

2009 Flock Hill Workshop

An Integrated Ecological Approach to Urban Green Spaces Planning in Beijing, China

Chundi (Sophie) Chen:

School of Landscape Architecture

Faculty of Environment, Society and Design, Lincoln University

Hongbing Deng:

Research Center for Eco-Environmental Sciences,

Chinese Academy of Sciences, Beijing



Project outline

- 2006-2008, funded by the Chinese Academy of Sciences.

Questions:

1. How many urban green spaces does Beijing need?
2. Where will they be located?
3. Which is better between two scenarios?



1. Study area

Basic stats:

Location: $39^{\circ} 38' - 41^{\circ} 05' N$; $115^{\circ} 25' - 117^{\circ} 30' E$

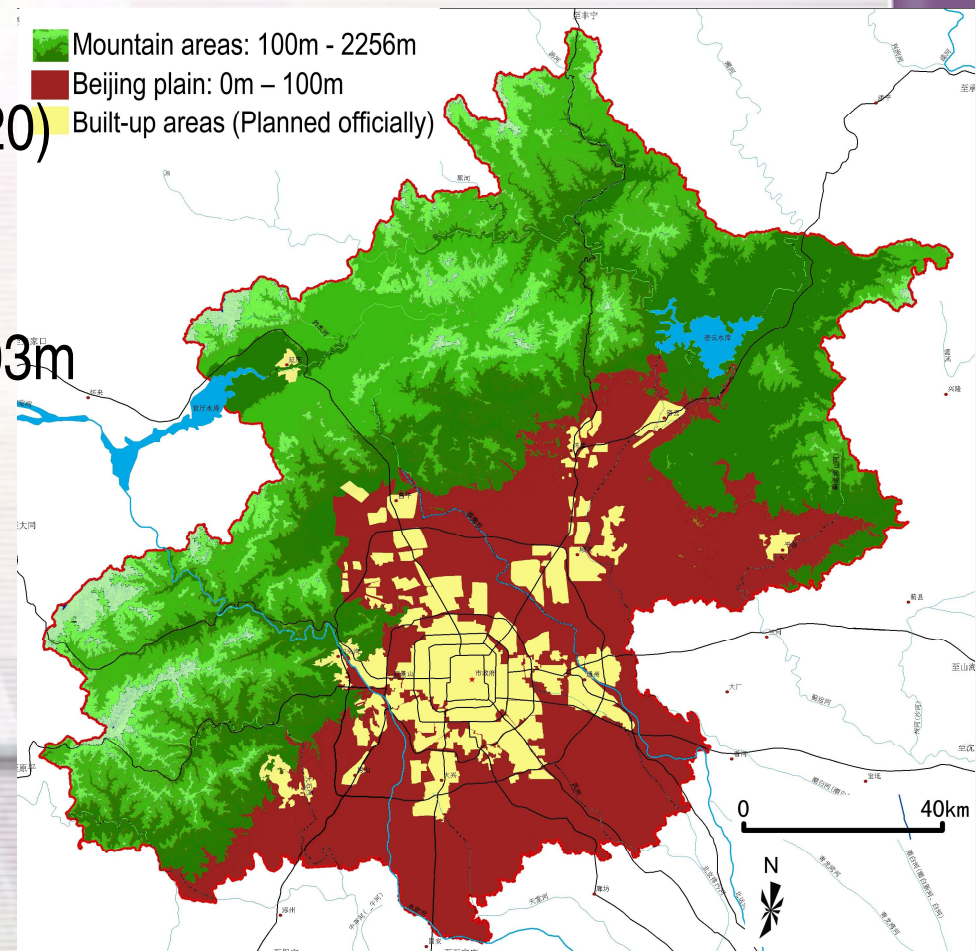
Climatic zone: warm temperate continental monsoon

Population: 13.8million (2007)
18 million (planned in 2020)

Area: 16,808km²

Plain area: 38.6%

Mountains: 61.4% with highest at 2203m





1. Study area

Situation of urban green spaces:

