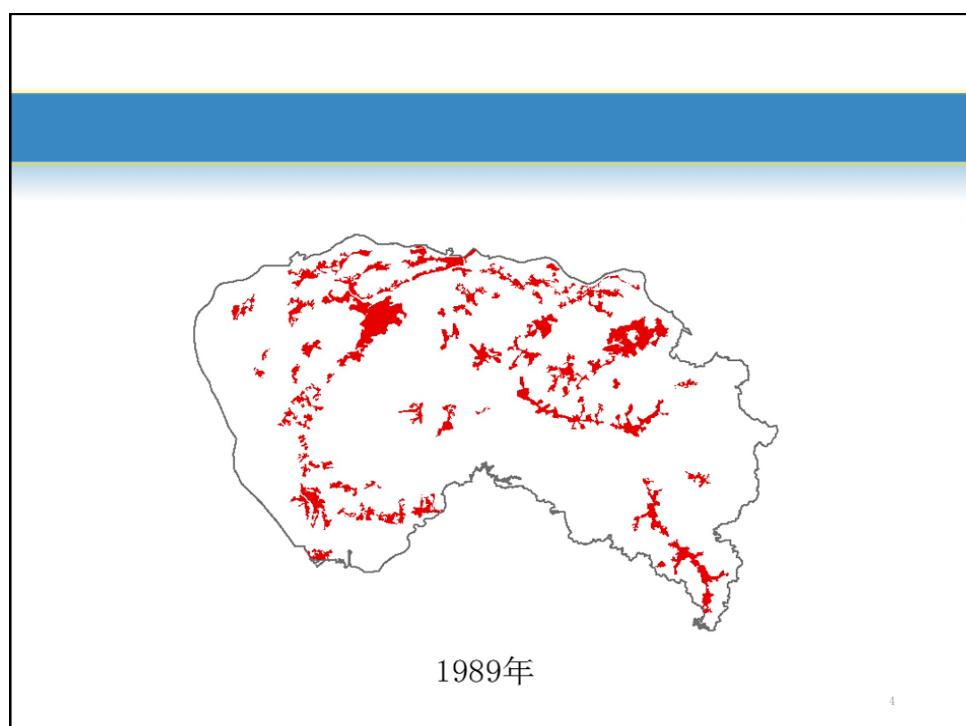
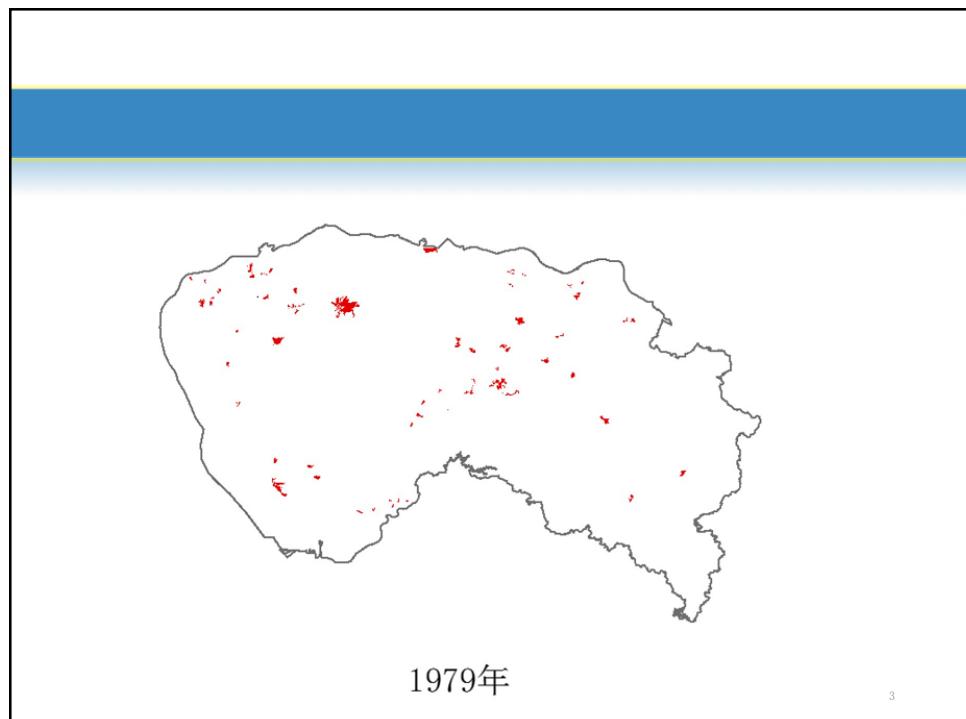
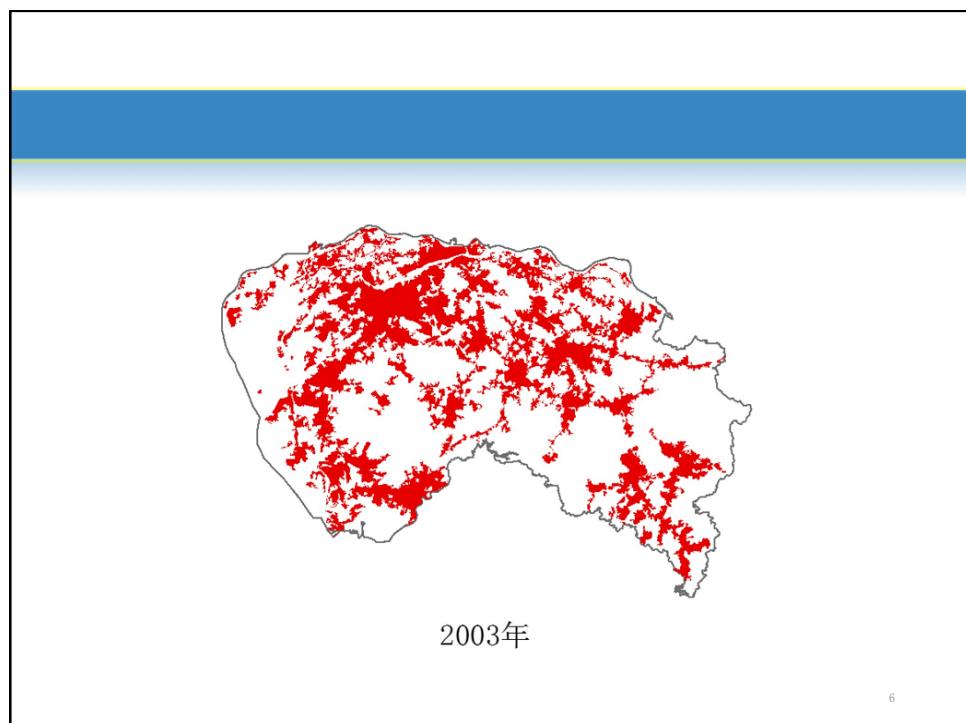
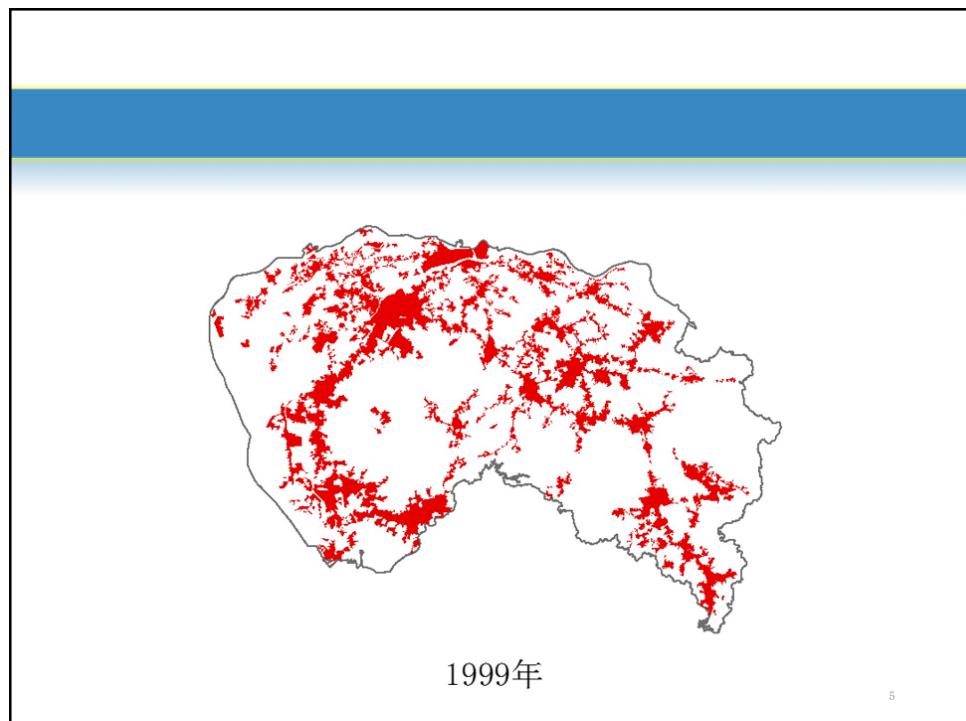


