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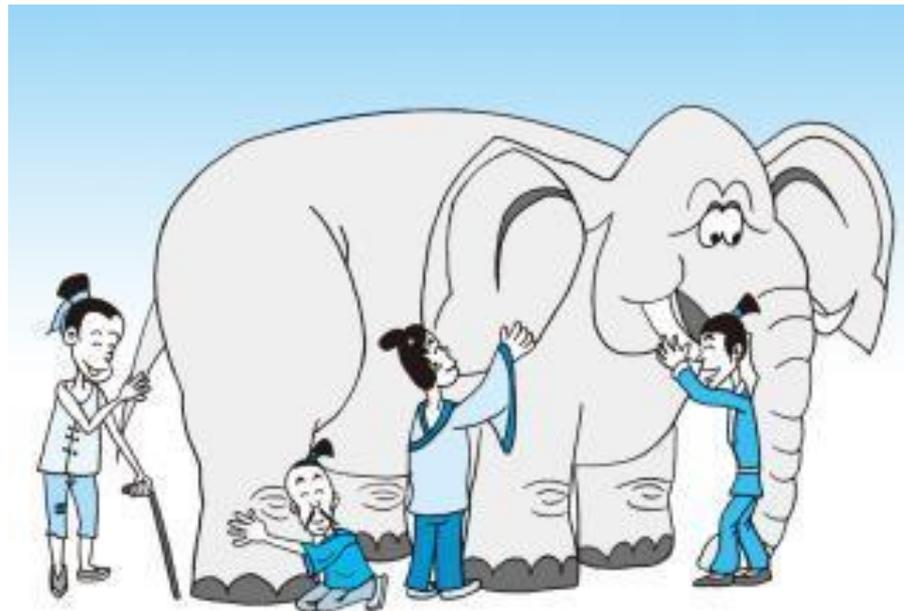
Spatial Database Design and Analysis Based on Ecological Approaches

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China Data Institute

Ecological Approach: A System Theory

Wikipedia: Systems theory. https://en.wikipedia.org/wiki/Systems_theory

“A system is a cohesive conglomeration of **interrelated** and **interdependent** parts that is either natural or man-made. Every system is delineated by its **spatial** and **temporal** boundaries, surrounded and influenced by its **environment**.”

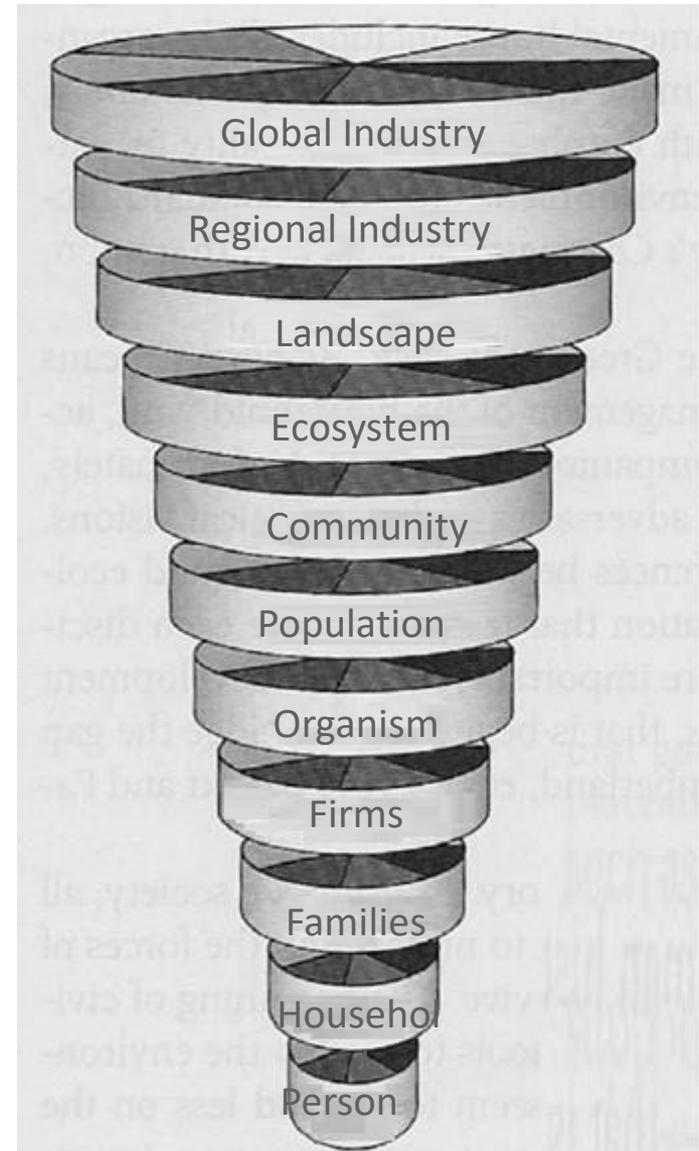
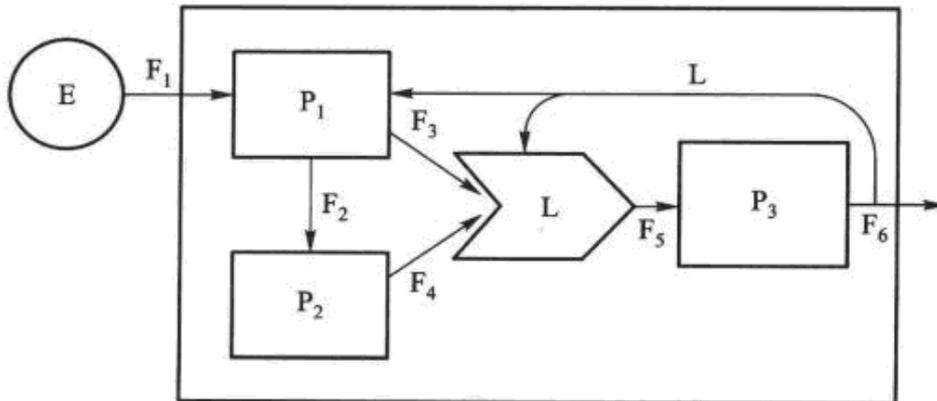


Ecological Models for Social Sciences

Fundamental Assumptions:

- ❑ Everything is related
- ❑ Degenerative system
- ❑ Increasing ecological risks:
 - Environmental risk
 - Health risk
 - Social risk

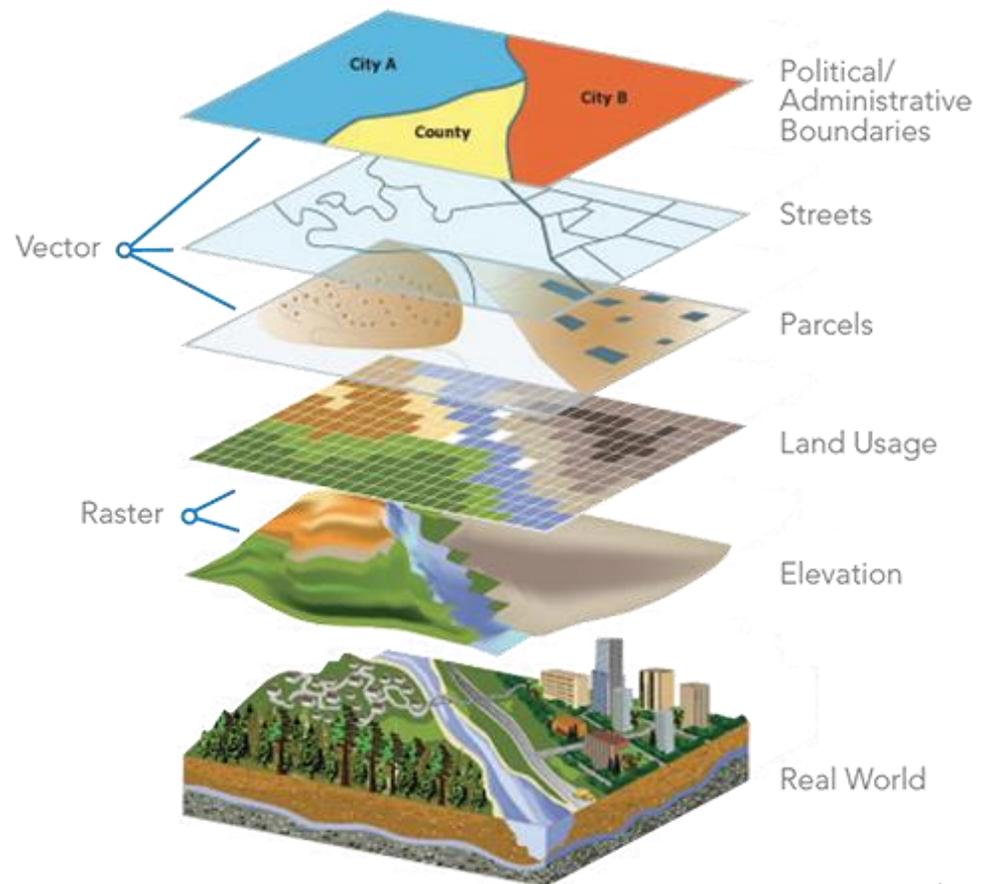
An graphic model of ecosystem



Spatial Data Infrastructure for Ecological Analysis

Spatial Data Platform: A Unique Platform for Multi-sources and Multi-scale Data Integration:

- Location
- Time
- Integration



Topics

- **Principles** for spatial database design
- **Methodologies** for ecological analysis
- **Functions** for spatio-temporal analysis
- **Applications** of China Geo-Explorer
- **Directions** for future work

Principals for Spatial Database Design

Principals:

- **Comprehensive** data coverage
- **Comparable** spatio-temporal data structure
- **Compatible** multi-source data structure
- **Consistent** multi-scale data structure

Primary Factors:

1. Space (boundary)
2. Time
3. Scale (Sub-systems)

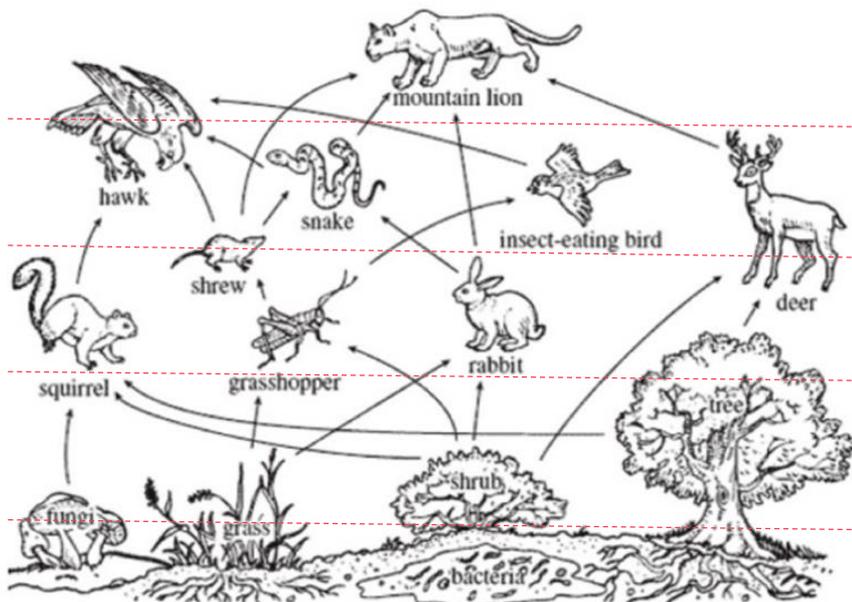
Methodologies for Ecological Analysis

❑ **Classification** (spatial and non-spatial)

❑ **Identification**

- Patterns
- Linkages (Inter and intra-regions, Inter and intra-sectors)
- Changes (spatio-temporal patterns and structures)

❑ **Modeling**



Tertiary consumers (predator)

Secondary consumers (meat)

Primary consumers (vegetable)

Producers (make own food and do not depend on any other organism for nutrition)

Environment (Detritivores & Decomposers)

Questions for Spatial Data Analysis

- What are the spatial **patterns** of data?
- What are the spatial **structures** of data?
- What are the spatial **trends** (patterns and structures) over the time?
- What are spatial **interactions** between different regions and aspects of the society over the time and space?
- What are the potential **impacts** of proposed actions on the complex systems?