Beijing urban form: rolling out a pancake

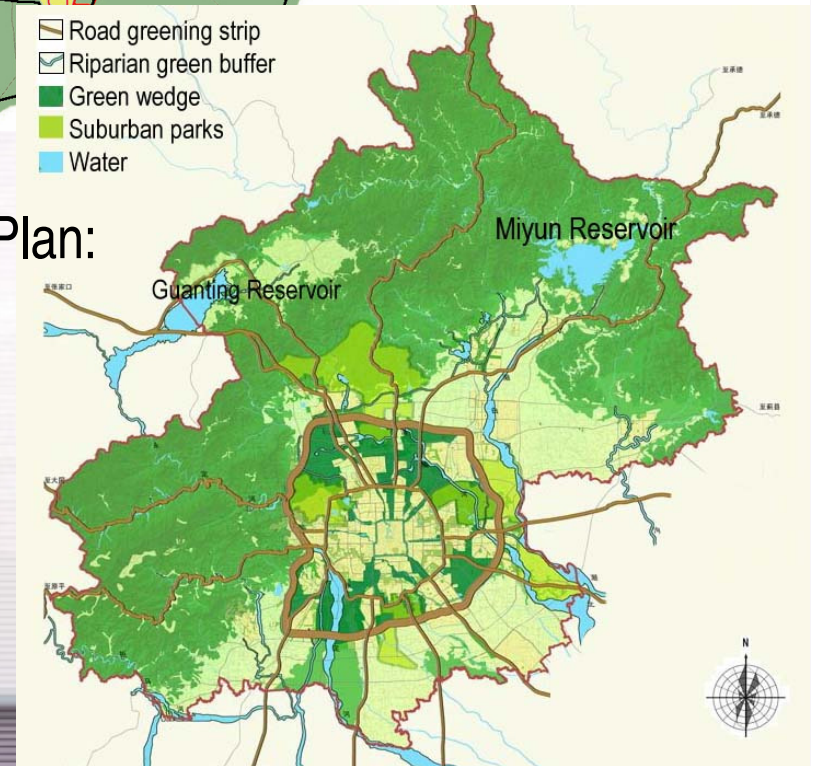
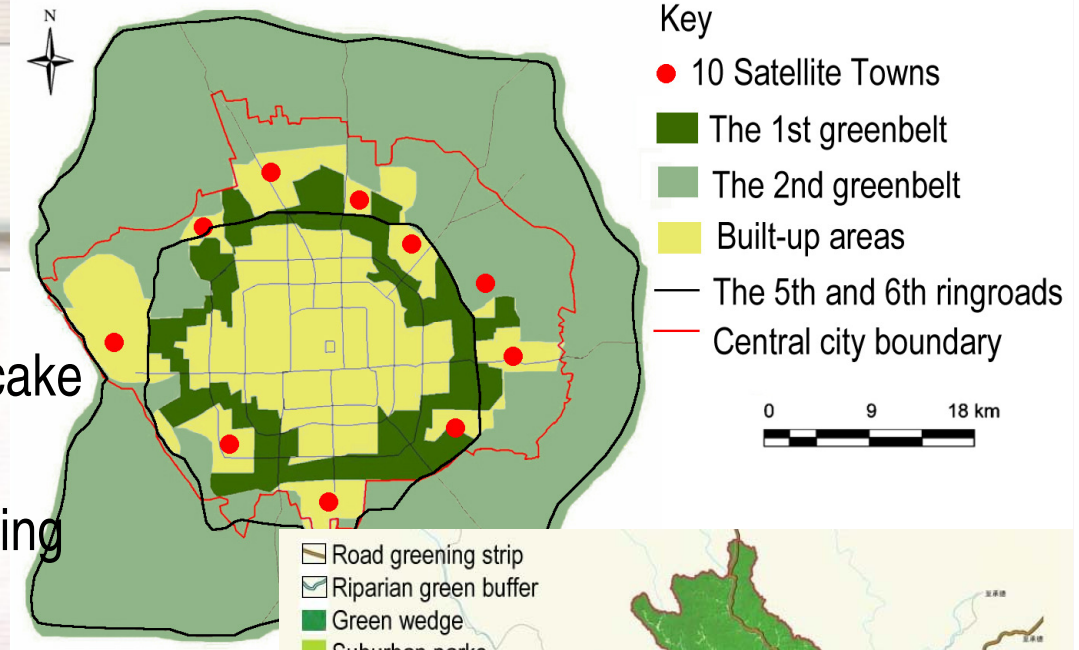
The 1st greenbelt (1958): failed

