Space Back to Humanism: Research on the Development Trend and Coupling Characteristics of "Industry-City-People" in London

Ran Yaolin, Wang Bingjie, Xiong Wei, Luo Lei
Wuhan Land Use and Urban Spatial Planning Research Center (WLSP), 55 Sanyang Road, Jiang'an District, Wuhan, Hubei, China; 430014
luolei0607@126.com

Abstract. Human-oriented development is an important issue in the world, and it also has become an important driving force for urban development and industrial upgrading in the world’s major cities. So, the paper takes 33 administrative districts of London as the research object, through judging the current development trend and coupling analysis characteristics of industry, city and people in London, hoping to provide some references for the future upgrade and development of large cities. This paper constructs a human-oriented index system about the development of London’s industry, city and people, and comprehensively evaluating the degree of industrial development, urbanization and people development of each administrative district of London by SPSS principal component analysis, while using the physical coupling coordination degree model to analyse the characteristics of the coupling development of London’s industry, city and people. It is found that London’s industrial development has the characteristics of central agglomeration and development in the direction of west, northwest and southeast. While city development also has the characteristics of central agglomeration, and it is developing towards the southwest and southeast. However, the characteristics of central agglomeration of human development are not obvious. It is developing along the south bank of the Thames and southwest of London. In addition, the coupling results of industry, city, and people systems have prominent functional hierarchy characteristics, which are obviously related to the layout of urban industrial function value areas. Finally, the paper summarizes the revelations for the development of major cities.

1. introduction
In the 《New Urban Agenda》 [1] of the United Nations Habitat III, in order to meet the challenges of economic and cultural activities, environment and housing, infrastructure, health and safety brought about by the growth of the world population in the future, The idea of human settlements that put forward by the new urban agenda hopes to create safety guarantees for community development on human development, increase social equality and public participation, and use urbanization to achieve structural transformation, high productivity, and high value-added activities and resources in industrial economic growth Efficiency, sustainable growth, fulfilling regional functions across administrative boundaries in the development of urban space, increasing investment in infrastructure and construction of high-quality public goods.
In addition, judging from the strategic planning of large cities in London and many other developed countries, in the next 30 years, the strategic goals of the development of foreign metropolises will also be guided by human needs. In the 2016 edition of the Greater London Strategic Plan [2], the vision of "Excellent Global City" was proposed, which listed the development goals of a community space with diverse prosperity, safety and convenience. In the 2049 strategic plan of the New York metropolitan area [3], people-oriented goals, such as reducing differences between different classes and races, increasing life expectancy, reducing sickness, creating 2 million jobs, and increasing people’s real income, were proposed. In addition, in the 2040 strategic plan of the San Francisco Bay Area [4], restrictive goals such as climate protection, housing protection, healthy and safe communities, equality and justice, and the effectiveness of transportation systems are also set.

It can be seen that the future urban development in developed countries has begun to transform from urban space expansion and function unravelling to human health, safety and prosperity. Among them, employment and housing security, physical health and community safety, social equality and justice and other social needs-oriented social soft power have become the main goals of continuous attention in the development of world big cities. Therefore, the paper hopes to provide empirical ideas for the integration and upgrading of the "industry-city-people " in the world's large cities by studying the development trends and coordination characteristics of London's industry, city and people.

2. London "Industry-City-People" Development Trends
A new form of government which is called GLA has founded in London after the 21st century, and purposed 5 planning of London that all aim at sustainability, but they had different goals at different times, there are obvious spatial planning properties in the program of 2004 and 2008, in 2012, 2016, 2019 planning of London has increasingly attach importance to addressing human development issues such as population growth, population diversity, social equity, and social security, It can be said that the evolution process of these 5 editions of London planning has been traced from spatial planning to "people-oriented" in regional strategic planning. This is also closely related to the current development trend of "industry-city-people" in London.

