

# 北京城市实验室

Beijing City Lab and Its Research in the Context of Transitioning China

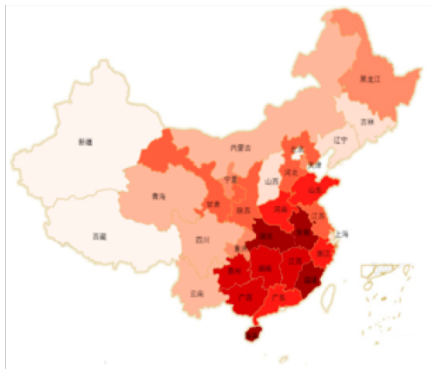


**Ying Long, PhD**

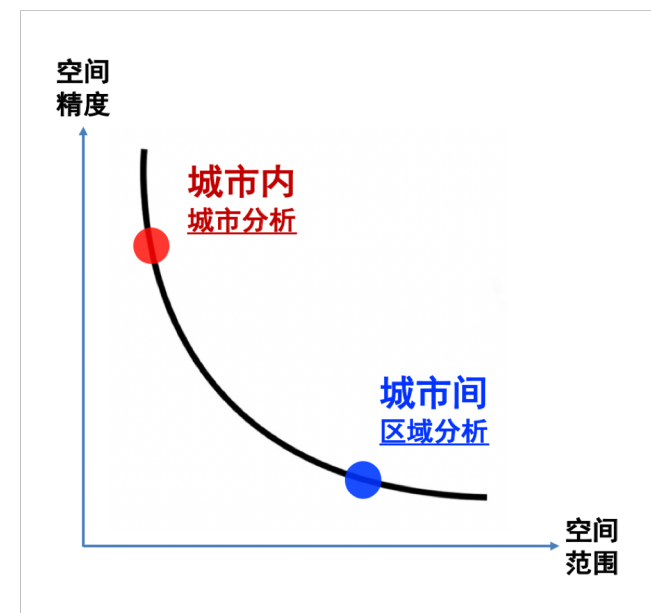
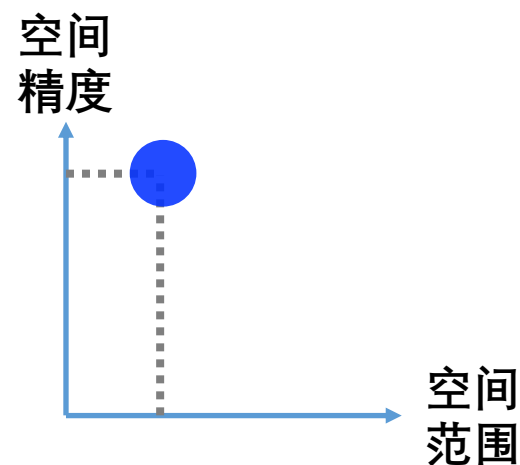
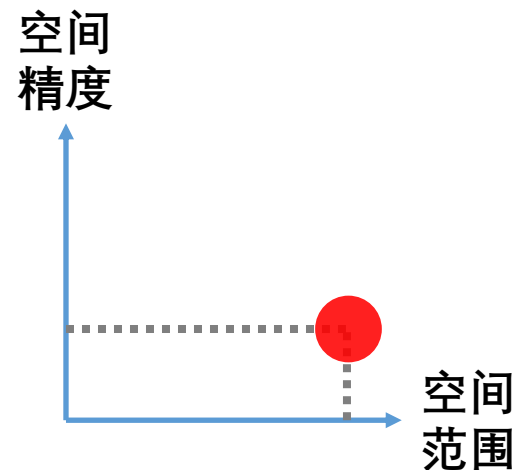
School of Architecture, Tsinghua University  
Founder and Executive Director, Beijing City Lab

## 已有城市空间研究尚存的挑战

**城市系统层面：**  
多依赖统计资料，客观详实数据支持有限



**人本尺度层面：**  
多依赖小规模现场调研，难以测度和量化



# 城市空间量化及其规划设计响应

传统数据、大数据、开放数据

量化研究方法

城市模型

先锋技术

理解城市系统

- 1 整个国家 (大模型)
- 2 城市设计尺度 (人本尺度城市形态)

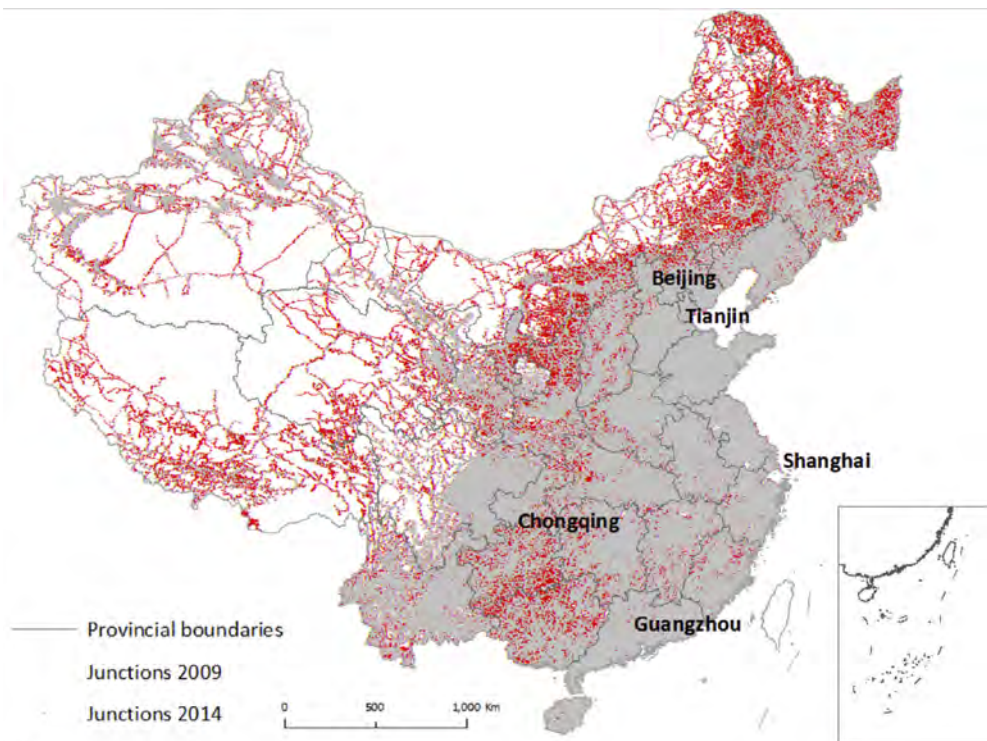
空间干预/规划设计响应

(数据增强设计)

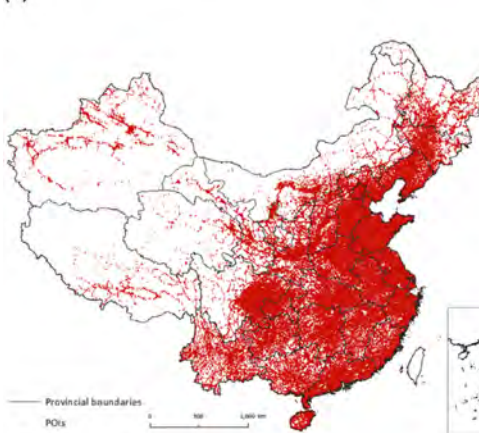


个人主页 : <http://www.beijingcitylab.com/longy>

# 微观视角的中国城市空间研究



(a)



(b)



(c)

# 大数据、新城市科学、城市模型、MOOC

### 课程简介：

本课程将结合中国城市（规划）以及技术发展特点进行讲授，秉承技术方法与城市研究与规划并重的原则，既侧重大数据技术方法的讲解，又重视城市系统和规划设计领域的应用。主要涵盖数据获取、统计、分析、可视化，城市系统分析，各个规划类型的应用，以及最新前沿介绍等内容。

### 考核方式：

基于MOOC的混合式教学，网上MOOC占40%成绩（MOOC每节后选择题和期末选择题分别各占一半），大作业50%（选题ppt占15%+最终论文占35%），考勤10%。

## 大数据与城市规划

## Big Data and Urban Planning

清华大学混合式教学  
课程号：70000662

### 课程简介：

致力于介绍近十年涌现出的认识城市和改变城市的新技术、新数据和新领域等，达到了解城市，扩展专业视野的目的。

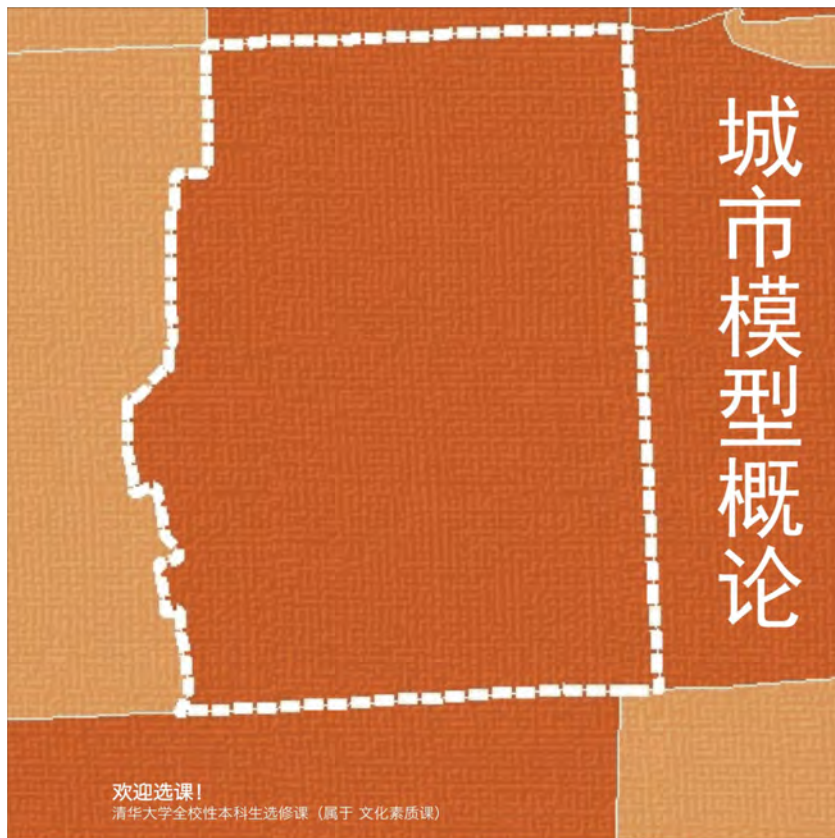
### 考核方式：

课堂讨论30分，考勤20分，期末论文50分（针对某个新技术新数据新领域的思考、批判或展望，4000-6000字。

## 新城市科学

## The New Science of Cities

清华大学本科文化素质课（科技与社会）  
（课号00000042）



欢迎选课！  
清华大学全校性本科生选修课（属于文化素质课）

欢迎选课

#### 课程信息

课程名称：城市模型概论  
授课教师：龙瀛，清华大学建筑学院  
授课时间：1-8周/每周二/第六大节（19:20-20:55）  
授课地点：五教（具体地点详见选课系统）  
课程类别：全校性本科生选修课（属于文化素质课）  
课时：16  
学分：1  
考核方式：考察中期作业（30分）+出勤（30分）+大作业（40分）

#### 教学大纲

1. 城市模型概论之概念（城市模型的流派、经典城市模型、最新发展趋势两大阵营）
2. 建立城市模型所需要的基础数据
3. 城市空间分析方法
4. 城市模型语言（Python）
5. 空间相互作用模型
6. 基于规则建模
7. 向量元胞自动机模型
8. 大数据时代的城市模型展望及课程总结



关于龙瀛



已有在线课程



更多信息



## 大数据与城市规划(2018秋)

清华大学



龙瀛



长按识别看课程

大规模在线免费MOOC公开课

# 1 Chinese Cities in Transition

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# Ancient walled Chinese cities