The 2nd greenbelt (1993): not promising

Overview:

The statutory 2004-2020 Beijing Green Spaces Plan:

1. 38% in 2020 (convert others to green).
2. Emphasize the ecological links
– both internally and externally
between built-up areas, the plain
and mountain areas.



Statutory 2020 Beijing Green Spaces Structure Plan (Beijing City Council, 2007)



3. Methodology

An Integrated approach:

- Carbon-oxygen balance
- Land-use suitability analysis based on GIS
- Potential linkages analysis based on GIS



3. Methodology

1. Carbon-oxygen balance

- $2C + O_2 = CO_2$;
- production activities and humans in 2020:

A: Standard coal burning: the average O_2 consumption = coal amount $\times 2.13$ (t)

B1: Human respiration O_2 consumption per year = total population $\times 0.292$ (t/a)

B2: Consumption of breakdown of excreta O_2 consumption per year = total population $\times 0.0146$ (t/a)



3. Methodology

2. Land-use suitability analysis

- To determine the suitability for some specific land-use (for Nature Reserve, urban land-use, Landfill sites, etc.)
- Steps: 1. Select factors; 2. Rank factors; 3. Score each factors; 4. Overlay by GIS; 5. Determine suitability.

Criteria for green spaces: more ecologically sensitive; important wildlife habitats; recreation or cultural value for humans.

Factors:

1. Slope; 2. existing land cover; 3. surface water body; 4. existing parks or gardens; 5. Vegetation distribution.

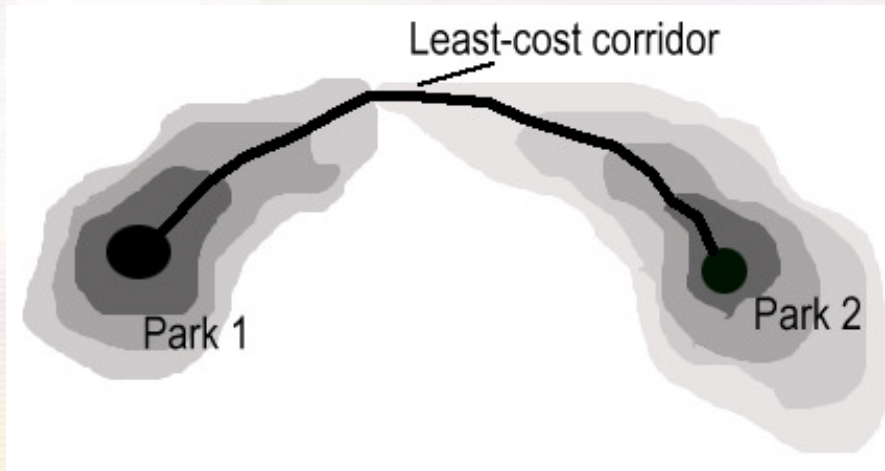


3. Methodology

3. Potential linkage analysis

Least-cost distance model:

Design of nature reserves
to identify important linkages.



The major steps are:

- ① Defining target points: the most suitable areas & larger than 1 ha
- ② Defining “cost” surface: The cost surface identifies the cost of developing green spaces. Land use/cover, transportation, etc. could act as barriers to influence the cost of developing green spaces.