2.1 Industrial Development
In the 19th and early 20th century, Manufacturing occupies the leading position in London, but today, the service industry, especially financial and business services, has become the leading industry in London. Financial and business services account for approximately 42% of the total exports of goods and services in London in recent years. At the same time, service industry employment accounts for about 85% of all jobs in the London service industry. Among them, only the financial sector accounts for one-third of service industry employment. In contrast, the manufacturing and construction industries employ 500,000 residents in the Greater London area, accounting for approximately 11% of the employed population in Greater London. At the same time, due to the high reliance on information technology, the rapid development of the financial and insurance industries has also driven the rapid development of related industries such as electronic communications, so the technology industry in London is also an important economic component.

In addition, London's healthcare industry, digital media industry and tourism have also brought a lot of economy and employment to London. In London, the number of people working in the media industry accounts for one-fifth of the total employed population. It also spawned a large number of creative industry companies, these companies are rapidly incubating under a good industrial background and financial environment. The high value-added and resource-efficient industries in London have formed a good ecosystem.

2.2 Urban development
The "London Plan" promulgated in 2004 became the first new type of regional planning in the UK because of its spatial planning characteristics and the 2008 edition of "London Planning" is a perfect
complement to the previous edition, in the 2004 and 2008 editions of the Greater London Development Strategic Plan, dominated by spatial planning, the sustainable development of space is its main focus. The 2004 edition of the London Plan aims to address issues such as traffic congestion, rising business costs, housing shortages, social polarization and environmental pollution, and the 2008 edition of the plan continues these policies, and strengthens the investment in the construction of infrastructure in terms of population and employment growth, focusing on the corresponding carrying capacity of the central area and the outer suburbs, and clearly addressing climate change as one of the core goals at the same time. In the subsequent version of the London plan, these spatial orientations are continued, and the focus on environmental quality, infrastructure, and housing supply is the main goal of urban space development in London since the 21st century.

2.3 People development

Under the ardent industrialization process of the 18th century, the industrialization of Britain did not take into account how people can survive in an orderly, healthy and safe way in the city. Therefore, it not only caused a series of public health problems such as smog and cholera but also has brought about social problems such as high crime rate and widening gap between rich and poor. Until the 19th century, the concept of British urbanization began to change, as a pioneer in urban planning, the United Kingdom has promulgated more than 40 laws and regulations on cities, and finally takes human needs as the ultimate goal of urban development. At the same time, London, which has consistently ranked first in the GAWC World City Rankings in recent years, is not only one of the global financial centres, but also a representative of the comprehensive strength of contemporary cities.

In the 2016 edition of the Greater London Strategic Plan, the concept was to lead the global quality of life as the goal, "global city of excellence“ was proposed. Among the six leading goals, it emphasizes the creation of a diverse, prosperous, safe and convenient neighbourhood community, the convenient accessibility between residents and jobs, and the global leadership in the quality of the living environment, demonstrating its sustainability goals towards humanity development-oriented evolution. Comprehensive social governance, safe and liveable communities and diversified housing supply are the main trends of people-oriented development in London.

3. Research methods and data sources

3.1 Research methods

The paper uses a coupled model to measure the degree of development and coordination of industries, cities and people in 33 administrative districts of London. The concept of coupling was first applied to the field of physics chemistry, etc. It refers to a benign dynamic association relationship between two or more systems or movement forms that interacts with each other to form a mutually dependent and coordinated promotion.

Therefore, this paper uses the coupling model to measure the degree of mutual cooperation among the internal factors of the three systems of industry, city and people development. By constructing an index evaluation system for each subsystem of the industry, city and people, and using SPSS principal component analysis to assign weights to the respective indexes of the three subsystems of the industry, city and people, and by calculating the comprehensive value of the index of each subsystem, it reflects the development degree of the industry, city and people, and then measure the synergy of the industry, city and people through the coupling degree. The algorithm is as follows:

$$C = \frac{(CX \times CY \times CZ)^{1/3}}{(CX + CY + CZ)^{1/3}}$$

(1)

X, Y, Z represents the respective evaluation values of industrialization, urbanization and people development subsystems.
However, the coupling is also divided into benign coupling and vicious coupling. When the level of industrialization, urbanization and people development is very low, it will also show a high degree of coupling. Therefore, the paper needs to use the coupling coordination degree to calculate the degree of positive coupling, algorithm as follows:

$$D = \sqrt{C \times T} = aX + \beta Y + \gamma Z$$

(2)

$\alpha, \beta, \gamma$ represent the proportion of the subsystems of industry, city and people in the whole system.

