

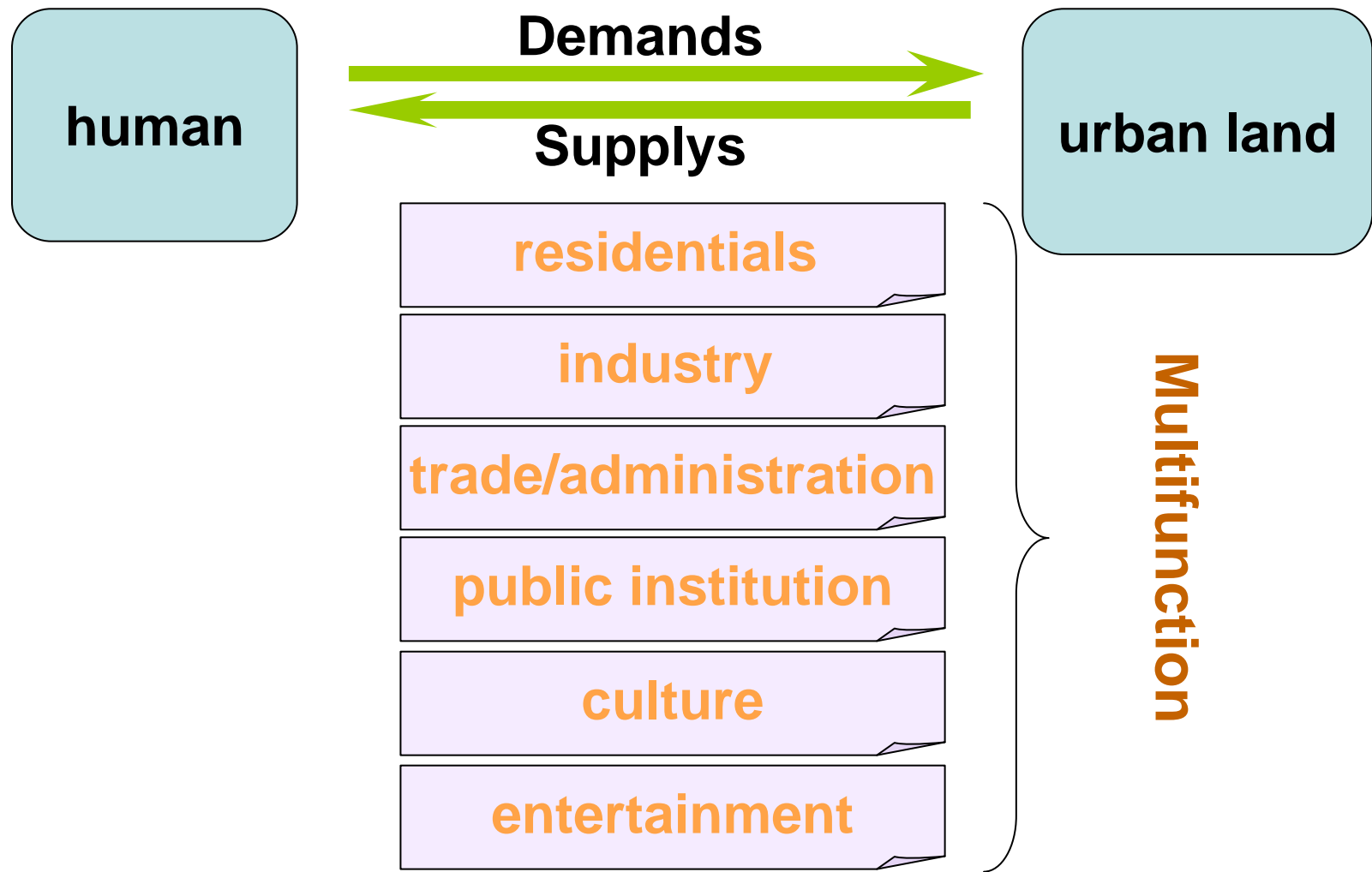
Urban Land Carrying Capacity Evaluation Based on Multi-dimensional Model