3. Results

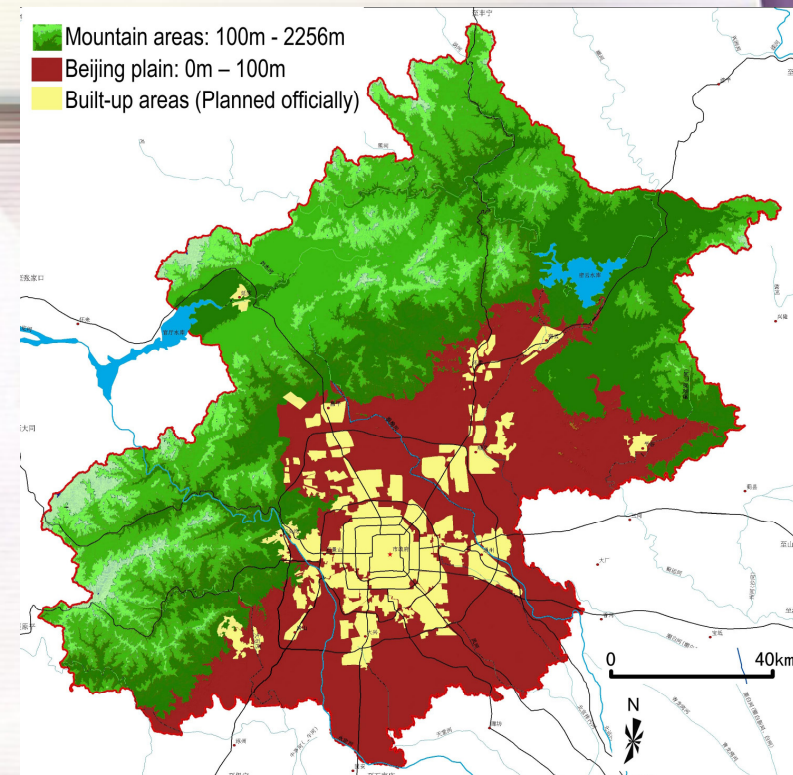
How many green spaces we need?

Carbon-oxygen balance:

- Reality (2007): 5825.7 km²
- Needed in 2020: 6051.6 km²
- Statutory plan in 2020: 6236 km²

Note:

1. Mountainous forests make the biggest contribution.
2. Forests in built-up areas: insufficient & monoculture, ornamental shrubs and lawns