3.2 Data sources

The research area of this paper is 1580 square kilometers, including 32 municipalities and the City of London. In order to facilitate data statistics and observation, This article uses 33 administrative districts as spatial units to conduct statistics and analysis of industrial, urban and people development indicators, and research data is divided into three types - POI data, map data and statistical data (Table 1).

### Table 1. Data sources

| Data sources               | type of data | Data content                                                                 |
|----------------------------|--------------|------------------------------------------------------------------------------|
| OSM open source data       | point (POI)  | Social and cultural facilities (libraries, theaters, art centers), medical facilities (hospitals, health centers, pharmacies), educational institutions (primary and secondary schools, kindergartens, universities), productive services (banking, real estate, design, consulting, etc.), Transportation station (bus station, subway station) |
|                            | line (Vector)| Road network, rail transit network                                           |
|                            | surface (Vector)| Various types of land (commercial, park, green space, residential area)             |
| National Bureau of Statistics | Statistical data | GDP by Region, Number and Size of Enterprises in Various Industries by Region, Population by Region, Employment Rate, Housing Loans, Thousand Fires |
| UK Data Analysis Network   |              |                                                                              |

4. Human-oriented index system construction

Combining London's industrial development, city development and people's development trends and characteristics, in terms of industrial development, as an international metropolis, the industry measurement label should focus on the high-value sector industries that it needs to fulfil, such as financial services, insurance, professional Technology and other high-end producer services. In urban development, it is mainly based on infrastructure, public service products and environmental quality construction. In terms of people development, employment security, housing security, and community safety are the main factors. The construction of the indicator system and the evaluation values of the indicators are as follows (Table 2):

### Table 2. Industry-city-person index system

| First-level indicators | Secondary indicators | Third-level indicators               | property | Weight |
|------------------------|----------------------|--------------------------------------|----------|--------|
| Urban development      | surrounding          | Proportion of green space, parks and lakes | +        | 0.15   |
|                        |                      | air quality                          | +        | 0.06   |
| Public service products| Social and cultural undertaking density | (pieces/square kilometer) | +        | 0.20   |
| infrastructure         | Subway (pcs/km²)     | +                                    | 0.19     |
|                        | Road density (m²/ km²)| +                                    | 0.20     |
|                        | Density of bus stops | +                                    | 0.19     |
| Service industry       | Information and Communication Industry | +                                    | 0.19     |
5. London "Industry-City-People" Development and Coupling Characteristics

5.1 "Industry-City-People" Development Characteristics

Through the analysis of the principal components of the subsystems of industry, city and people, the comprehensive score of each subsystem of 33 administrative districts in London is calculated. Because the coupling coordination degree reflects the synergy between the industry, the city and the people, it cannot deduce to the development degree of the industry, city and people. It is also necessary to combine the development level of each factor of the respective system to Judge the whole development degree (Table 3).