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Urban land carrying capacity

an indicator describing human-land relationship





urbanization



industrialization



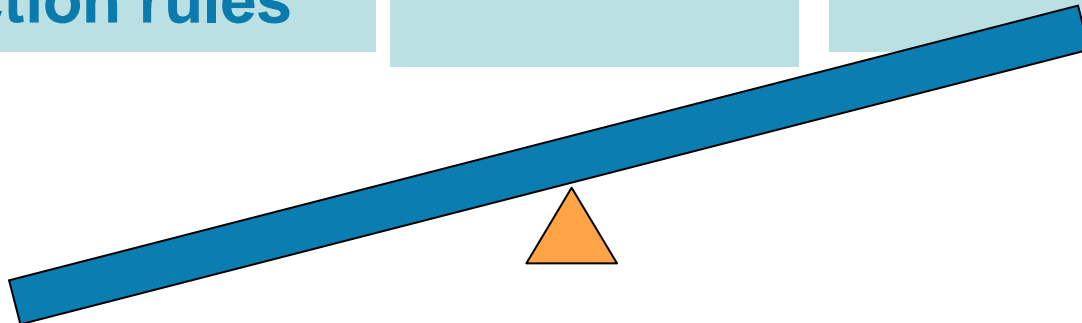
**increasing
population**

pressure

**rigid arable land
protection rules**

rural exodus

environ protection



Thus, the conflicts between **human** and **land resource** becomes even more outstanding in cities in China.

Questions

1. What are the major determinants of the urban land carrying capacity?

and

2. How to avoid cities in China being overloaded?



It is therefore crucial:

- ☀ to identify the linkages between **natural resources, economy, environment and society of a city**
- ☀ to understand how these systems impact on the urban land carrying capacity to which they are linked

Objectives

- (1) To evaluate carrying capacity of large and middle scale cities in China;**
- (2) To extract the determinants of urban land carrying capacity;**
- (3) To analyze the resilience and potentiality of urban land carrying capacity.**



Urban land carrying capacity

Natural resources

Economy

Sociality

Environment

Indicator system for evaluating ULCC

| Natural resources | Economy | Sociality | Environment |
|---|--|---|---|
| Gross volume of water resource, precipitation, downtown area, area for construction etc. | GDP, % of primary , secondary and tertiary industry, saving rate of residents, Number of enterprises etc. | number of hospitals, opera, schools, public vehicle, communication device etc. | Greenbelt area, percentage of industrial waste treatment, percentage of life sewage treatment, percentage of life rubbish treatment etc. |
| 7 | 19 | 24 | 13 |

Methodology

- **Principle Component Analysis**
- **Hierarchical Cluster Analysis**

Based on

Multi-dimensional Evaluative Model

Data

Yearbook, 2007

286 cities/municipalities

large or middle scale

Result (1)

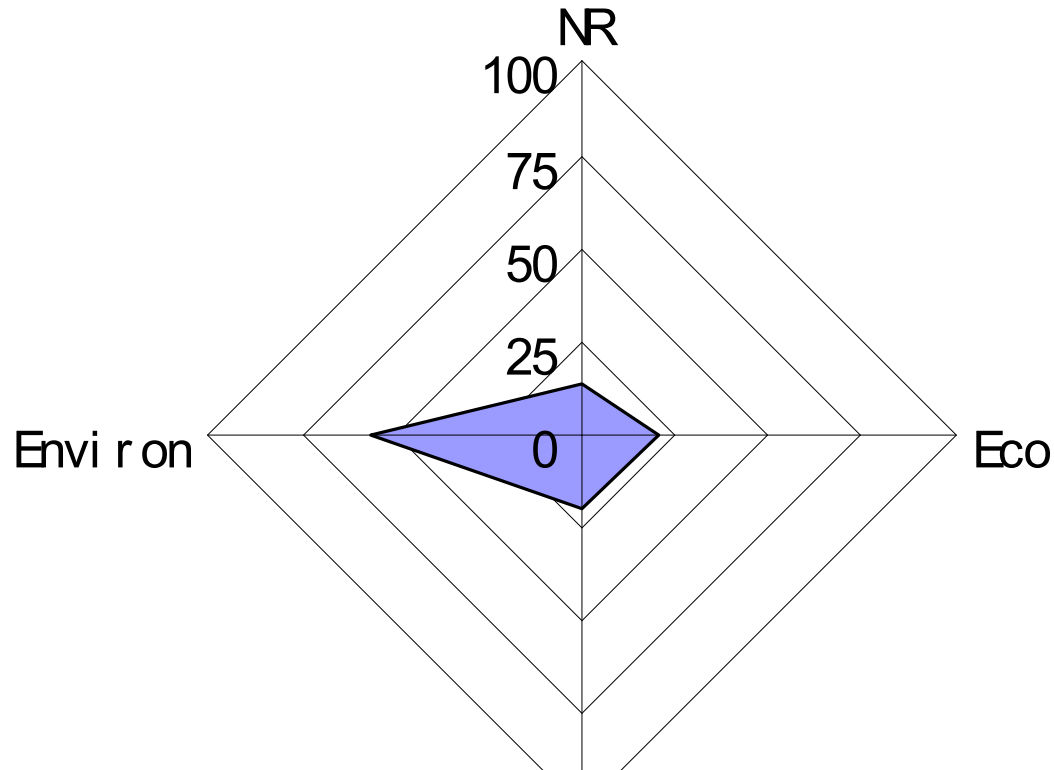
1. Bei j i ng, Shanghai (2)

