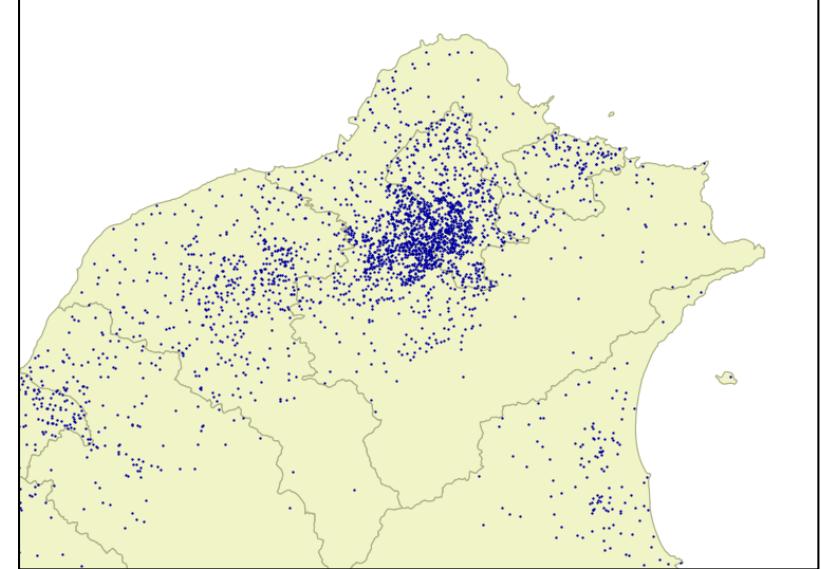
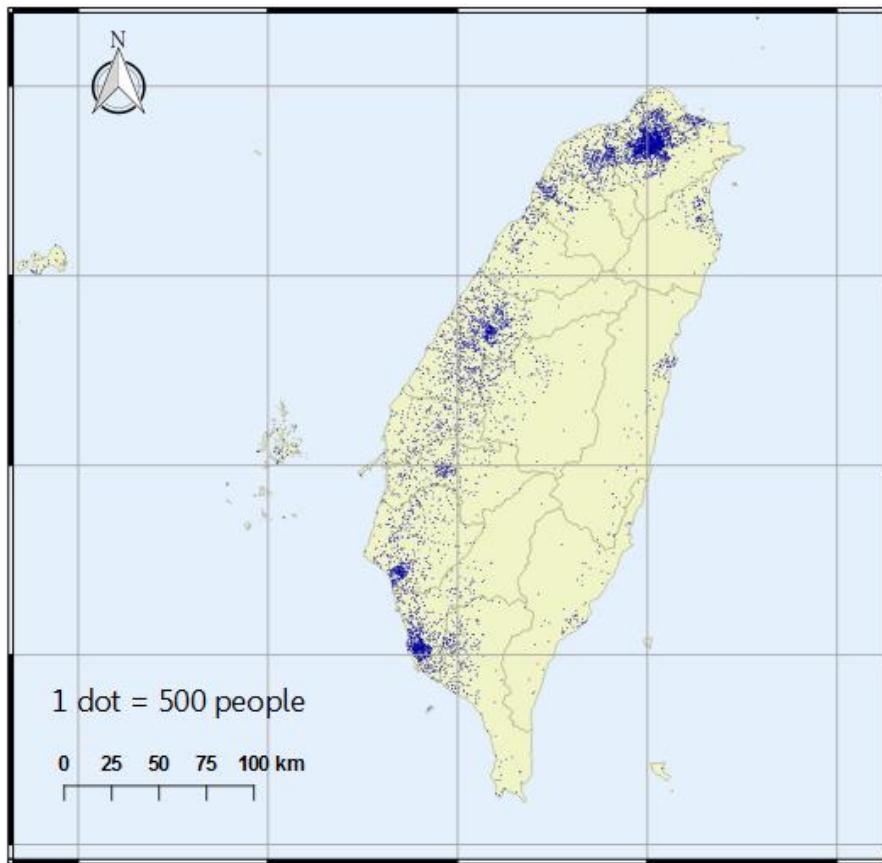


# 產生隨機點：設定屬性欄位



# 地圖實作(預期成果)：台灣老年人口分布圖(點子圖)

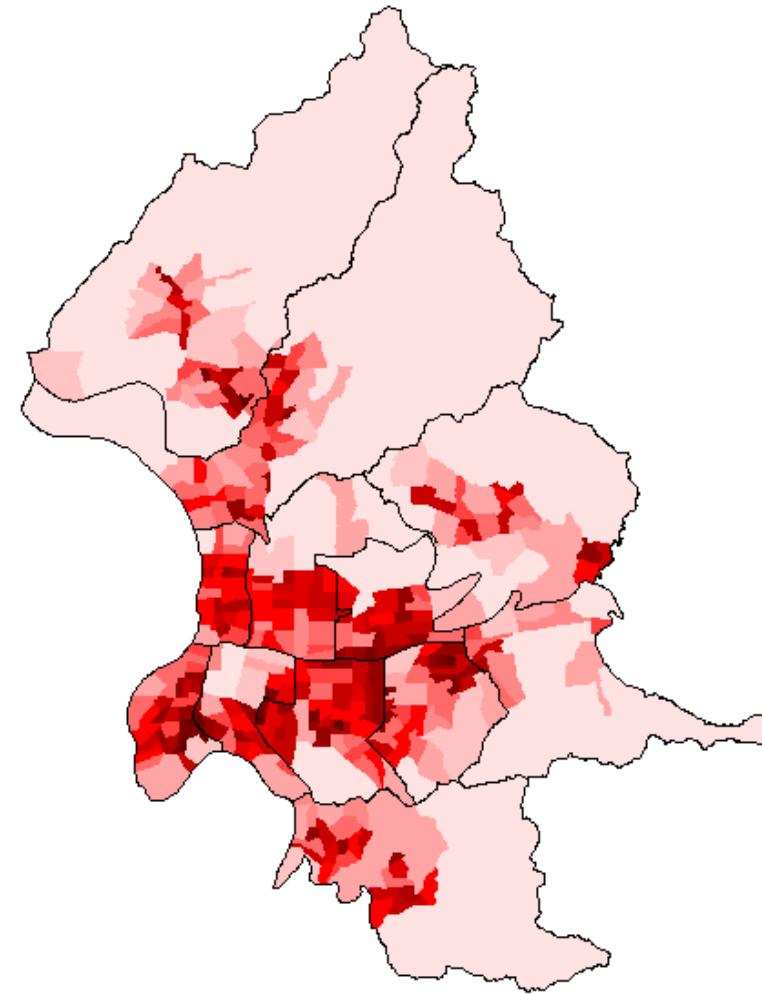
台灣老年人口分布圖



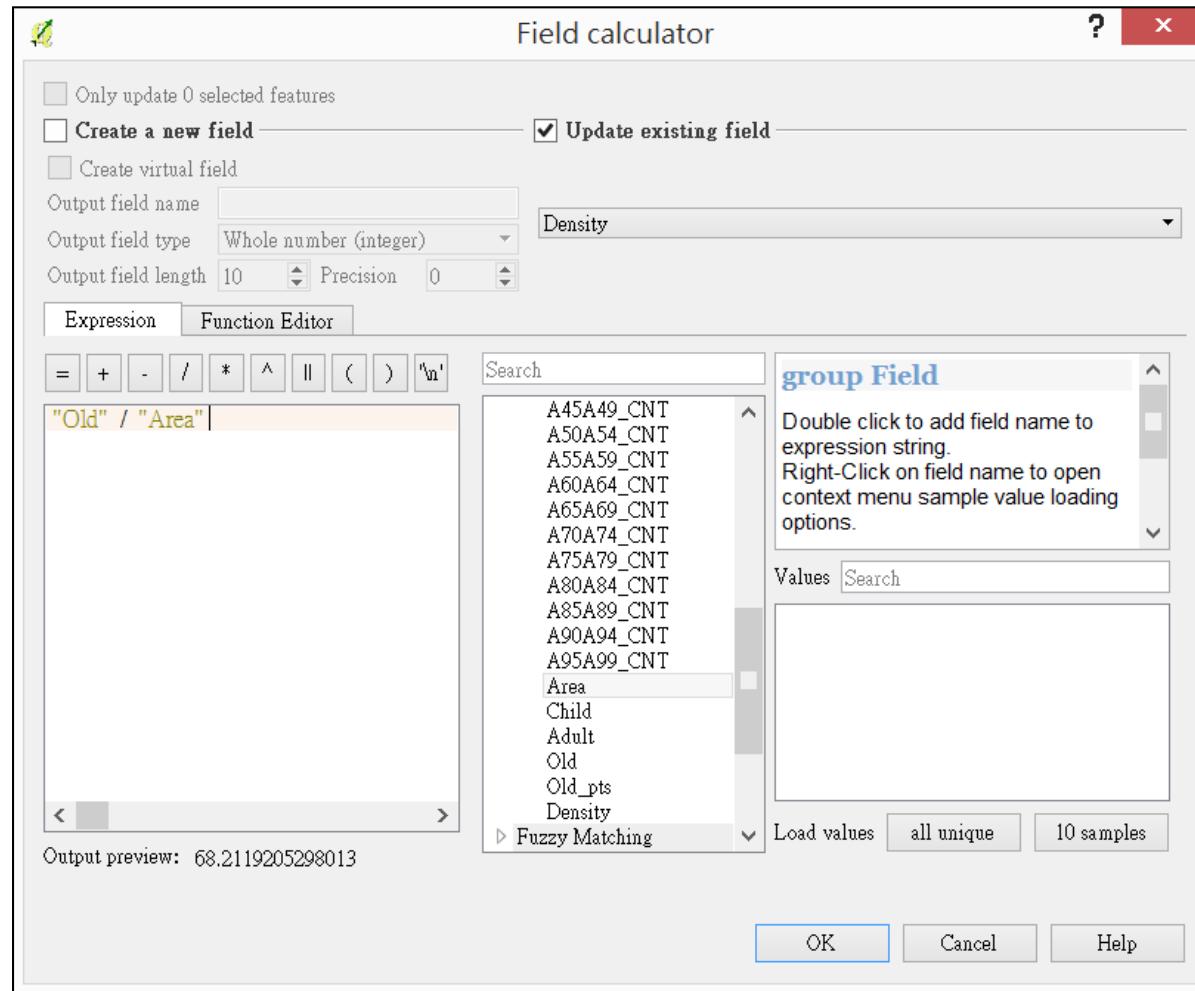
(北部地區局部放大圖)

# 人口地圖常見的表現方式 2

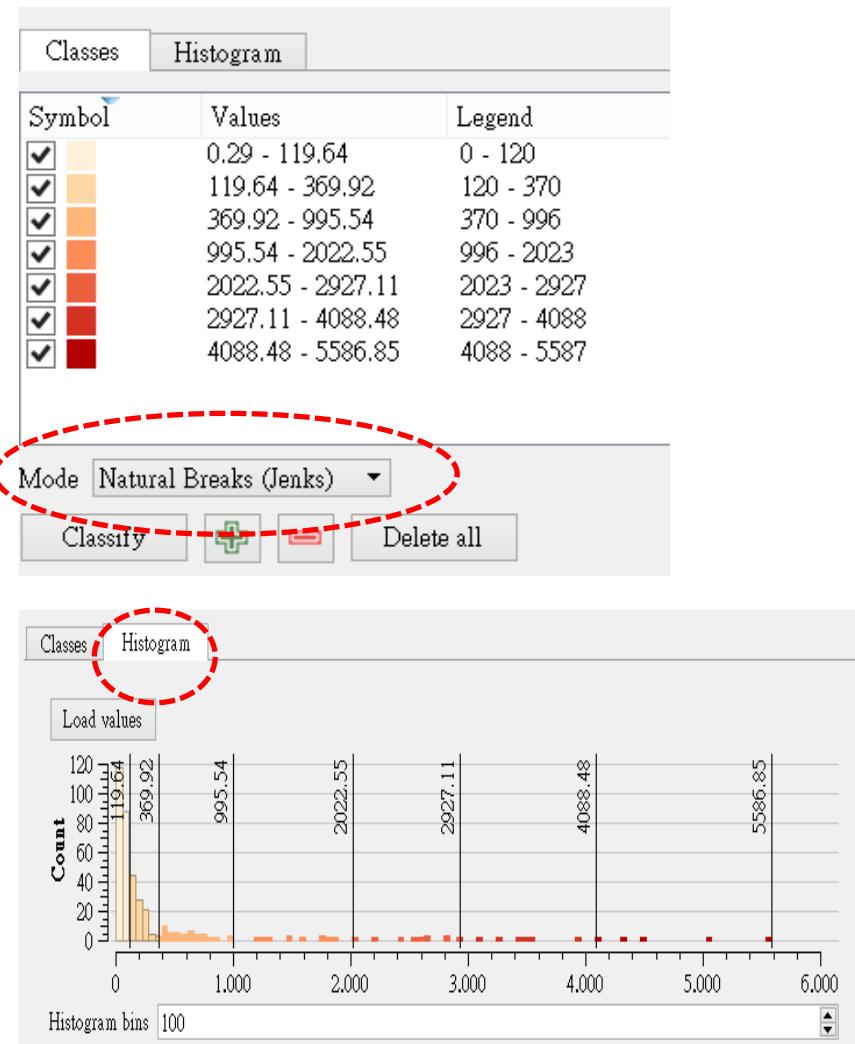
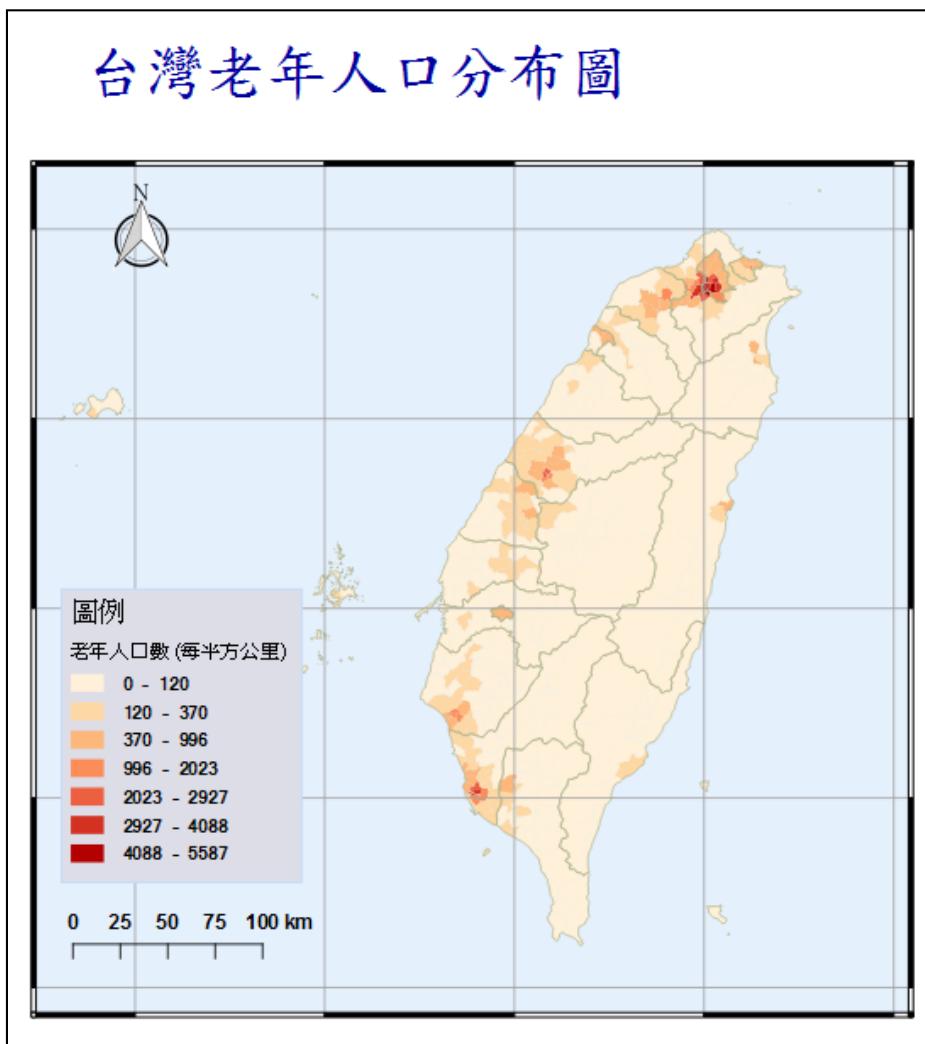
面量圖 Shaped Map