### Table 3. Comprehensive scores for the development of city, industry and people

| Sort | Urban development | People development | Industrial Development |
|------|-------------------|--------------------|------------------------|
| 1    | City of London    | 0.802              | City of London         | 0.796                  |
| 2    | Westminster       | 0.481              | Westminster            | 0.618                  |
| 3    | Camden            | 0.335              | Camden                 | 0.589                  |
| 4    | Hackney           | 0.316              | Kensington and Chelsea | 0.554                  |
| 5    | Tower Hamlets     | 0.309              | Kensington and Chelsea | 0.554                  |
| 6    | Kensington and Chelsea | 0.299 | Lambeth              | 0.548                  |
| 7    | Islington         | 0.297              | Richmond upon Thames   | 0.535                  |
| 8    | Lambeth           | 0.250              | Southwark              | 0.527                  |
| 9    | Richmond upon Thames | 0.247             | Kingston upon Thames   | 0.512                  |
| 10   | Merton            | 0.245              | Lewisham               | 0.507                  |
| 11   | Southwark         | 0.242              | Merton                 | 0.495                  |
| 12   | Wandsworth        | 0.239              | Hackney                | 0.491                  |
| 13   | Hammersmith and Fulham | 0.233 | Camden               | 0.474                  |
| 14   | Lewisham          | 0.210              | Sutton                 | 0.445                  |
| 15   | Haringey          | 0.195              | Harrow                 | 0.420                  |
|   | Area 1         | Value 1 | Area 2         | Value 2 | Area 3         | Value 3 |
|---|----------------|---------|----------------|---------|----------------|---------|
| 16| Greenwich      | 0.194   | Waltham Forest | 0.412   | Bromley        | 0.129   |
| 17| Newham         | 0.182   | Haringey       | 0.412   | Hounslow       | 0.117   |
| 18| Croydon        | 0.178   | Greenwich      | 0.403   | Croydon        | 0.113   |
| 19| Hounslow       | 0.175   | Westminster    | 0.389   | Brent          | 0.113   |
| 20| Waltham Forest | 0.166   | Hounslow       | 0.380   | Lewisham       | 0.101   |
| 21| Brent          | 0.161   | Tower Hamlets  | 0.358   | Harrow         | 0.100   |
| 22| Bexley         | 0.159   | Ealing         | 0.352   | Redbridge      | 0.100   |
| 23| Ealing         | 0.158   | Barnet         | 0.347   | Merton         | 0.097   |
| 24| Kingston upon  | 0.150   | Newham         | 0.339   | Enfield        | 0.094   |
|    | Thames         |         |                |         |                |         |
| 25| Sutton         | 0.149   | Redbridge      | 0.339   | Hillingdon     | 0.076   |
| 26| Barking and    | 0.135   | Brent          | 0.323   | Greenwich      | 0.074   |
|    | Dagenham       |         |                |         |                |         |
| 27| Redbridge      | 0.130   | Bromley        | 0.299   | Kingston upon  | 0.073   |
|    |                |         |                |         | Thames         |         |
| 28| Enfield        | 0.129   | Barking and    | 0.286   | Sutton         | 0.068   |
|    |                |         | Dagenham       |         |                |         |
| 29| Barnet         | 0.127   | Bexley         | 0.280   | Waltham Forest | 0.067   |
| 30| Bromley        | 0.123   | Croydon        | 0.269   | Newham         | 0.061   |
| 31| Harrow         | 0.116   | Hillingdon     | 0.266   | Bexley         | 0.048   |
| 32| Havering       | 0.106   | Havering       | 0.247   | Havering       | 0.038   |
| 33| Hillingdon     | 0.095   | Enfield        | 0.242   | Barking and    | 0.025   |
|    |                |         | Dagenham       |         |                |         |

**Figure 1.** Spatial characteristics of urban development evaluation
Level of city development among the 33 administrative districts in London, the City of London and Westminster, the financial and business centers of Greater London, have the highest scores. The third is the gold futures market trading center Camden, followed by the North of the Thames, and several municipalities adjacent to the City of London and Westminster, the overall degree of development presents an evenly decreasing state from the center to the southeast and southwest. At the same time, as the indicators of higher urban development (Figure 1) contribution are mainly road traffic, public stations, social and cultural facilities, it can be seen that the surroundings of the City of London, Westminster, and the Thames River gather the best infrastructure and social culture resources in London.