Functions for Spatio-temporal Data Analysis

- Report Analysis
- Chart Analysis
- Spatial Analysis
- Statistical Analysis
- Map Analysis

Data: China



- **Government Statistics**
 - Provincial Statistics (1949 -)
 - City Statistics (1996 -)
 - County Statistics (1997 -)
- **Population Census**
 - Census 1953
 - Census 1964
 - Census 1982
 - Census 1990
 - Census 2000/2010 (province, city, county, township, GRID)
- **Economic Census**
 - Industrial Census 1995 (province, city, county, ZIP)
 - Basic Unit Census 2001 (province, city, county, ZIP)
 - Economic Census 2004/2008 (province, city, county, ZIP)
- **Establishments** (more than 7 millions companies and organizations)
- **Geography and Environment**
 - Land Use data
 - Night-Time data
- **Base Maps**
 - 2000
 - 2010
 - 2000-2010

China Geo-Explorer

Administrative Units – Location – Chart – Time Series – Establishment
– GIS Map Export – China-US Comparison – Map Library

The screenshot displays the China Geo-Explorer web application interface. The left sidebar contains the following elements:

- Base Year:** Radio buttons for 2000, 2010, and 2000-2010.
- Group:** Radio buttons for Single group and Multi-groups.
- Level:** Radio buttons for Province, City, County, Town, and Any area.
- Region:** Buttons for Customized Report, Standard Report, and Upload your data.
- China (Province):** A list of provinces with a "Back to the Upper Level" button.
- Selection:** A list of provinces (Anhui, Chongqing, Henan, Hubei, Hunan, Jiangxi, Shaanxi) with "Add", "Add All", "Remove", and "clear" buttons.
- Selection count:** 10

The main map area shows a map of China with administrative units highlighted in pink. The map includes a toolbar with various operations (pan, zoom, etc.) and a "Level: Province" dropdown menu. The map also shows labels for various cities and regions in Chinese and English, such as 乌鲁木齐市 (Urumqi), 兰州市 (Lanzhou), 西安市 (Xi'an), 成都市 (Chengde), and 昆明市 (Kunming).

The Windows taskbar at the bottom shows the following icons: Windows Start button, File Explorer, Internet Explorer, Microsoft Store, Google Chrome, and Microsoft PowerPoint. The system tray on the right shows the time 10:02 and the date 2018/8/20.

Tests of Spatial Patterns

Reports

Household Summary

	anhui		beijing		chongqing		fujian		gansu		guangdong		guangxi		guizhou		hainan		
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	
Total Households	16,505,420	100.0%	4,417,045	100.0%	9,318,199	100.0%	9,325,897	100.0%	6,251,195	100.0%	21,538,730	100.0%	11,517,720	100.0%	9,338,955	100.0%	1,807,521	100.0%	1,750,710
Family Households	16,313,885	98.8%	4,096,844	92.8%	9,141,558	98.1%	8,742,252	93.8%	6,086,988	97.4%	18,762,127	87.1%	11,309,236	98.2%	9,239,409	98.9%	1,750,710	100.0%	1,750,710
Collective Households	191,535	1.2%	320,201	7.2%	176,641	1.9%	583,645	6.2%	164,207	2.6%	2,776,603	12.9%	2,008,484	1.8%	99,546	1.1%	96,811	5.4%	96,811

Average Size: Family Households

	anhui	beijing	chongqing	fujian	gansu	guangdong	guangxi	guizhou	hainan
Average Size: Family Households	3	3	3	3	3	3	3	3	4

Sex Ratio: Family Households

	anhui	beijing	chongqing	fujian	gansu	guangdong	guangxi	guizhou	hainan
Sex Ratio: Family Households	105	98	105	103	104	103	111	108	110

Sex Ratio: Collective Households

	anhui	beijing	chongqing	fujian	gansu	guangdong	guangxi	guizhou	hainan
Sex Ratio: Collective Households	189	230	189	147	248	104	164	239	165

Literacy

	anhui	beijing	chongqing	fujian	gansu	guangdong	guangxi	guizhou	hainan										
Total Population 15 and Over	43,956,751	100.0%	11,725,426	100.0%	23,849,894	100.0%	26,253,482	100.0%	18,337,151	100.0%	64,673,917	100.0%	32,369,442	100.0%	24,613,920	100.0%	5,485,403	100.0%	5,485,403

Illiterate Population - Total

	anhui	beijing	chongqing	fujian	gansu	guangdong	guangxi	guizhou	hainan										
Illiterate Population - Total	5,905,526	13.4%	877,604	4.9%	2,122,431	8.9%	2,342,608	9.7%	3,613,287	19.7%	3,345,269	5.2%	1,734,347	5.3%	4,886,149	19.9%	532,094	9.9%	532,094

Illiterate Population - Males

	anhui	beijing	chongqing	fujian	gansu	guangdong	guangxi	guizhou	hainan										
Illiterate Population - Males	1,684,204	26.5%	133,051	8.4%	561,094	17.2%	742,415	19.6%	1,138,605	38.2%	556,863	10.4%	303,272	10.1%	1,278,469	38.1%	109,919	20.1%	109,919

Illiterate Population - Females

	anhui	beijing	chongqing	fujian	gansu	guangdong	guangxi	guizhou	hainan										
Illiterate Population - Females	4,221,322	19.5%	494,353	8.1%	1,561,337	13.3%	1,597,192	14.0%	2,474,682	27.8%	2,788,206	8.4%	1,334,075	8.8%	3,607,671	30.6%	422,075	20.6%	422,075

Marital Status

	anhui	beijing	chongqing	fujian	gansu	guangdong	guangxi	guizhou	hainan										
Total Population 15 and Over	41,175,322	100.0%	11,134,081	100.0%	2,048,451	100.0%	2,419,670	100.0%	1,782,343	100.0%	6,075,562	100.0%	3,050,182	100.0%	1,363,586	100.0%	517,358	100.0%	517,358

Never Married

	anhui	beijing	chongqing	fujian	gansu	guangdong	guangxi	guizhou	hainan										
Never Married	767,697	18.4%	287,428	23.6%	293,829	14.3%	582,936	24.1%	347,892	19.5%	1,038,057	31.0%	798,083	26.2%	463,322	19.7%	141,265	27.3%	141,265

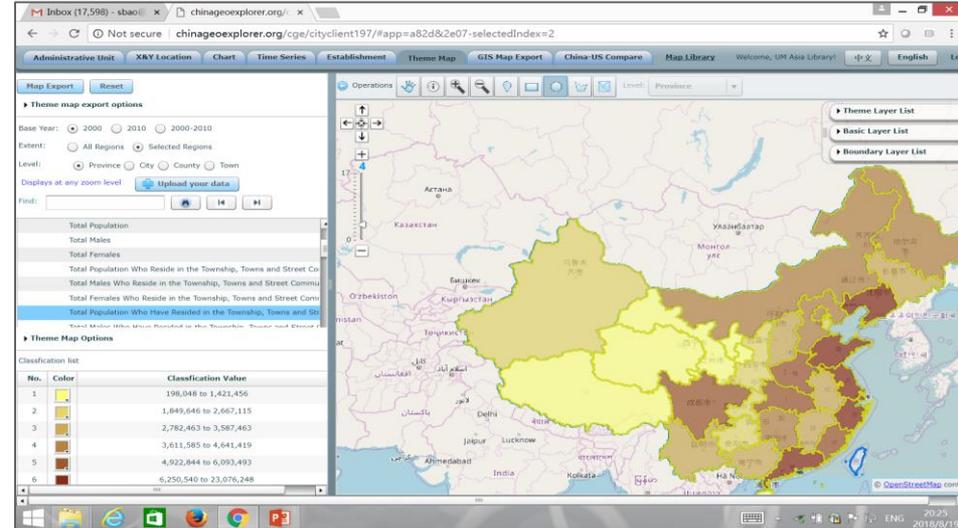
First Married

	anhui	beijing	chongqing	fujian	gansu	guangdong	guangxi	guizhou	hainan										
First Married	3,061,831	73.3%	779,056	68.7%	1,514,535	73.9%	1,647,059	68.1%	1,289,955	72.4%	3,773,987	62.1%	1,996,490	65.5%	1,678,883	71.6%	339,764	65.6%	339,764

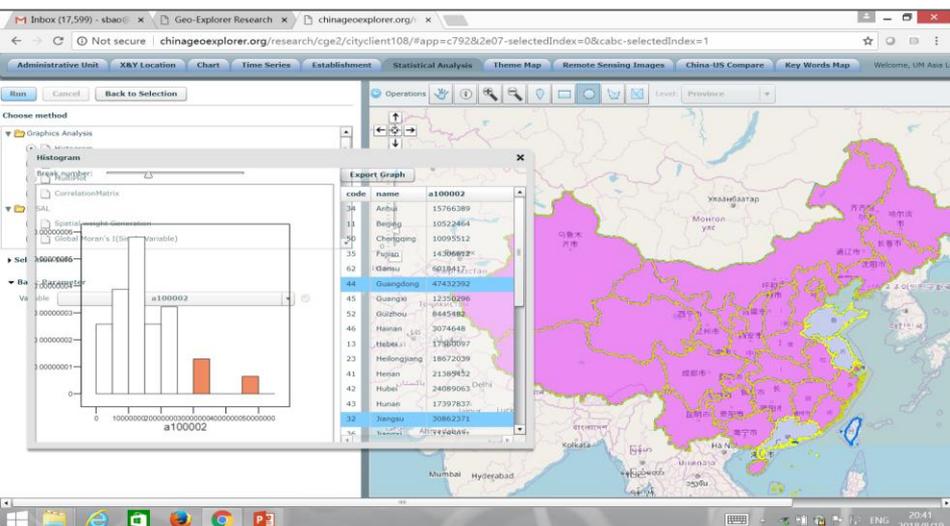
Re-Married

	anhui	beijing	chongqing	fujian	gansu	guangdong	guangxi	guizhou	hainan										
Re-Married	67,801	1.6%	24,575	2.2%	69,817	3.4%	36,115	1.5%	20,828	1.8%	53,059	0.9%	45,240	1.5%	61,135	2.6%	7,062	1.4%	7,062