2 Ti anj i n (3)

3 Shi j i azhuang(15)

Envi r on

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Result (cont'd)

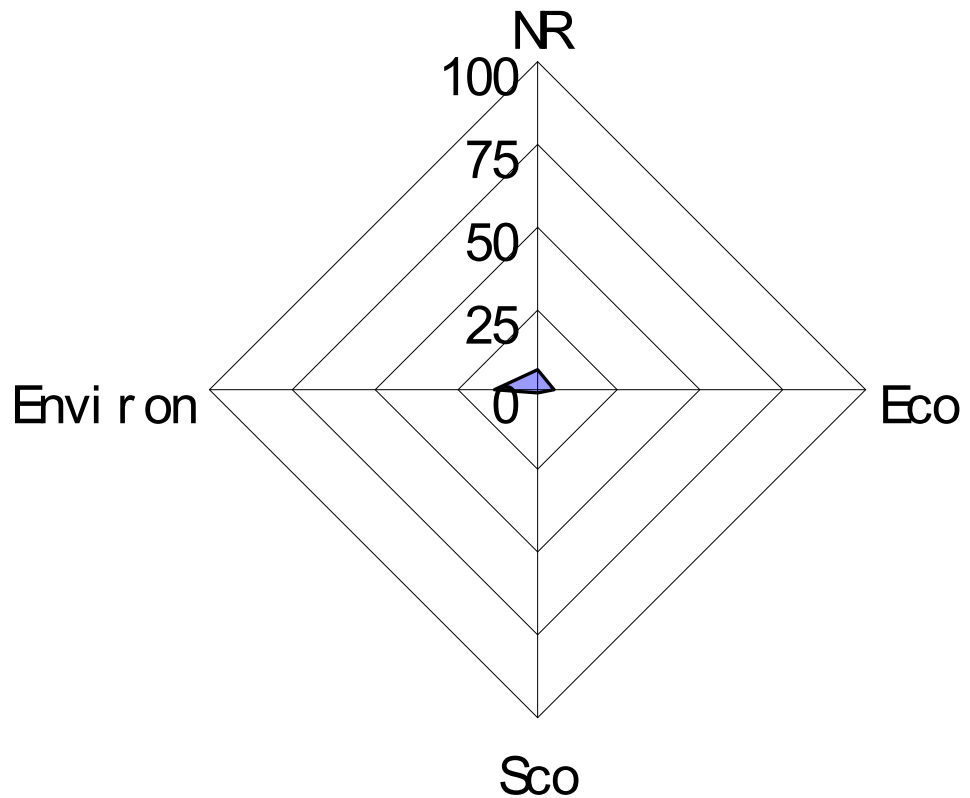
4 Q nahuanadao(85)