# 計算老年人口密度



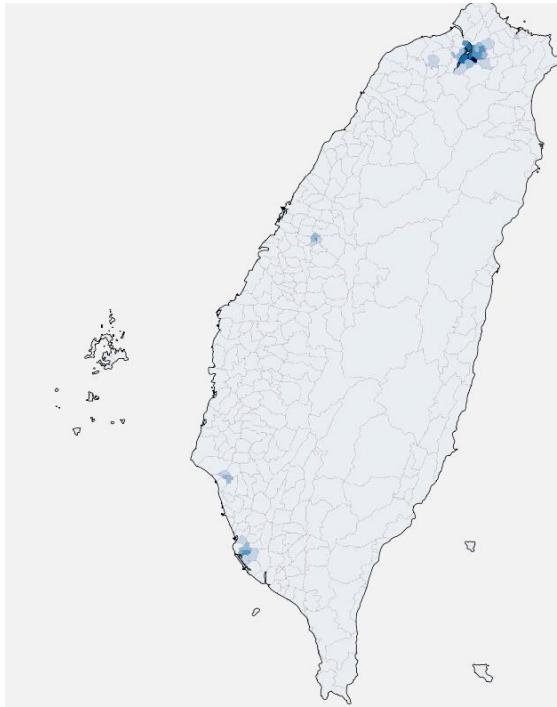
# 地圖實作(預期成果)：台灣老年人口分布圖(面量圖)



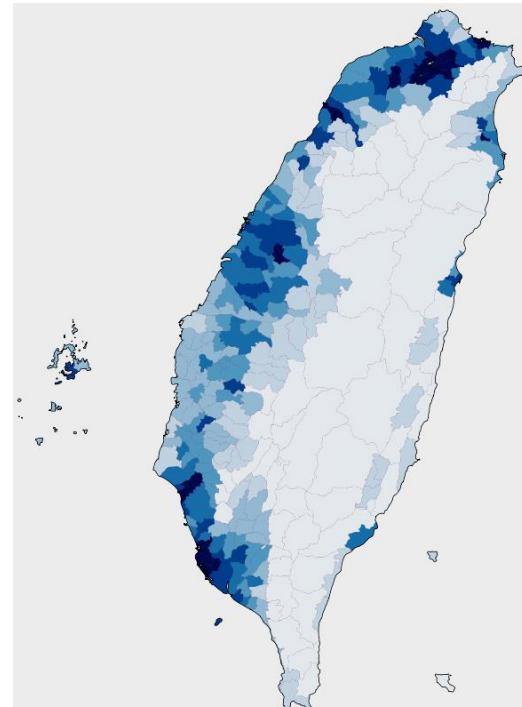
# The devil is in the details

台灣人口分布圖

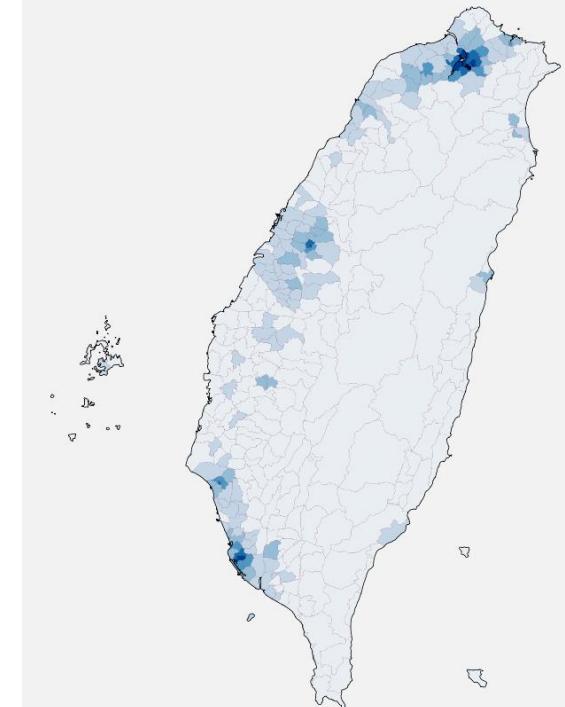
*Equal Interval*



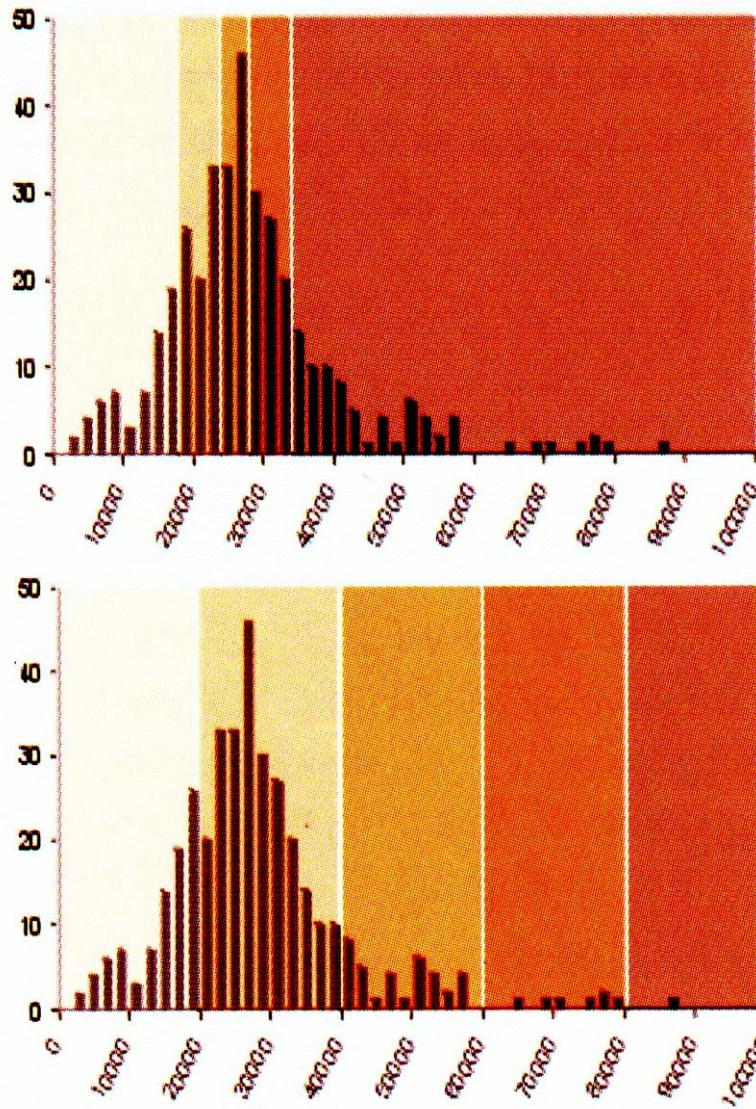
*Quantile*



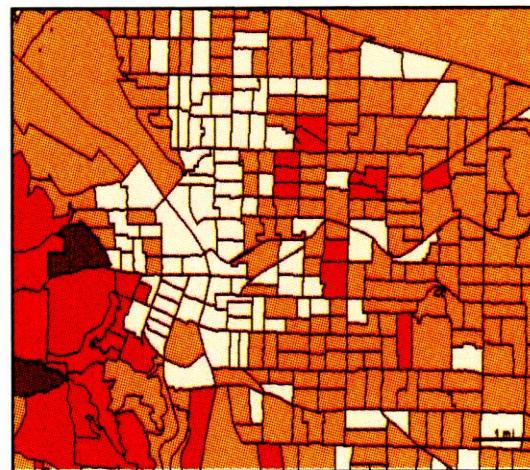
*Natural Breaks*



# Classification Schemes



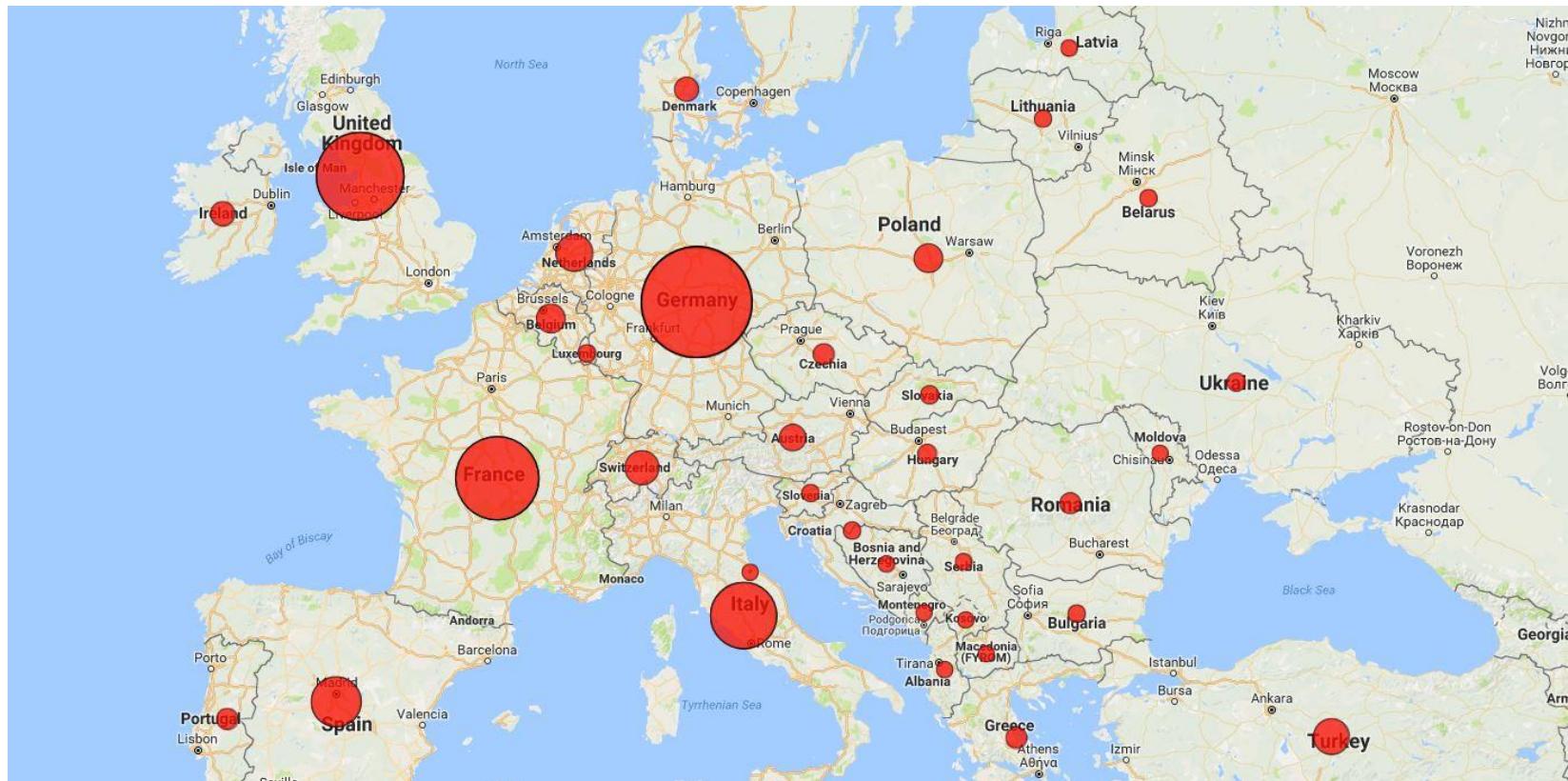
0 - 17056  
17059 - 22500  
22543 - 26387  
26429 - 32083  
32306 - 100000



0 - 20000  
20001 - 40000  
40001 - 60000  
60001 - 80000  
80001 - 100000

# 人口地圖常見的表現方式 3

## Bubble Map



<https://www.espatial.com/articles/create-a-bubble-map>

# 建立行政區的幾何中心點 centroid

The screenshot shows the QGIS application interface. On the left, the main menu bar includes Vector, Raster, Database, Web, Processing, and Help. The Vector menu is currently selected. A sub-menu for Geometry Tools is open, displaying various tools: Check validity, Densify geometries, Polygon centroids (which is highlighted with a blue selection box), Lines to polygons, Polygons to lines, Multipart to singleparts, Simplify geometries, Extract nodes, Delaunay triangulation, Singleparts to multipart, Export/Add geometry columns, and Voronoi polygons.

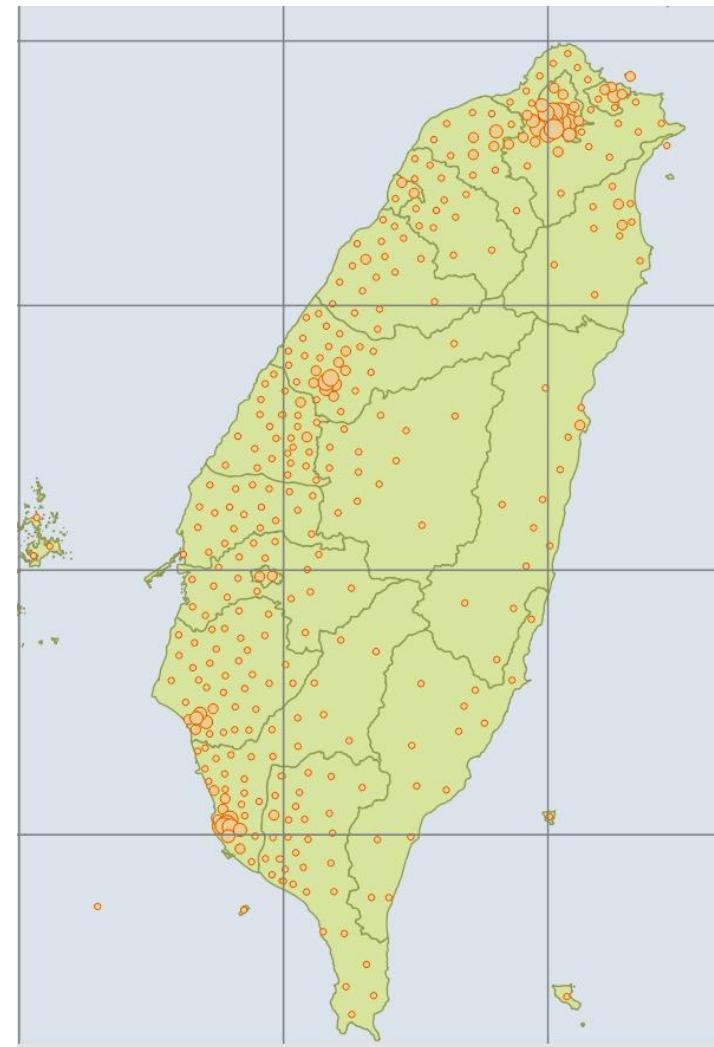
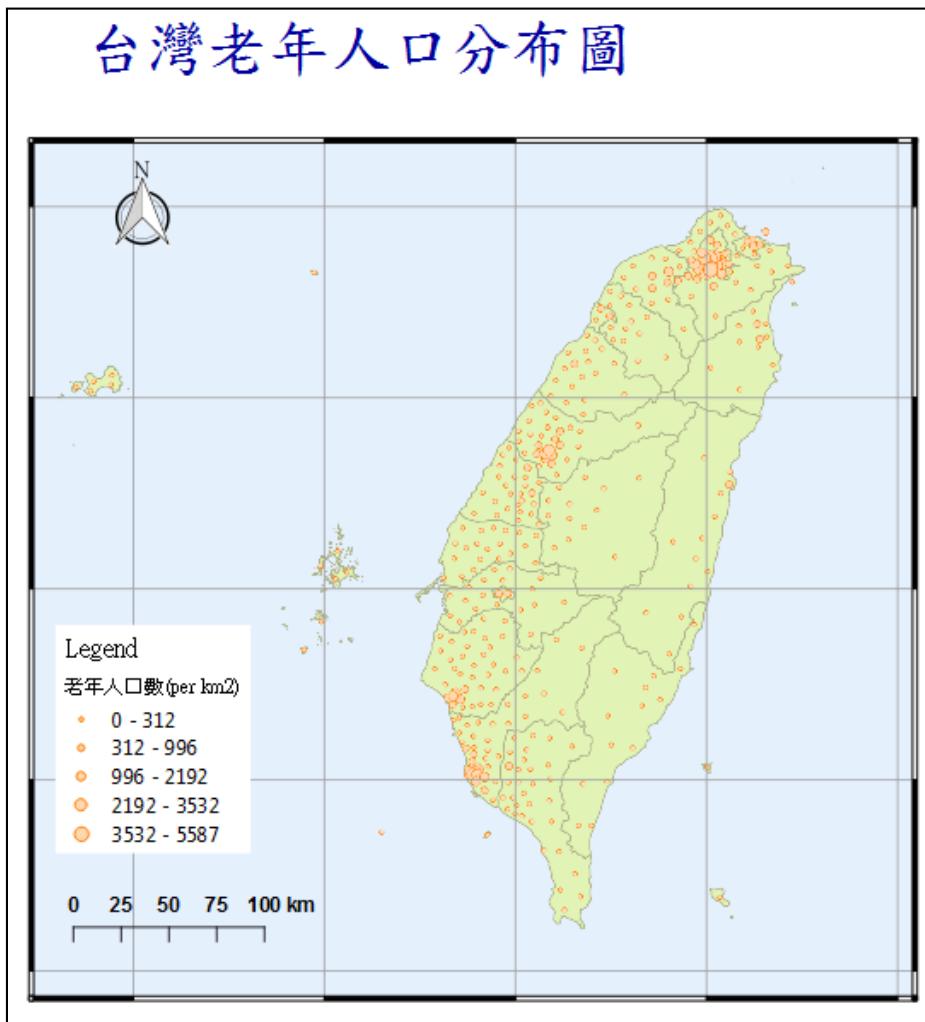
The right side of the screen displays the 'Polygon centroids' dialog box. At the top, there are tabs for Parameters, Log, and Run as batch process... (the Log tab is selected). The Input layer dropdown contains 'twn\_population [EPSG:3826]'. The Centroids field is set to '[Create temporary layer]'. A checked checkbox says 'Open output file after running algorithm'. Below the dialog is a progress bar at 0% and buttons for Run and Close.