## Ancient walled Chinese cities

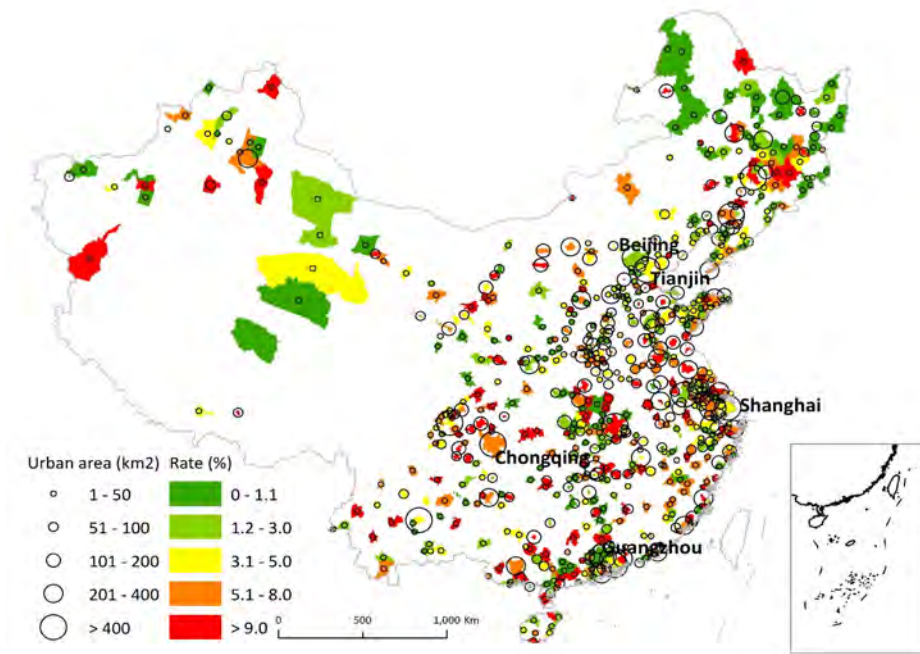




## Ancient walled Chinese cities



Historical Chinese cities ( $N=1481$ )



The city system is getting more and more complex in contemporary China, and studying modern Chinese cities raises new challenges.

## “Ghost” cities/towns in new developed urban areas



# Spatial disorder in old part of cities

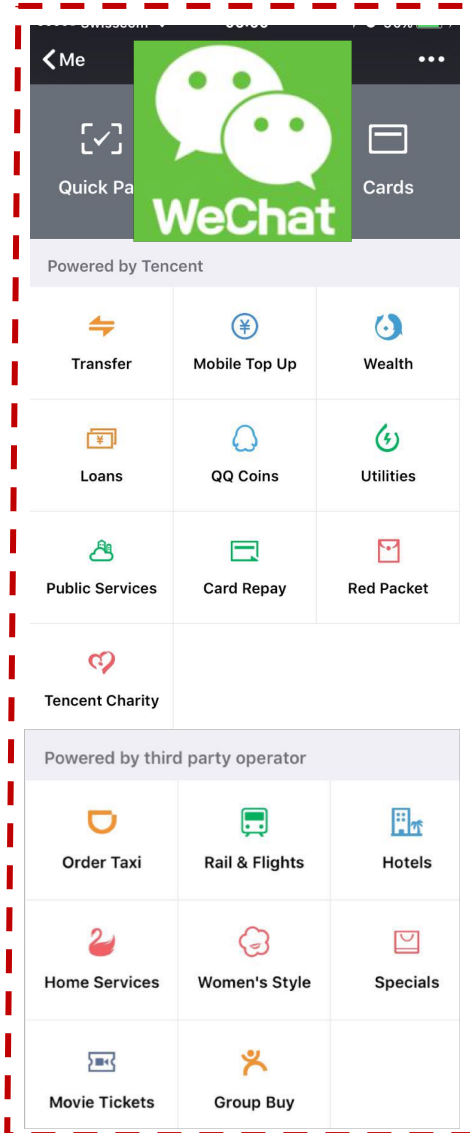


## Shrinking cities suffer from population loss



# E-life in Chinese cities

- Online shopping
- dinning
- facilities
- pay
- leisure
- even sport



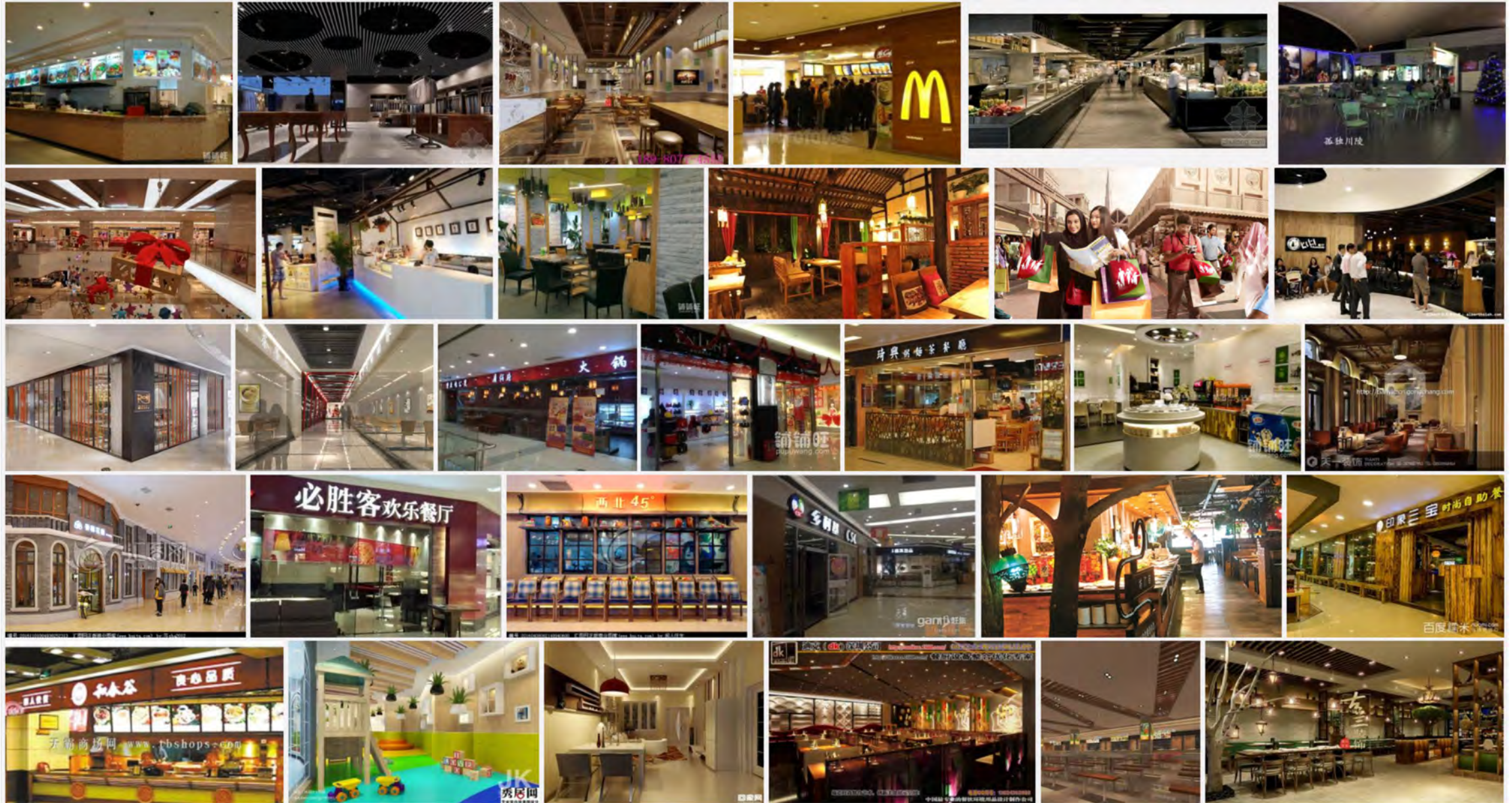
# Vanishing restaurants and shops along streets



# Vanishing restaurants and shops along streets BEFORE



# Vanishing restaurants and shops along streets NOW





# The way we use public space has been changed



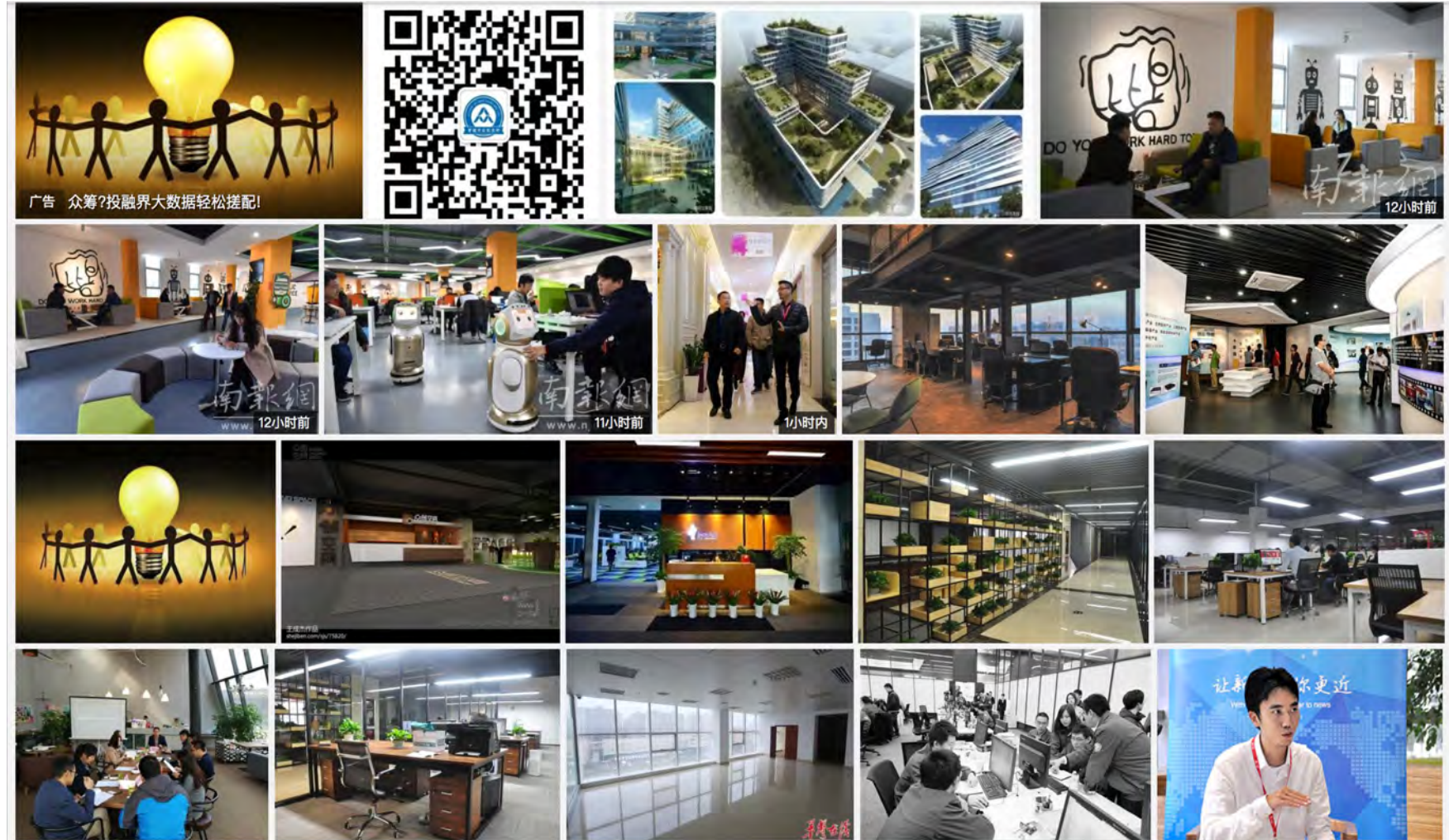
# Even in classrooms



ICTs lead to greener, more efficient  
and healthy Chinese cities?