5 Handan(39)

6 Chengde(71)

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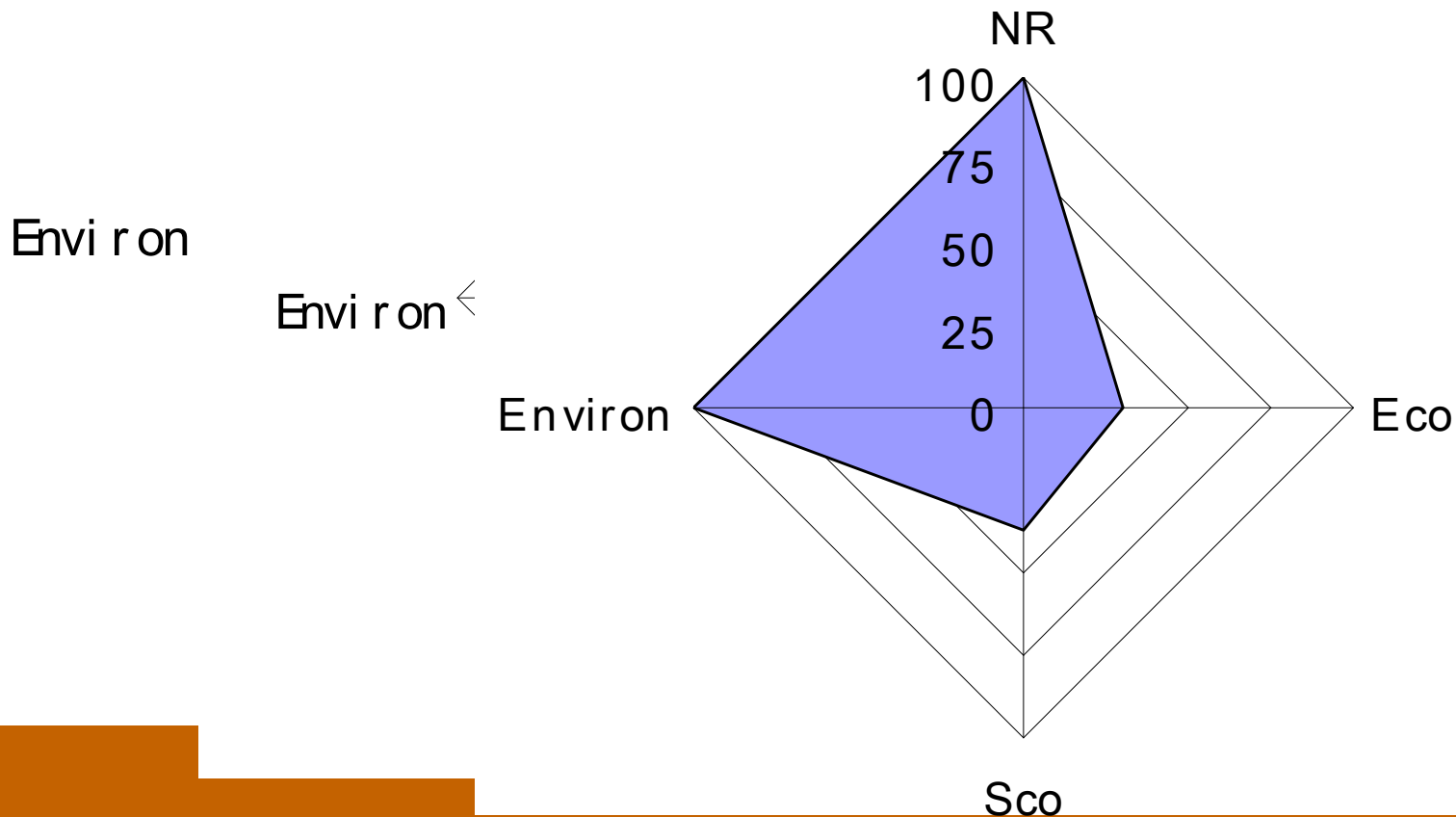


Result (cont'd)