**Polygon centroids**

This algorithm creates a new point layer, with points representing the centroid of polygons of an input layer.

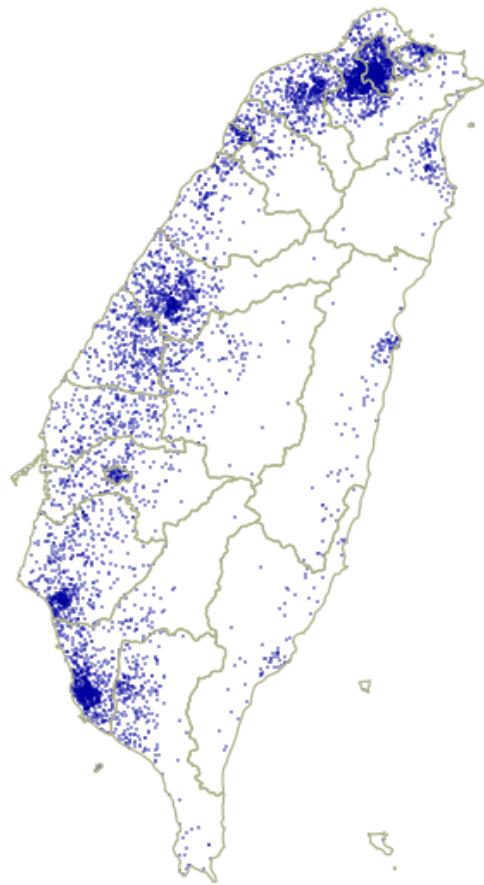
The attributes associated to each point in the output layer are the same ones associated to the original polygon.

# 地圖實作 (預期成果)：台灣老年人口分布 (泡泡圖)

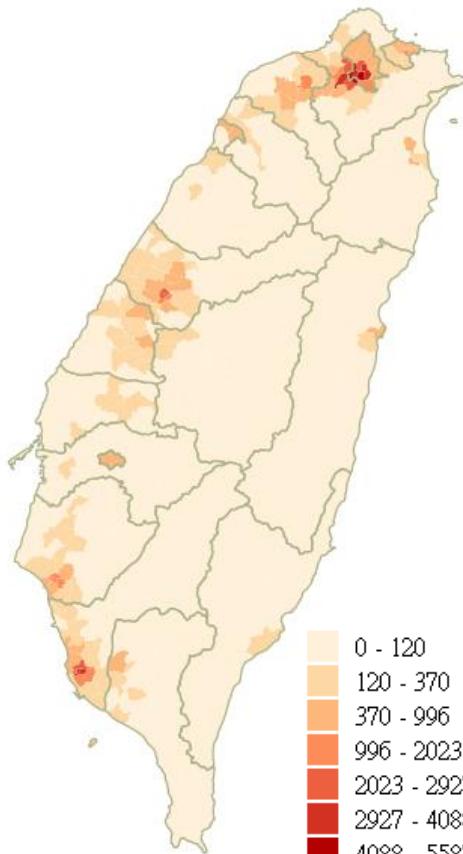


# Comparisons: 人口地圖常見的表現方式

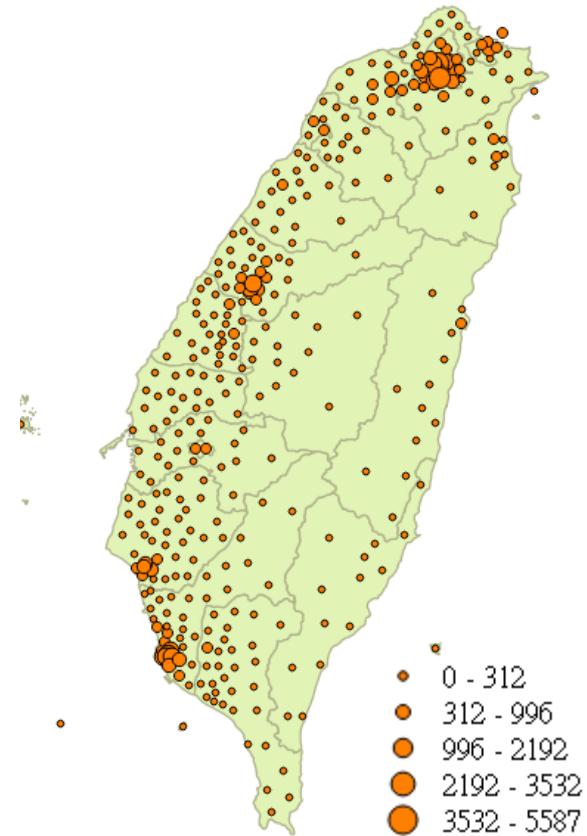
Dot map



Shaped map



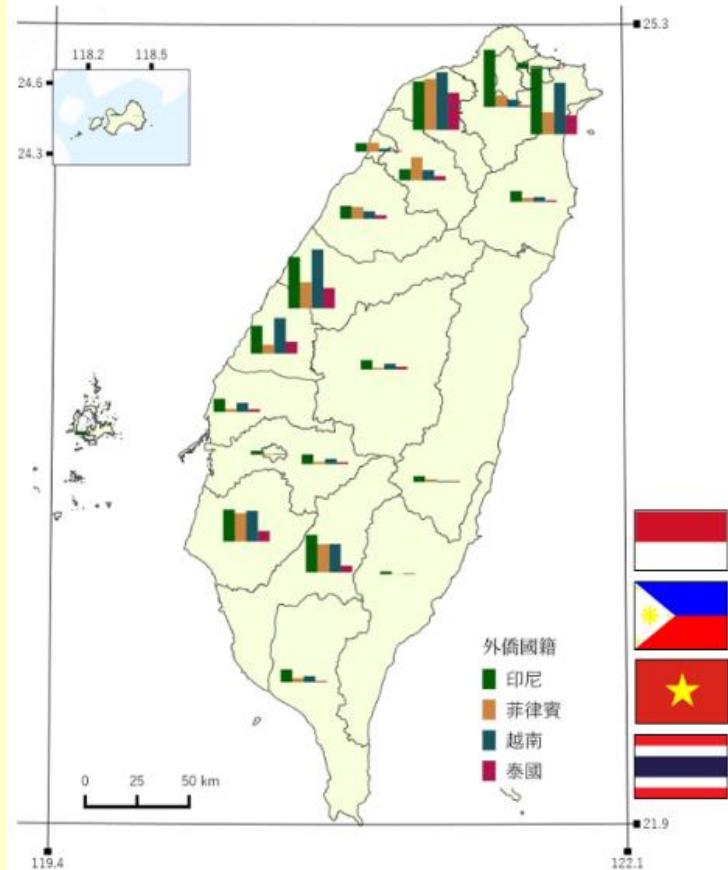
Bubble map



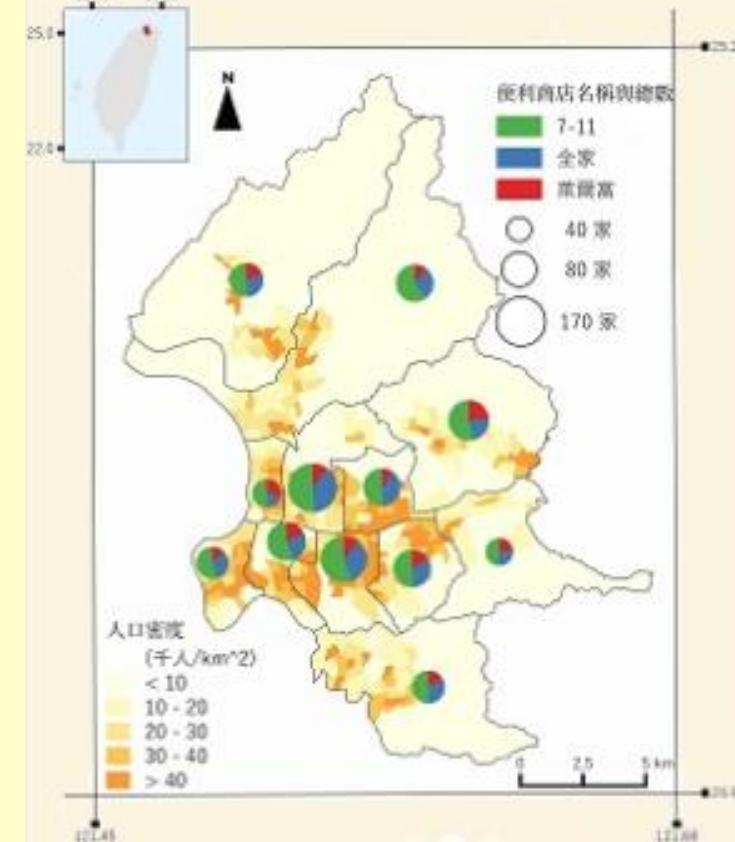
# 1/16 上午課程

## 統計地圖：長條圖與圓餅圖

2015 前四名外籍僑居人口



便利商店據點比例與人口密度



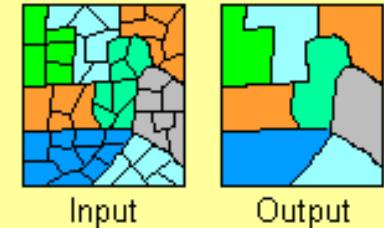
# 建立縣市單位的統計圖資

## # 情境 1

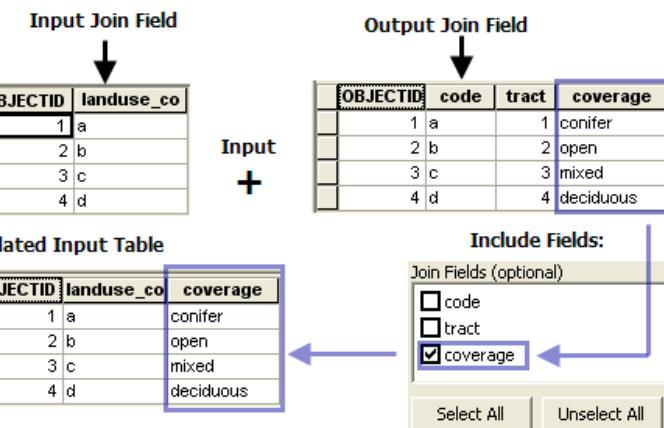


### About Dissolve

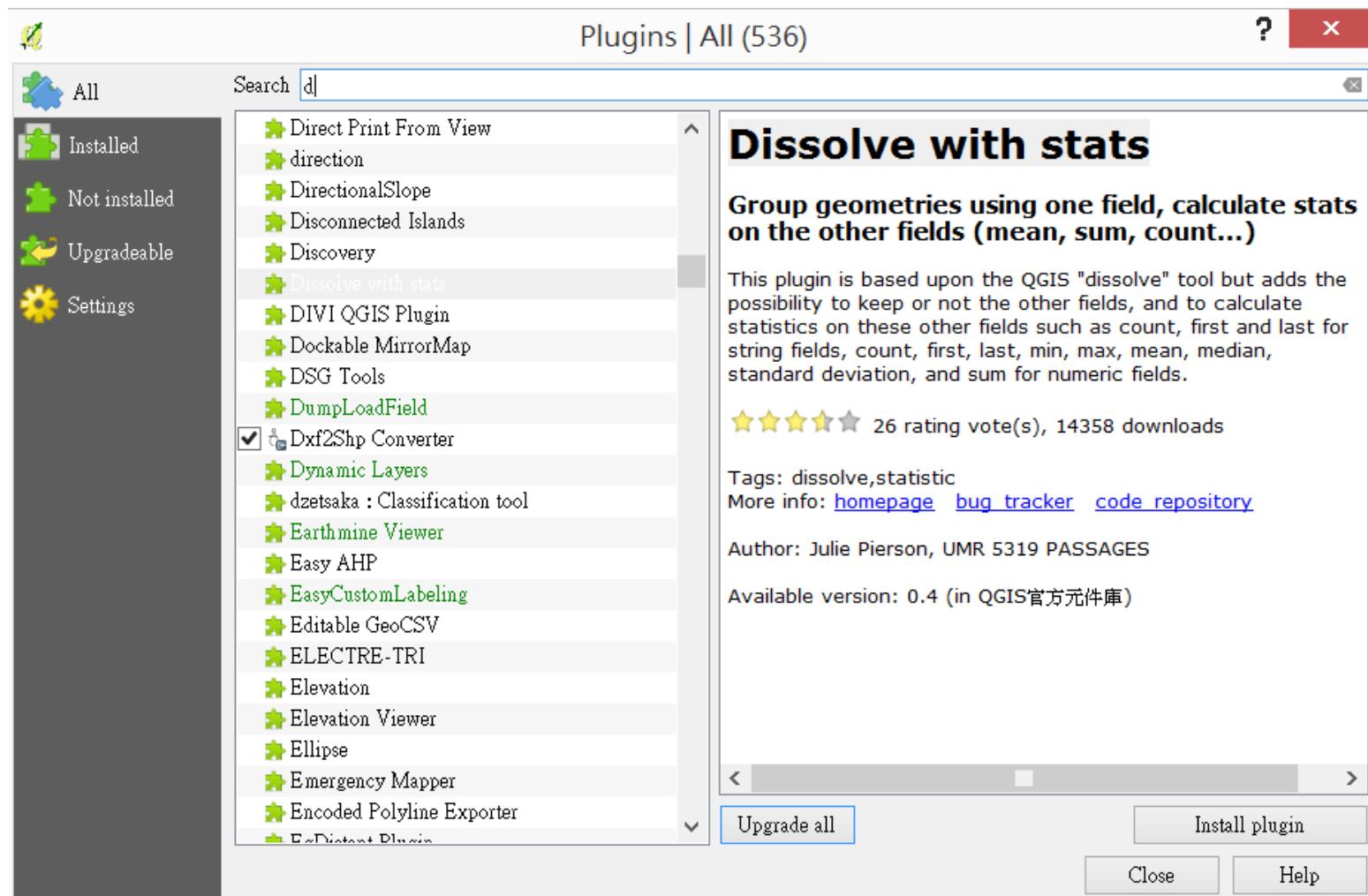
This operation aggregates features that have the same value for an attribute that you specify.