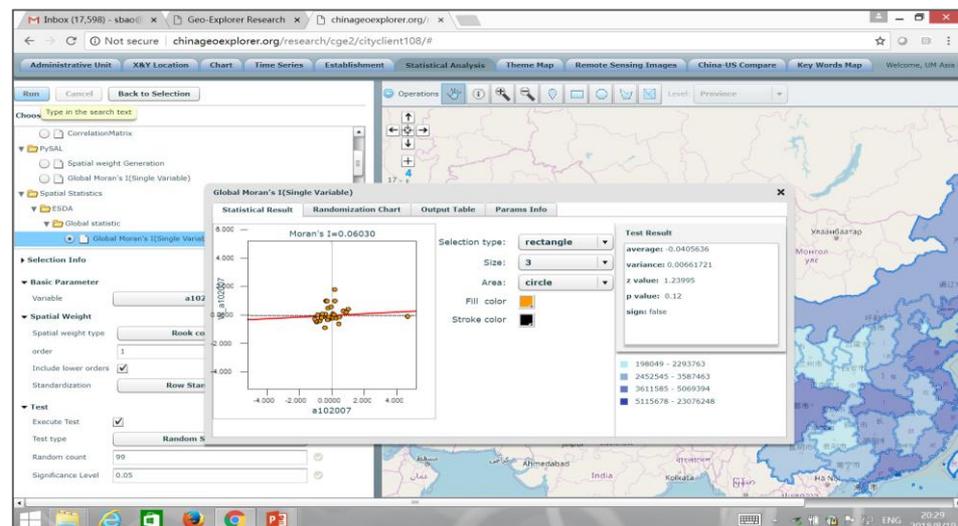
Maps



Charts: Histogram



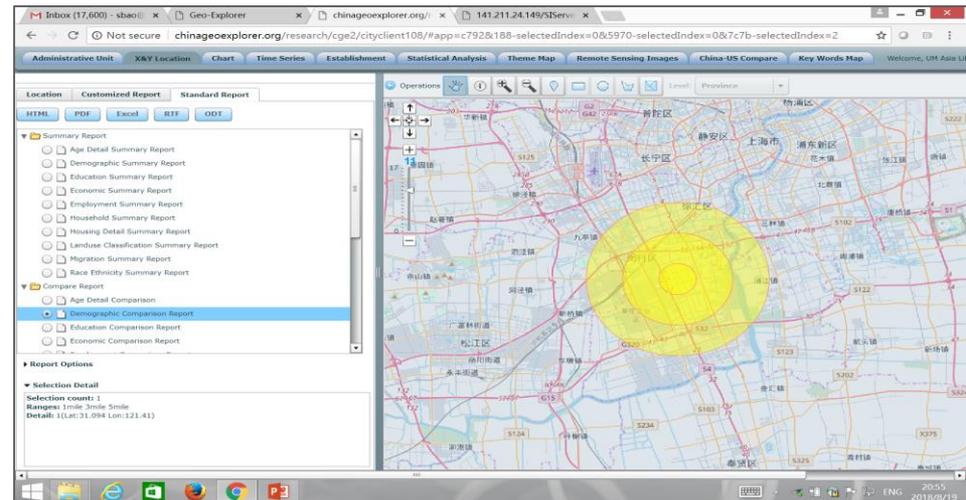
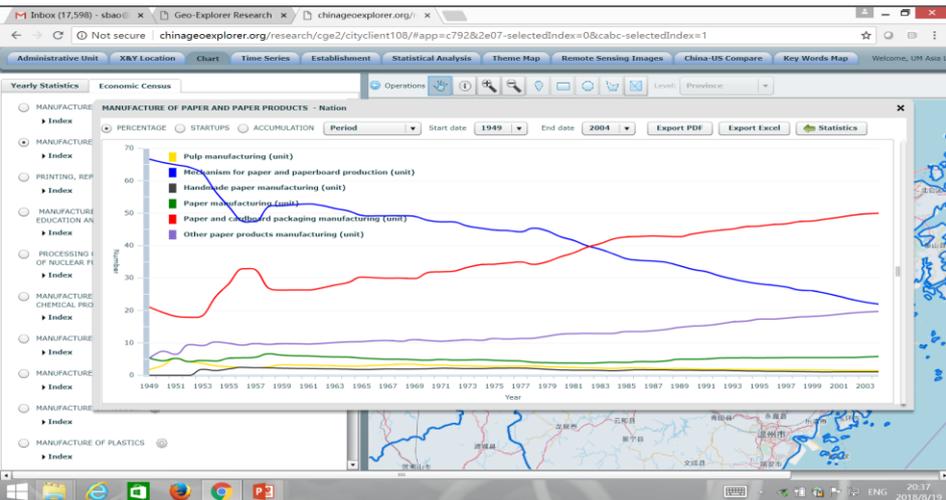
Morans' I: Spatial Autocorrelation



Tests of Spatial Structures

Industrial Structures

Spatial Structures



The screenshot shows an Excel spreadsheet titled 'generated.xls (Compatibility Mode) - Excel'. The table contains data for various manufacturing categories across different years. The columns are labeled: Year, Name, Code, Pulp manufacturing, Mechanism for paper and paperboard production, Handmade paper manufacturing, Paper manufacturing, Paper and cardboard packaging, and Other paper products manufacturing.

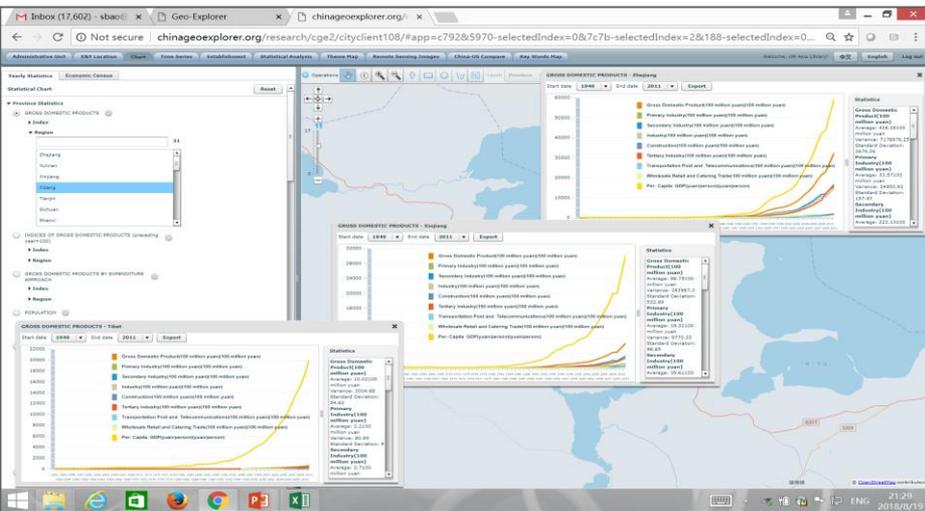
Year	Name	Code	Pulp manufacturing	Mechanism for paper and paperboard production	Handmade paper manufacturing	Paper manufacturing	Paper and cardboard packaging	Other paper products manufacturing
1	1949	11.12.1.1543859649122808	66.86866666666666	0.0	0.0	2.263157894736842	21.052631578947368	7.46265667164178
2	1950	11.12.1.29850748268656714	55.67164179104478	0.0	0.0	4.477611942098507	19.402985074826866	6.46265667164178
4	1951	11.12.1.194805194805195	64.93506493506493	0.0	0.0	5.194805194805195	18.1818181818181	6.493506493506493
5	1952	11.12.1.2105263157894735	54.2105263157894735	0.0	0.0	4.2105263157894735	17.894736842105264	6.473684210526317
6	1953	11.12.1.669724770642202	62.38532110091744	0.0	0.0	5.487155963302752	18.34862385321101	6.174311926605505
7	1954	11.12.1.2841176470588235	56.81764705882353	1.4705882352941175	0.0	4.411764705882353	24.284705882352942	6.10294117647058822
8	1955	11.12.1.63167847368421	51.63167847368421	1.63167847368421	0.0	4.163167847368421	28.28473684210524	6.868421052631579
9	1956	11.12.1.450980392156863	47.549019607843135	0.0	0.0	3.392156862745098	32.84313725490196	6.313725490196079
10	1957	11.12.1.3255813953488373	47.44186046511628	0.0	0.0	3.3255813953488373	32.55813953488372	6.767441860465116
11	1958	11.12.1.6116609364162	52.0231213873823	0.0	0.0	5.647389843903605	26.878612716730005	6.53757225433528
12	1959	11.12.1.252032303252035	52.30352303252035	0.0	0.0	2.186021680216802	26.2872627262873	6.75609756097561
13	1960	11.12.1.1578947368421053	52.62157894736842	0.0	0.0	2.1052631578947367	26.31578947368421	6.736842105263158
14	1961	11.12.1.125	52.86469333333333	0.0	0.0	2.869693333333334	30.20833333333333	6.635416666666666
15	1962	11.12.1.022670025188917	52.39294710327456	0.0	0.0	2.0151133501259446	26.952141057934508	6.82367758186398
16	1963	11.12.1.865666624630642	51.47782521231527	1.8776433497536946	0.0	2.86502463041872	27.832512315270936	6.09852167487685
17	1964	11.12.1.8169014084507045	50.10422632112607	1.8776433497536946	0.0	2.838028169074009	26.6364976262164	6.32638497625262
18	1965	11.12.1.8761061949892053	49.336283185840706	1.7899115044247788	0.0	3.309734513274365	30.30973451327434	6.398230088495975
19	1966	11.12.1.073736918032787	49.18032786885246	1.8442822950819672	0.0	5.122950819672131	30.122950819672127	6.85573704918032
20	1967	11.12.1.174603180317844	49.2063462063462	1.984126984126984	0.0	4.9603174603174605	29.96031746031746	6.10714285714285714
21	1968	11.12.1.43511450381674	49.23664122137404	1.9083969465648856	0.0	4.961932061068702	29.961932061068705	6.49618320610687
22	1969	11.12.1.27477775133215	49.023095814564	1.8538168277087036	0.0	4.7857371225577266	29.8401206591474	6.112433392398965
23	1970	11.12.1.105590021118013	47.82608695652171	0.0	0.0	4.658385093167702	31.67701863354037	6.10714285714285714
24	1971	11.12.1.1854876258992804	47.3381294864298	0.0	0.0	2.158273381294862	31.942446043165468	6.105397122302159
25	1972	11.12.1.849061982198391	47.19034825246911	0.0	0.0	4.691680090428955	27.11581769437	6.72386058812332
26	1973	11.12.1.933673469387755	46.045918367346935	0.0	0.0	4.719387755102041	33.29081632653062	6.96938775510204
27	1974	11.12.1.784503631981259	45.39951573849879	0.0	0.0	4.842615012106657	34.14043583535109	6.10774818401937045
28	1975	11.12.1.22417701160406	45.1664018161160406	0.0	0.0	4.65380244671623165	34.27022144682974	6.1135073779766807

The screenshot shows a 'Household Summary' report. The table displays data for different household types and population groups across three distance ranges: 1(mile), 1(3mile), and 1(5mile). The columns are labeled: Count, Percent, Count, Percent, Count, Percent.