# Share economy

- The Chinese version of Fab Lab, c-base, Hackerspace, Techshop, Metalab, and Makerspace
- The third place, co-working
- Small and Internet based business



## Smart city initiative in China



## 走到了多个十字路口

### 城市化的下半程：50%+、收缩城市、存量规划、减量化、双修

- 上海、北京等大城市提出了减量化规划、零增长规划等
- 对空间与生活品质提升的需求（以人为本的落到实处）
- 人口势必要增长的规划理念/范式遇到挑战（抢人大战）
- 中国收缩城市研究网络的成立（年会、专刊、媒体报道、学术发表等）

### 未来已来：智慧城市、未来城市、第四次工业革命

- 生活方式的巨大变迁
- 城市空间的变化
- 这些变化对已有的规划设计产生较大冲击（如何设计具有网络互动属性的城市空间？如何用规划政策正确引导网络空间分布的发展？）

### 国土空间规划时代的到来

- 多规合一
- 三线划定
- 规划与设计渐行渐远？

## 2 Data Environment in Transition

Big Data + Open Data

清华大学  



# Historical records for cities

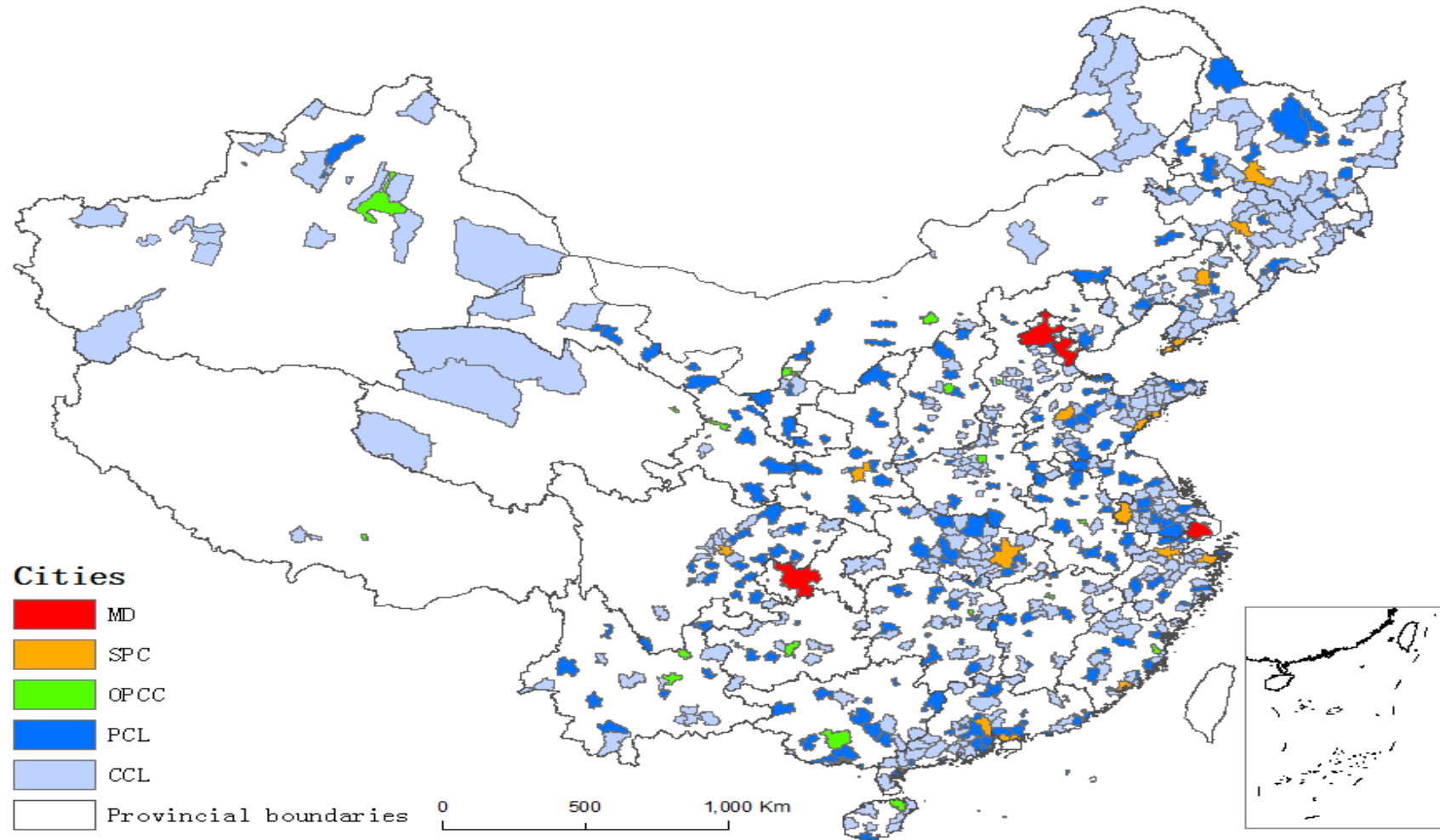




# Understanding and governing cities mainly rely on official yearbooks

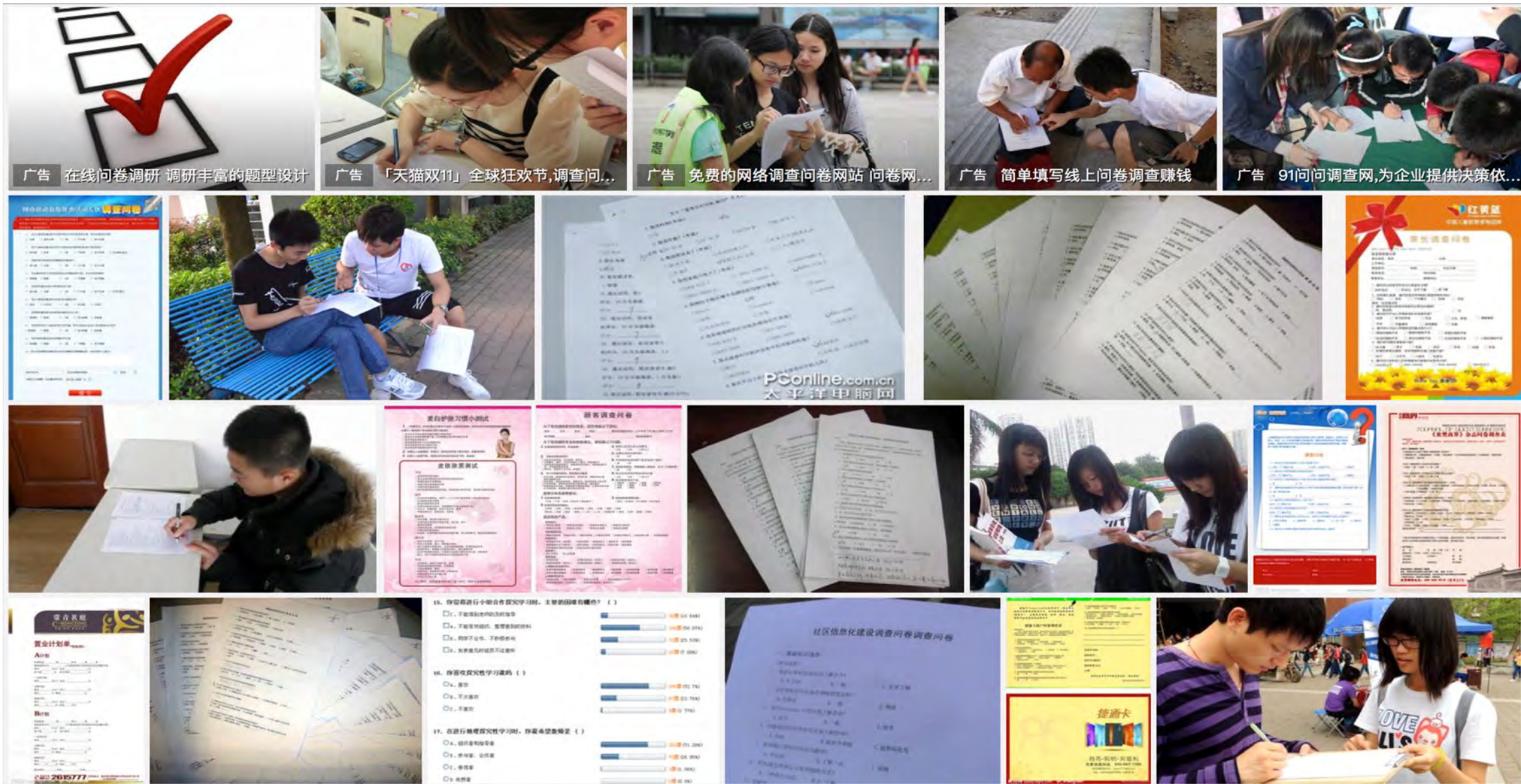


## Understanding and governing cities mainly rely on official yearbooks (for administrative cities)

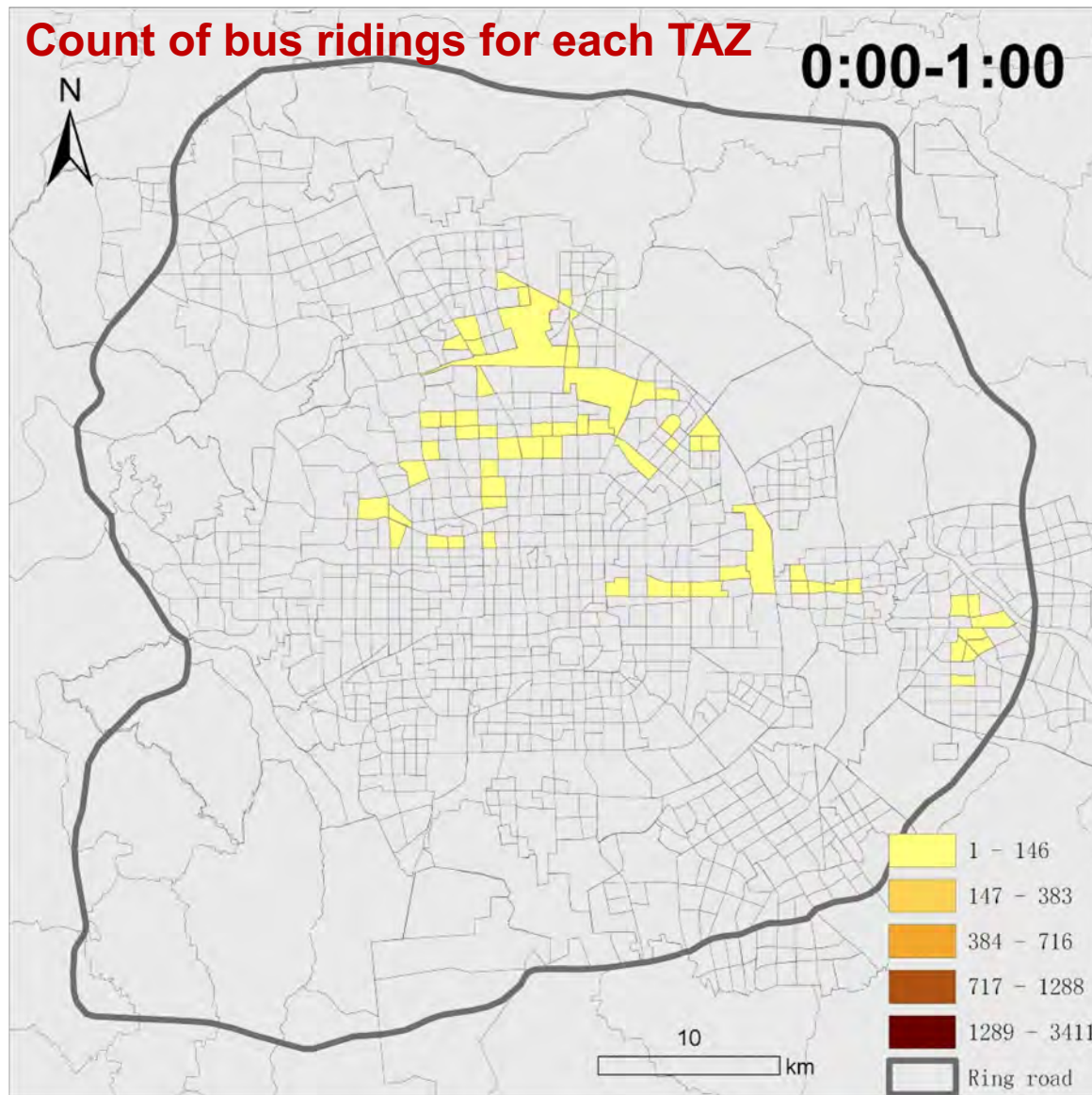


- Administrative levels of Chinese cities: municipalities, prefecture level cities (副省级、省会和一般地级市) and county level cities ( $N=653$ )
- City proper spatial distribution (both urban and rural areas)