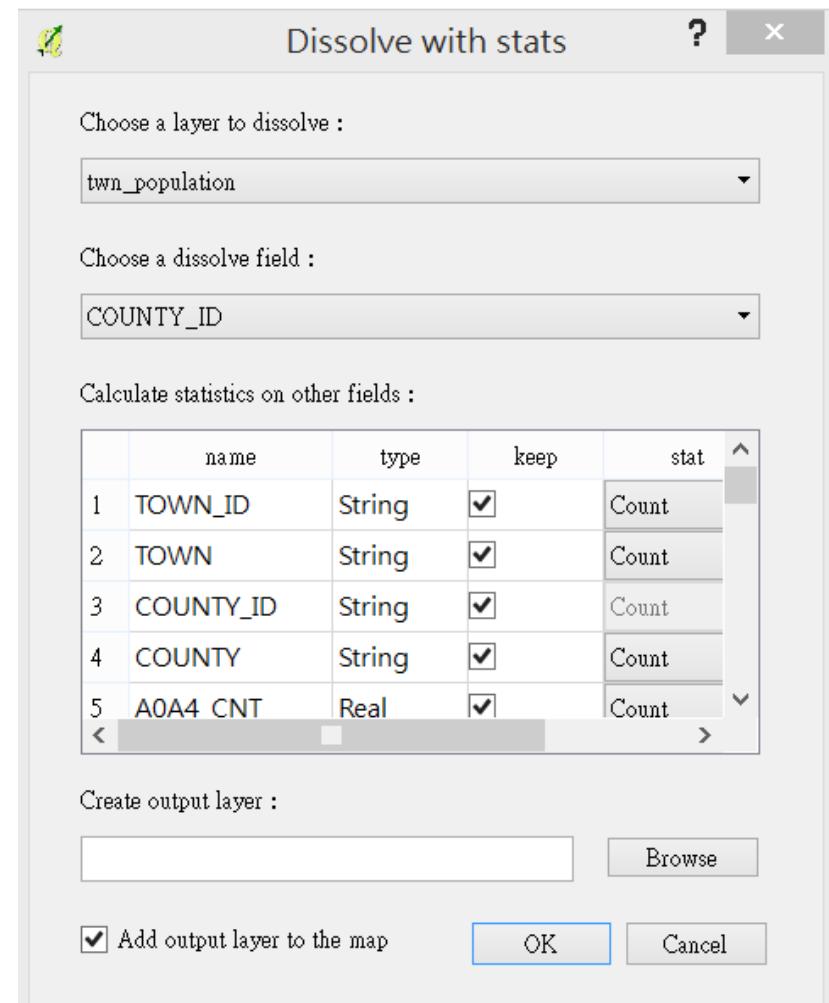
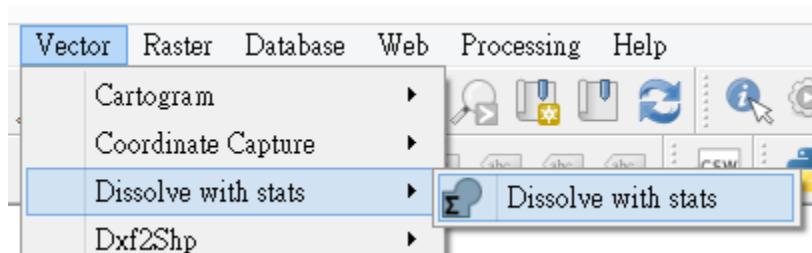
## # 情境 2



# 安裝QGIS套件：Dissolve with stats



# Using Dissolve with stats

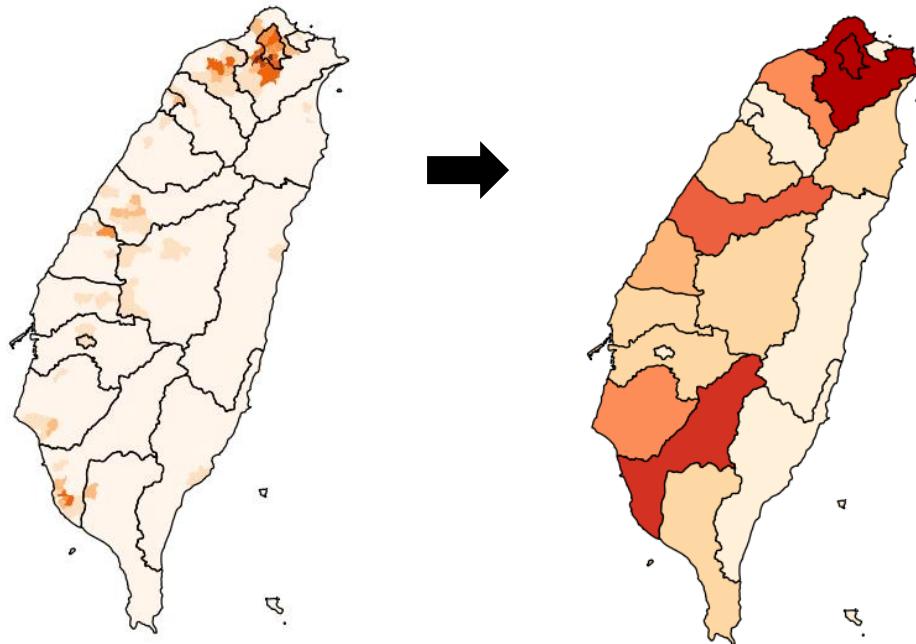


# Dissolve

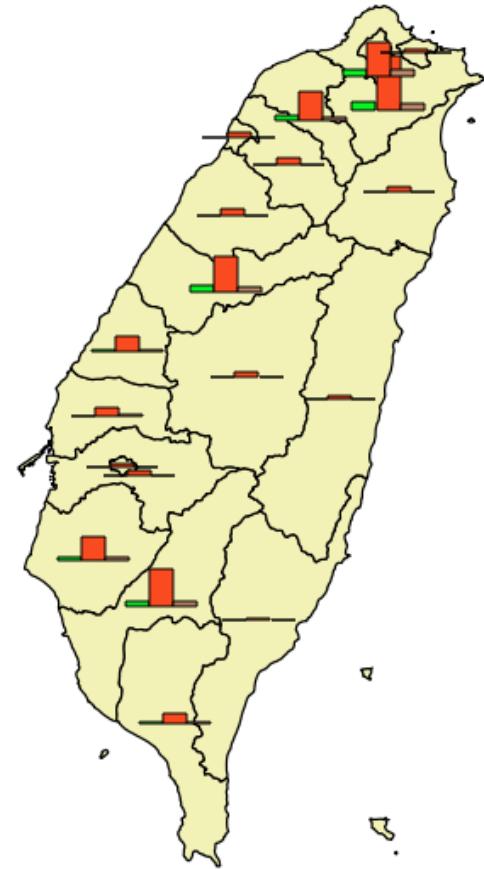
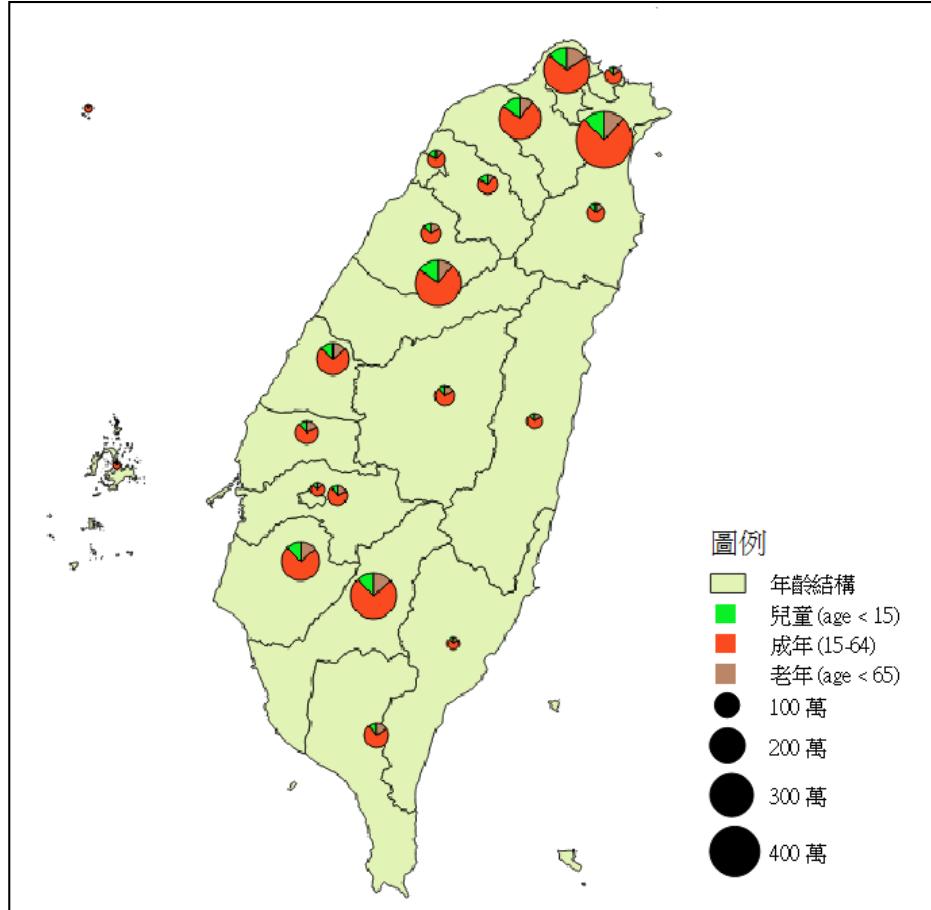
## 情境 1



	COUNTY_ID	COUNTY	Area	Child	Adult	Old
1	67000	臺南市	2258.81	236571	1389761	259500
2	09020	金門縣	185.00	13674	105671	15723
3	66000	臺中市	2239.79	409212	2056123	301663
4	63000	臺北市	269.85	375128	1901446	418420
5	10009	雲林縣	1399.58	84610	491499	118693
6	10010	嘉義縣	1952.76	52919	370167	92176
7	09007	連江縣	29.73	1594	9714	1286
8	10016	澎湖縣	135.24	11486	76198	15569
9	10007	彰化縣	1244.54	175423	928761	182860

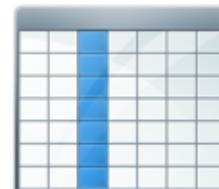


# 地圖實作 (預期成果)：統計地圖--長條圖與圓餅圖 (dissolve)

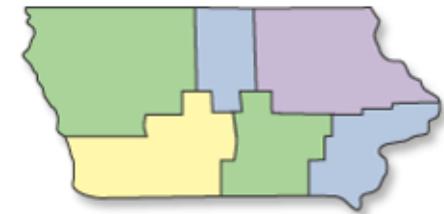


# Data Join

# 情境 2



Join



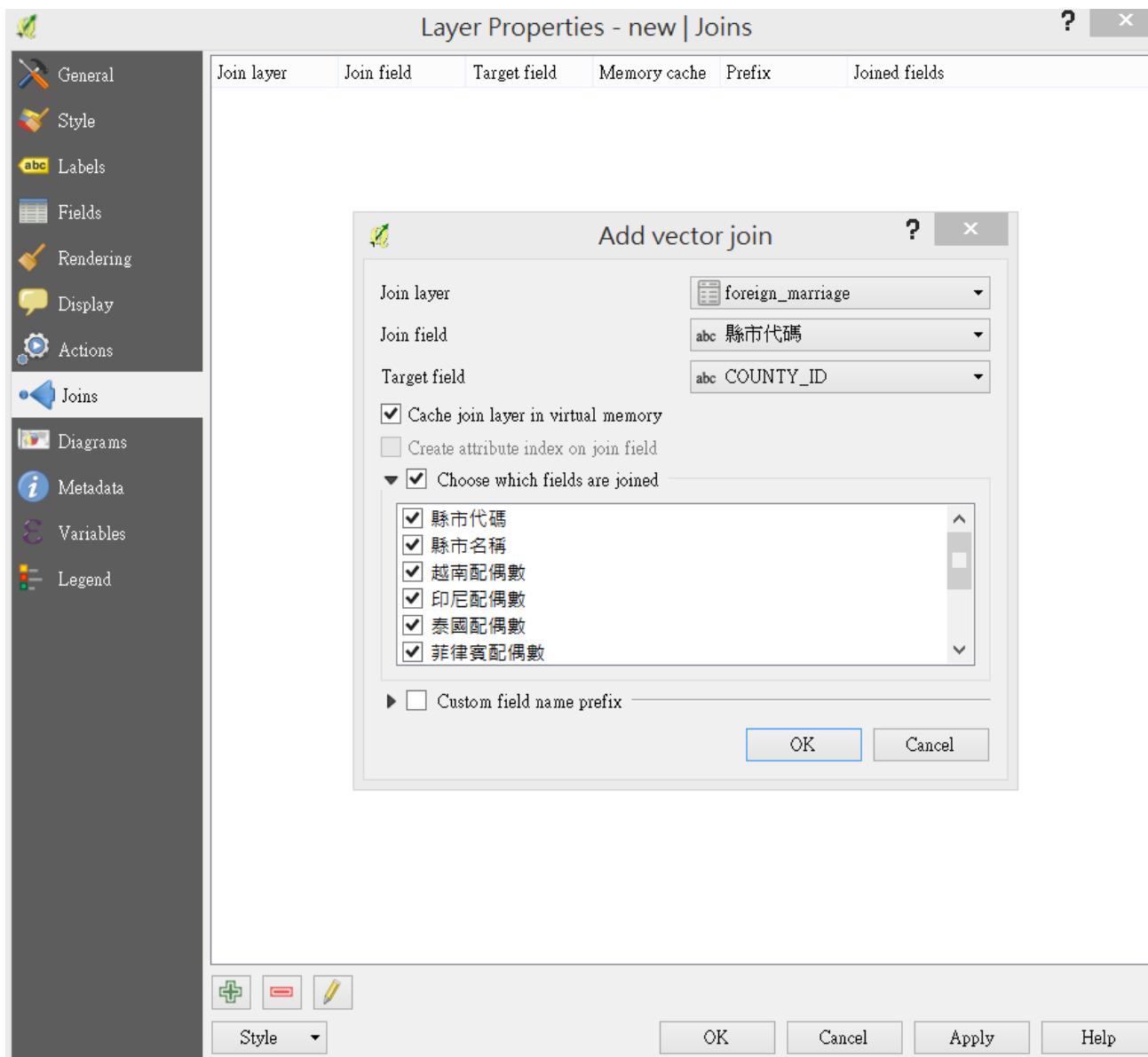
縣市統計表格

縣市統計圖資

A	B	C	D	E	F	G	H	I	
1	縣市代碼	縣市名稱	越南配偶數	印尼配偶數	泰國配偶數	菲律賓配偶數	柬埔寨配偶數	日本配偶數	韓國配偶數
2	65000	新北市	16728	3578	1617	1448	433	920	396
3	63000	臺北市	5177	1093	481	599	186	1546	412
4	68000	桃園市	9697	4625	2268	1585	299	347	116
5	66000	臺中市	9980	2242	832	791	742	477	138
6	67000	臺南市	7537	1064	500	405	328	230	68
7	64000	高雄市	11174	2065	629	867	440	450	135
8	10002	宜蘭縣	2179	449	118	88	131	40	9
9	10004	新竹縣	2267	2410	313	524	52	86	36
10	10005	苗栗縣	2884	1868	255	249	70	28	12
11	10007	彰化縣	6599	1723	484	380	407	64	19
12	10008	南投縣	3166	903	172	114	226	24	5
13	10009	雲林縣	4119	1803	214	155	261	38	12
14	10010	嘉義縣	3613	1170	139	121	167	13	4
15	10013	屏東縣	4687	1709	202	786	238	50	11
16	10014	臺東縣	956	259	29	87	42	29	4
17	10015	花蓮縣	1068	526	66	66	63	49	14
18	10016	澎湖縣	552	318	0	8	42	5	2
19	10017	基隆市	1673	282	104	92	67	51	28
20	10018	新竹市	1300	664	156	241	23	145	62
21	10020	嘉義市	877	195	45	59	63	24	10
22	9020	金門縣	170	113	6	4	3	3	1
23	9007	連江縣	43	5	3	1	3	0	0