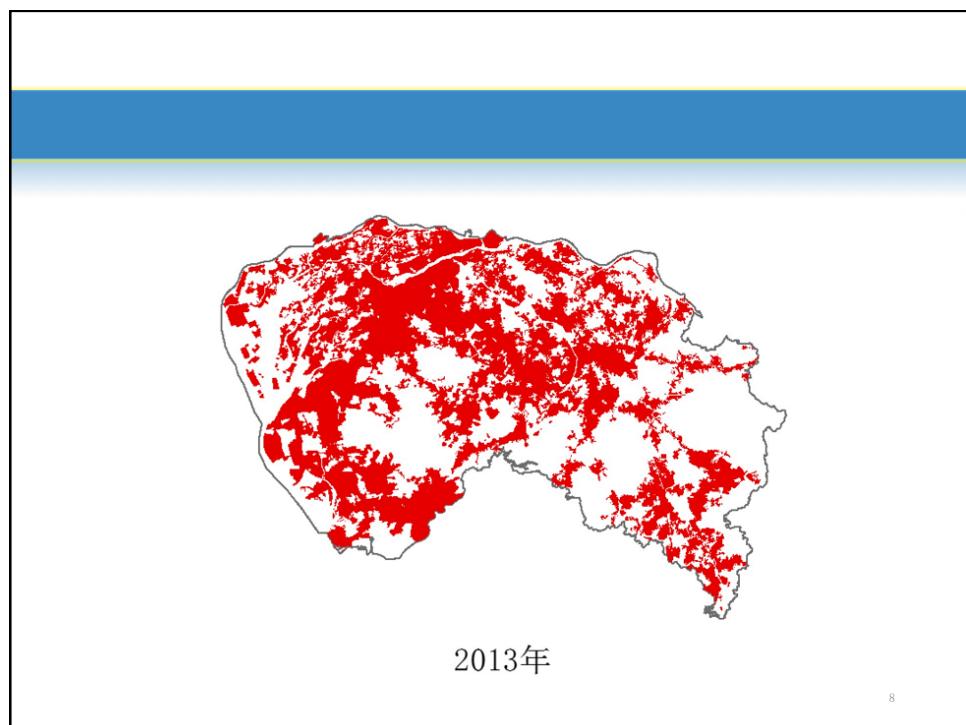
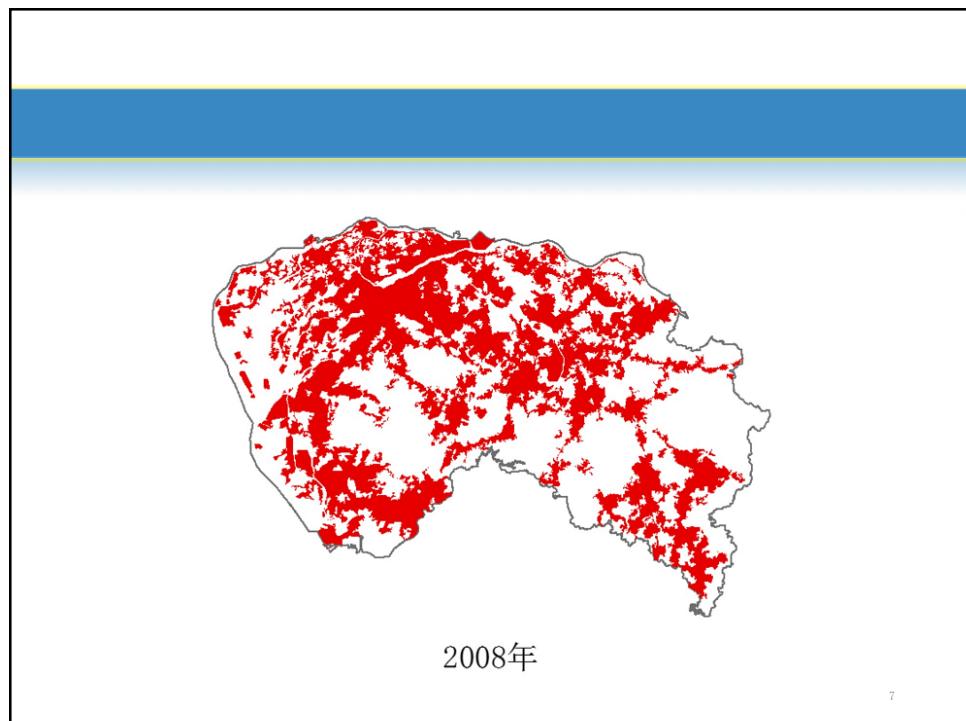
Indicators on Urbanization