# Understanding and governing cities mainly rely on official yearbooks, surveys and questionnaires



# Big data (not open all the time)



## Open data: (1) Commercial websites / social media

Not big all the time

### 社交网络



### 专业网站



**- Road junctions derived from road networks**

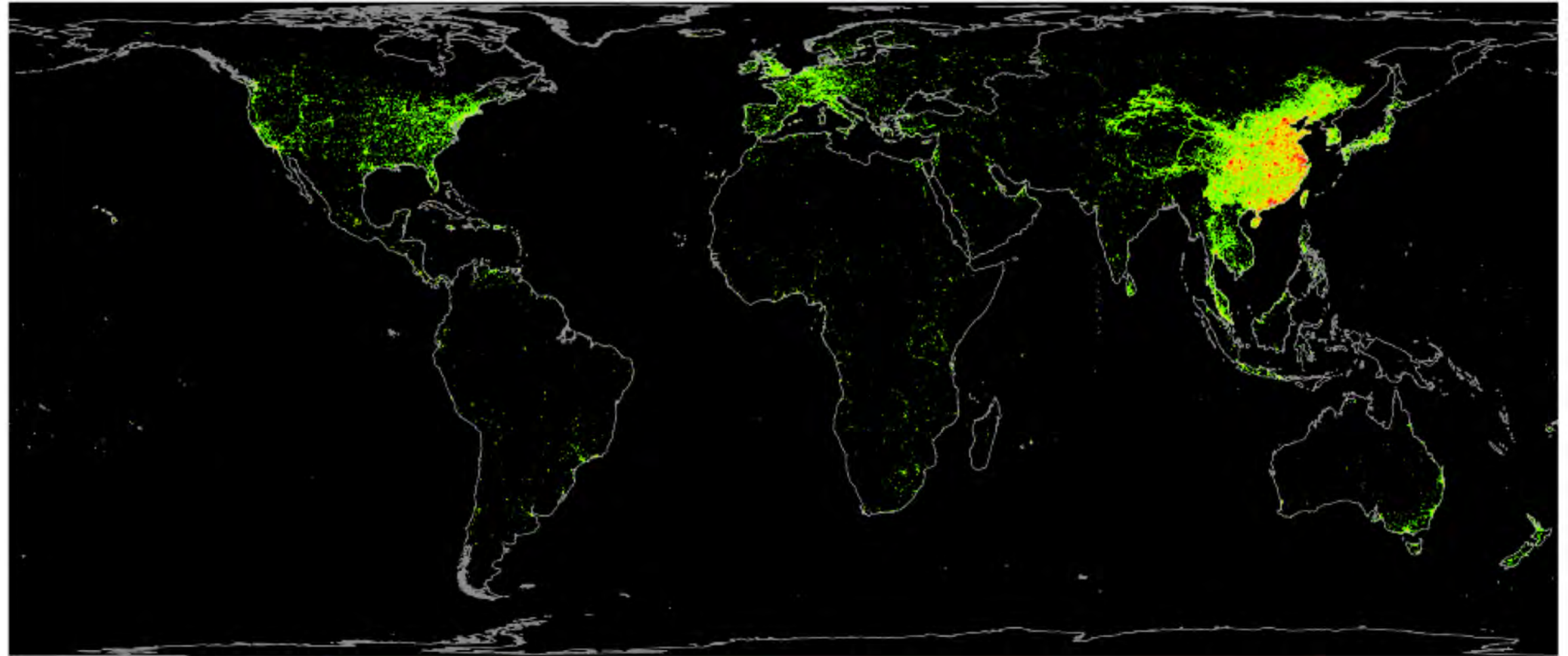


**- Points of interes**



- Geotagged Sina Weibos

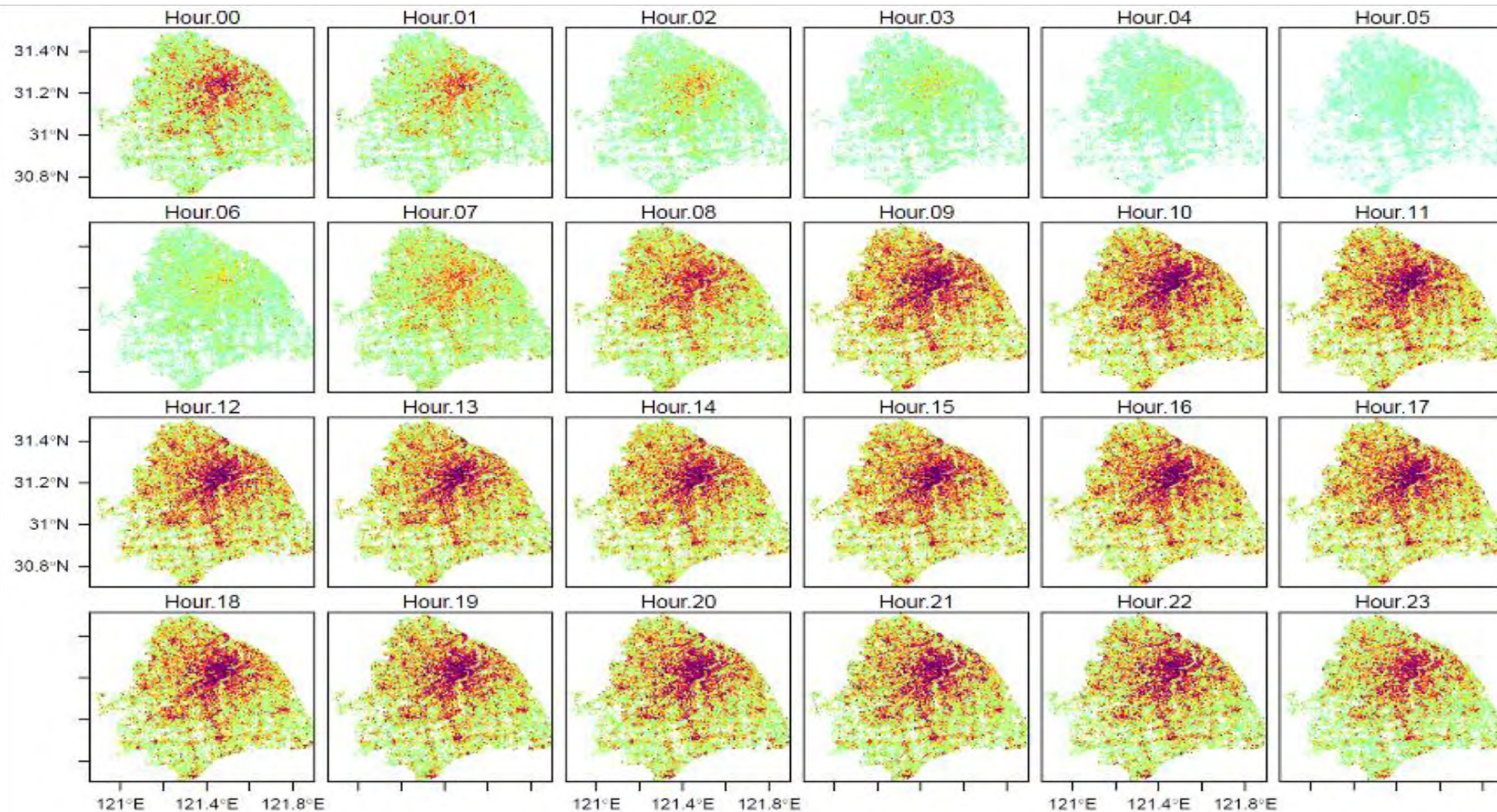
Source: Wang Jianghai





# - Online Users of Tencent QQ

Source: Wang Jianghai



## Open data: (2) Government websites

[登录](#) | [注册](#) | [旧版数据库](#) | [English](#)



# National data 国家数据

中华人民共和国国家统计局  
National Bureau of Statistics of China

[首页](#) | [月度数据](#) | [季度数据](#) | [年度数据](#) | [普查数据](#) | [地区数据](#) | [部门数据](#) | [国际数据](#) | [可视化产品](#) | [出版物](#) | [帮助](#)

**查数 CHASHU** 如: 2012年 北京 GDP

**统计热词** gdp cpi 人口 出口 总人口 房价 社会消费品零售总额 固定资产 ppi 货币

**用户中心** [立即注册](#)

邮箱:

请输入密码:

自动登录 [忘记密码](#)











**为用户提供更好的服务**

经济学家曾这样预言：“新时代最重要的趋势是将世界上的信息组织起来，让每个角落的人都能够找到最有价值的信息。”为此，国家统计局创新升级了“涵盖内容更加全面、使用体验更加快捷”的新版数据库，这就是“国家统计数据库”。

公开透明，信息共享。  
我们一直在努力……



1 2 3 4 5 6 **7** 8 9 10 11 12 13 14 15

**快速查询 (专题统计报表)**

月度	季度	年度
工业增加值增速	房地产开发投资	各地区居民消费价格分类指数
主要工业产品产量	各地区商品房销售面积	工业生产者价格指数
各地区工业增加值增长速度	各地区房地产开发、竣工面积	各地区工业生产者价格指数
分行业主要工业企业经济指标	社会消费品零售总额	七十个大中城市住宅销售价格指数
固定资产投资 (不含农户)	限额以上企业商品零售类值表	全社会客货运输量
各地区固定资产投资 (不含农户)	居民消费价格分类指数	邮电业务完成量
各行业固定资产投资 (不含农户)	商品零售价格分类指数	国际比较

[2013年统计公报](#) | [热点问题解读](#) | [统计指标解释](#)

**发布日期**

2014年 4月

日	一	二	三	四	五	六
		1	2	3	4	5
6	7	8	9	10	<b>11</b>	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

今日发布: 工业生产者价格指数月度报告  
明日发布: 明日无发布内容

**可视化图表**

**数据更新**

## Open data: (2) Government websites

# 北京市规划委员会

BEIJING MUNICIPAL COMMISSION OF URBAN PLANNING

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简体中文 | 繁体中文 | ENGLISH



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[城乡规划管理](#)
[勘察设计测绘管理](#)

[北京规划](#)

[在线服务](#) >> [审批结果](#) >> [建设用地规划许可证](#)

### 在线服务

- [办事指南 >>](#)
- [表格下载](#)
- [网上咨询](#)
- [状态查询](#)
- [审批结果 >>](#)
- [建设项目选址意见书](#)
- [建设用地规划许可证](#)
- [建设工程规划许可证](#)
- [规划核验（验收）](#)
- [建筑名称核准](#)
- [建设单位办理项目](#)
- [在线申报 >>](#)

## 在线服务 Online Services

### 建设用地规划许可证

共有 **9377** 个用地许可证 共 **626** 页 项目搜索  [搜索](#)

证书编号	建设单位	项目名称	建设位置	核发日期	查看
2014规（怀）地字0011号	北京东方美都农业科技有限公司	北京东方美都农业科.....	怀柔区北房镇黄吉营村32号	2014-06-12	<a href="#">查看</a>
2014规（密）地字0012号	北京古北水镇房地产开发有限公司	密云县古北水镇国际.....	密云县古北口司马台	2014-06-06	<a href="#">查看</a>
2014规（大）地字0025号	北京鸿坤伟业房地产开发有限公司	西红门0801-0.....	大兴区西红门镇	2014-06-06	<a href="#">查看</a>
2014规（房）地字0028号	北京京投阳光房地产开发有限公司	房山区长阳镇长阳西.....	房山区长阳镇篱笆房村	2014-06-05	<a href="#">查看</a>
2014规（房）地字0027号	中石化催化剂（北京）有限公司	6000立方米/年.....	房山区房山区城关街道办事处前、后朱各庄村	2014-06-05	<a href="#">查看</a>
2014规（房）地字0026号	中国核电工程有限公司	中国核电工程有限公.....	房山区长阳镇水碾屯	2014-06-03	<a href="#">查看</a>

# Open data: (2) Government websites

The screenshot displays the website of the Beijing Municipal Commission of Urban Planning. At the top, there is a navigation bar with links for '加入收藏' (Add to Favorites), '联系我们' (Contact Us), and '手机版' (Mobile Version). Below this, there are language options: '简体中文' (Simplified Chinese), '繁体中文' (Traditional Chinese), and 'ENGLISH'. A search bar is located on the right side of the navigation bar.