foreign\_marriage.csv

台灣縣市外籍配偶統計

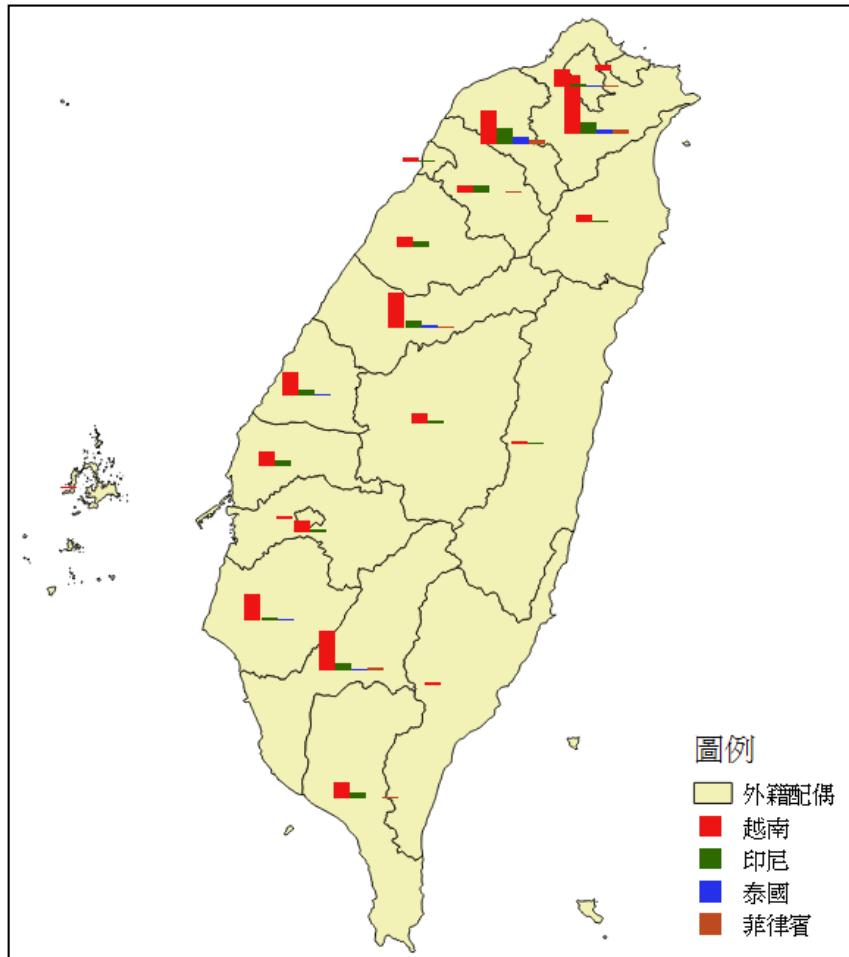


# 縣市統計的圖資

new :: Features total: 22, filtered: 22, selected: 0

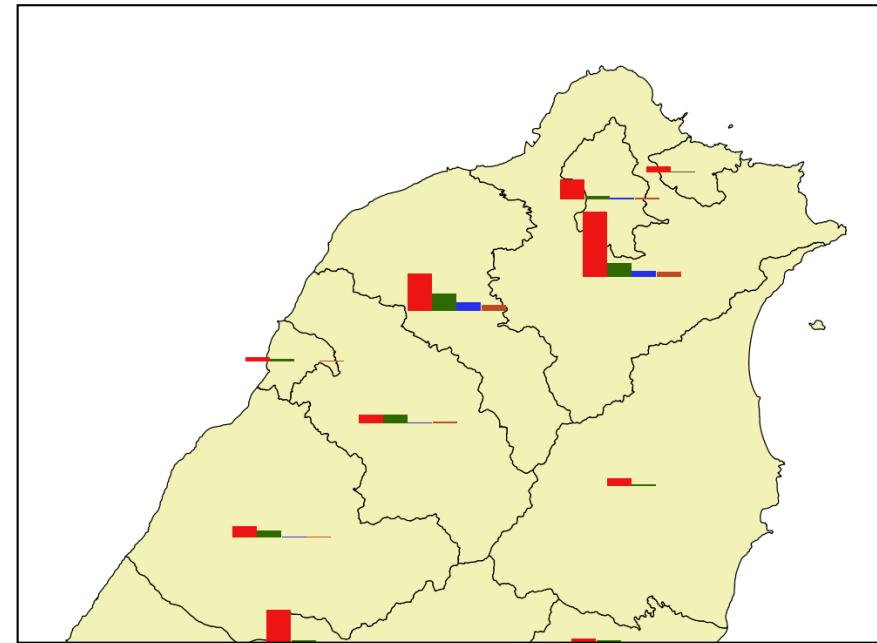
	COUNTY_ID	COUNTY	Area	Child	Adult	Old	Total	marriage_縣	marriage_縣市	marriage_越南	marriage_印尼	marriage_泰國	marriage_菲律賓
1	10016	澎湖縣	135.24	11486	76198	15569	103253	10016	澎湖縣	552	318	0	8
2	67000	臺南市	2258.81	236571	1389761	259500	1885832	67000	臺南市	7537	1064	500	405
3	10014	臺東縣	3581.85	27326	160416	33022	220764	10014	臺東縣	956	259	29	87
4	63000	臺北市	269.85	375128	1901446	418420	2694994	63000	臺北市	5177	1093	481	599
5	66000	臺中市	2239.79	409212	2056123	301663	2766998	66000	臺中市	9980	2242	832	791
6	10007	彰化縣	1244.54	175423	928761	182860	1287044	10007	彰化縣	6599	1723	484	380
7	10010	嘉義縣	1952.76	52919	370167	92176	515262	10010	嘉義縣	3613	1170	139	121
8	10020	嘉義市	59.72	38588	195018	36235	269841	10020	嘉義市	877	195	45	59
9	10004	新竹縣	1411.56	91690	391751	63973	547414	10004	新竹縣	2267	2410	313	524
10	10018	新竹市	124.39	76283	312913	48079	437275	10018	新竹市	1300	664	156	241
11	65000	新北市	2066.28	507423	3005876	465354	3978653	65000	新北市	16728	3578	1617	1448
12	10009	雲林縣	1399.58	84610	491499	118693	694802	10009	雲林縣	4119	1803	214	155
13	10017	基隆市	137.57	40508	279643	51870	372021	10017	基隆市	1673	282	104	92
14	64000	高雄市	2995.07	343793	2061974	373392	2779159	64000	高雄市	11174	2065	629	867
15	68000	桃園市	1217.21	329307	1599031	219195	2147533	68000	桃園市	9697	4625	2268	1585
16	10005	苗栗縣	1826.69	76178	400240	82692	559110	10005	苗栗縣	2884	1868	255	249
17	10013	屏東縣	2805.06	93786	614990	126936	835712	10013	屏東縣	4687	1709	202	786
18	10008	南投縣	4097.76	58294	366734	80078	505106	10008	南投縣	3166	903	172	114
19	10015	花蓮縣	4605.70	41252	241010	48584	330846	10015	花蓮縣	1068	526	66	66
20	10002	宜蘭縣	2201.43	56836	332894	67737	457467	10002	宜蘭縣	2179	449	118	88

# 地圖實作 (預期成果)：統計地圖 (data join)

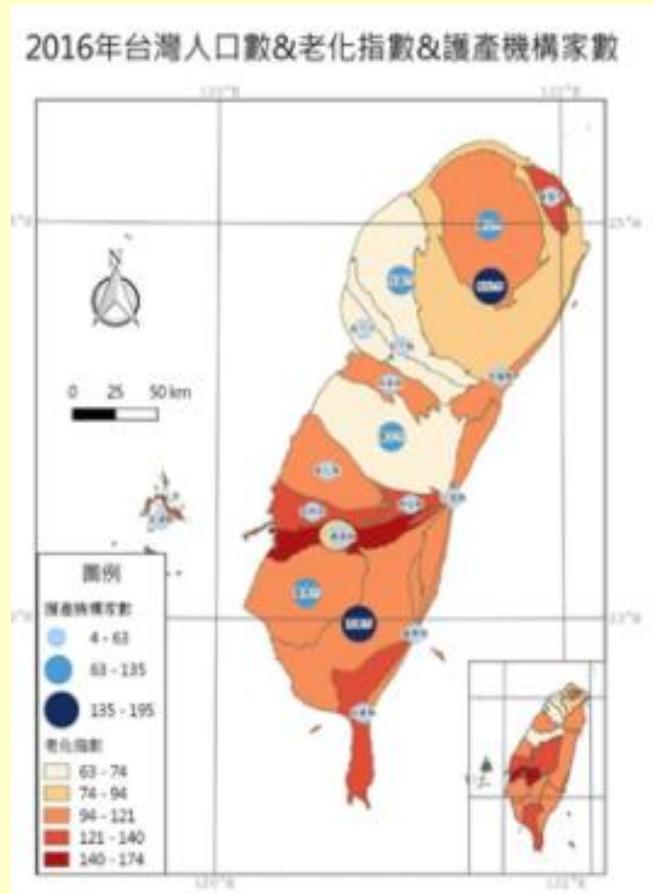


圖例

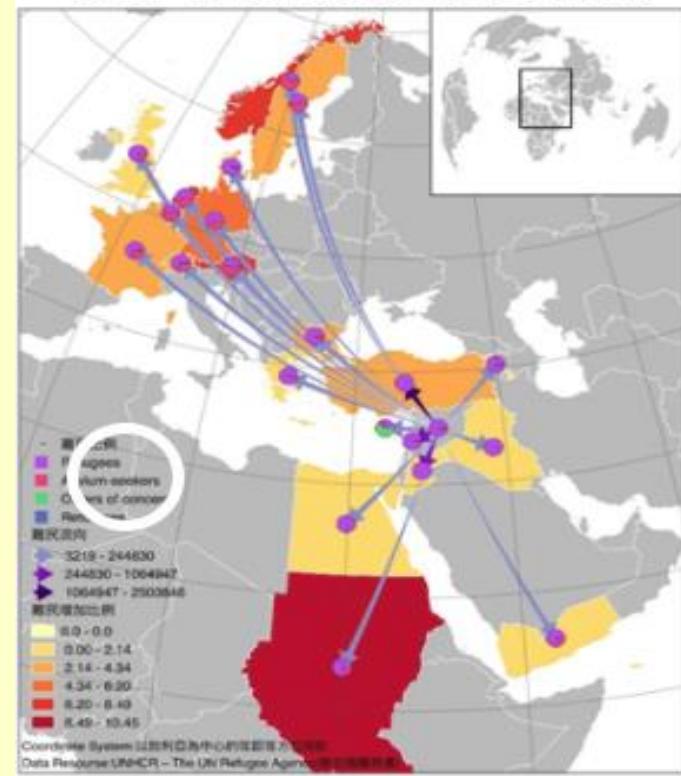
- 外籍配偶
- 越南
- 印尼
- 泰國
- 菲律賓



# 2/16 下午課程：面積變形圖與流動地圖



敘利亞悲歌，難民的流與留：  
一張地圖帶你看敘利亞難民的流向



# WORLD MAPPER



DER WEG ZU NEUEN KARTEN

## Ein neues Bild der Erde

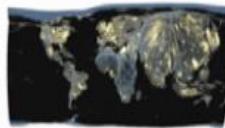
Mit seinen Landkarten macht ein junger deutscher Geograf verborgene Zusammenhänge sichtbar. Jetzt arbeitet er an einem Atlas des 21. Jahrhunderts

von Udo Hartl und Benjamin Hennig

**Ziel:** Allein seines von Blöcken gesetzten Weltkarten kann keiner mehr genug haben. Umso interessanter sind solche jungen Geographen wie Udo Hartl und Benjamin Hennig, die mit einer grünen Revolution die Welt umgedreht haben.

Mit dem Preis für

**RÄSTERTRANSFORMATION: WIE SCHWICHTIG WELT IN EINEM BILD**



sichtbar. Jetzt arbeitet er an einem Atlas des 21. Jahrhunderts

Prinzip des Rastertransformationskörpers besteht darin, dass es möglich ist, die Welt in einem einzigen Karte zu zeigen, die alle wichtigen menschlichen und natürlichen Beziehungen sowie die geographischen Besonderheiten der verschiedenen Regionen, ohne die Weltkarte aufzuteilen, darstellt. Die Karte selbst ist kein landesweites Muster, sondern eine Mischung aus verschiedenen Karten, die die Welt in verschiedene Teile unterteilt. Es gibt jedoch keine vorgegebene Größe oder Form, die die Karte bestimmt. Stattdessen ist sie eine Art von Raster, in dem jede Einheit eine bestimmte Größe und Form hat.

**EU-BUDGET: DIESE LÄNDER ZAHLEN MEHR DURCH, ALS SIE BEKOMMEN**



Die Karte bei Nacht

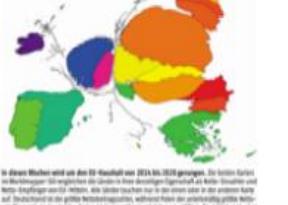
Hier kommt es auf die Lichter der Städte an, um die Bevölkerungsdichte darzustellen. Die Karte ist eine Kombination aus einer Rastertransformationsmethode, die die Bevölkerungsdichte in der Welt darstellt, und einer speziellen Farbgebung, die die Bevölkerungsdichte in der Welt darstellt.

**THE WORLD AS IT IS:** Die Erde nach Hartl und Hennig

Die Karte zeigt die Bevölkerungsdichte in der Welt und die Beleuchtung in den Städten. Sie zeigt die Bevölkerungsdichte in der Welt und die Beleuchtung in den Städten.



**EU-BUDGET: DIES LÄNDER ERHÖHEN MEHR, ALS SIE ZAHLEN**

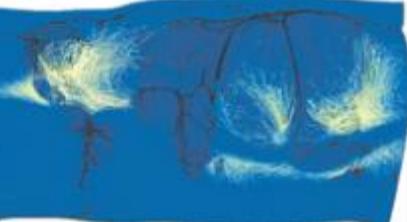


**Weltbevölkerung**

Die Karte zeigt die Bevölkerungsdichte in der Welt und die Beleuchtung in den Städten.

**Die Erde bei Nacht**

Die Karte zeigt die Bevölkerungsdichte in der Welt und die Beleuchtung in den Städten.



**Tropische Stürme**  
Die Karte zeigt das Auftreten von tropischen Wirbelstürmen in Relation zur Bevölkerungsgröße. Am stärksten betroffen sind Menschen in Nordamerika und in weiten Teilen Südostasiens.

## Die Neuvermessung der Welt

Eine neue Kartografierungs-Methode kann selbst komplexe Zusammenhänge visualisieren



### Weltbevölkerung

Große Teile Asiens weisen eine hohe Bevölkerungsdichte auf und sind dementsprechend groß in der Weltkarte dargestellt. Das dann beseitigte Sibirien hingegen ist nur ein schmaler Streifen.



### Die Erde bei Nacht

Die Karte zeigt die Bevölkerungsdichte in der Welt und die Beleuchtung in den Städten.

### VON MICHAEL HEINE

• Wer erkennt sich nicht an die guten alten Schulaufgaben mit ihren holzschnittartigen Weltkarten? Bodenschätze waren mit farbigen Symbolen gekennzeichnet und die Bevölkerungsgrößen oder Niederschläge wurden lediglich durch unterschiedliche große Balken visualisiert.

Nunzt können Schüler mit Kartenspielen umher, das weit ausdetaillierter ist. Manche der sogenannten Rastertransformationskartenförmige waren geografische und auch soziokulturelle Inhalte schlüssig dargestellt. Einwärts hat sie Benjamin Hennig: Der in Sheffield forschen deutsche Geograf wurde für seine Innovati-



**In Diese Welt**

Basis ist eine physikalische Weltkarte, die alle Erdteile gleich groß darstellt. Der Koeffizienten wird bestimmt, um die Bevölkerungsdichte und die Beleuchtung in den Städten zu berücksichtigen.

**Unterschiede:** Der Koeffizienten wird bestimmt, um die Bevölkerungsdichte und die Beleuchtung in den Städten zu berücksichtigen.

**Methoden:** Eine physikalische Weltkarte, die alle Erdteile gleich groß darstellt.

**Ergebnisse:** Eine physikalische Weltkarte, die alle Erdteile gleich groß darstellt.

<http://www.worldmapper.limited/>

# The New York Times

INTERACTIVE GRAPHIC

## Election Results

### RESULTS: THE PRESIDENCY

RESULTS: THE SENATE

RESULTS: THE HOUSE

RESULTS: THE GOVERNORS

PREVIOUS ELECTIONS

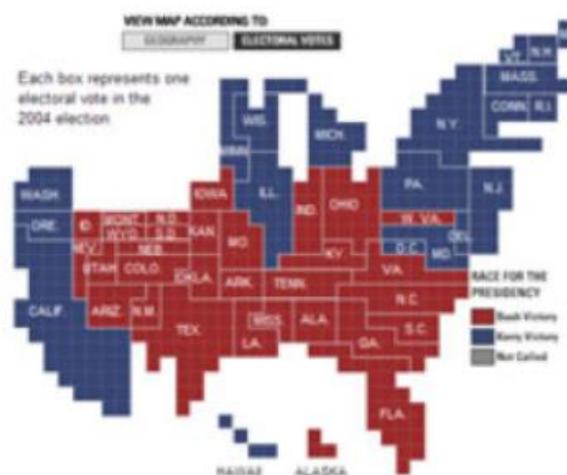
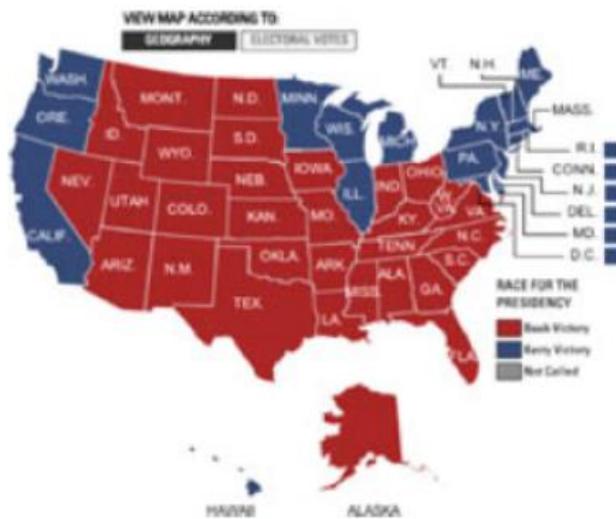


Fig. 1. Geographic map and a cartogram for the 2004 US election [1].