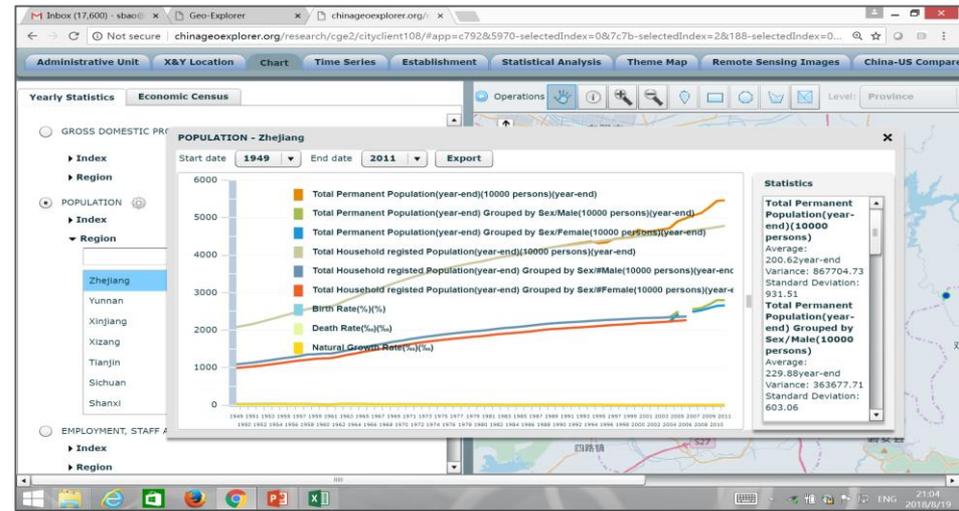
	1(mile)		1(3mile)		1(5mile)	
	Count	Percent	Count	Percent	Count	Percent
Total Households	4,614	100.0 %	79,130	100.0 %	246,702	100.0 %
Family Households	4,166	90.3 %	71,785	90.7 %	222,818	90.3 %
Collective Households	447	9.7 %	7,344	9.3 %	23,884	9.7 %
Total Population	14,043	100.0 %	229,353	100.0 %	714,080	100.0 %
Agricultural Population	8,124	57.9 %	91,913	40.1 %	279,878	39.2 %
Non-Agricultural Population	5,918	42.1 %	137,439	59.9 %	434,202	60.8 %
Population in Family Households	11,388	80.4 %	191,103	82.7 %	600,565	83.5 %
Population in Collective Households	2,778	19.6 %	40,019	17.3 %	118,916	16.5 %
Average Size: Family Households	2		2		2	
Sex Ratio: Family Households	106		104		113	
Sex Ratio: Collective Households	293		252		203	
Literacy						
	1(mile)	1(3mile)	1(mile)	1(3mile)	1(mile)	1(3mile)
	Count	Percent	Count	Percent	Count	Percent

Tests of Spatial Trends

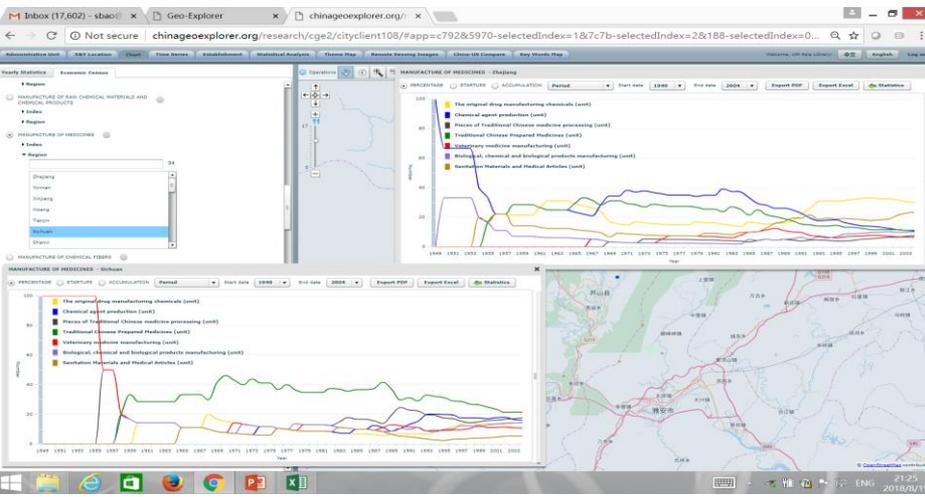
GDP: Zhejiang/Xinjiang/Tibet



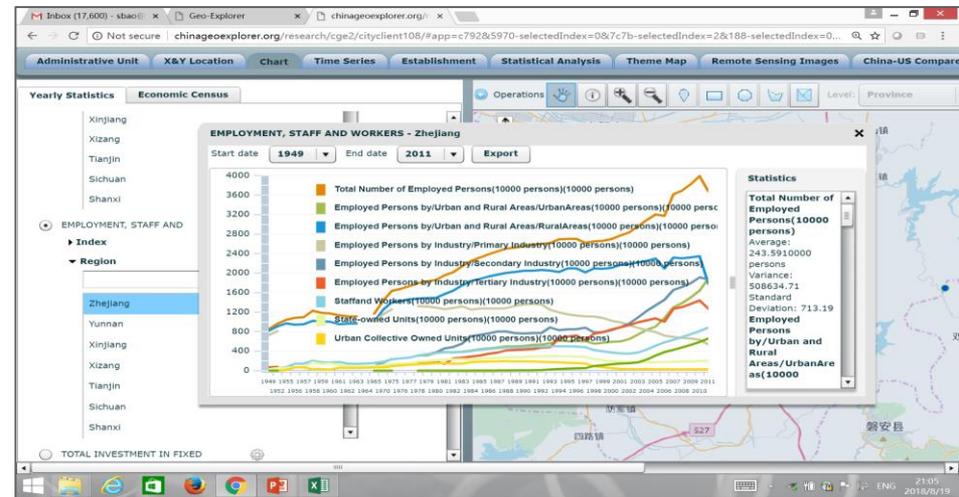
Population



Manufacture of Medicine: Zhejiang & Sichuan



Employment



Tests of Inter and Intra-Regional Similarities

Comparative Reports between Groups

Page 1 of 3

	Group 1		Group 2		Group 3		Group 4		Group 5	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Total Households	32,071,061	100.0 %	21,246,966	100.0 %	72,426,097	100.0 %	132,418,970	100.0 %	93,070,604	100.0 %
Family Households	31,670,458	98.8 %	20,767,702	97.7 %	70,952,313	98.0 %	129,268,671	97.6 %	87,832,053	94.4 %
Collective Households	400,603	1.2 %	479,264	2.3 %	1,473,784	2.0 %	3,150,299	2.4 %	5,238,551	5.6 %
Total Population	104,109,254	100.0 %	79,101,940	100.0 %	256,157,701	100.0 %	460,752,658	100.0 %	333,681,463	100.0 %
Agricultural Population	56,543,142	54.3 %	57,694,613	72.9 %	207,154,028	80.9 %	353,326,328	76.7 %	253,998,118	76.1 %
Non-Agricultural Population	47,566,112	45.7 %	21,407,327	27.1 %	49,003,673	19.1 %	107,426,330	23.3 %	79,683,345	23.9 %
Population in Family Households	102,132,164									
Population in Collective Households	2,732,015									
Average Size: Family Households	3									
Sex Ratio: Family Households	103									
Sex Ratio: Collective Households	166									

Literacy	
	Group 1
	Count
Total Population 15 and Over	85,554,268
Illiterate Population - Total	5,100,563
Illiterate Population - Males	1,447,980
Illiterate Population - Females	3,652,583

Comparative Reports within Groups

Demographic Comparison Report (2000)

Date: 19/08/2018

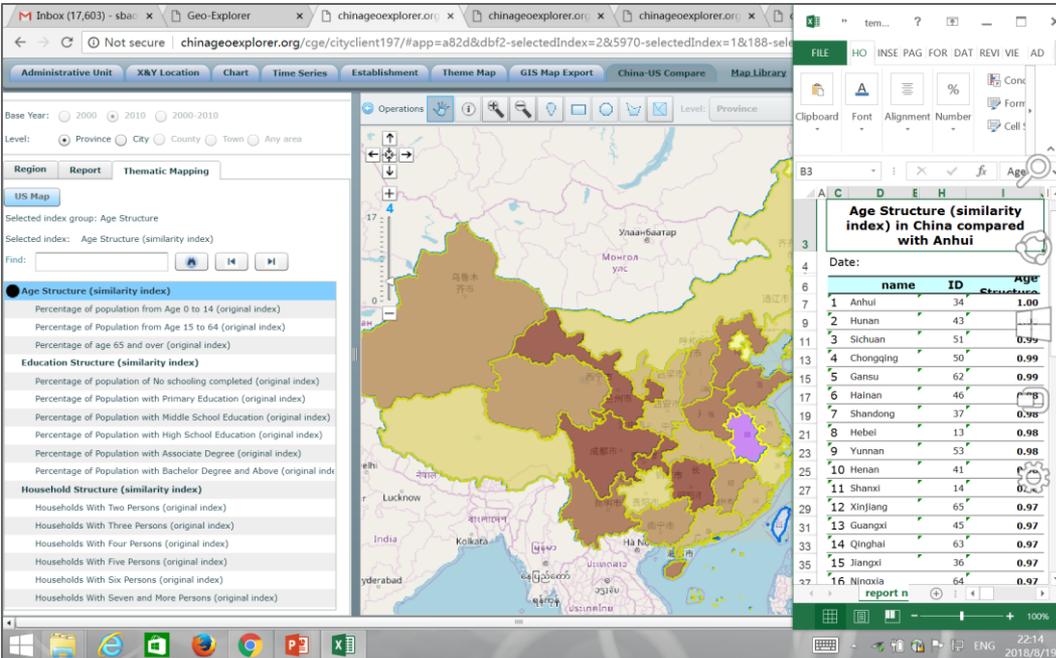
Selection: Group 1(3): liaoning,jilin,heilongjiang

Household Summary

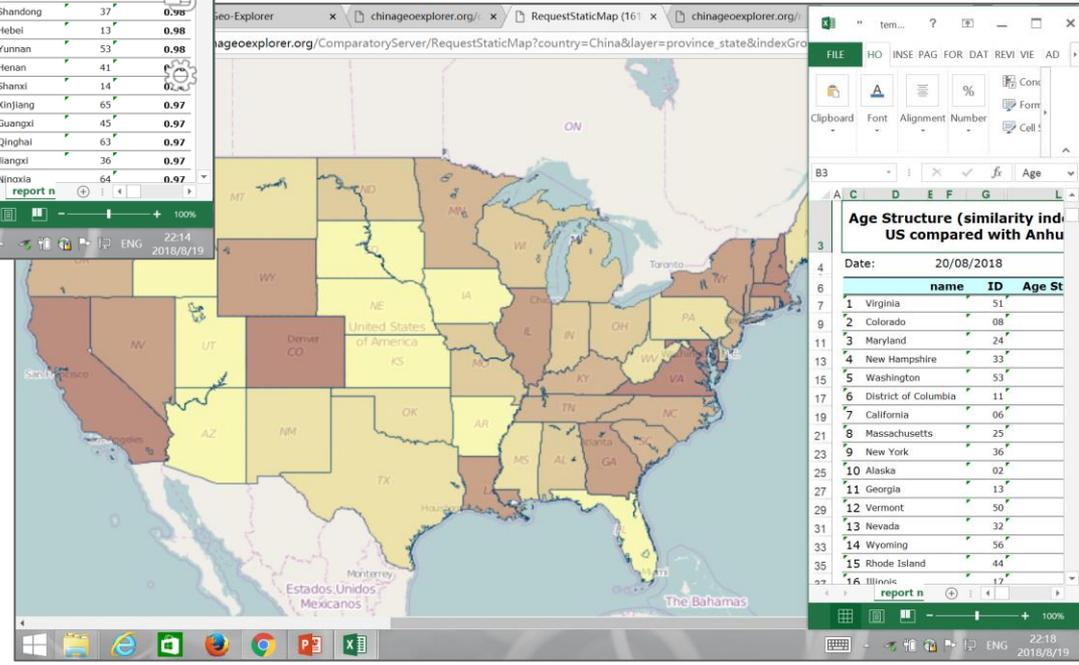
	liaoning		jilin		heilongjiang	
	Count	Percent	Count	Percent	Count	Percent
Total Households	13,046,524	100.0 %	7,953,615	100.0 %	11,070,922	100.0 %
Family Households	12,866,262	98.6 %	7,848,446	98.7 %	10,955,750	99.0 %
Collective Households	180,262	1.4 %	105,169	1.3 %	115,172	1.0 %
Total Population	41,553,243	100.0 %	26,591,484	100.0 %	35,964,527	100.0 %
Agricultural Population	22,462,770	54.1 %	15,076,240	56.7 %	19,004,132	52.8 %
Non-Agricultural Population	19,090,473	45.9 %	11,515,244	43.3 %	16,960,395	47.2 %
Population in Family Households	40,597,750	97.1 %	26,076,948	97.3 %	35,457,466	97.8 %
Population in Collective Households	1,226,662	2.9 %	725,243	2.7 %	780,110	2.2 %
Average Size: Family Households	3		3		3	
Sex Ratio: Family Households	102		103		103	
Sex Ratio: Collective Households	171		168		159	