Level of industrial development (Figure 3) among the 33 administrative districts in London, the City of London, Westminster, and Camden still have the highest scores, similar to the characteristics of city development, it has the characteristics of central concentration, while decreasing in the direction of southwest and southeast. As the indicators of higher industrial development contribution value are
mainly creative arts industry, information communication industry, financial insurance industry, etc., all are high-value sector industries with strong central agglomeration trend, so the industrial development of Greater London is highly concentrated in the city center, and mainly distributed in the north of inner London.

Level of people development (Figure 2) among the 33 administrative districts in London, City of London, Hammersmith and Fulham, and Wandsworth have the highest scores. Among them, Hammersmith and Fulham is the main office central area in the west of London. It gathers the headquarters of many large and multinational companies. And has the highest per capita income in London, while Wandsworth’s municipal property tax rate is the lowest in the UK. Unlike urban development and industrial development, the central aggregation characteristics of the people development comprehensive score are not significant. Although the City of London and Islington in the central area have higher scores, however, the overall development is mainly along the south bank of the Thames and southwest of London.

As the indicators of higher people development contribution value are mainly employment rate, traffic accessibility, high education percentage, thousands of fires, ambulance accidents, housing loans, etc., It can be seen that these areas have the characteristics of gathering high-quality talents, good health, high-quality living environment, convenient transportation and good social security.

5.2 "Industry-city-people" coupling characteristics

5.2.1 "Industry-city-people" coupling spatial characteristics. Judging from the coupling characteristics of London, the central agglomeration is relatively strong. Mainly because the Central London gathers the most important financial and commercial service industries in London, while the financial insurance industry and international business service industry are important components of the London economy. They belong to the producer service industry in the high-value sector and have strong central agglomeration, so its central agglomeration effect brings the concentration of urban space and industrial resources.

![Figure 4. "Industry-city-people" coupling spatial analysis](image)

5.2.2 "Industry-city-people" coupling functional hierarchy characteristics. From the measurement results of the coupling coordination degree, it can be seen that the coupling coordination degree is between 0.31 and 0.90 (Figure 4), and the overall coupling coordination level is relatively high. In order to better display the internal ranking characteristics of the coupling coordination degree, Using SPSS
cluster analysis to classify the results of coupling coordination. From the dendrogram results of cluster analysis, it can be seen that the minimum is divided into 5 groups, and the City of London and Westminster each form a group, forming a fault. So, the paper classifies the City of London and the City of Westminster as a group, and divides all municipalities into 4 levels (Figure 5).

From the perspective of the spatial distribution of the four levels, the overall coupling coordination degree shows a downward trend from the center to the periphery, and the overall development level in the southwest direction is relatively high. Judging from the social, economic and cultural characteristics of municipalities at 4 levels, the characteristics are as follows:

![Figure 5. "Industry-city-people" coupling functional hierarchy analysis](image)

The first level is a highly coordinated area with coupling coordination degree of 0.64 to 0.90. It is the core area of London. As the financial center of London, the City of London has a coupling coordination of 0.90, and a fault has appeared. The second Westminster coupling coordination degree is 0.70. It is the central activity area and the political and cultural center of London [5]. The Parliament building and the judicial system are also located here. It is also the most important international business gathering area in London, with a large number of real estate companies, private banks, company headquarters and government organizations. Westminster and the City of London are home to the most important financial and business services industries in London and the UK.

The second level is a higher coordination area, with a coupling coordination degree of 0.51 to 0.64, which mainly includes the municipalities around the City of London and Westminster. And It also includes several municipalities along the south and west of the Thames. Among them, Camden is a gold and other precious metals trading center in London, Kensington and Chelsea are British Royal Boroughs, and there are a large number of palaces and museums around it. Islington is a beautiful residential area around the city center. Hammersmith and Fulham gather many large and multinational companies. Such as L’Oreal UK headquarters, Disney UK headquarters, etc., Wandsworth has London's largest flower and fruit trading market. Hackney is the declining and renaissance art block of East London, and a gathering place for young and trendy people in the cultural industry. Lambeth south of the Thames is the art center on the south bank of the Thames, Southwark is a historic residential area, and a lot of historical and cultural heritage is left behind, while Richmond upon Thames (royal resort area) on the west is mainly a residential area, which was once on the list One of the top 50 liveable areas in the UK,
nearly two-fifths of the administrative area is reserved for public open space. Finally, Canary Wharf in Tower Hamlets north of the Thames is London's second largest financial center.