Prof. Dr. John W. Z. SHI
The Hong Kong Polytechnic University

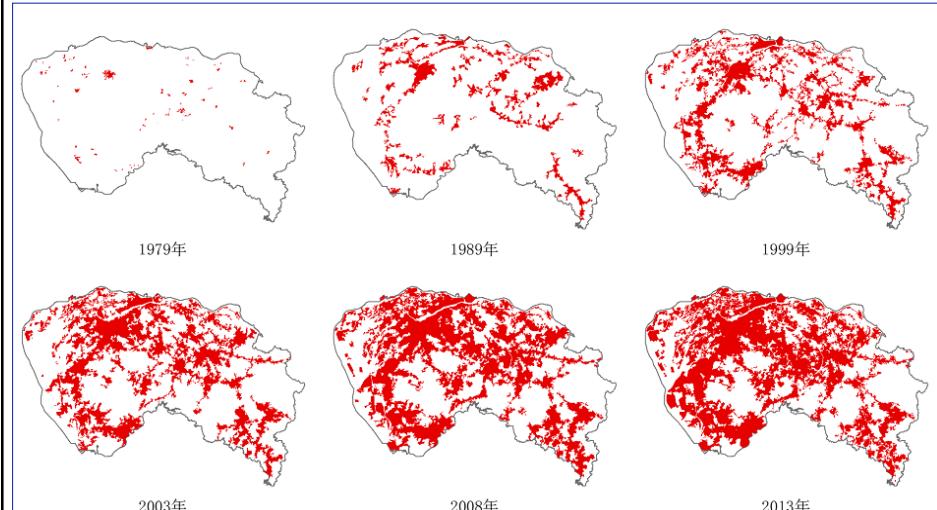
Urbanization







An example of urbanization

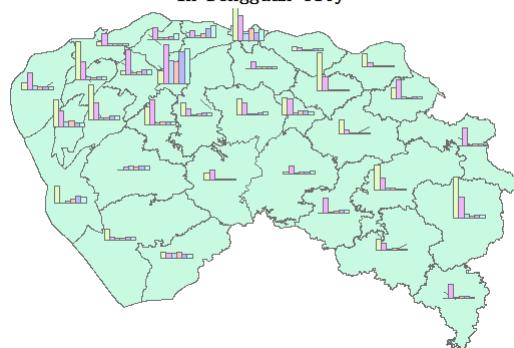


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Urban Shape Compactness Index