The main content area features a navigation menu with the following items: '首页' (Home), '政务信息' (Government Information), '在线服务' (Online Services), '公众参与' (Public Participation), '城乡规划管理' (Urban and Rural Planning Management), '勘察设计测绘管理' (Surveying and Mapping Management), and '北京规划' (Beijing Planning). A search icon is also present.

The '在线服务' (Online Services) section is highlighted, showing a list of services:

- 办事指南 >>
- 表格下载
- 网上咨询
- 状态查询
- 审批结果 >>** (Selected)
- 建设项目选址意见书
- 建设用地规划许可证
- 建设工程规划许可证
- 规划核验 (验收)
- 建筑名称核准
- 建设单位办理项目
- 在线申报 >>

The main content area displays a map of Beijing with a heatmap overlay. The heatmap shows areas of high density in green and yellow, with a prominent area labeled '1997' in the center. The map includes various roads, highways, and landmarks, with labels for different districts and areas.

**New data environment = Big Data + Open Data** (commercial, social network and official)



**ISOCARP · REVIEW 10**

**BIG/OPEN DATA IN CHINESE  
URBAN STUDIES AND PLANNING**  
A REVIEW

YING LONG · LUN LIU

**A planner worked in Tencent (one of the largest Internet companies in the world) for preparing the recent Spatial Plan of China**

Source: Wechat



## Various competitions for big/open data

Source: Wechat

**SODA**  
Shanghai Open Data Apps

ABOUT SODA DATA RULES PRESS RELEASES EVENT REVIEW 中文版 | English

**SODA**  
Shanghai Open Data Apps

上海开放数据创新应用大赛

城市安全

Top 100 Teams Finalists

# Various competitions for big/open data

Source: Wechat

**2016上海城市设计挑战赛**  
2016 SHANGHAI URBAN DESIGN CHALLENGE

专业组报名 即将截止  
小伙伴们准备好了吗?

我要报名 Registration

下载中心 Download

专业组	2016/8/15
公众组	2016/9/15

上海城市设计挑战赛  
SHANGHAI URBAN DESIGN CHALLENGE

首页 Home | 最新动态 Last News | 2016挑战赛 The Competition of 2016 | 数据下载 Data Download | 公众咨询 Public Consultation | 联系我们 Contact us



# 3 The Profile of Beijing City Lab

Understanding urbanizing China with emerging new data



北京城市实验室  
Beijing City Lab

HOME

PROJECTS

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WORKING PAPERS

SLIDES

COURSES

DATA RELEASED

RANKING

LINKS&PARTNERS

ABOUT



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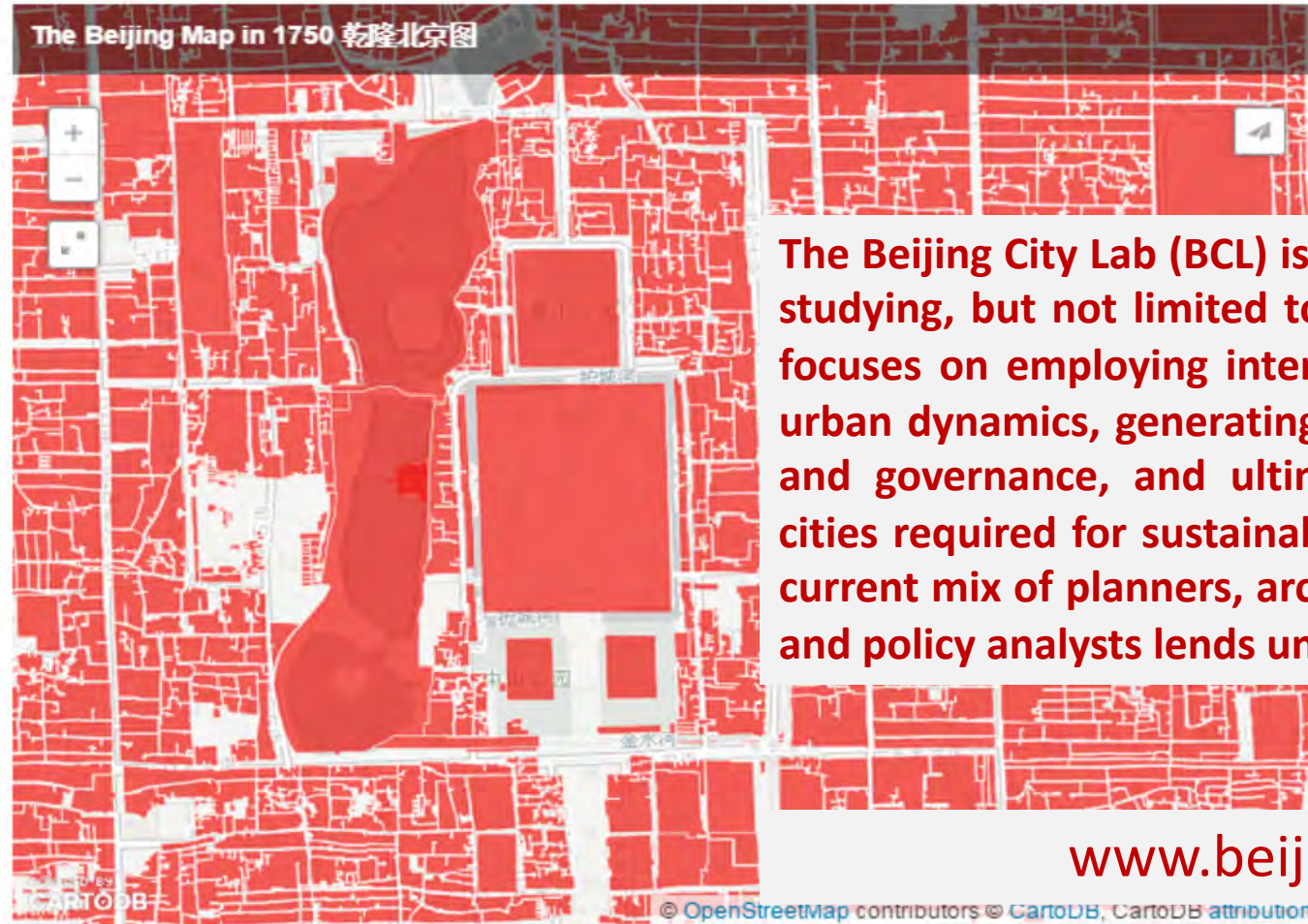
Links&Partners

About

For any issue related to BCL,  
please address your email to:  
BeijingCityLab(at)gmail(dot)com



The Beijing City Lab (BCL) is a research network, dedicated to studying, but not limited to, China's capital Beijing. The Lab focuses on employing interdisciplinary methods to quantify urban dynamics, generating new insights for urban planning and governance, and ultimately producing the science of cities required for sustainable urban development. The lab's current mix of planners, architects, geographers, economists, and policy analysts lends unique research strength.



[www.beijingcitylab.com](http://www.beijingcitylab.com)

Map created by  [bcl](http://bcl.com)

We geocoded and digitalized the famous Beijing Map in 1750 乾隆北京图. Our interactive map exhibits the lot details of the original map, which also includes buildings information. For more information for the original map, click [HERE](#).

背景是现代的北京城，由于底图是火星坐标，经纬度配准的乾隆北京图稍有位置偏差，日后换成OSM底图有望解决这一问题。

## Beijing City Lab, BCL

- **Organizing framework**

- Executive directors (×10)
- Honorary directors (×14)
- Research fellows (×34)
- Junior/student members (×43)
- Followers from social medias ( 20,000+ )

- **Our profile**

- A research network for quantitative urban studies
- **We use open data and produce open data as well**
  - Open platform for sharing working papers, research data, slides and city rankings
- Visualization for the public (received dozens of media coverage)
- Based at Beijing and perspective on the whole China
  - **Current focus of my studies: Understanding urbanizing China with emerging new data**

## 75 working papers

Researchers are invited to use our working paper series to disseminate their research about Beijing. Please email Dr. Xingjian Liu ([xliu6@hku.hk](mailto:xliu6@hku.hk)) (1) your paper as a single file; and (2) a message indicating the journal to which the working paper has been submitted (this information will not be posted until the paper gets accepted). Please use the following file as your first page in the working paper.



WP\_BCL\_Cover.docx  
Microsoft Word Document [17.1 KB]  
[Download](#)

**Working paper navigation: [1-20](#), [21-40](#), [41-60](#), [Latest](#)**

### 66 Evaluating Liang-Chen scenario using counterfactual analysis

LONG Ying, ZHOU Yin



The Liang-Chen scenario for Beijing Urban Planning, though failed to put into practice, is an important milestone in the history of urban planning in China. However, planners hold different views on this scenario: Some think that, if the scenario had been adopted, the development pattern of single center would not appear; while some others point out that this scenario is just another form of single-center-spreading. These arguments are derived from perceptual knowledge, but not rational analysis. Based on constrained cellular automatic and the theory of

## 10 city rankings

### How to cite:

**Author(s), Year, Name, Ranking at Beijing City Lab, <http://www.beijingcitylab.com>**  
E.g. Long Y, Wang J, Wu K, 2014, PM2.5 pollution of Chinese cities, Ranking at Beijing City Lab, <http://www.beijingcitylab.com>

Ranking navigation: [Latest](#)

### 10 Road intersection density in China

LONG Ying, 2014

Road intersection density of each prefectural or above city in China defined as the ratio between the road intersection count within the urban built-up area of a city and the urban built-up area in square kilometer of the city. Road intersections are derived from the BCL data "21 Road junction density of China in 2011", and the urban built-up area of each city is interpreted from remote sensing images (2010).



## 35 datasets released

A list of conventional, big and open data for describing built-environment of China.

This channel would release Beijing, or the whole China, micro-data and maps (e.g. road networks, parcels, human mobility, historical city maps) for the BCL research fellows and external researchers. There are three levels of data access, free download, email request, and shared among research fellows / student members.

Our released datasets are stored in DropBox. We would like to recommend you setup DropBox for downloading the datasets to your account. This is helpful when the download is temporally unavailable due to too many requests.