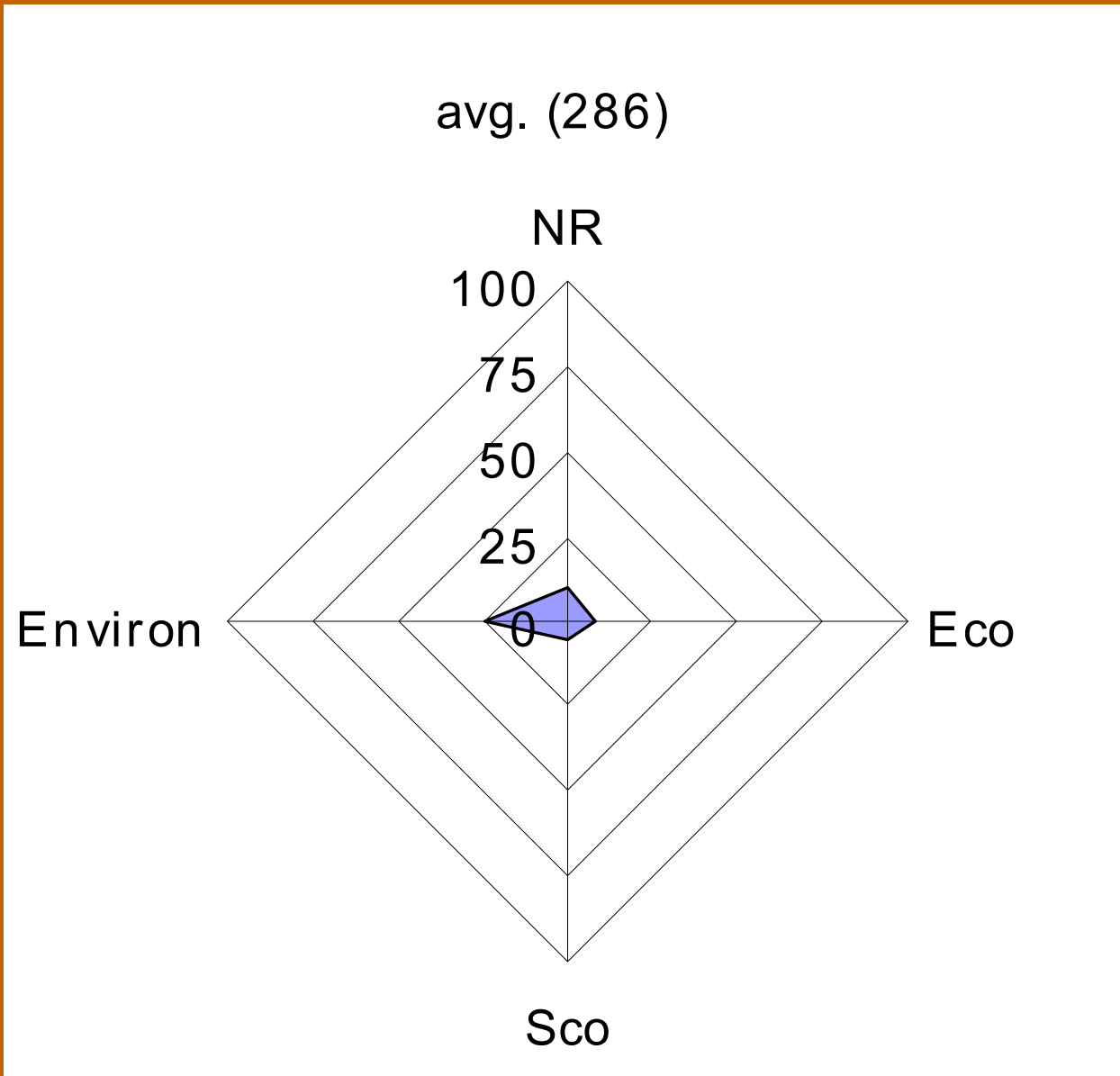
7 Tai yuan(13)