# 面積變形地圖 Cartogram

IEEE TRANSACTIONS ON VISUALIZATION AND COMPUTER GRAPHICS, VOL. 24, NO. 2, FEBRUARY 2018

## Evaluating Cartogram Effectiveness

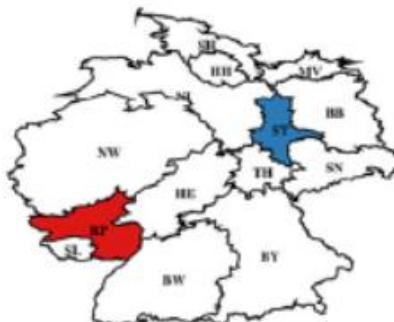
Sabrina Nusrat, Md. Jawaherul Alam<sup>ID</sup>, and Stephen Kobourov

**Abstract**—Cartograms are maps in which areas of geographic regions, such as countries and states, appear in proportion to some variable of interest, such as population or income. Cartograms are popular visualizations for geo-referenced data that have been used for over a century to illustrate patterns and trends in the world around us. Despite the popularity of cartograms, and the large number of cartogram types, there are few studies evaluating the effectiveness of cartograms in conveying information. Based on a recent task taxonomy for cartograms, we evaluate four major types of cartograms: contiguous, non-contiguous, rectangular, and Dorling cartograms. We first evaluate the effectiveness of these cartogram types by quantitative performance analysis (time and error). Second, we collect qualitative data with an attitude study and by analyzing subjective preferences. Third, we compare the quantitative and qualitative results with the results of a metrics-based cartogram evaluation. Fourth, we analyze the results of our study in the context of cartography, geography, visual perception, and demography. Finally, we consider implications for design and possible improvements.

**Index Terms**—Cartograms, geo-visualization, subjective evaluation



The figure shows a cartogram with two states highlighted, one state in red, another in blue. Which state is bigger?



Red       Blue

(a) Contiguous cartogram, *Compare* task

The figure shows the population cartogram of Germany. Find out which state has the second highest population after NW?



BY       HE       BW       NI

(c) Non-contiguous cartogram, *Find top-k* task

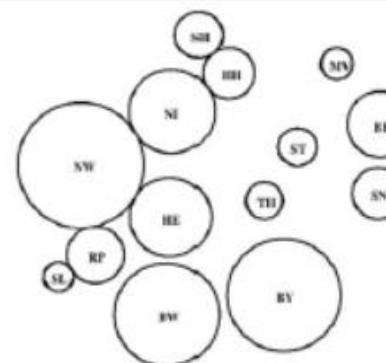
The figure shows a cartogram with a state highlighted. Which one of the following states is a neighbor of the highlighted state?



NI       SN       ST       BB

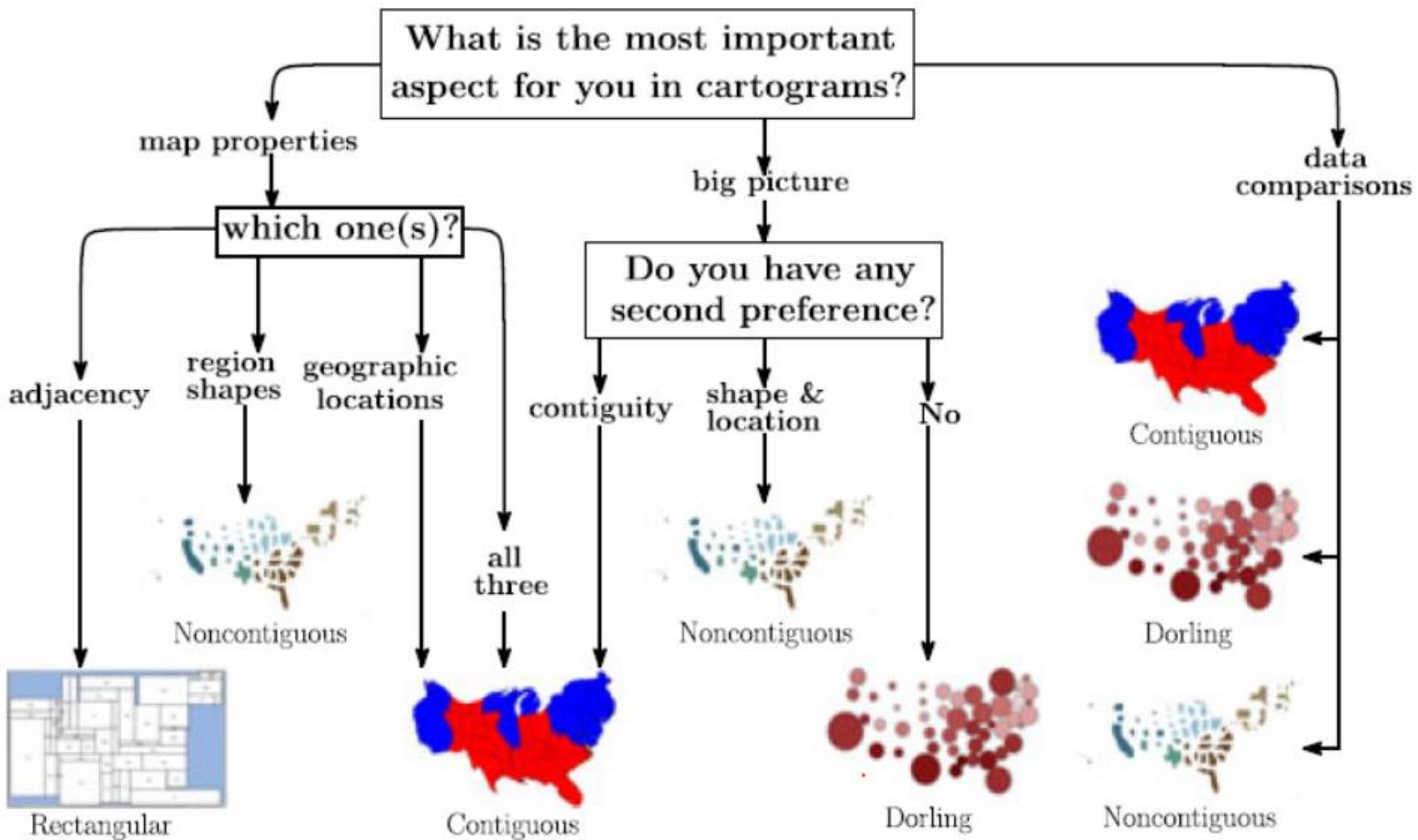
(b) Rectangular cartogram, *Find adjacency* task

The following cartogram shows the GDP (Gross Domestic Product) of Germany. Which part of the country contributes more to GDP?

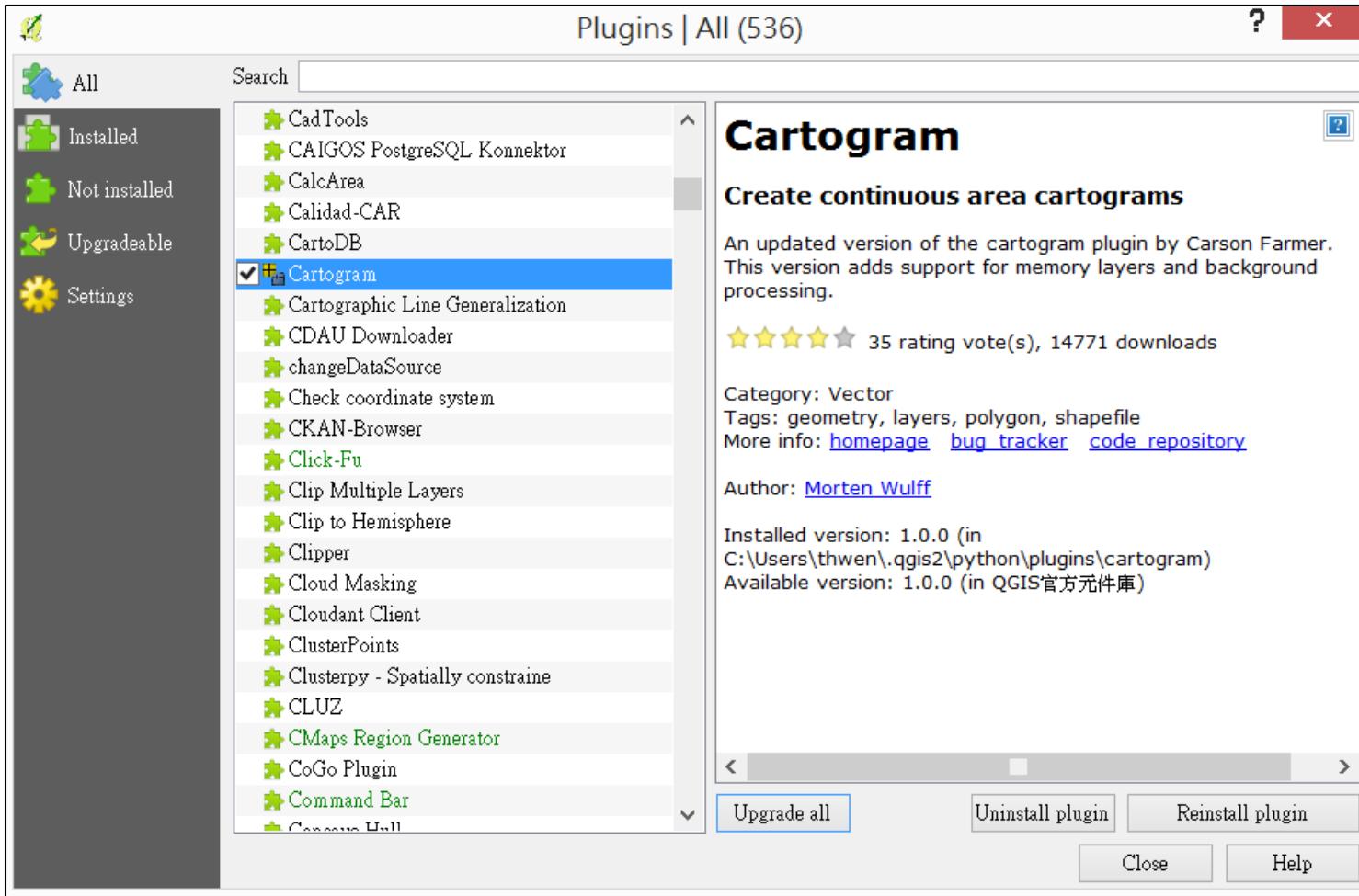


The East side       The West side       The middle       It's not clear

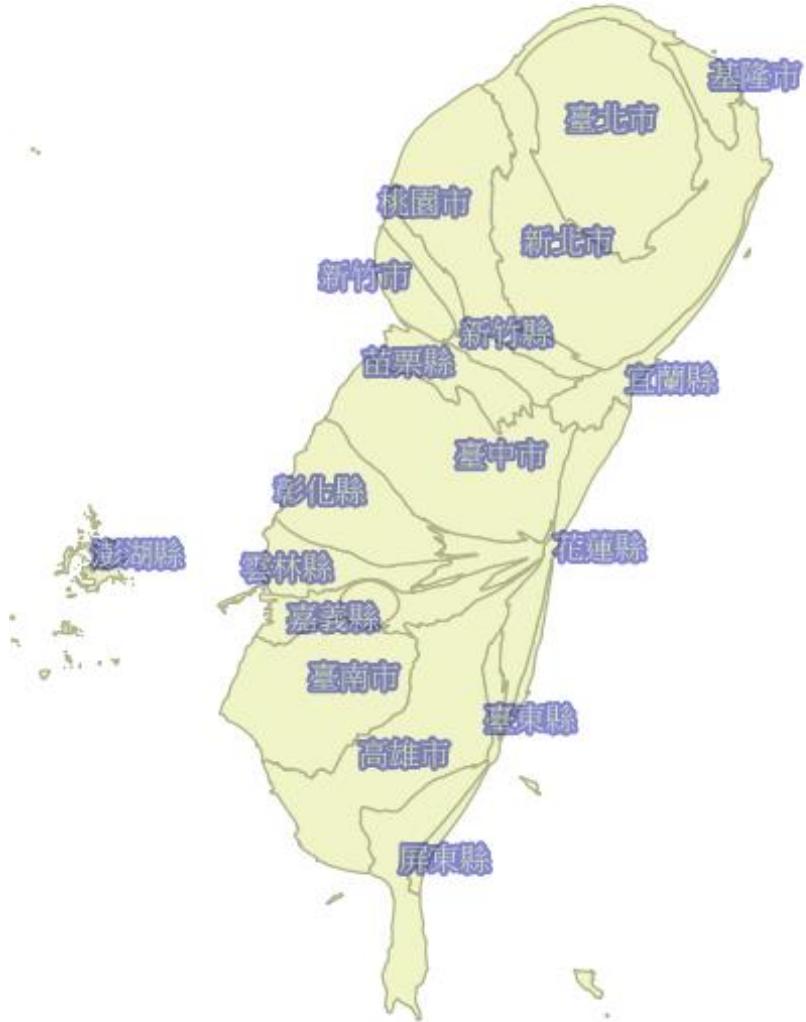
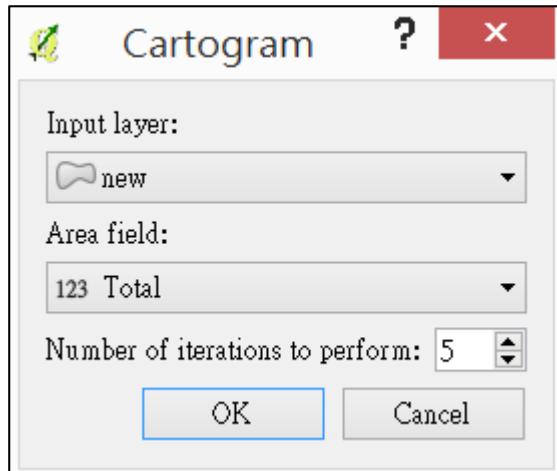
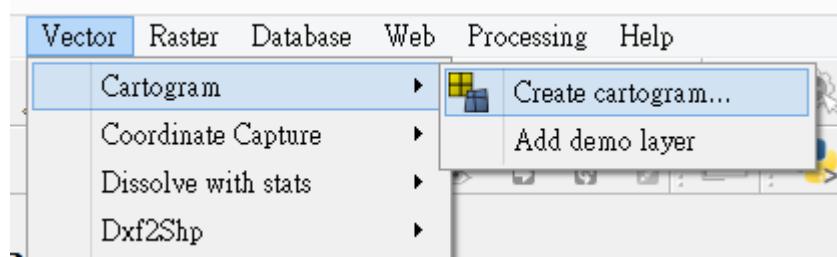
(d) Dorling cartogram, *Summarize* task