### How to cite:

**Beijing City Lab, Year, Data ID, Data Name, <http://www.beijingscitylab.com>**

E.g. Beijing City Lab, 2013, Data 8, Housing price in Beijing, <http://www.beijingscitylab.com>

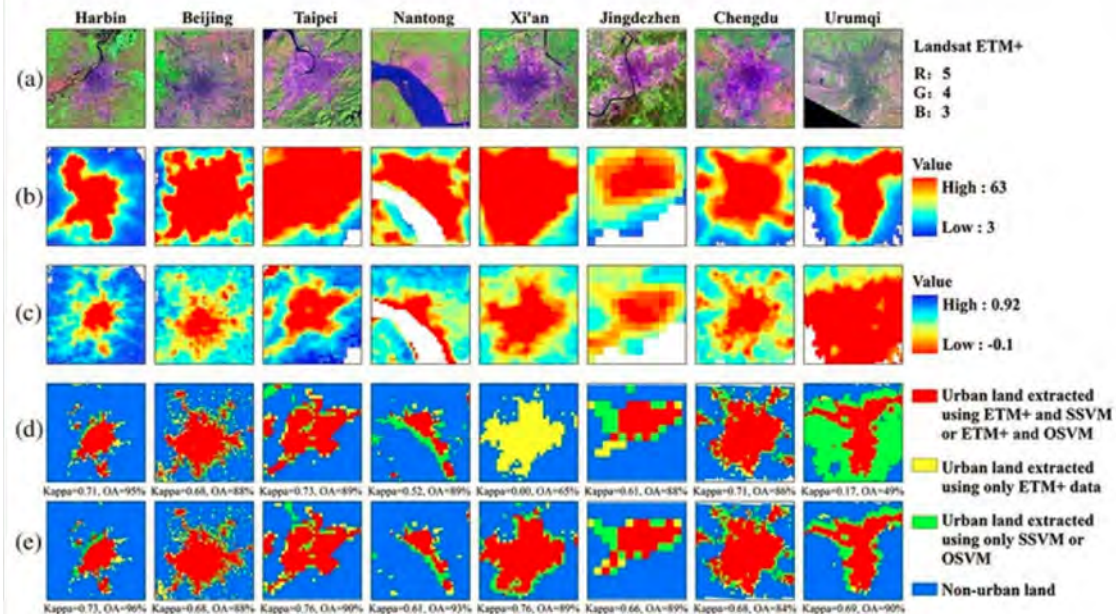
(For the dataset from external source other than BCL, we would recommend you to cite the original source)

[Free external data please click here>>](#)

[Data released 1-20-->](#)

### 28 DMSP/OLS interpreted urban areas of China in 1992-2007

2015



## 35 datasets released

### 32 The new data of Yichun, a shrinking city in North East China

2016

According to **our previous bibliometrics study** (城市规划的知识产出、消费与网络), the large Chinese cities have been attracted over much attention from researchers, and most of small cities in China are not well studied. For alleviating this situation, we are releasing the emerging new data (open data) for a small city in North East China, Yichun, which is experiencing population shrinking (for more, see the BCL project 15 Shrinking Cities, <http://www.beijingscitylab.com/projects-1/15-shrinking-cities/>). We hope this effort may shed light on the research for Shrinking Cities in China as well as potentially improve the quality of life of this small city through the lends of more studies and better decision making.

Data format: ESRI ArcGIS 10.x, File Geodatabase

The data contributors: Ying Long, Dong Li (more to come)

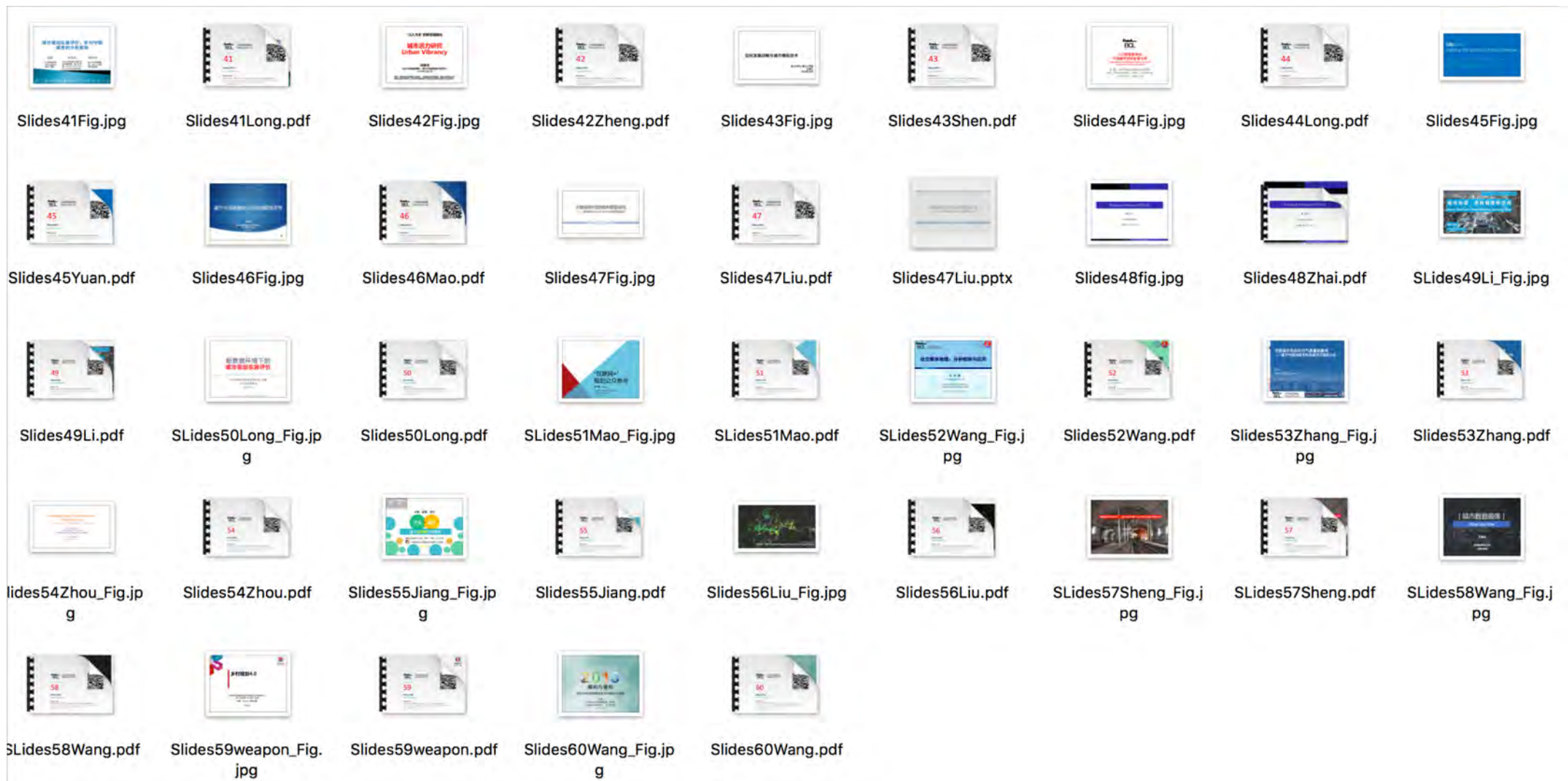
For data downloading, please contact Dr Ying Long via [ylong@tsinghua.edu.cn](mailto:ylong@tsinghua.edu.cn)

Welcome cite our papers:

1. Long Y, Wu K, 2016, "Shrinking cities in a rapidly urbanizing China", Environment and Planning A 48 220-222
2. Liu X, Song Y, Wu K., Wang J, Li D, Long Y. (corresponding author), 2015, "Understanding urban China with open data", Cities 47 53-61
3. Li D, Long Y, 2015, "A crowd-sourced data based analytical framework for urban planning", China City Planning Review 24 49-57

- 伊春市
- <http://www.beijingscitylab.com/data-released-1/>

## 78 slides





## BCL visitors from the world



### Comments from Prof Michael Batty @ CASA, University College London

“China rising: Beijing City Lab, interesting virtual lab that is exploring many scientific issues in Chinese cities”  
<http://blogs.casa.ucl.ac.uk/author/michael/>

## Annual conferences of Beijing City Lab 2014-2018



- Applied Urban Modeling, **2014**, Tsinghua University
- Urban Planning and Studies in the New Data Environment, **2015**, Beijing Jiaotong University
- Space Quality, Vitality and Design of Cities, **2016**, Tongheng Planning Institute
- Quantitative Urban Studies: From Beijing to China, **2017**, Tsinghua University
- Data+Future, **2018**, Chinese Academy of Sciences

# 4 The Beijing City Lab Research

Understanding urbanizing China with emerging new data



北京城市实验室  
Beijing City Lab

HOME

PROJECTS

MEMBERS

WORKING PAPERS

SLIDES

COURSES

DATA RELEASED

RANKING

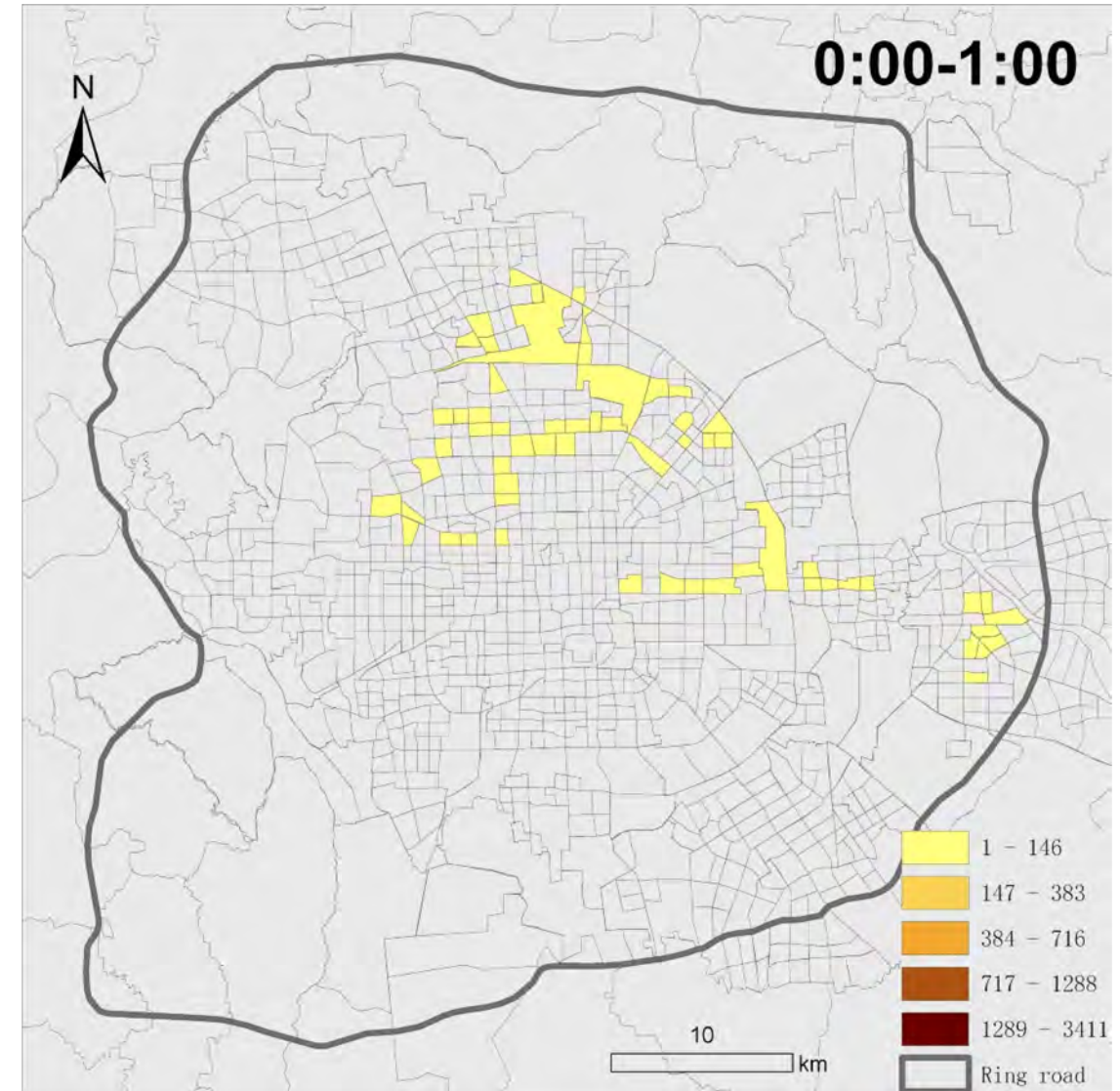
LINKS&PARTNERS

ABOUT

## 36 projects conducted by BCL

NO.	Projects
0	Historical Beijing
1	BUDEM
2	Urban Growth Boundaries
3	Bus Landscapes
4	Population China
5	Planning Support Systems
6	Urban Form
7	Population Synthesis
8	Social Network Mining
9	Big Model
10	Beijing Parking
11	Urban Network Analysis
12	AM10:00
13	PM2.5
14	SinoGrids
15	Shrinking Cities
16	Participatory Urban Sensing
17	Data Augmented Design