Tests of Regional Similarities and Dissimilarities

Similarity Index between Anhui and Other Provinces of China



Similarity Index between Anhui and States of the US



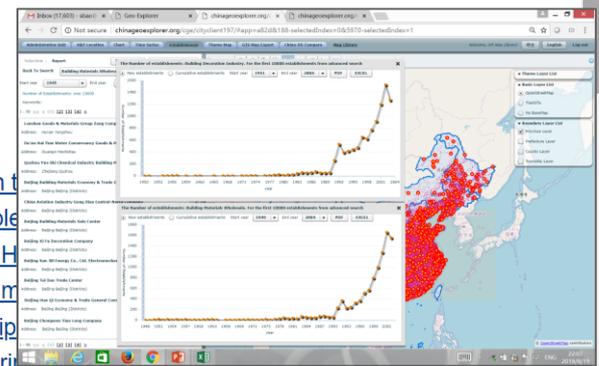
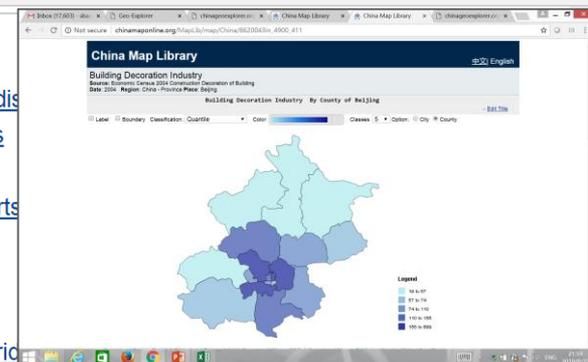
Tests of Industrial Linkages by Space and Time

Rank of Related Industries 2004 By Spatial Relevance

- 1 [Other machinery and equipment rental](#)
 - 2 [Building Materials Wholesale](#)
 - 3 [Other cleaning services](#)
 - 4 [Construction and installation industry](#)
 - 5 [Cars, motorbikes Maintenance](#)
 - 6 [Other food wholesale](#)
 - 7 [Other interior decoration materials retail](#)
 - 8 [Automotive retail](#)
 - 9 [Flower retail](#)
 - 10 [Cosmetics and health supplies wholesale](#)
 - 11 [Management of urban greening](#)
 - 12 [Paint retail](#)
 - 13 [Real estate development and management](#)
 - 14 [Hardware retail](#)
 - 15 [Retail of Auto Parts and Accessories](#)
 - 16 [Semiconductor manufacturing dis](#)
 - 17 [Repair of household appliances](#)
 - 18 [Fruit and vegetables wholesale](#)
 - 19 [Cars, motorbikes and spare parts](#)
 - 20 [Laundry and dyeing Services](#)
 - 21 [Building cleaning services](#)
 - 22 [Retail](#)
 - 23 [Railways, roads, tunnels and brid](#)
 - 24 [Metal and metal ore wholesale](#)
 - 25 [Taxi passenger](#)
 - 26 [Kitchen, bathroom appliances and daily groceries wholesale](#)
 - 27 [Textiles, knitwear and raw materials wholesale](#)
 - 28 [Western medicine wholesale](#)
 - 29 [Other cultures and office machinery manufacturing](#)
 - 30 [Furniture retail](#)
- [Export All](#)

Rank of Related Industries 2004 By Temporal Relevance (Startups)

- 1 [Manufacture of metal doors and windows](#)
- 2 [Industrial Automation System device manufacturing](#)
- 3 [Property management](#)
- 4 [Project management services](#)
- 5 [Paint manufacturing](#)
- 6 [Retail of Auto Parts and Accessories](#)
- 7 [Electronic components and parts manufacturing](#)
- 8 [Supply with General Instruments and other equipment manufacturing](#)
- 9 [Transport agency services](#)
- 10 [Environmental Pollution Prevention Equipment](#)
- 11 [Other real estate activities](#)
- 12 [Other real estate activities](#)
- 13 [Other real estate activities](#)
- 14 [Other real estate activities](#)
- 15 [Other real estate activities](#)
- 16 [Wood furniture manufacturing](#)
- 17 [Other activities not specified in t](#)
- 18 [Processing crude oil and petrole](#)
- 19 [Manufacture of Nutritious and H](#)
- 20 [Power electronic components m](#)
- 21 [Distribution switch control equip](#)
- 22 [Textile and apparel manufacturing](#)
- 23 [Refrigeration and air-conditioning equipment manufacturing](#)
- 24 [Hardware retail](#)
- 25 [Other real estate activities](#)



Panel Data for Spatial Modeling

Time-series Report

Date: 19/08/2018
 Selection: (4 selected) zhejiang , tianjin , yunnan , xjiang

Original Variables

Spatially Weighted Variables

	name	year	Gross Domestic	Primary Industry	Secondary Industry	Gross Domestic	Primary Industry	Secondary Industry
1	tianjin	2009	7,521.9	128.8	3,987.8	15,159.8	1,324.7	7,640.2
2	tianjin	2010	9,224.5	145.6	4,840.2	18,081.4	1,526.9	9,226.2
3	tianjin	2006	4,344.3	118.2	2,488.3	9,570.7	918.0	4,939.7
4	tianjin	2007	5,050.4	110.2	2,892.5	11,455.6	1,050.3	5,902.5
5	tianjin	2008	6,354.4	122.6	3,821.1	13,626.3	1,241.1	7,117.9
6	tianjin	2011	11,307.3	159.7	5,928.3	21,441.7	1,762.1	10,970.9
7	zhejiang	2010	27,722.3	1,360.6	14,297.9	17,809.7	1,551.2	8,940.6
8	zhejiang	2011	32,318.8	1,583.0	16,555.6	21,163.0	1,798.8	10,653.4
9	zhejiang	2006	15,742.5	925.1	8,509.6	9,421.9	946.0	4,764.4
10	zhejiang	2007	18,780.4	986.0	10,148.5	11,259.4	1,083.4	5,669.9
11	zhejiang	2008	21,486.9	1,095.4	11,580.3	13,348.6	1,287.2	6,812.6
12	zhejiang	2009	22,990.3	1,163.1	11,908.5	14,943.3	1,347.8	7,377.5
13	yunnan	2010	7,224.2	1,108.4	3,223.5	12,753.8	1,372.5	6,304.8
14	yunnan	2011	8,893.1	1,411.0	3,780.3	15,398.3	1,639.1	7,734.8
15	yunnan	2006	3,981.3	749.8	1,712.6	6,481.9	835.0	3,042.2
16	yunnan	2007	4,741.3	837.4	2,051.1	7,801.2	985.9	3,683.3
17	yunnan	2008	5,700.1	1,020.9	2,451.1	9,276.7	1,187.1	4,471.8
18	yunnan	2009	6,169.8	1,067.6	2,582.5	10,583.4	1,190.0	5,030.8
19	xinjiang	2008	4,203.4	691.1	2,086.7	678.7	83.0	322.6
20	xinjiang	2006	3,045.3	527.8	1,459.3	465.3	60.3	205.6
21	xinjiang	2007	3,523.2	628.7	1,647.5	562.9	69.2	258.1
22	xinjiang	2009	4,277.1	759.7	1,929.6	761.3	85.6	356.0
23	xinjiang	2010	5,437.5	1,078.6	2,592.2	929.0	101.8	454.3
24	xinjiang	2011	6,610.1	1,139.0	3,225.9	1,138.1	114.8	592.0

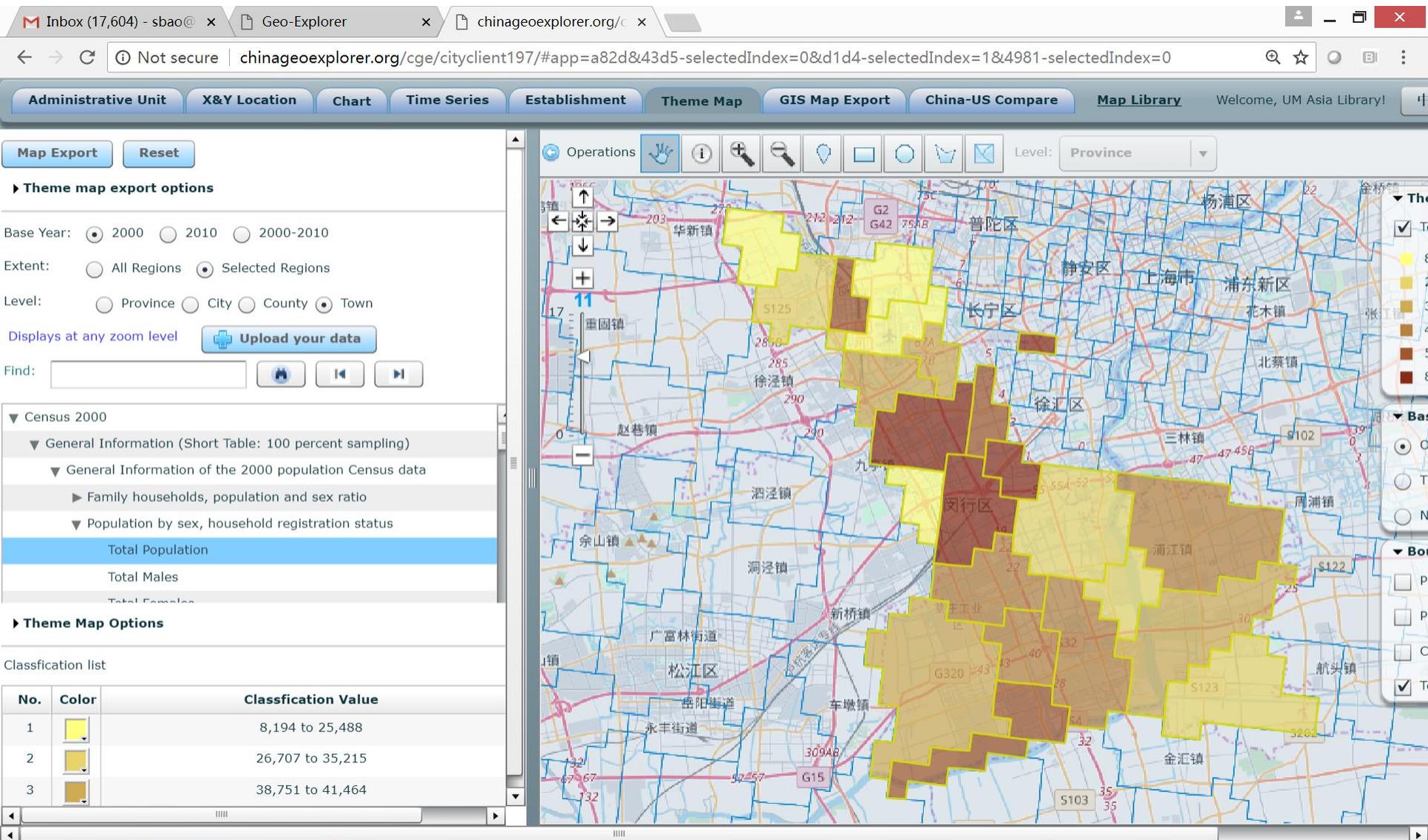
Case Study: Risk Assessment of Wujing Thermal Power Plant, Shanghai, China