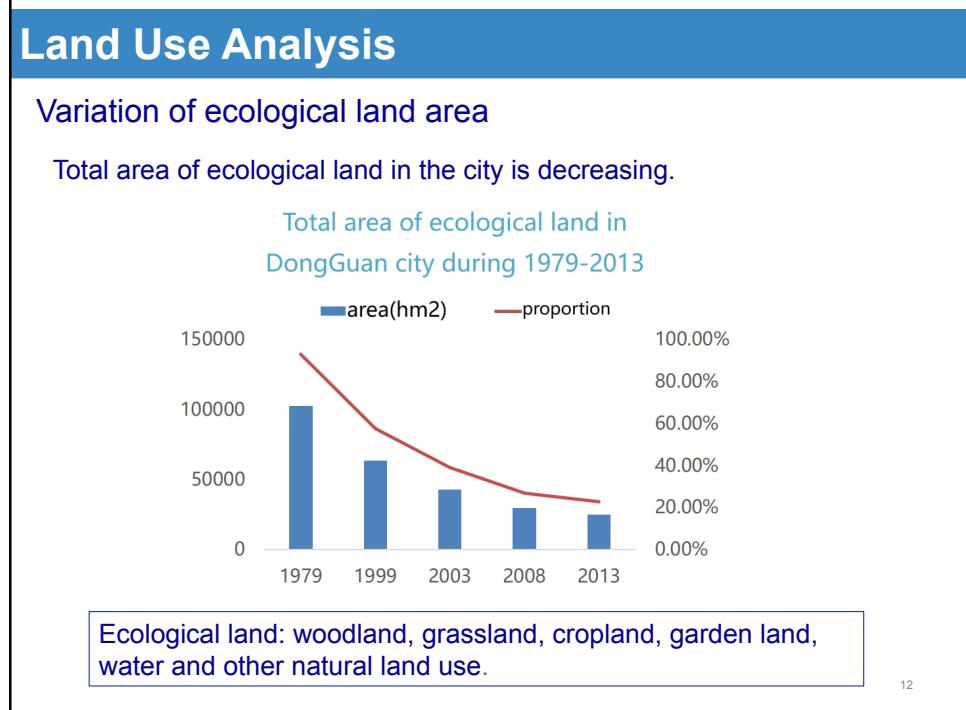
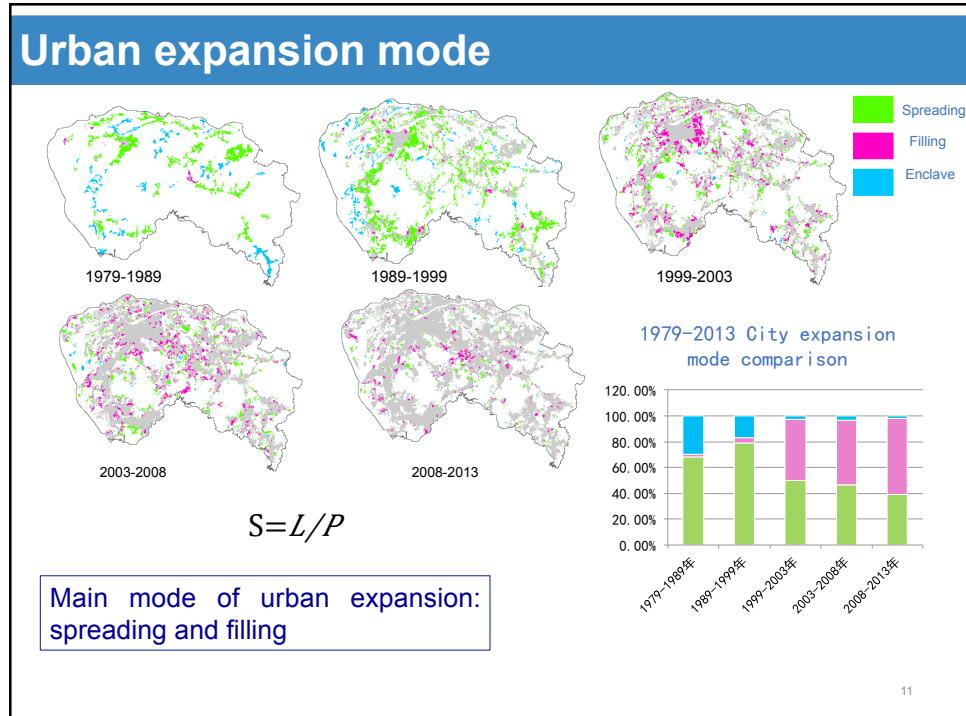
- $c = \sum_{i=1}^n (2\sqrt{\pi A_i} / P_i) / n^{1/2}$, measure of compactness of urban area's contour
- Higher value indicates higher compactness of Urban Area (denser distribution)