NO.	Projects
18	Digital Desert
19	New Data Environment
20	NIMBY
21	Baseline Water Stress
22	Street Urbanism
23	Human scale urban form
24	Ten Seconds
25	Urban China using Didi Records
26	Urban Vitality and Urban Design
27	Wilderness
28	Polycentric China
29	Picture Urbanism
30	Ghost Cities
31	Redefining Chinese City System
32	Urban Informality
33	Monitoring Urbanizing China with New Data
34	Healthy Cities
35	Urban Green Infrastructure

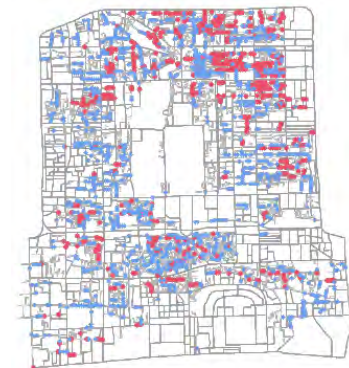
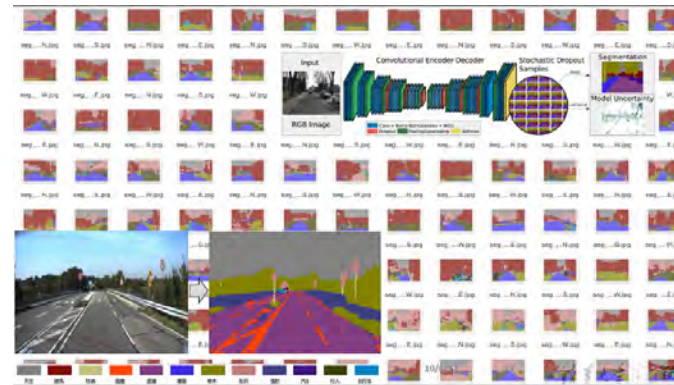
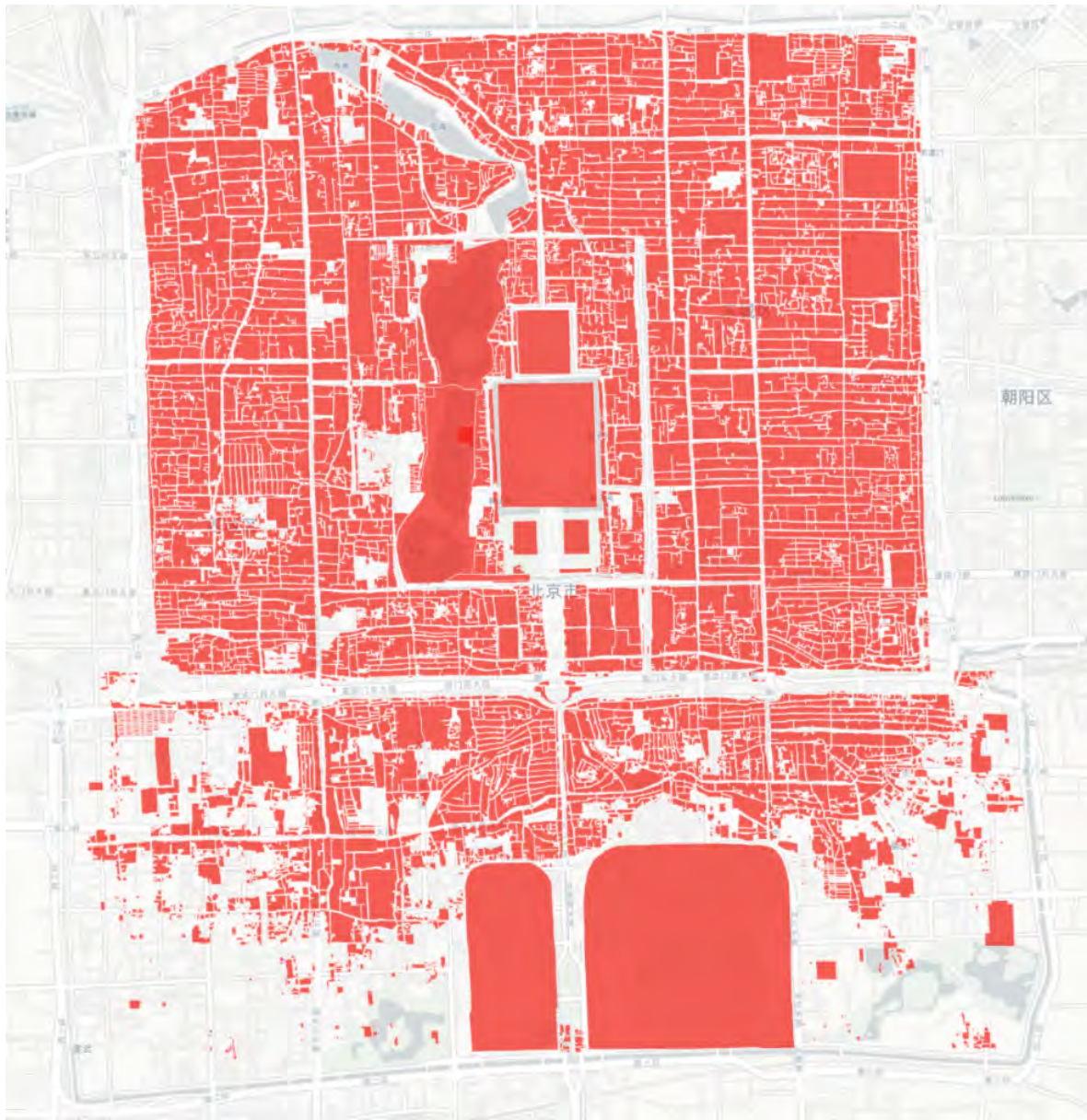


Urban dynamics revealed by smart card records of Beijing

## 0 Historical Beijing

- The Beijing Map in 1750
- Understanding Beijing Hutongs with Street View Pictures
- Other studies for historical land use reconstruction

# 0 Historical Beijing : Understanding Beijing Hutongs with Street View Pictures



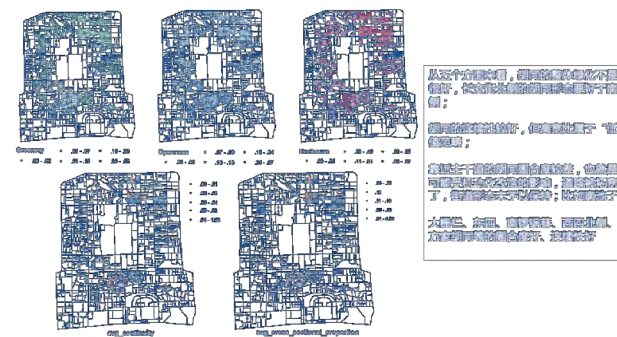
- 观测样本总量: 1893
- 非典型胡同空间: 1225
- 典型胡同空间: 639

二环内较多传统空间遭到破坏, 典型胡同空间保留较少  
**仅33.7%**

非典型胡同空间  
● 典型胡同空间

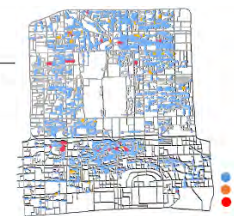
	指标	N	Mean	变化总数
外立面	立面色彩变化X1	1852	0.10	X1+X2=352
	立面清理、材质更改等其他X2	1852	0.09	
	停车空间整治X3	1891	0.04	
人行道部分	绿化改善X4	1891	0.07	X3+X4+X5=284
	街道家具X5	1891	0.04	
道路部分	车道绿化X6	1498	0.06	X6+X7=165
	绿化X7	1497	0.05	
底商部分	店面变化X8	845	0.16	X8+X9=211
	店面立面X9	842	0.09	
墙体部分	围墙通透性X10	433	0.08	X10+X11=68
	围墙周边绿化X11	441	0.07	

通过各部分的变化监测, 可以反映出, 胡同的改变速度是很慢的, 在两三年内变化的比率  
**低于10%**



从这几个方面来看, 胡同的保留率并不高, 变化的速度非常快, 而且变化的方向也很明确: 胡同的消失, 胡同的改造, 胡同的更新, 胡同的复兴, 胡同的重生, 胡同的涅槃, 胡同的重生, 胡同的涅槃, 胡同的重生, 胡同的涅槃...

	变化的有效性	N	有效变化的比例
外立面	Non-Effective	7	3.5%
	Effective	16	2.5%
人行道部分	Non-Effective	82	4.6%
	Effective	9	0.5%
道路部分	Non-Effective	56	3.9%
	Effective	10	0.7%
底商部分	Non-Effective	47	5.6%
	Effective	14	1.7%
围墙部分	Non-Effective	19	4.4%



有效变化, 即变化改善了胡同品质的占比在0.7%-4.6%之间。  
改变的很少, 精细化的改变  
**更少**

胡同所在的旧城发生了显著的绅士化过程 2005-2010



# 0 Historical Beijing : ther studies for historical land use reconstruction

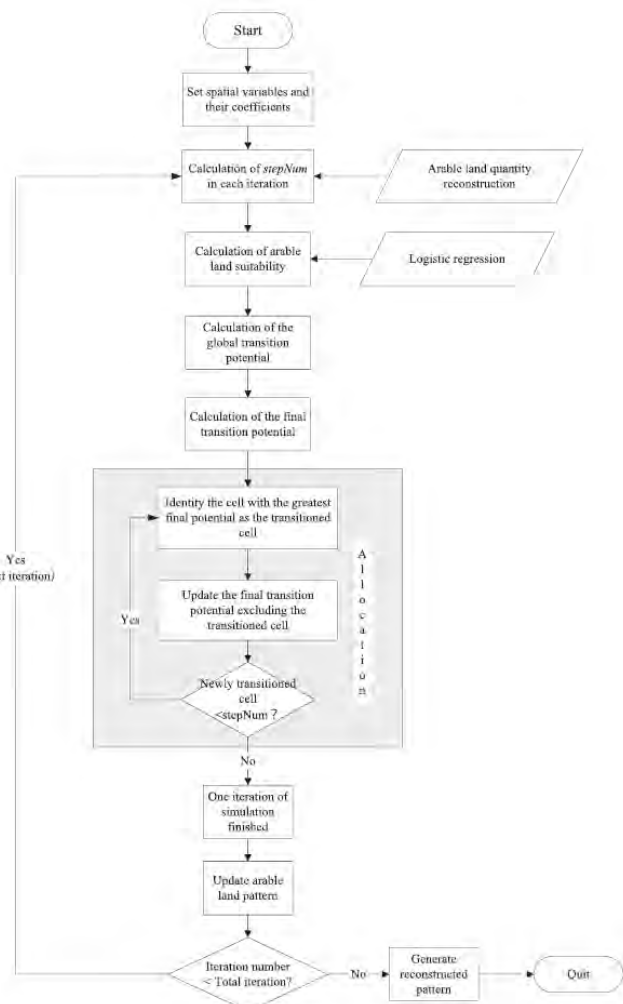


Fig. 5. Flow chart of the HARM.

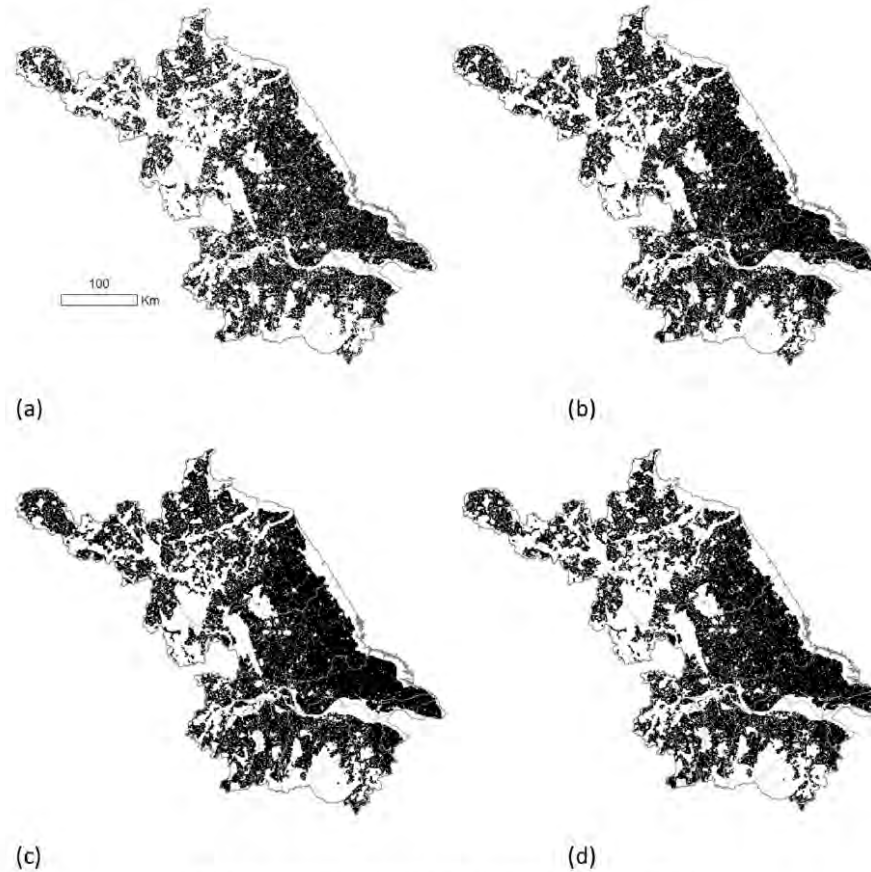


Fig. 6. Reconstructed arable lands in 1661 (a), 1820 (b), 1887 (c) and 1933 (d).