The screenshot shows a web browser window displaying a GIS application. The browser address bar shows the URL: chinageoexplorer.org/cge/cityclient197/#. The application interface includes a top navigation bar with tabs for Administrative Unit, X&Y Location, Chart, Time Series, Establishment, Theme Map, GIS Map Export, China-US Compare, and Map Library. Below this is a toolbar with various GIS tools and a 'Level: Province' dropdown menu. The main map area shows a detailed view of Shanghai, China, with numerous red and green markers indicating power plant locations. A red arrow points to a specific location on the map. A 'Detailed Information' window is open, displaying the following data:

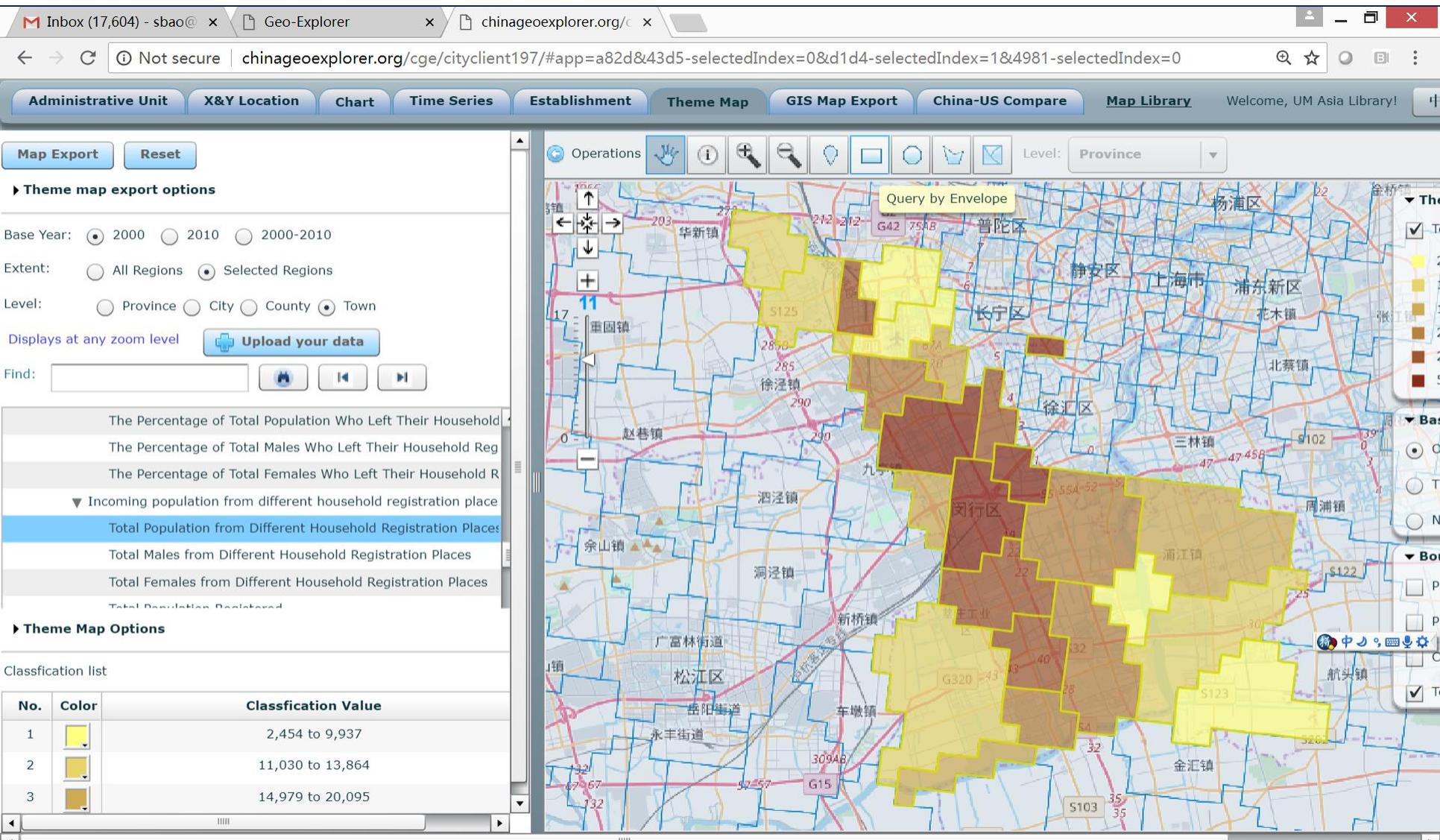
name:	Shanghai Wu Jing Power Co., Ltd.
Responsible person:	赵静雄
Type:	Electric Power . Heating Power De Production
ZIP:	200241
Address:	Shanghai Minhang Long Wu Lu 5060Hao
Telephone:	021-64500150
Ownership:	State-own only
Starting year:	1991
Revenue:	100000-150000
Employee Count:	500-999

At the bottom of the 'Detailed Information' window, there are links for 'Google', 'Baidu', and 'Wanfang Data', along with buttons for 'Go to Location Selection' and 'Close'. The left sidebar of the application shows a search filter for 'Thermal power' and a list of search results, including 'Shanghai Wu Jing Power Co., Ltd.' and other power companies. The bottom of the screen shows the Windows taskbar with various application icons and the system clock displaying 22:45 on 2018/8/19.

Population by Township of Minhang



Migration from Other Places



Location Analysis

Inbox (17,603) - sbao@ x Geo-Explorer x chinageoexplorer.org/c x chinageoexplorer.org/S x

Not secure chinageoexplorer.org/cge/cityclient197/#app=a82d&43d5-selectedIndex=0&d1d4-selectedIndex=2&4981-selectedIndex=0

Administrative Unit X&Y Location Chart Time Series Establishment Theme Map GIS Map Export China-US Compare Map Library Welcome, UM Asia Library!

Location Customized Report Standard Report

HTML PDF Excel RTF ODT

- Economic Summary Report
- Employment Summary Report
- Household Summary Report
- Housing Detail Summary Report
- Landuse Classification Summary Report
- Migration Summary Report
- Race Ethnicity Summary Report

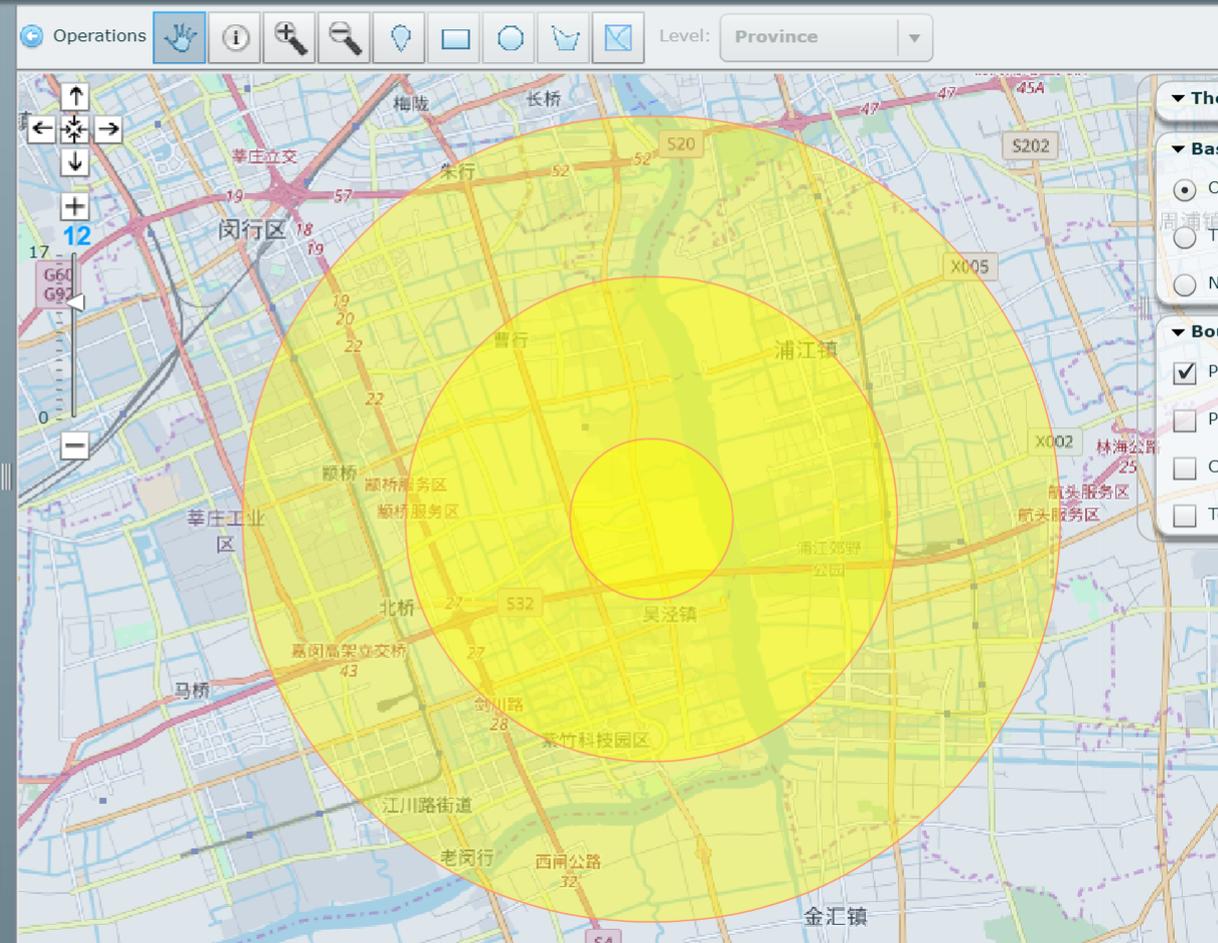
Compare Report

- Age Detail Comparison
- Demographic Comparison Report
- Education Comparison Report
- Economic Comparison Report
- Employment Comparison Report

Report Options

Selection Detail

Selection count: 1
Ranges: 1mile 3mile 5mile
Detail: 200241(Lat:31.062 Lon:121.459)



Demographic Report by Spatial Ranges

Demographic Comparison Report (2000)

Date: 20/08/2018
Selection: (1 places selected) 200241(lat: 31.06 lon:121.46)
Ranges: 1mile 3mile 5mile

Household Summary

	200241(1mile)		200241(3mile)		200241(5mile)	
	Count	Percent	Count	Percent	Count	Percent
Total Households	6,521	100.0 %	35,693	100.0 %	113,743	100.0 %
Family Households	5,941	91.1 %	32,069	89.8 %	103,476	91.0 %
Collective Households	580	8.9 %	3,623	10.2 %	10,267	9.0 %
Total Population	18,638	100.0 %	110,077	100.0 %	340,905	100.0 %
Agricultural Population	5,577	29.9 %	68,252	62.0 %	187,363	55.0 %
Non-Agricultural Population	13,061	70.1 %	41,825	38.0 %	153,541	45.0 %
Population in Family Households	16,079	85.6 %	91,714	82.5 %	290,608	84.5 %
Population in Collective Households	2,695	14.4 %	19,442	17.5 %	53,246	15.5 %

Business of Power Industries by Spatial Ranges

Inbox (17,603) - sbao@ x Geo-Explorer x chinageoexplorer.org/c x chinageoexplorer.org/S x
Not secure | chinageoexplorer.org/SIServer3//tempReport/7005400c-4c39-4ada-837d-4b1eb9dc9a33/temp_report.html