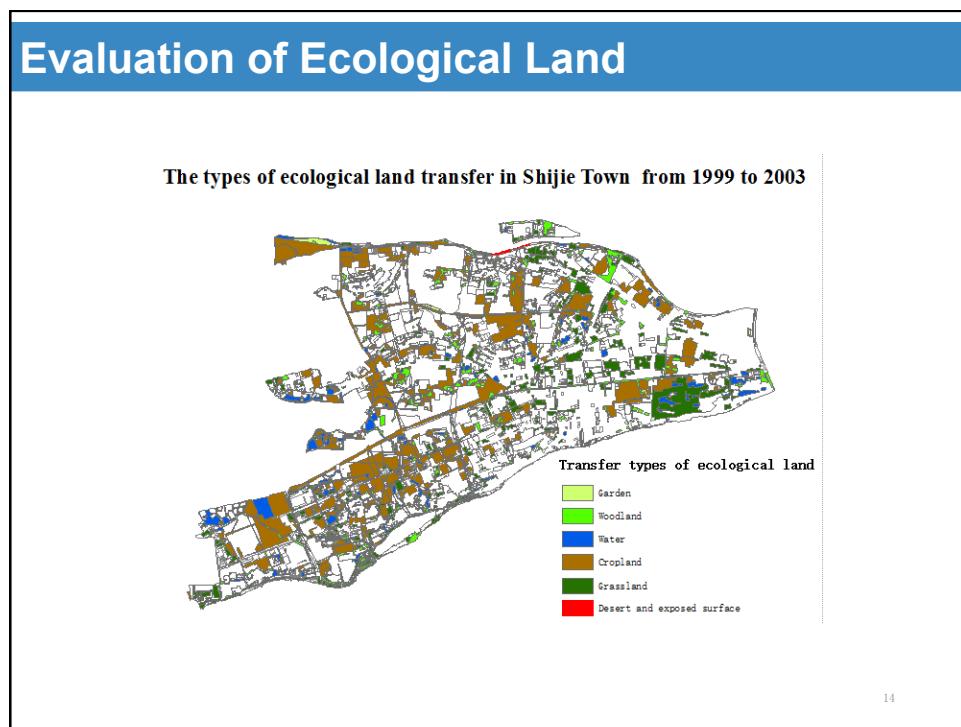
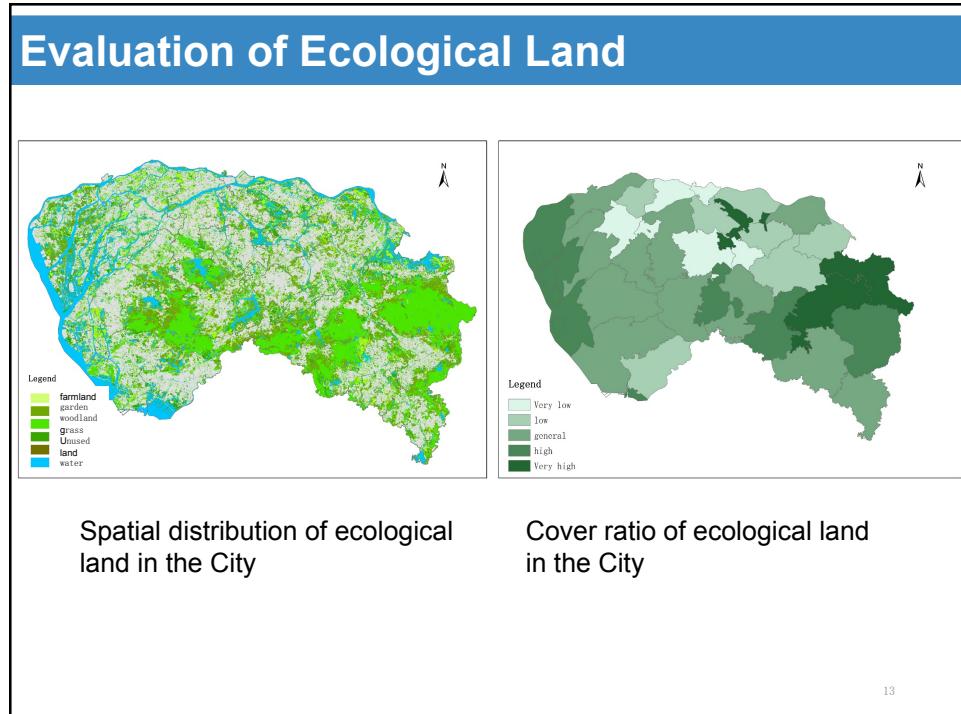
1979–2013 Urban Shape Compactness Index
in Dongguan City



**Higher compactness
and denser urban area
distribution in central
area**

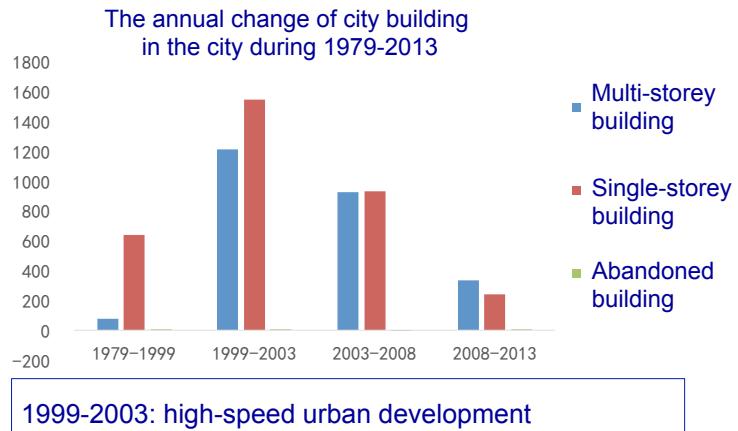
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Land Use Analysis