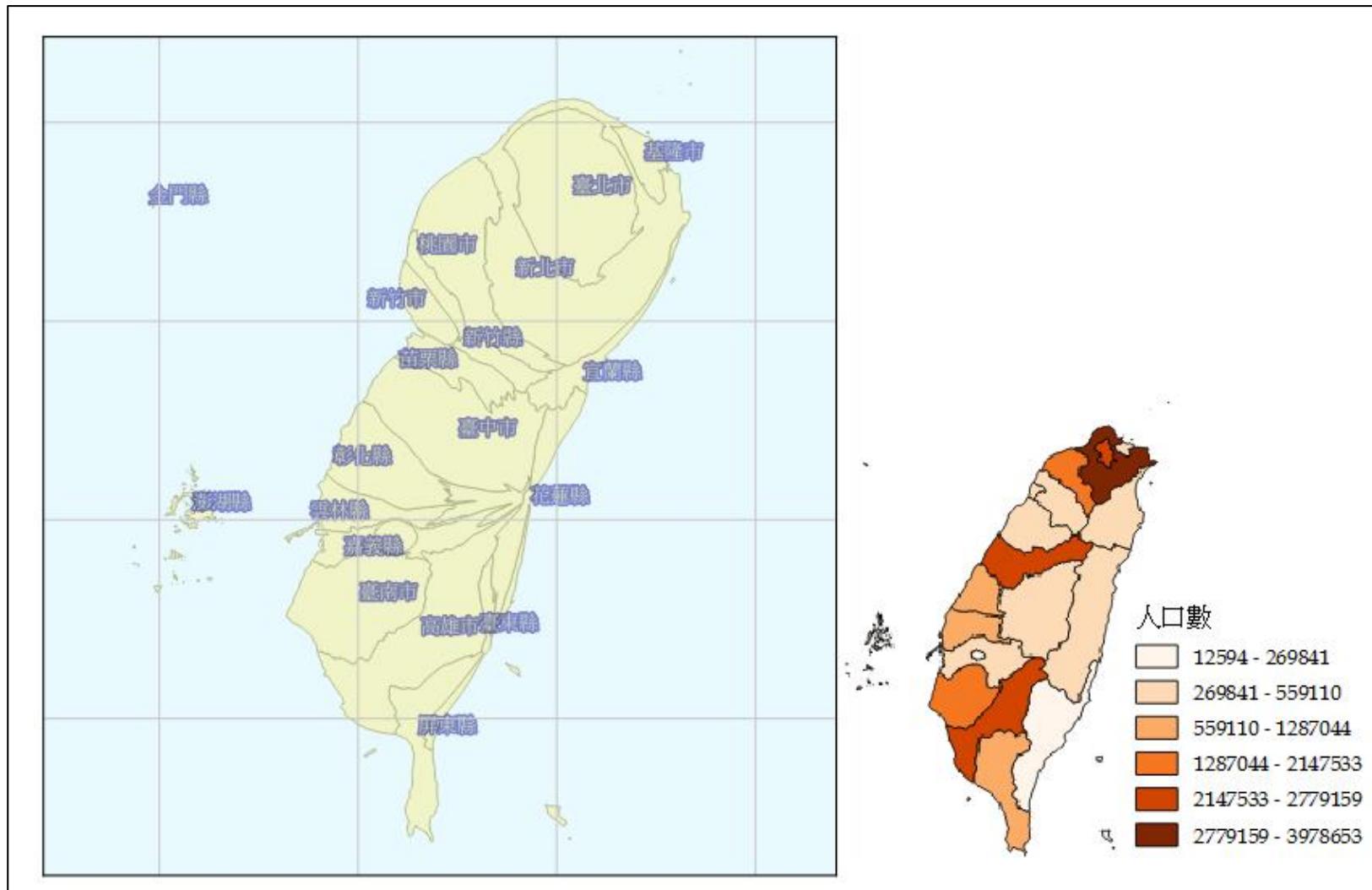
# 安裝QGIS套件：Cartogram



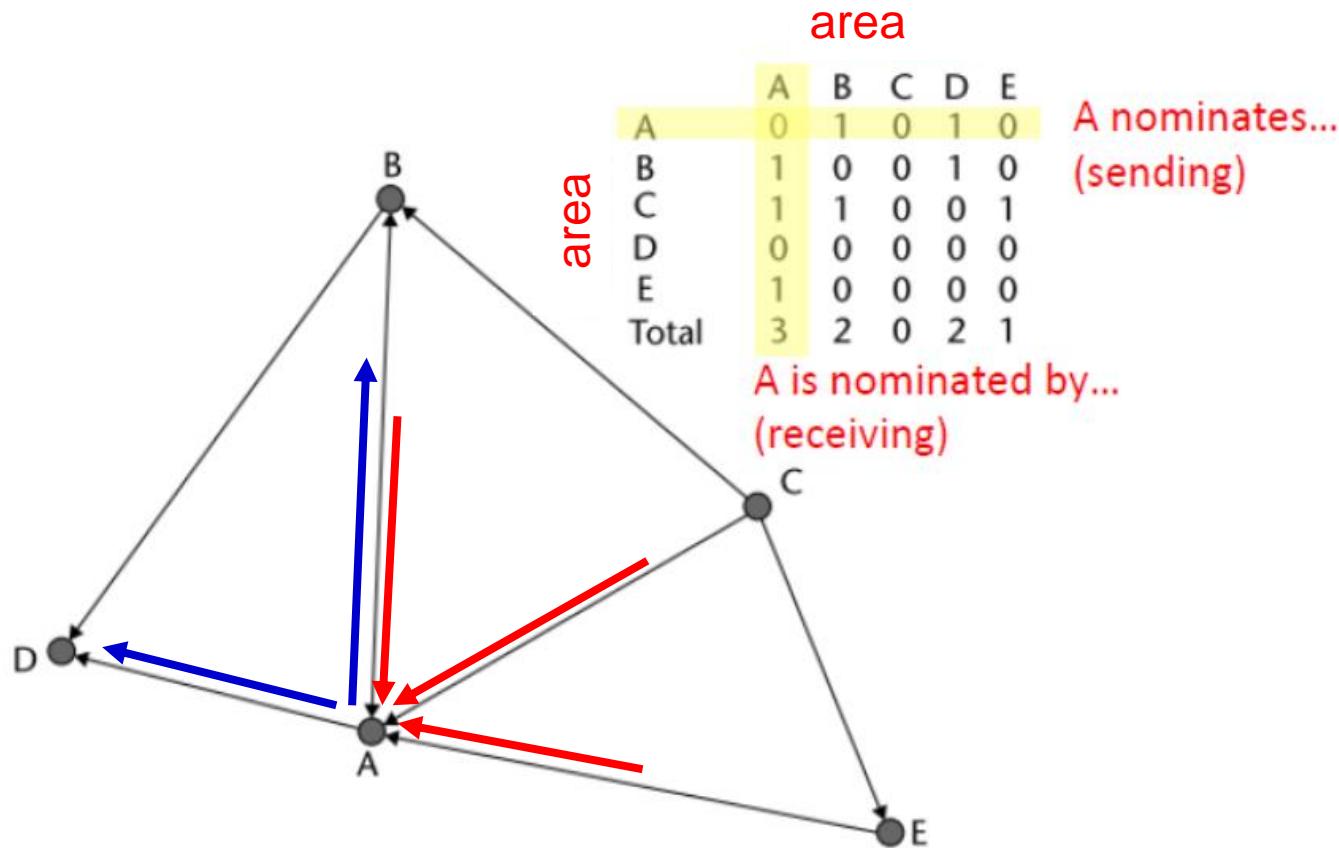
# Cartogram in QGIS



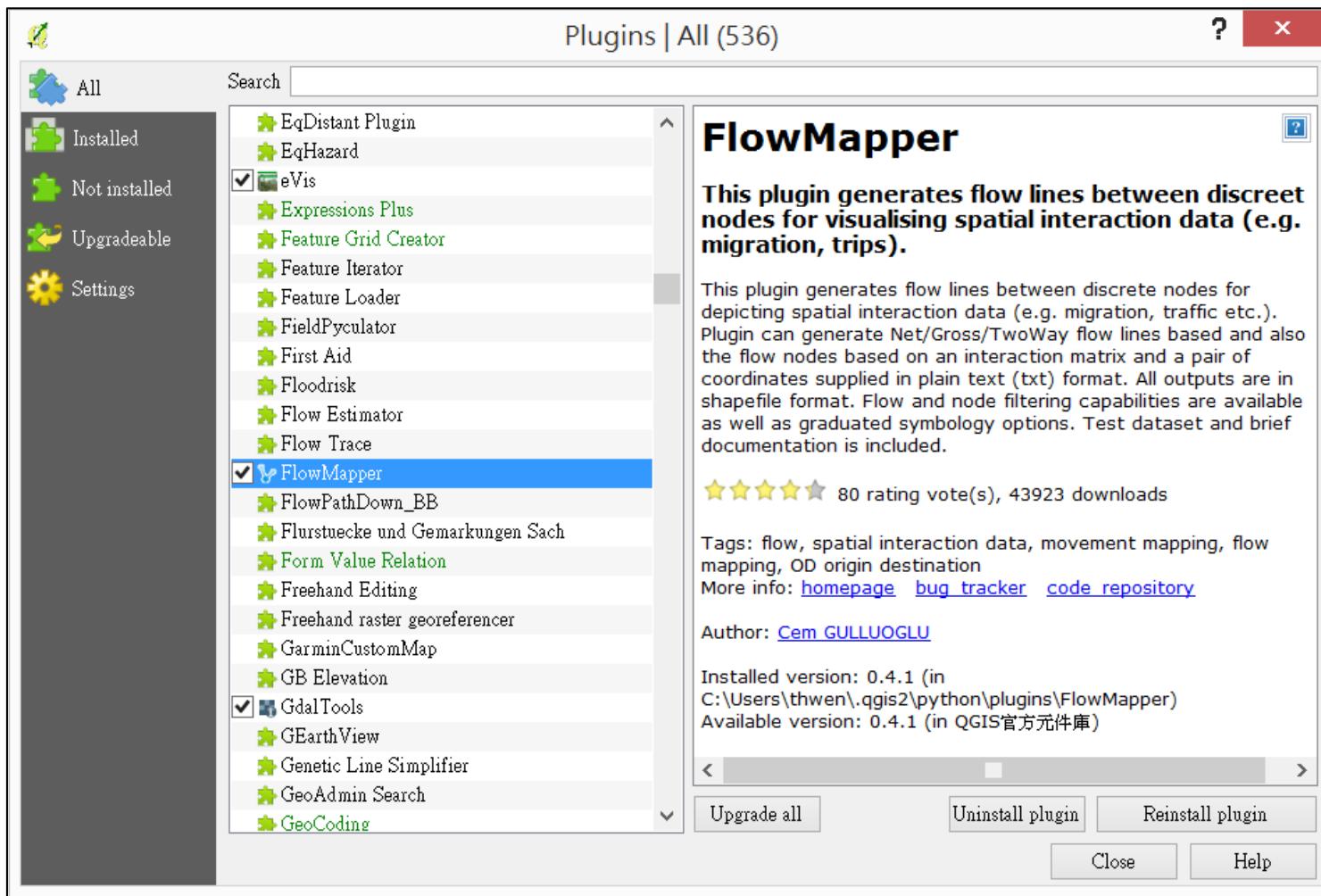
# 地圖實作(預期成果)：Cartogram



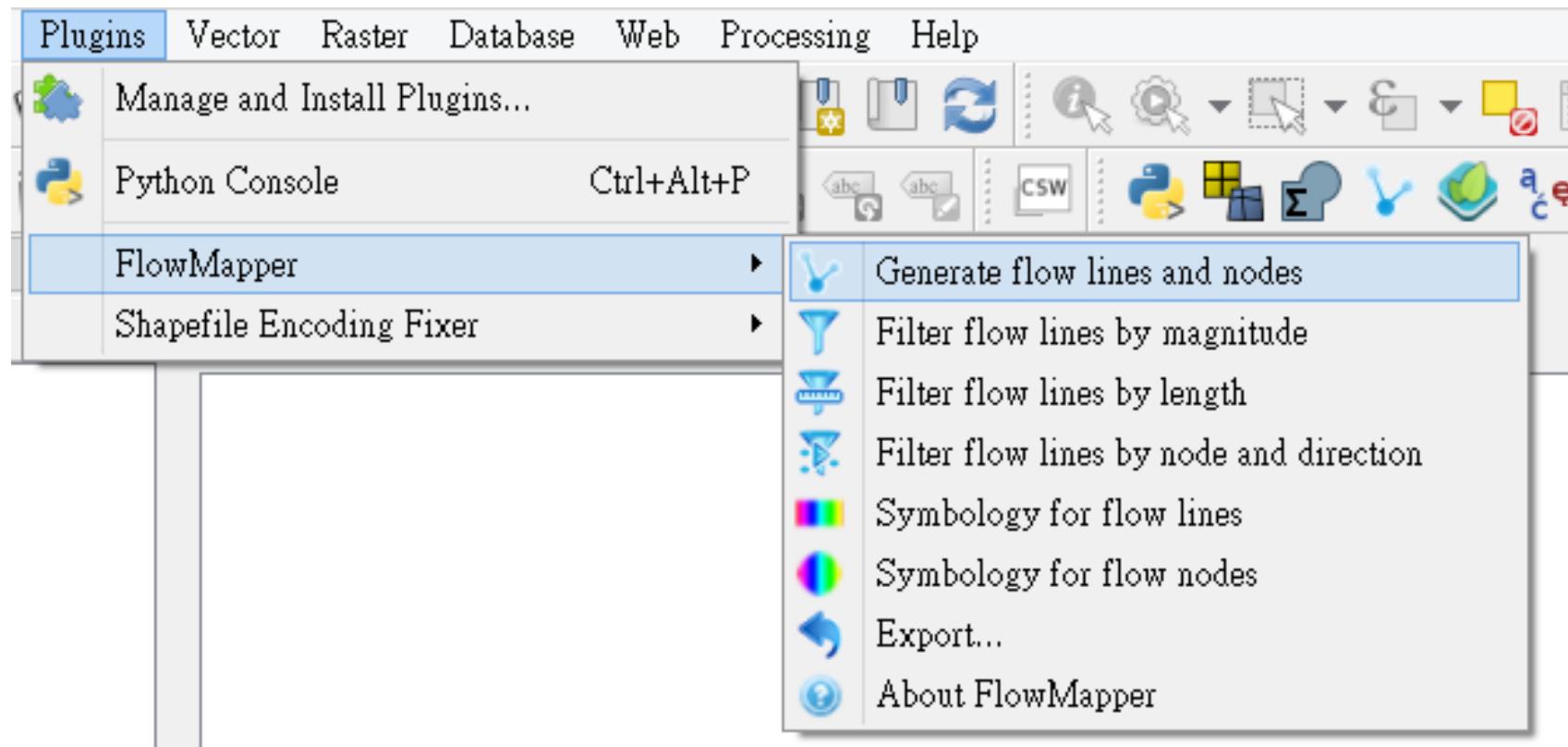
# 流動地圖的基本概念



# 安裝QGIS套件：FlowMapper



# Generating flow lines in QGIS



## Generate flow lines and nodes



Select file storing node coordinates:

[Browse...](#)

Include node names in output shapefile Node coordinates at [Geographic](#) ▾

Select file storing node names:

[Browse...](#)

Select file storing flow map:

[Browse...](#)

Select flow type :

Two Way  Gross  Net

Output shapefile to store flow lines:

[Browse...](#)

Create shapefile to store flow nodes:

[Browse...](#)

Add flow nodes to map after creation:

Differentiate node symbology by flow gain or loss

Add flow lines to map after creation:

Show flow direction:

[Single Symbol](#) ▾

No. of classes:

Class interval:

Class interval:

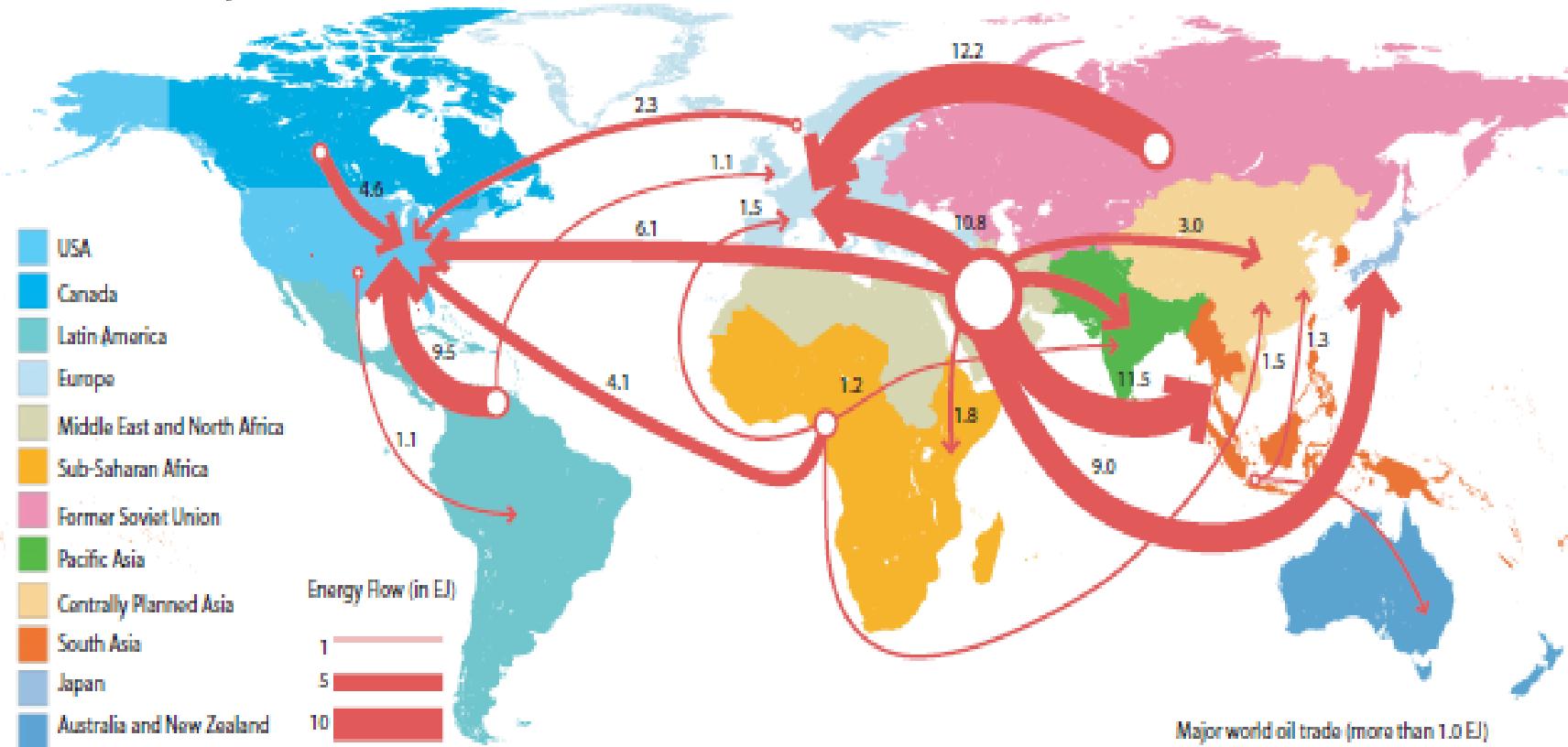
[1/4 Std. Dev.](#) ▾

[OK](#)