Compare Report

Date: 20/08/2018
Selection: (1 places selected) 200241(lat: 31.06 lon:121.46)
Ranges: 1mile 3mile 5mile

	200241(1mile)	200241(3mile)	200241(5mile)
2008 Thermal power	2	2	2
2008 Hydraulic Power	0	0	0
2008 Nuclear Power	0	0	0
2008 Other forms of energy generation	1	1	1
2008 Power supply	0	0	0
2008 Heat production and supply	1	3	3
2008 Gas production and supply	1	3	3
2008 Water production and supply	0	2	3
2008 Sewage treatment and recycling	0	0	0
2008 Other water treatment, utilization and distribution	0	1	1

Correlations between Thermal Power and Other Power Plants by Space and Time

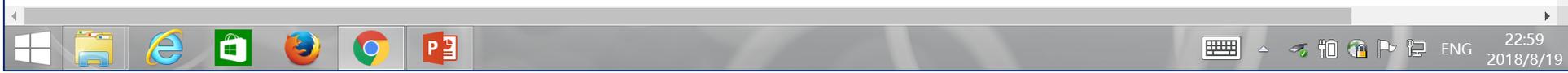


Rank of Related Industries 2004 By Spatial Relevance

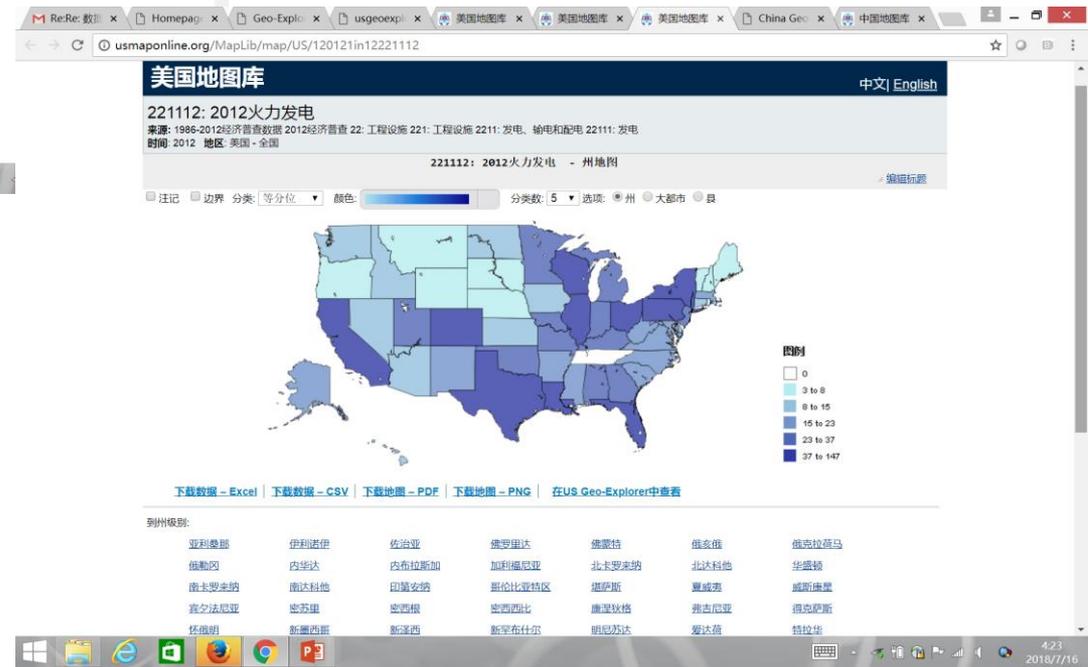
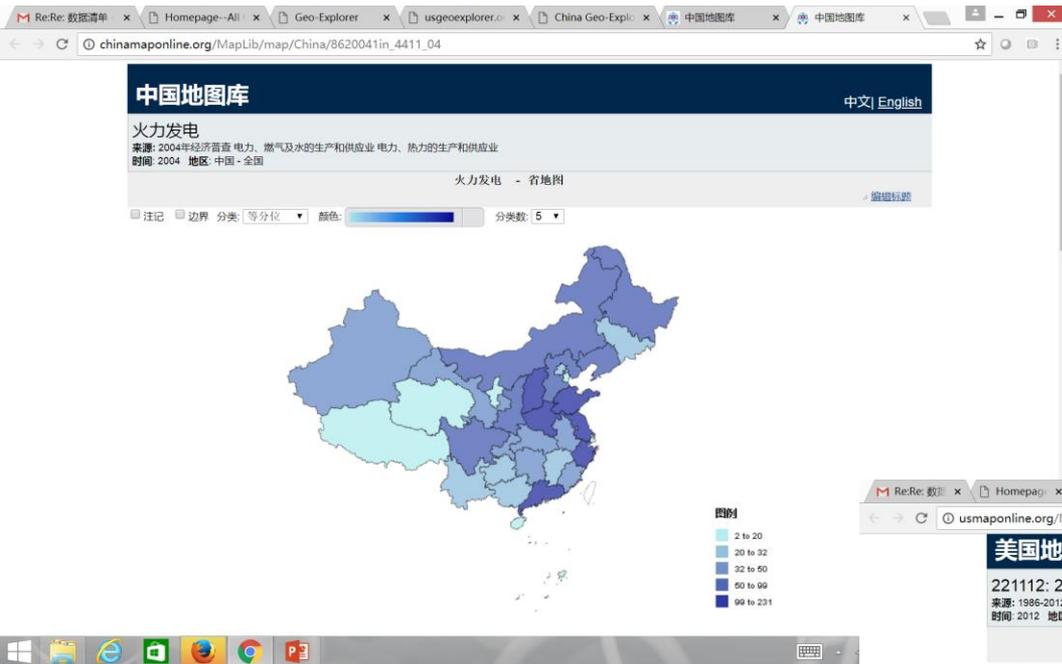
- | | |
|--|--|
| 1 Acrylic fiber manufacturing | 16 Road transport of goods |
| 2 Oil refineries and chemical production equipment for manufacturing | 17 Special ceramic products manufacturing |
| 3 Wholesale of coal and its products | 18 Mechanical Parts Manufacture and Equipment Repair |
| 4 Other rubber products manufacturing | 19 Plastic plates, tubes, profiles of manufacturing |
| 5 Other special chemical products manufacturing | 20 Safety, fire metal products manufacturing |
| 6 Graphite and carbon products manufacturing | 21 General Hospital |
| 7 Other Daily-used Chemical Products | 22 Manufacture of metal doors and windows |
| 8 Wholesale of oil and its products | 23 Metal manufacturing pressure vessels |
| 9 Chemical reagents and additives manufacturing | 24 Motor vehicle manufacturing |
| 10 Manufacture of Instant Noodle and Other Convenient Foods | 25 And pipe-line construction |
| 11 Toy manufacturing | 26 Wholesale of renewable materials recovery |
| 12 Other synthetic materials | 27 Coal products manufacturing |
| 13 Building Materials Wholesale | 28 Other machinery and equipment rental |
| 14 Basic geological exploration | 29 Other Daily-used Plastic Products |
| 15 Manufacture of Equipments for Open Amusement Park | 30 Heat-insulating and Soundproof Materials |
- [Export All](#)

Rank of Related Industries 2004 By Temporal Relevance (Startups)

- | | |
|---|--|
| 1 Manufacture of Liquor | 16 Printing of Packaging and Upholstering |
| 2 Taxi passenger | 17 Communications terminal equipment manufacturing |
| 3 Religious organizations | 18 Primary forms of plastics and synthetic resin manufacturing |
| 4 Other support activities for road transport | 19 Gas compression machinery manufacturing |



Spatial Distribution of Thermal Power Plants in the US and China



Future Directions: Big Data Integration

Mobile facilities

- Cell phones
- Mobile tablets

APPS

- QQ, WeChat, Facebook, Twitter, Tumblr etc.

Transportation network

- Bus
- Train
- Bicycle

Traditional Business systems:

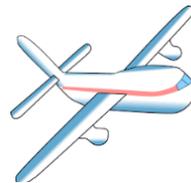
- Data produced by Public Agencies
- Data produced by businesses

Internet of Things:

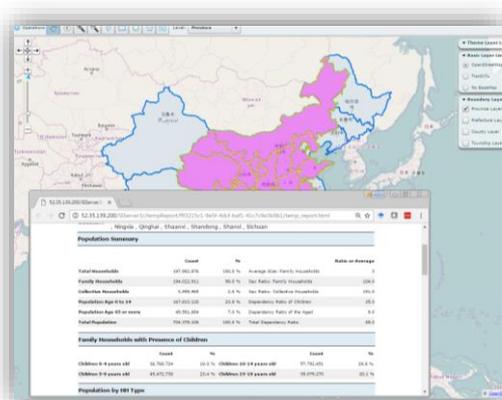
- Data from sensors
- Data from online shopping

Features of Big Data:

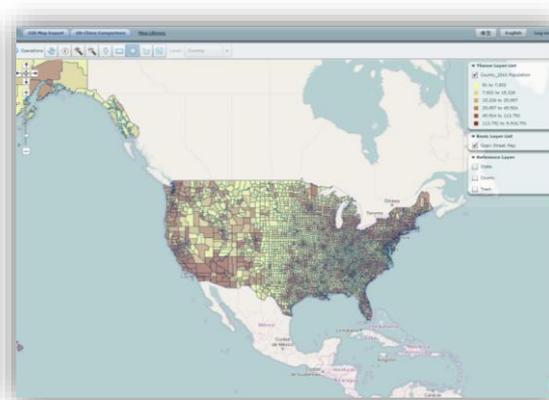
- Multi-sources
- Space and time
- Classifications
- Complex structure