8 Hul unbei r (57)

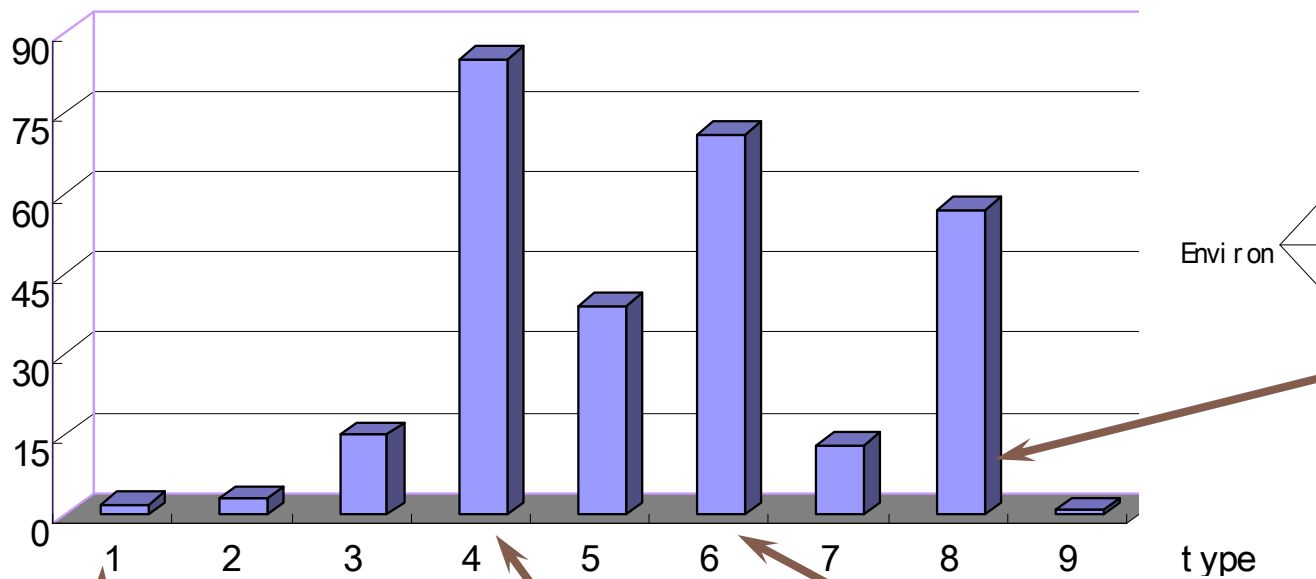
9 Chongqing(1)



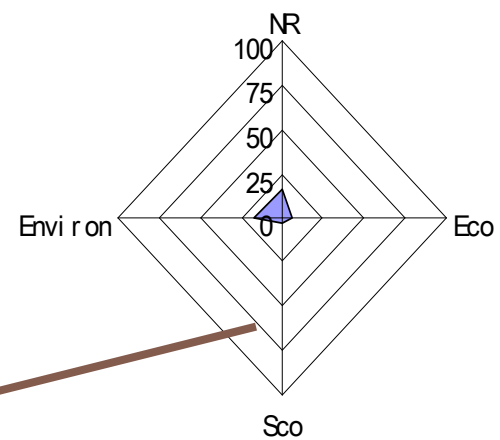
Result (cont'd)



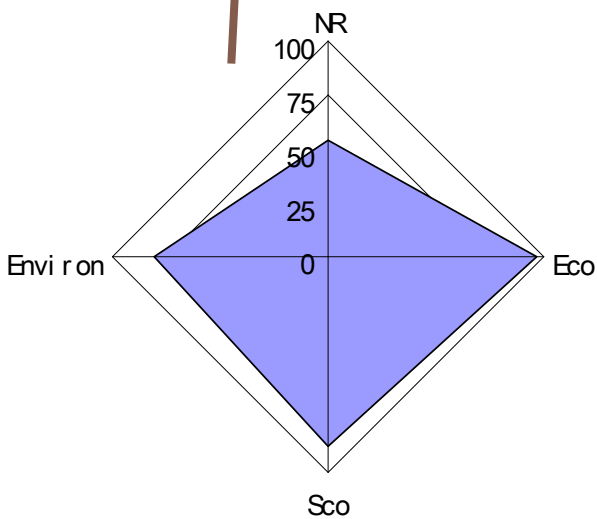
9 clustered ULCC types



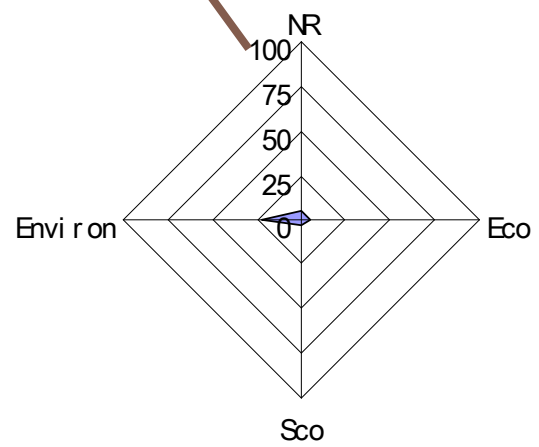
8 Hulunbeir (57)