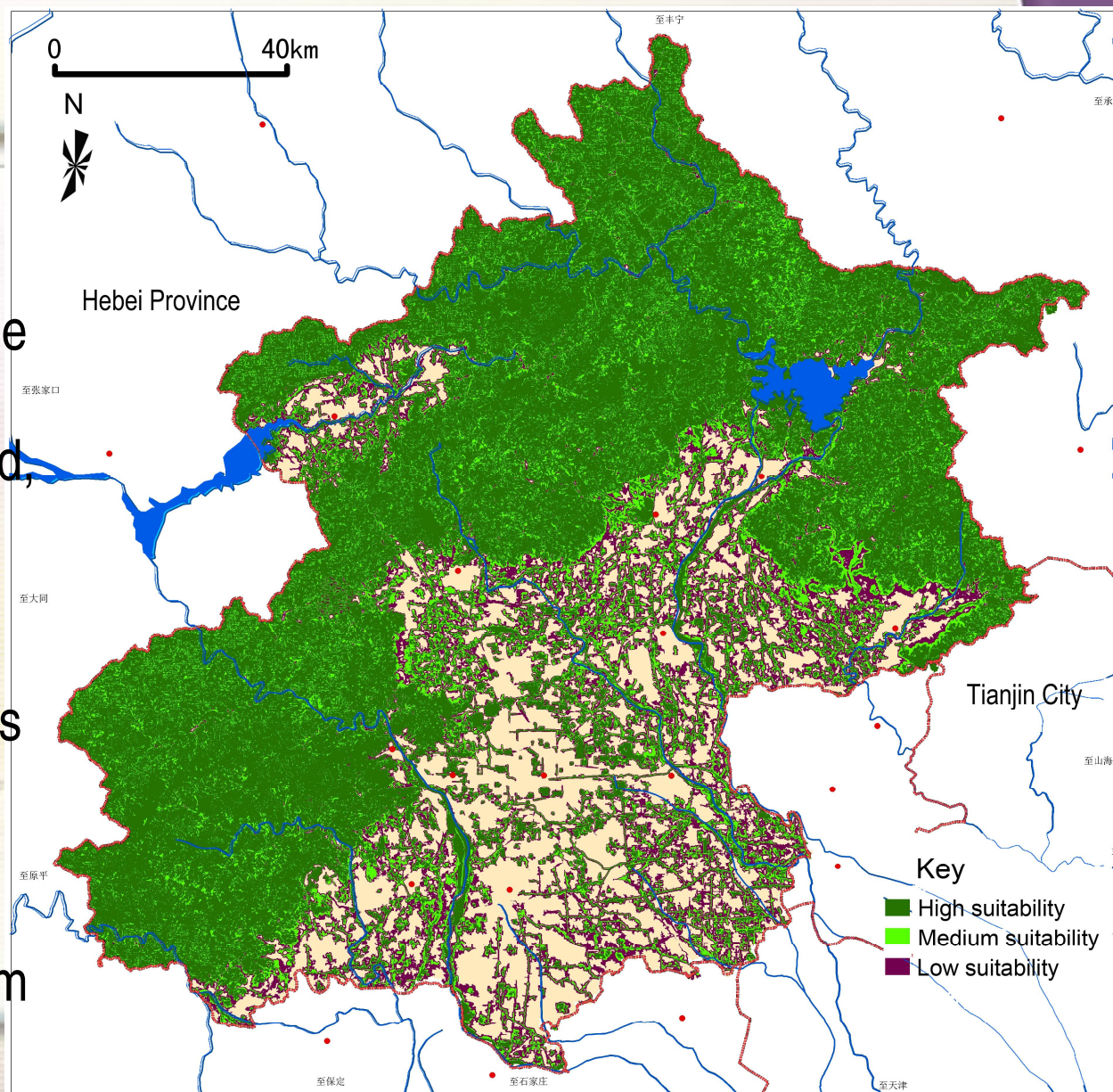
3. Results

Where to place them?

High Suitability: existing parks, gardens, or some highly feasible areas, like river banks, wetland, bare land, etc.

Medium Suitability: agricultural areas, grass land, orchard, etc.

Low Suitability: cost more, but could be a long-term goal.