[Cancel](#)

# International Crude Oil Flow

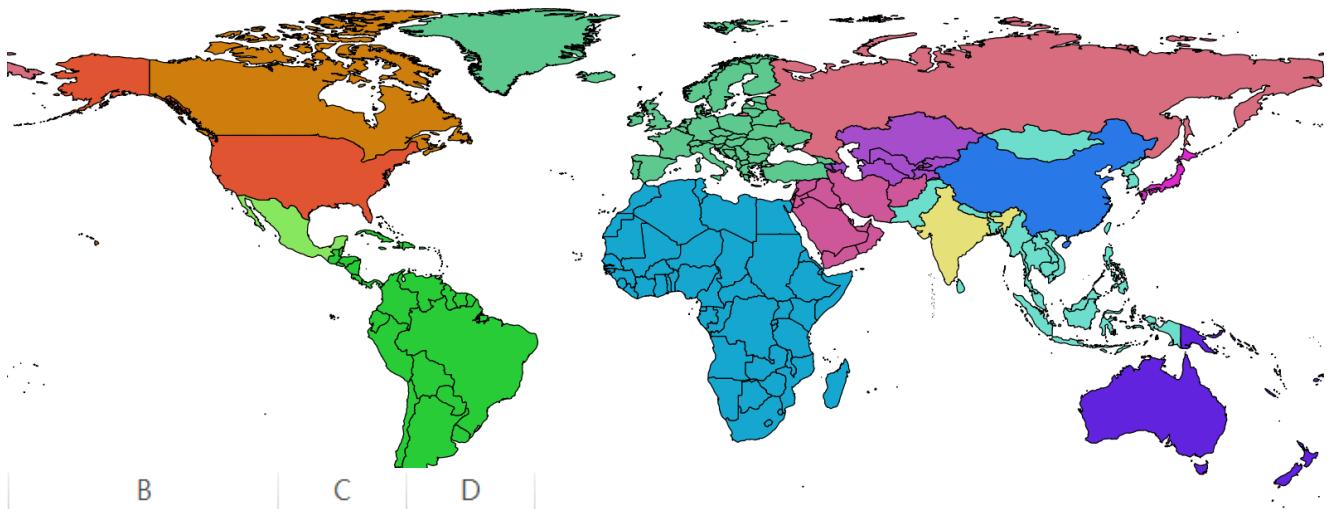
Crude oil and oil products



# Flow Data: nodes

country.shp

世界國家邊界



CrudeFlow2015.xlsx

國際原油交易

	A	B	C	D
	ID	Name	X	Y
Africa	1	US	-112.492	45.69558
Australasia	2	Canada	-98.2655	61.39204
Canada	3	Mexico	-102.533	23.95046
China	4	S. & Cent. America	-61.648	-13.9701
Europe	5	Europe	-7.88424	61.55354
India	6	Russia	96.69193	61.98838
Japan	7	Other CIS	65.98129	45.77121
Mexico	8	Middle East	50.36606	28.20909
Middle East	9	Africa	18.28737	6.41873
Other Asia Pacific	10	Australasia	136.5631	-25.3071
Other CIS	11	China	103.8342	36.56309
Russia	12	India	79.61623	22.8836
S. & Cent. America	13	Japan	137.9907	37.56216
Singapore	14	Singapore	103.8081	1.35162
US	15	Other Asia Pacific	102.7787	22.67643

# Flow Data: links

CrudeFlow2015.xlsx

國際原油交易

單位：百萬噸

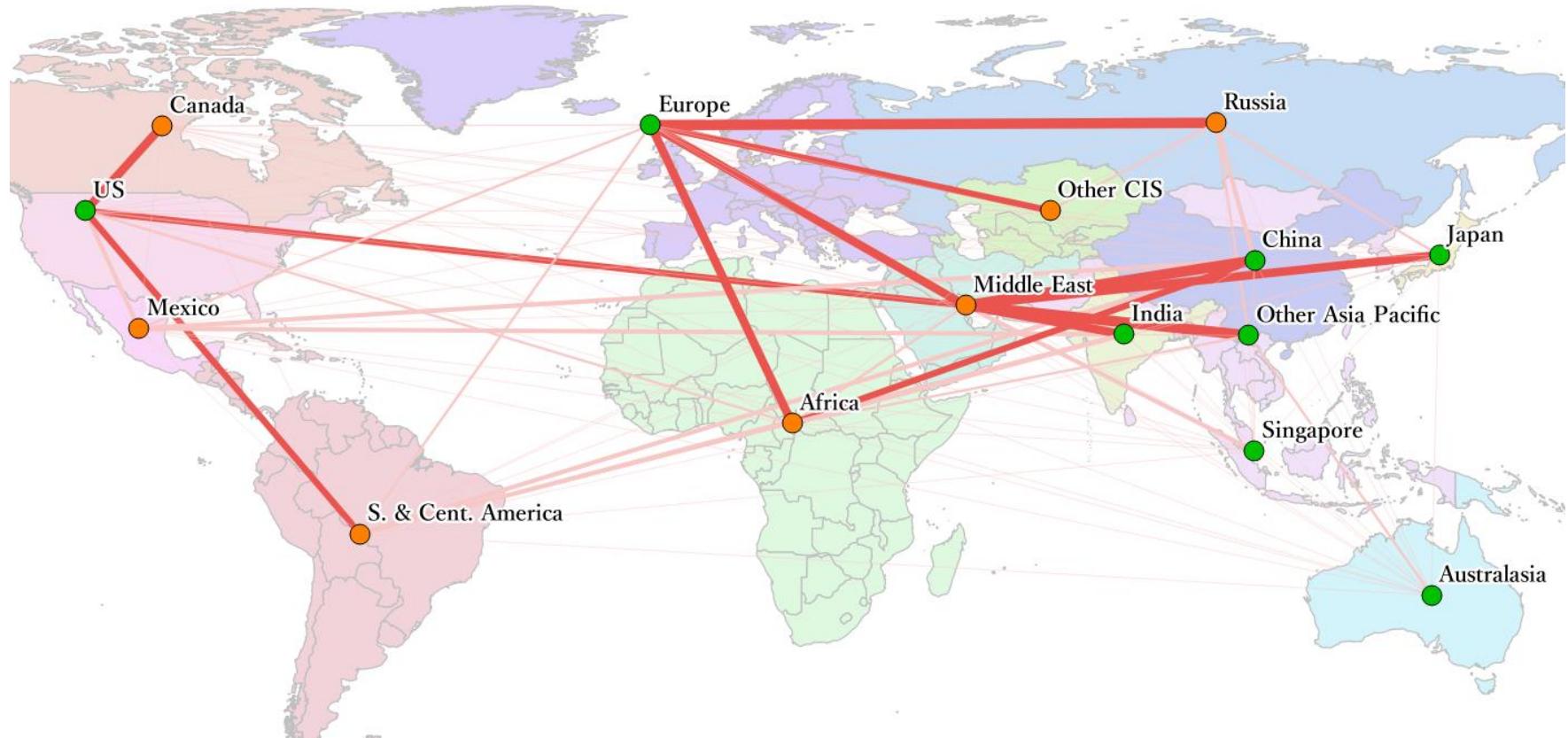
	US	Canada	Mexico	S. & Cent. Europe	Russia	Other CIS	Middle East	Africa	Australasia	China	India	Japan	Singapore	Other Asia	
US	0	21	0	0.4	1.8	0	0	0.2	0.3	0.05	0.1	0.05	0	0.1	0.4
Canada	157.8	0	0.05	0.05	1.4	0	0	0	0	0	0.1	0.05	0	0.05	0
Mexico	34.3	0	0	0.4	13.7	0	0	0	0	0	41.7	29.2	3.2	0.1	3.2
S. & Cent. America	79.7	0.6	0	0	14.6	0.05	0	0	0	0	41.7	29.2	3.2	0.1	3.2
Europe	1.3	0.8	0	1.2	0	0.05	0.05	0.05	0.4	0.05	2.1	0.7	0	0.05	3.6
Russia	1.4	0	0	0.9	158.5	0	23.2	0.2	0.9	1.6	42.4	0.1	14.2	0.9	10.3
Other CIS	0.7	0.6	0	0	56	2.9	0	6.6	0.7	0	5.3	1.4	1	0.1	5.8
Middle East	74.1	4.1	0	4.9	108.3	0.05	0	0	12.9	6.3	170.4	114.5	139.7	37.5	206.9
Africa	14	5.5	0	11.9	133.75	0	0	0.3	0	2.4	64.5	37.3	1	0.3	14.6
Australasia	0.5	0	0	0.4	0.05	0	0	0.05	0.05	0	2.4	0.05	0.05	0.9	5
China	0	0	0	0.05	0	0	0	0.4	0.05	0.05	0	0.4	1.5	0.05	0.4
India	0.1	0	0	0.05	0.05	0	0	0	0	0.1	0	0	0	0.05	0.05
Japan	0	0	0	0	0	0	0	0	0	0.05	0.05	0.3	0	0.05	0.05
Singapore	0	0	0	0	0	0	0	0	0	0.05	0.05	0	0	0	0.1
Other Asia Pacific	2.2	0	0	0.05	0.05	0	0	0.1	0	14.1	5.9	4.9	4.9	5.8	0

# Data Preparation: Node and Link files

檔案(F)	編輯(E)	格式(O)	檢視(V)	說明(H)
-112.49152		45.69558		
-98.26545		61.39204		
-102.53287		23.95046		
-61.64801		-13.97012		
-7.88424		61.55354		
96.69193		61.98838		
65.98129		45.77121		
50.36606		28.20909		
18.28737		6.41873		
136.56306		-25.3071		
103.8342		36.56309		
79.61623		22.8836		
137.99074		37.56216		
103.80805		1.35162		
102.77869		22.67643		

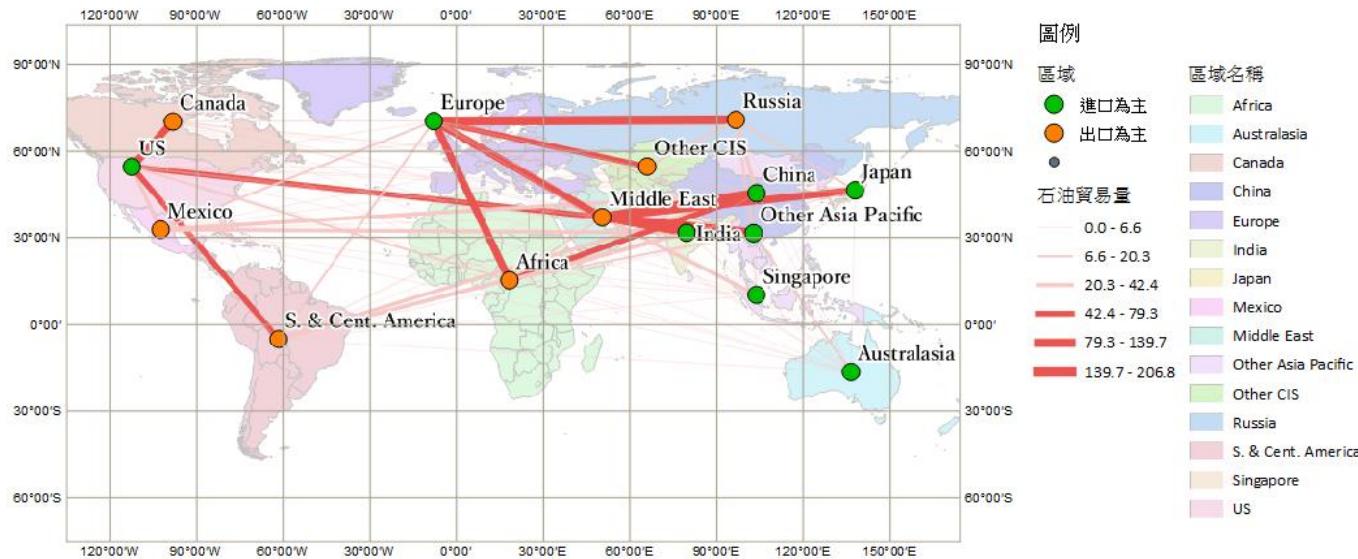
檔案(F)	編輯(E)	格式(O)	檢視(V)	說明(H)					
0	21	0	0.4	1.8	0	0	0.2	0.3	
157.8	0	0.05	0.05	1.4	0	0	0	0	
34.3	0	0	0.4	13.7	0	0	0	0	
79.7	0.6	0	0	14.6	0.05	0	0	0	
1.3	0.8	0	1.2	0	0.05	0.05	0.05	0.4	
1.4	0	0	0.9	158.5	0	23.2	0.2	0.9	
0.7	0.6	0	0	56	2.9	0	6.6	0.7	
74.1	4.1	0	4.9	108.3	0.05	0	0	12.9	
14	5.5	0	11.9	133.75	0	0	0.3	0	
0.5	0	0	0.4	0.05	0	0	0.05	0.05	
0	0	0	0.05	0	0	0	0.4	0.05	
0.1	0	0	0.05	0.05	0	0	0	0	
0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	
2.2	0	0	0.05	0.05	0	0	0.1	0	

# Flow Mapping



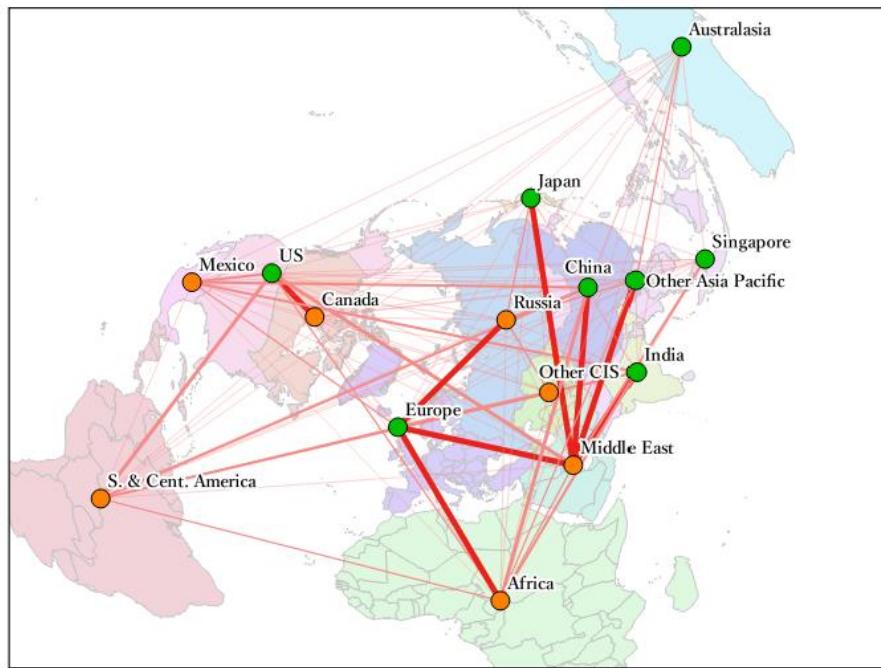
# 地圖實作(預期成果)：Flow Mapping

## International Crude Oil Flow



# 地圖實作(預期成果)：Flow Mapping (等距方位投影)

## International Crude Oil Flow



圖例

區域

- 進口為主
- 出口為主
- 

石油貿易量

- 0.0 - 6.6
- 6.6 - 20.3
- 20.3 - 42.4
- 42.4 - 79.3
- 79.3 - 139.7
- 139.7 - 206.8

區域名稱

- Africa
- Australasia
- Canada
- China
- Europe
- India
- Japan
- Mexico
- Middle East
- Other Asia Pacific
- Other CIS
- Russia
- S. & Cent. America
- Singapore
- US



UN Logo

- 點子圖 Dot Map (reflecting density)
- 面量圖 Shaded Map (graduated color)
- 泡泡圖 Bubble Map (graduated size)
- 統計地圖：圓餅圖與長條圖 Pie Chart vs. Bar Char Maps
- 面積變形地圖 Cartogram
- 流動地圖 Flow map

January 15-16, 2018

That's all for 2-day **QGIS** workshop;  
Thanks for participation in the workshop.

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