Annual change of urban area



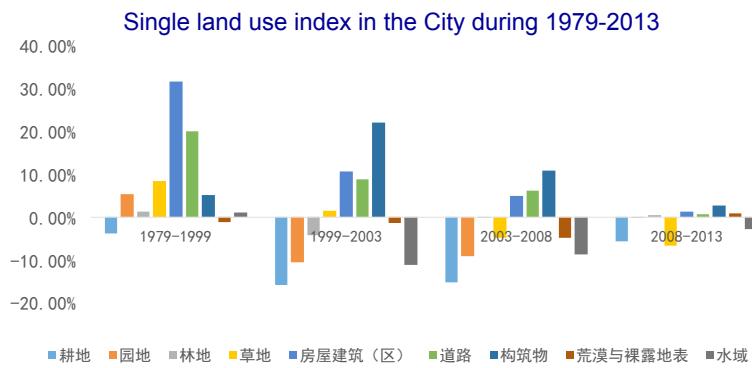
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Land Use Analysis

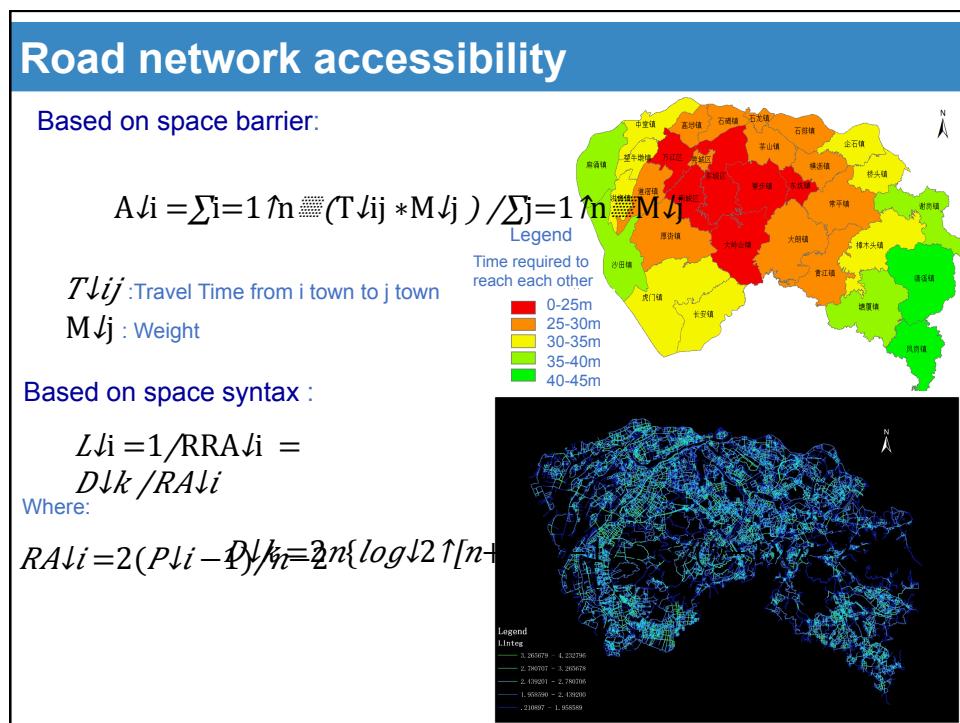
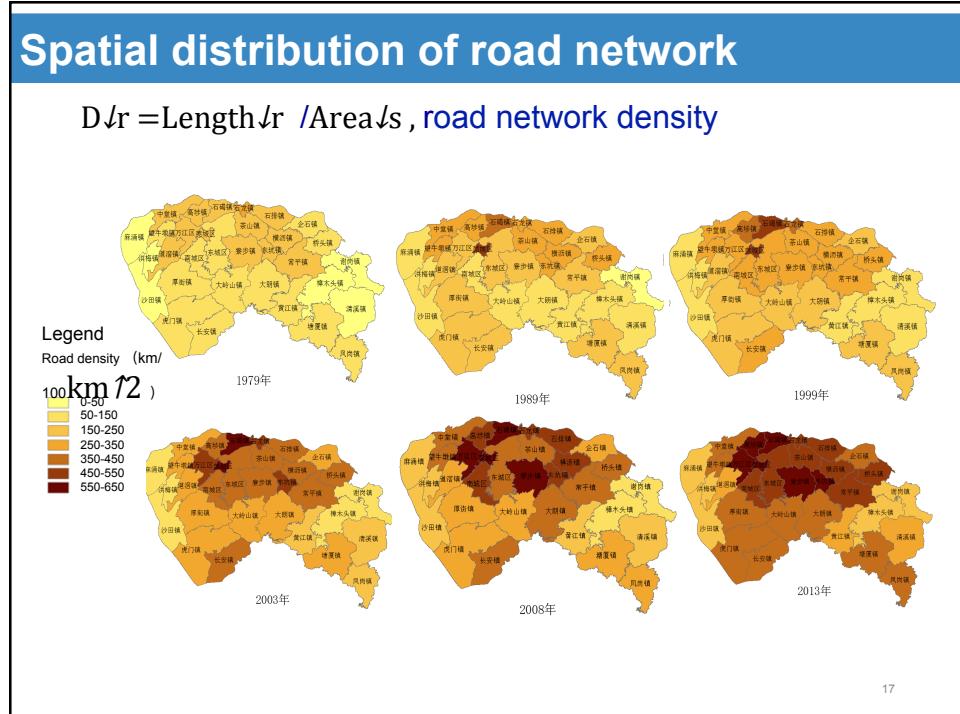
Single land use index