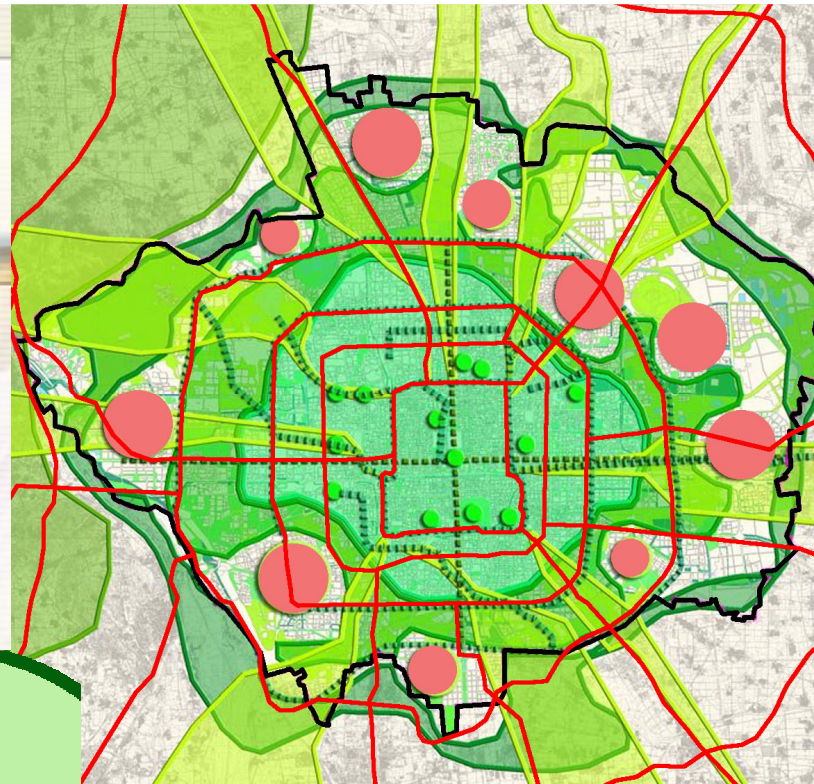




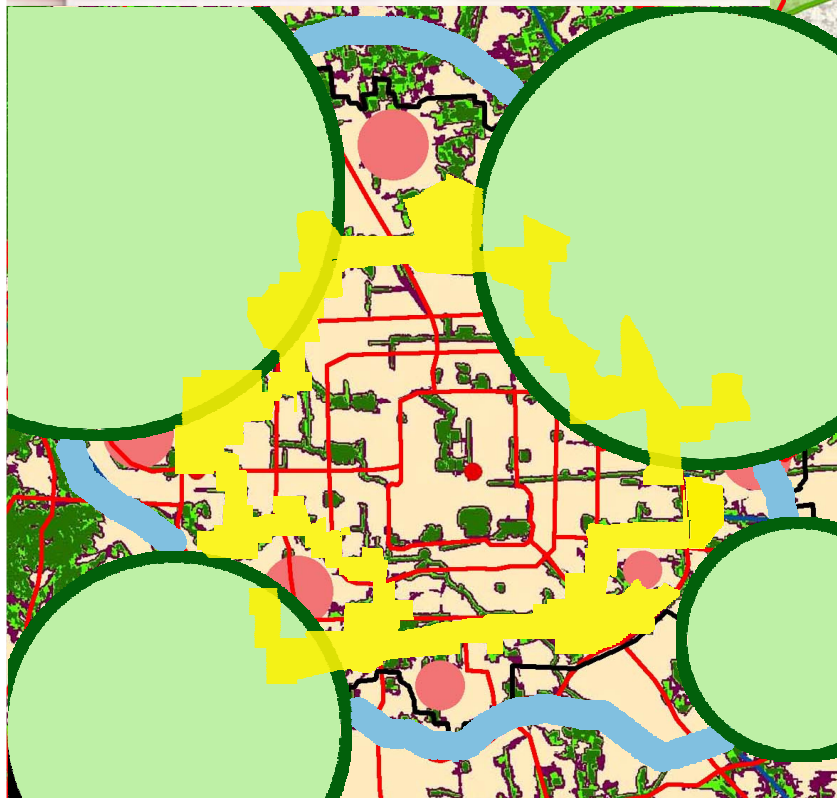
3. Results

Which is better?

Statutory 2020 Beijing Central City Green Spaces Structure Plan (Beijing City Council, 2007)



-  Green wedge
-  Greenbelt
-  Park
-  Road greening
-  Central city boundary
-  Main roads
-  10 Satellite Towns



-  Greenbelt
 -  Green block
 -  Green corridor
 -  Central city boundary
 -  Main roads
 -  10 Satellite Towns
- 0 10km N

Alternative 2020 Beijing Central City Green Spaces Structure Plan



4. Conclusions

1. Two scenarios:

- High + Medium Suitability, 30.54% to 32.42%
- High + Medium + Low Suitability, 30.54% to 53.73%

2. Face the reality:

- Statutory: 10 green wedges + 2 greenbelts
- Alternative: 4 green blocks + 4 corridors + 1 greenbelt


3. Go to the inner:

- increasing indigenous plants and enriching the layers of urban forests:
a main tree canopy, understorey shrubs and grass



5. Discussion

1. What boundary to define the carbon-oxygen balance calculation?
 - Beijing boundary is defined by the government;
 - Human activities occur in built-up areas.
2. How to fit into China's much complex city context?
 - Consider city as a homogeneous surface in this study;
 - Old districts revitalisation, new neighborhood development, population density, land price, etc.



Thanks for your attention

^ ^
—

Welcome any suggestions!



Appendix

- See my paper
---- *An Integrated Ecological Approach to Urban Green Spaces Planning in Beijing, China*