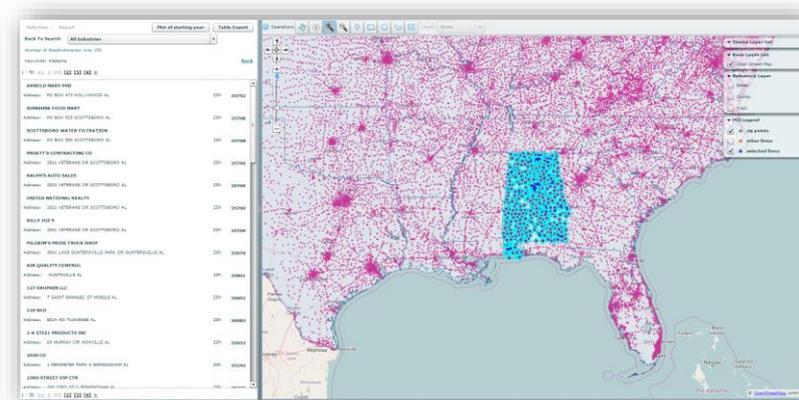
Geo-Explorers: Integrated Data Analysis



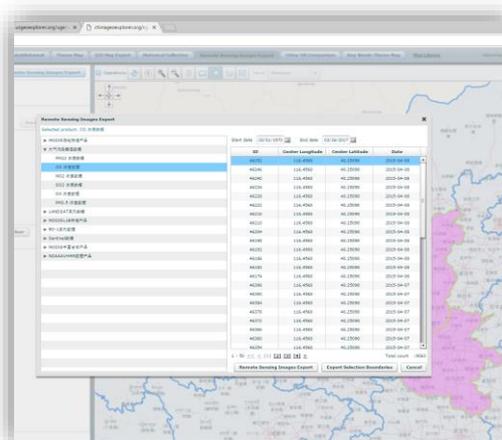
Reporting



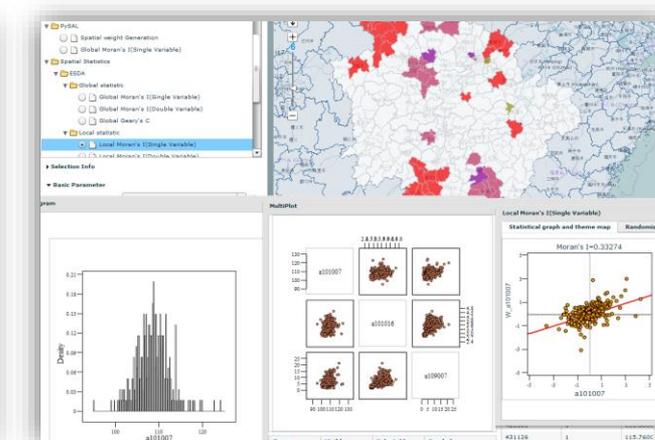
Thematic Maps



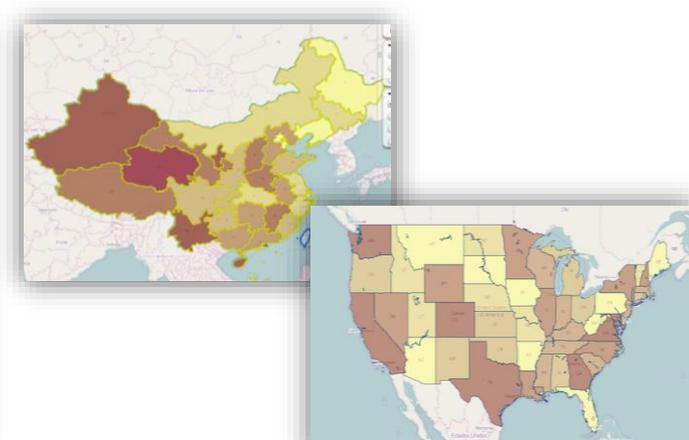
Establishment search



Remote Sensing Data



Exploratory Spatial Data Analysis



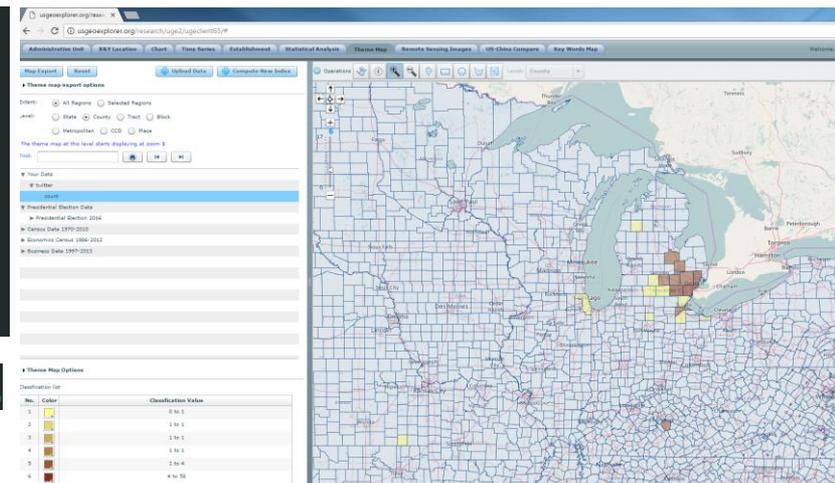
China-US Comparative analysis

Identifying Population Activities with Twitter Data

- ❑ Step 1: API Register
- ❑ Step 2: Search Twitter Data through Tweepy
- ❑ Step 3: Transform Twitter Data into GeoJson
- ❑ Step 4: Upload to GeoExplorer
- ❑ Step 5: Spatial analysis and visualization

<https://dev.twitter.com/overview/api/tweets>

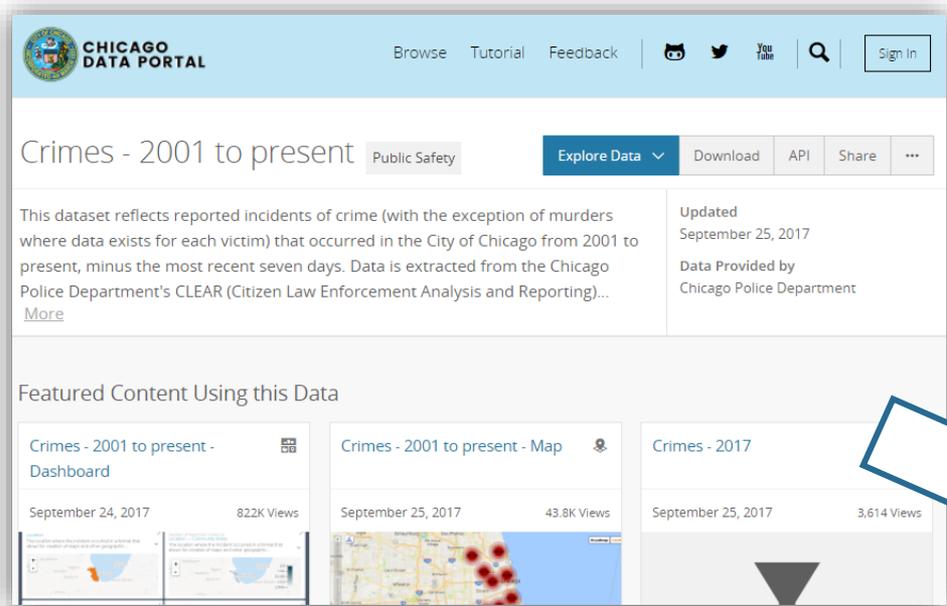
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      [-77.119759, 38.995548]  
    ]],  
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  },  
  "coordinates":  
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  },  
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}
```



Identifying Spatial Crime with Web Crawling

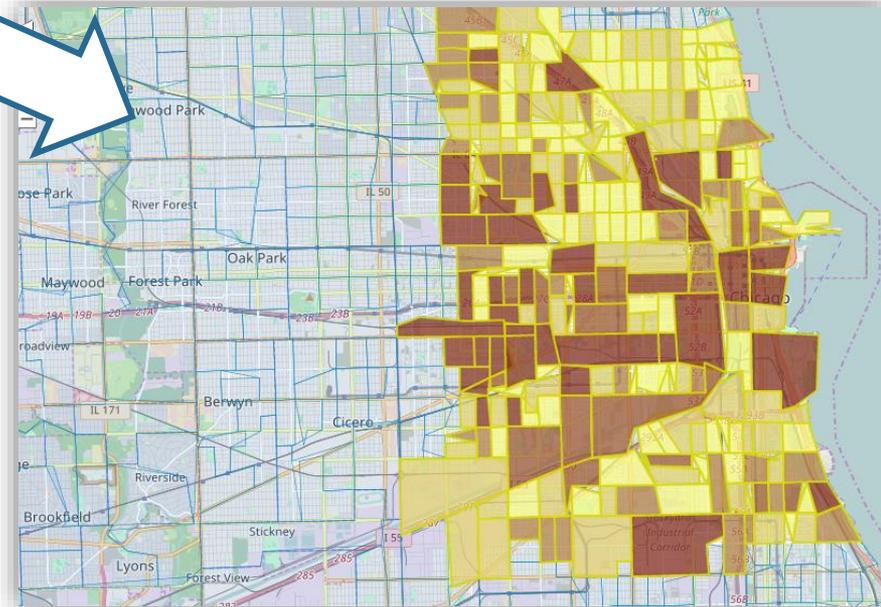
Open Government Data

<https://data.cityofchicago.org/>



The screenshot shows the Chicago Data Portal interface. At the top, there's a navigation bar with 'Browse', 'Tutorial', 'Feedback', and social media icons. The main content area is titled 'Crimes - 2001 to present' under the 'Public Safety' category. It includes an 'Explore Data' dropdown menu and buttons for 'Download', 'API', 'Share', and 'More'. A description states: 'This dataset reflects reported incidents of crime (with the exception of murders where data exists for each victim) that occurred in the City of Chicago from 2001 to present, minus the most recent seven days. Data is extracted from the Chicago Police Department's CLEAR (Citizen Law Enforcement Analysis and Reporting)... [More](#)'. Metadata includes 'Updated: September 25, 2017' and 'Data Provided by: Chicago Police Department'. Below this, a 'Featured Content Using this Data' section displays three items: 'Crimes - 2001 to present - Dashboard' (822K Views), 'Crimes - 2001 to present - Map' (43.8K Views), and 'Crimes - 2017' (3,614 Views). A large white arrow with a blue outline points from the 'Crimes - 2017' item towards the crime map on the right.

Crime Map by Tract



Big Data Integration – Web Search

Keyword: 伊斯兰教

Map

名称	基督教_雅虎	佛教_雅虎	道教_雅虎	伊斯兰教_雅虎
1 北京市	289,000	1,060,000	217,000	126,000
2 上海市	252,000	921,000	169,000	89,100
3 上海市	252,000	921,000	169,000	89,100
4 内蒙古	185,000	299,000	74,800	93,100
5 西藏	175,000	308,000	97,600	61,700
6 山东省	168,000	430,000	99,600	59,600
7 天津市	119,000	430,000	89,500	45,800
8 广东省	116,000	363,000	94,200	50,600
9 四川省	111,000	335,000	108,000	51,700
10 新疆	110,000	412,000	82,500	106,000
11 浙江省	109,000	400,000	92,800	34,800
12 江苏省	99,300	316,000	82,800	46,000
13 重庆市	95,600	401,000	77,100	50,200
14 河南省	88,400	364,000	100,000	51,700
15 福建省	85,100	283,000	85,900	38,000
16 湖南省	80,800	268,000	82,300	48,300
17 山西省	74,100	267,000	81,100	34,700
18 河北省	71,800	285,000	80,000	43,000
19 湖北省	70,100	208,000	87,300	37,500
20 江西省	70,000	284,000	87,200	36,500
21 云南省	68,900	330,000	65,200	44,900
22 陕西省	66,200	221,000	72,600	37,300
23 辽宁省	62,300	168,000	48,500	39,000
24 吉林省	61,400	163,000	45,400	30,300
25 贵州省	57,900	281,000	52,800	39,300
26 广西省	57,800	253,000	51,200	35,700
27 海南省	56,800	190,000	51,000	31,200
28 黑龙江省	53,600	143,000	42,900	30,200
29 甘肃省	51,900	167,000	48,100	36,100
30 青海省	47,400	175,000	39,000	33,600

Results from keyword search:

- Non-structural data -> Structural data
- Non-spatial data -> Spatial data
- Text data -> Numeric data
- Unlimited keywords -> Unlimited data
- Complimentary data to baseline data

	基督教_雅虎	佛教_雅虎	道教_雅虎	伊斯兰教_雅虎	蒙古族人口小计	回族人口小计
基督教_雅虎	1.0000	0.9017	0.8730	0.8539	0.2402	-0.2323
佛教_雅虎	0.9017	1.0000	0.8029	0.7753	-0.0707	-0.2482
道教_雅虎	0.8730	0.8029	1.0000	0.7445	-0.0651	-0.2685
伊斯兰教_雅虎	0.8539	0.7753	0.7445	1.0000	0.3377	-0.0241
蒙古族人口小计	0.2402	-0.0707	-0.0651	0.3377	1.0000	-0.0364
回族人口小计	-0.2323	-0.2482	-0.2685	-0.0241	-0.0364	1.0000

Correlations

<http://china-data-online.com>

Contact

China Data Institute

office@chinadatacenter.net

(734)680-3943