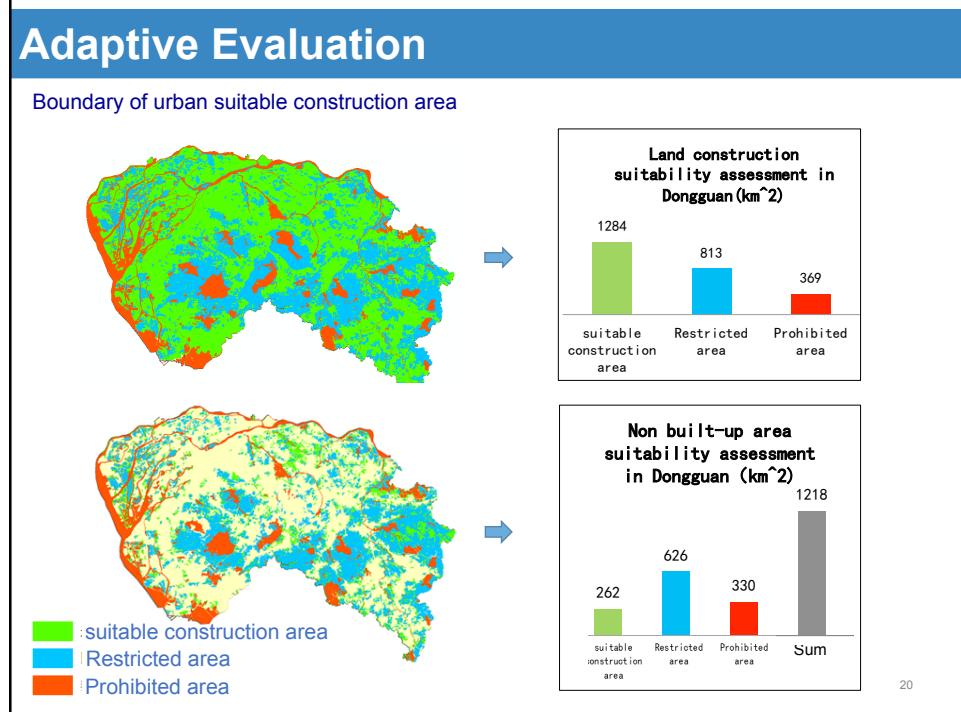
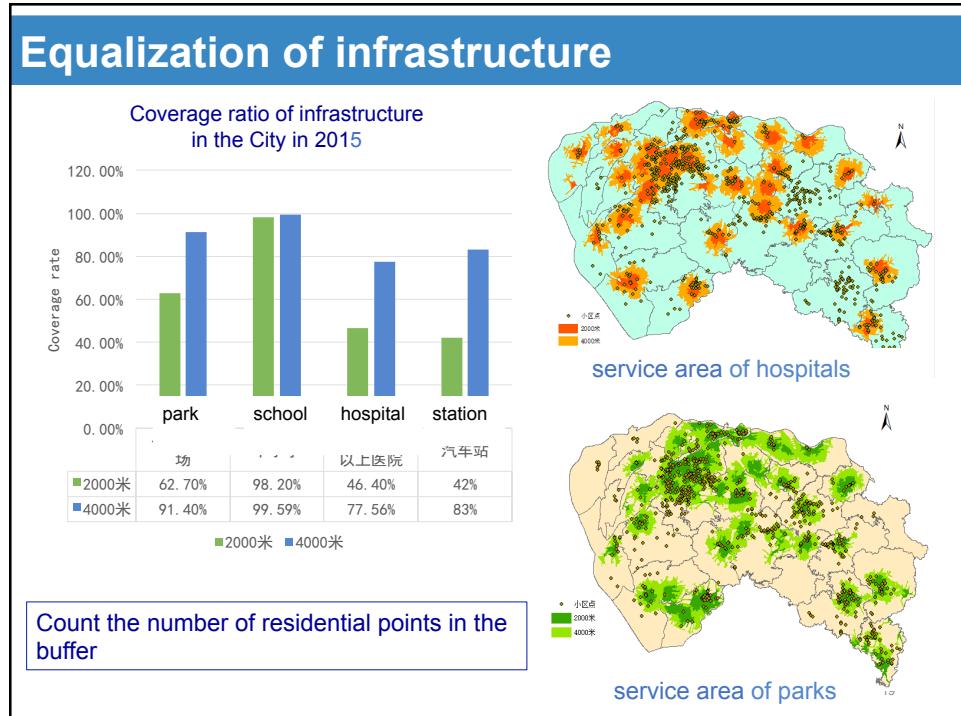
$$K = \frac{U_{lb} - U_{la}}{U_{la}} \times 1/T \times 100\%$$

Area change of a certain kind of land use



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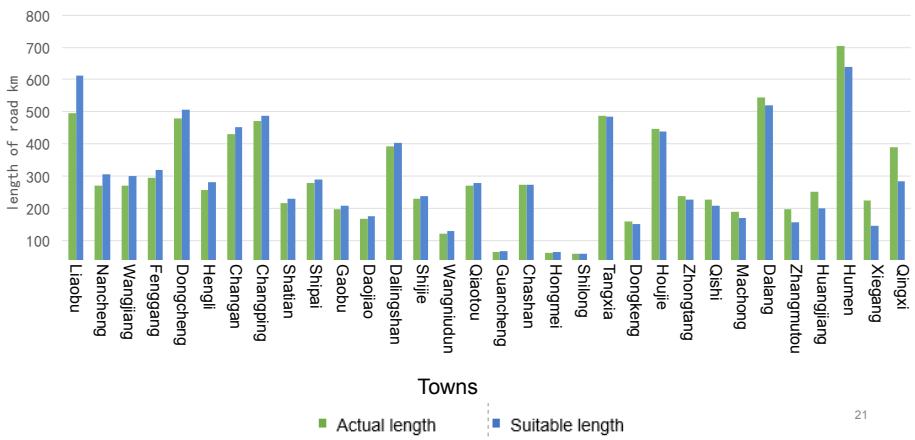