The third level is the general coordination area, with a coupling coordination degree of 0.38–0.51, including 16 municipalities. Among them, Ealing and Merton have better cultural and creative industries such as movies. Lewisham and Greenwich are mainly middle-class housing and commercial areas. Haringey is to the north of Islington, mainly manufacturing light industry, metal products, candy, furniture and so on. Sutton, Redbridge, Barnet, and Harrow are all high-quality school districts in London, with a high-quality living environment and a relatively developed business. Brent and Newham were the venues of the London Olympic Games in 1948 and 2012, respectively. Now they are mainly engaged in exhibition, business and residence together with Bromley. Hounslow, Waltham Forest, Kingston upon Thames are mainly located in the outer periphery of London, close to the agricultural zone and residential area with excellent green belt ecological environment in London. The industry is mainly light industry and manufacturing, and there will also be a small amount of business.

The fourth level is a lower coordination area with a coupling coordination degree of 0.31 to 0.39. There are 5 municipalities, all located in the outer area of Greater London, close to the Greater London Green Belt. Enfield is dominated by light manufacturing, while Croydon focuses on engineering and electronics. Hillingdon, airports, suburbs, golf courses and other leisure centers, Havering for engineering and manufacturing, Barking and Dagenham important manufacturers include large automobile factories and Dagenham chemical plants, the overall light industry, such as suburban entertainment, electronic engineering, etc. Dominated by manufacturing and other industries.

Judging from the coupling level characteristics of London, it also has obvious value segment characteristics. The first level is London's political and financial center, and the second level is London's financial sub-center and creative culture, historical art, market trading center. Belongs to the high-end producer service industry. The third level is located on the periphery of Inner London. Its functions are mainly cultural creativity, school district housing, film, commercial exhibitions, and some light industries and agriculture. The fourth level is the outermost area of Greater London, mainly manufacturing, light industry, construction, airport convention and exhibition. It can be seen that the functional level of the coupling coordination degree has a clear correlation with the industrial value segment. The space where high-value-added industrial functions are located has a high degree of coupling and coordination, and is more inclined to agglomeration of urban resource centers.

6. Conclusion
As can be seen from the development trends and spatial characteristics of London's industry, cities and people, high-end producer services and high-quality urban public products have the characteristics of central agglomeration, but there is no obvious central agglomeration characteristics of people's high-quality development areas. Rather, it is related to areas with high levels of social health and safety, community services, and urban management. Human-oriented development should change from the construction of material environment to the pursuit of health, safety and other soft directions for cities with higher urbanization levels. At the same time, through the measurement of the coordination of industry, city and people in 33 administrative districts of London, the overall development level of London is judged, and it is found that the development level of each administrative district in London has a clear correlation with the layout of the city's industrial function value section. The value system can more rationally lay out the urban industry, while constantly upgrading the city's industry is also an important driving force for urban development.

References
[1] New Urban Agenda [R/OL]. [Online] 2016. Available at: https://www.un.org/zh/chronicle
[2] The city of London local plan [R/OL]. Department of the Built Environment, City of London
Corporation. [Online] 2015. Available at: https://www.london.gov.uk/what-we-do/planning.

[3] City of New York. Pla NYC 2050: One New York: The Plan for a Strong and Just City [R/OL]. [Online] 2019. Available at: http://www.nyc.gov

[4] Plan Bay Area: Stratage for a sustainable region [EB/OL]. [Online] Available at: http://2040.planbayarea.org/the-bay-area-today

[5] Westminster city plan [R/OL]. City of Westminster [Online] 2013. Available at: www.westminster.gov.uk/revision-westminsters-city-plan.