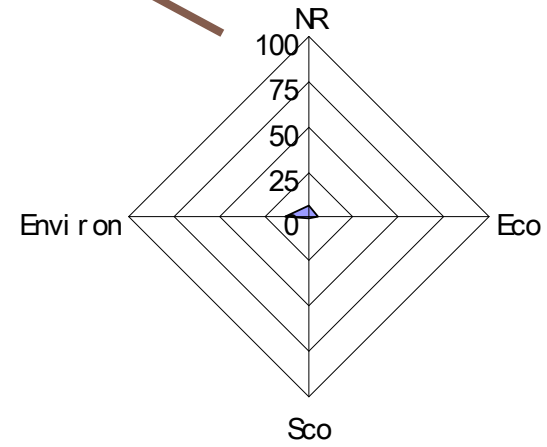
1. Beijing, Shanghai (2)



4 Qinghuangdao (85)



6 Chengde (71)



ULCC value for 286 cities

| | | Dimension value | | | | Integrated value | |
|------|--------|-----------------|------|-----|---------|------------------|---------|
| type | number | NR | Econ | Soc | Environ | Equal weight | 2-3-2-3 |
| 1 | 2 | 54 | 96 | 88 | 80 | 80 | 81 |
| 2 | 3 | 30 | 45 | 42 | 66 | 46 | 48 |
| 3 | 15 | 14 | 21 | 19 | 56 | 27 | 30 |
| 4 | 85 | 5 | 5 | 3 | 23 | 9 | 10 |
| 5 | 39 | 6 | 5 | 3 | 34 | 12 | 14 |
| 6 | 71 | 6 | 5 | 1 | 13 | 6 | 7 |
| 7 | 13 | 12 | 16 | 14 | 32 | 19 | 20 |
| 8 | 57 | 16 | 6 | 3 | 17 | 11 | 11 |
| 9 | 1 | 100 | 30 | 37 | 100 | 67 | 66 |
| Avg. | 286 | 10 | 8 | 5 | 24 | 12 | 12 |

Principal Components Extracted

| dimension | Principal components | meaning |
|--------------------------|-----------------------------|---|
| Natural Resources | F1 | water resource volume |
| | F2 | urban land area |
| Economy | F1 | gross output value |
| | F2 | tertiary industrial output value % |
| | F3 | primary industry output value% |
| Sociality | F1 | transportation, communication |
| | F2 | living installation |
| | F3 | medical security |
| Environment | F1 | industrial pollution prevented |
| | F2 | greenbelt area |
| | F3 | recycling of garbage, sewage etc. |

Resilience

| dimension | Principal component | meaning | Resilience |
|-------------------|---------------------|------------------------------------|------------|
| Natural Resources | F1 | Water resource volume | ☹️ |
| | F2 | Urban land area | ☹️ |
| Economy | F1 | Gross output value | 😊 |
| | F2 | tertiary industrial output value % | 😊 |
| | F3 | Primary industry output value% | 😐 😊 |
| Sociality | F1 | Transportation, communication | 😊 |
| | F2 | Living installation | 😊 |
| | F3 | Medical security | 😊 |
| Environment | F1 | Industrial pollution prevented | 😊 |
| | F2 | Greenbelt area | 😊 |
| | F3 | Recycling of garbage, sewage | 😊 |

Conclusions

- 1. Big variability in urban land carrying capacity**
- 2. About 88% cities have ULCC value less than the average**
- 3. 12% cities have smallest values in NR, i.e., NR is limiting factor**
- 4. Potentiality for improving ULCC lies mainly in S&T development**

Thanks!