Road Network Suitability Length

$L=K\sqrt{Pop*Area}$, the suitable length of road network

Suitable length of road network in the city, 2013

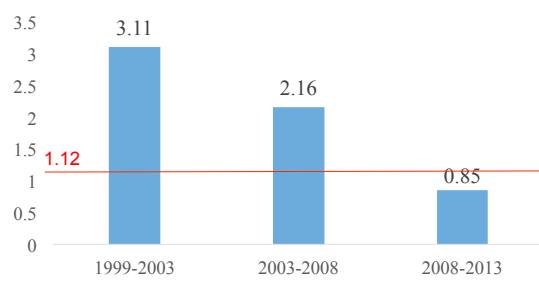


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Urban Landuse Expansion Elasticity Indicator

- $| = V \downarrow u / V \downarrow p$
- Reasonable Value: 1.12
- Higher or lower value : mismatch between urban expansion and population growth

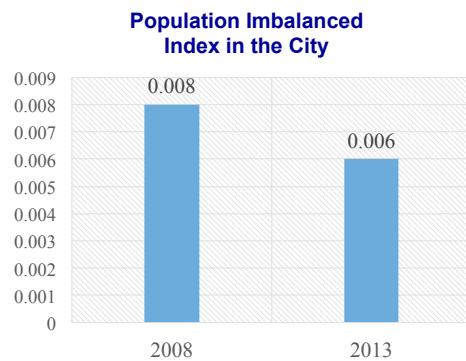
Elasticity Index of the City



From 1999 to 2013, Elasticity Index gradually stabilize to 0.85 (around **1.12**), indicating harmonious growth between urban land use and population in recent years.

Population Imbalanced Indicator

- $U = \sqrt{\sum_{i=1}^n [x_i - \bar{x}]^2 / n}$
- Indicator of the imbalanced distribution of urban area and population
- Higher value: more imbalanced

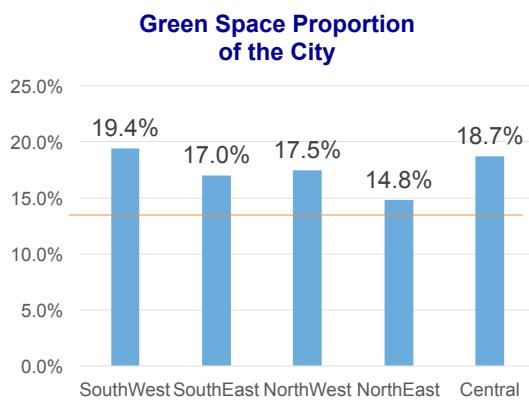


Low level of Population Imbalanced Index indicate balanced distribution of urban area and population

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Urban Landuse Area and Proportion

- Urban Landuse Area per capita, Green Space per capita, Green Space Proportion
- Indicator of the reasonability of the urban landuse



High proportion (up to 15%) of Green Space indicate good environment in urban area

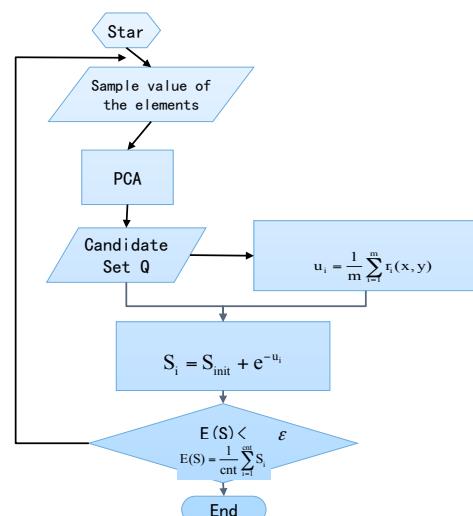
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Index on Geographic Conditions in China

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Computation Algorithm

- Identify components dynamically
- Determine the weight of elements



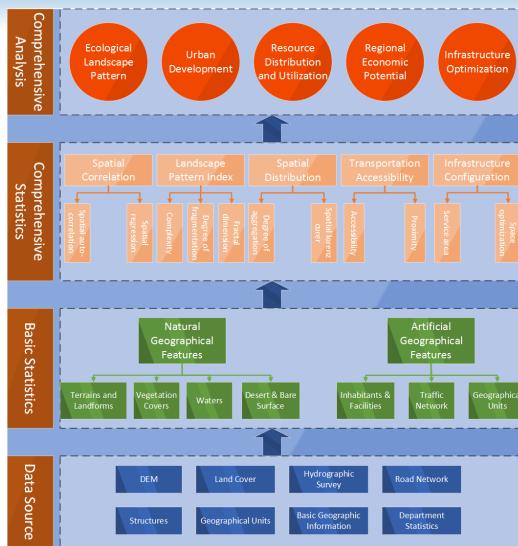
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The System



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System Structure



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