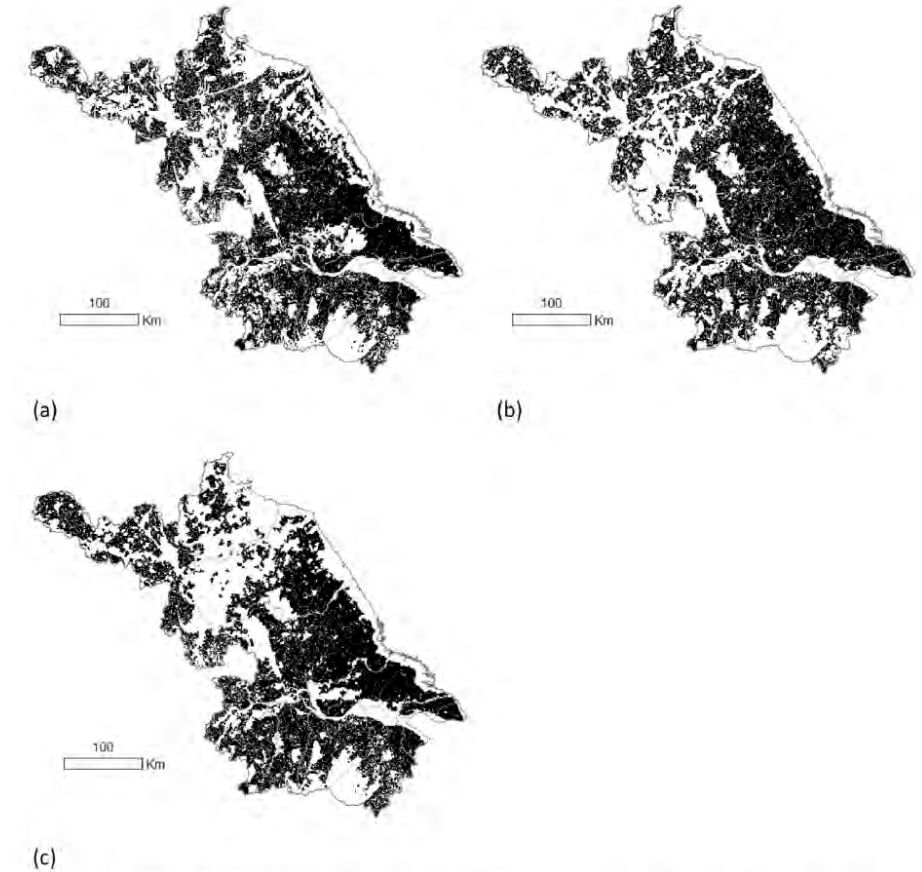
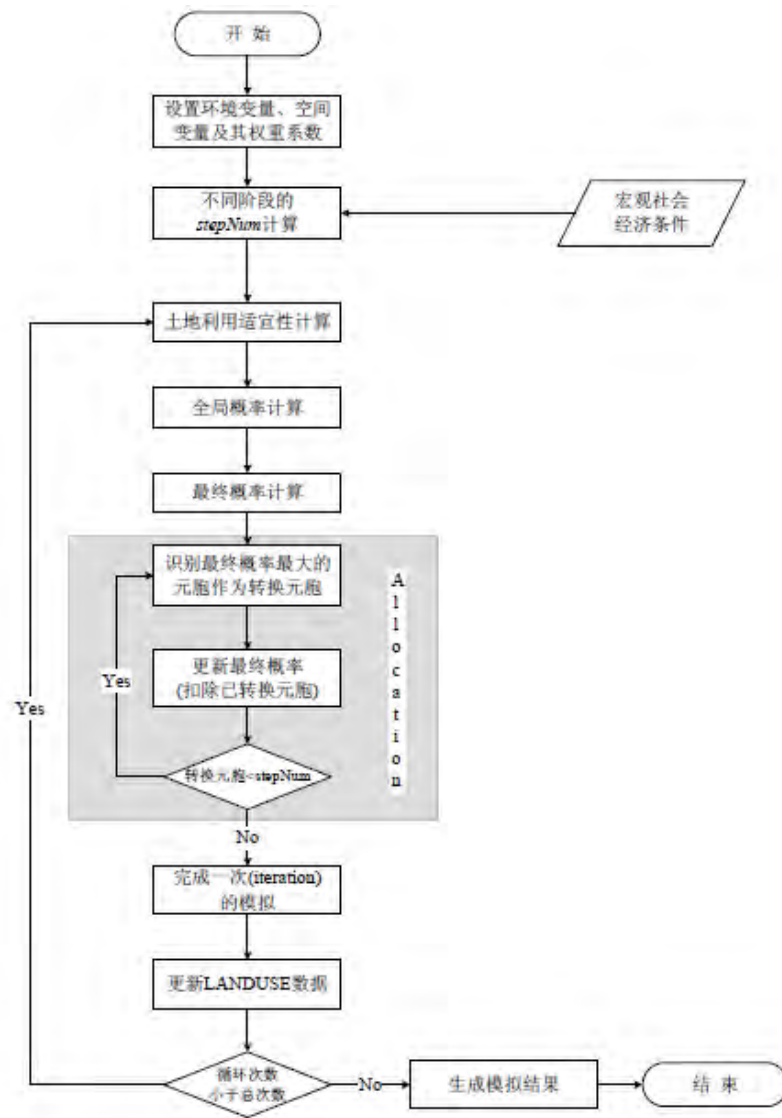


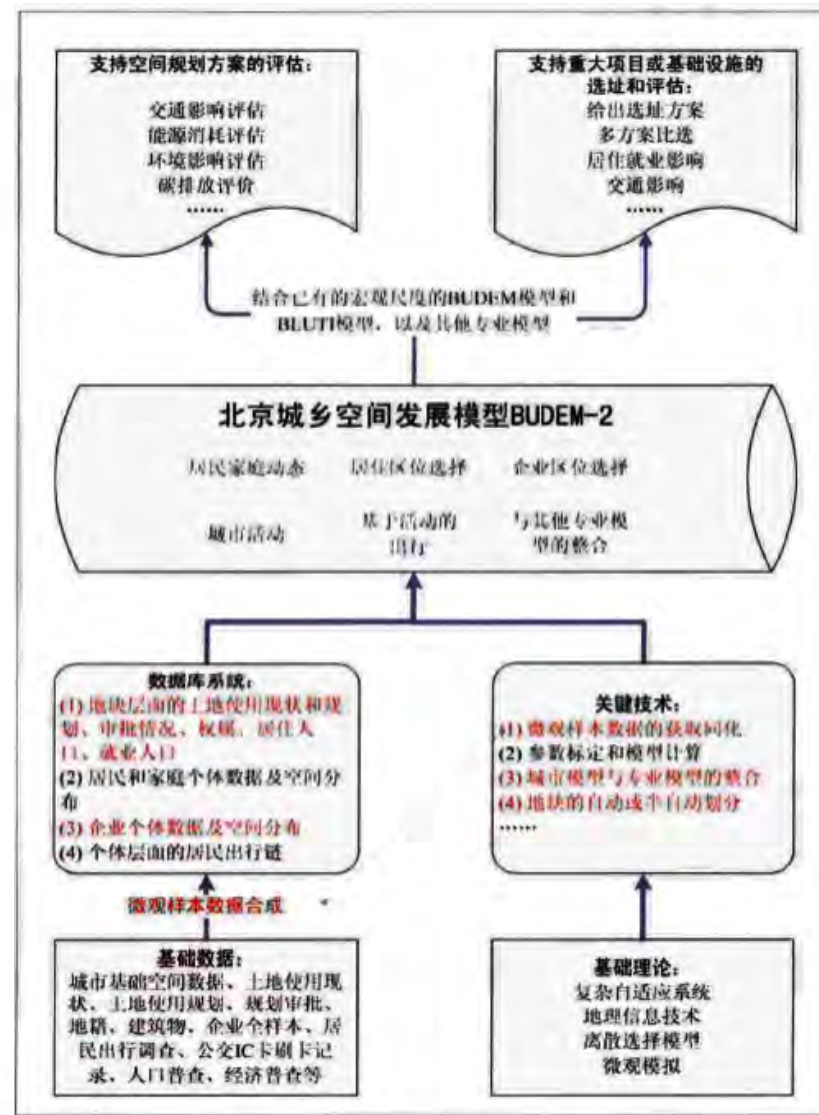
Fig. 7. Arable land reconstruction results for 1820 by: a: the allocation model; b: the HARM; c: the partition HARM.

# 1 BUDEM

- Environmental impacts of transformative land use and transport developments in the Greater Beijing Region: Insights from a new dynamic spatial equilibrium model
- Urban Microsimulation for Spatial Plan
- BUDEM2
- Applied Urban Modeling with Big Data
- Beijing Transportation and Land Use Integrated Model (BLUTI)
- BUDEM
- BUDEM-JJJ
- V-BUDEM
- Applying BUDEM in Pei Xian
- Residential and industrial location choice models using UrbanSim



BUDEM模拟流程



BUDEM2技术路线图





# 1 BUDEM: Urban Microsimulation for Spatial Plan

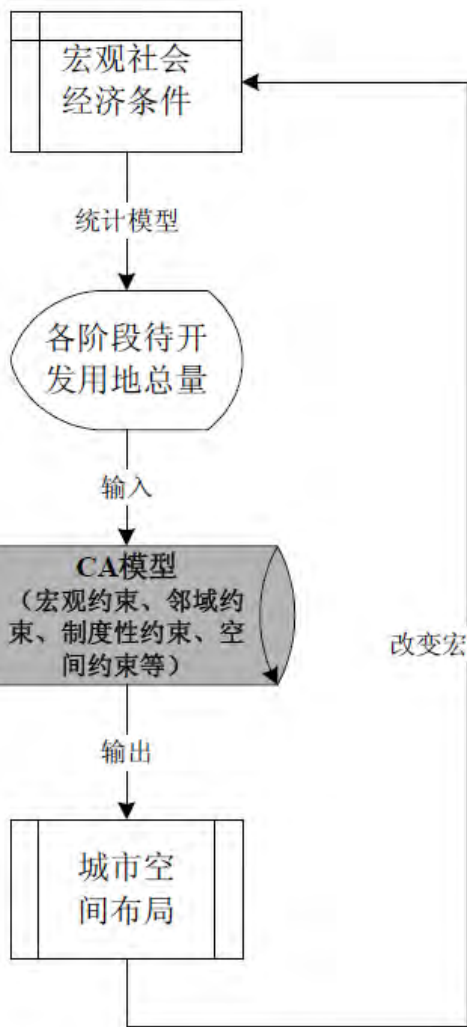


图 5-1 BUDEM模型模拟逻辑



图 5-3 BUDEM模型系统结构



图 5-13 根据模拟结果制定的中心城及新城UGBs空间分布图

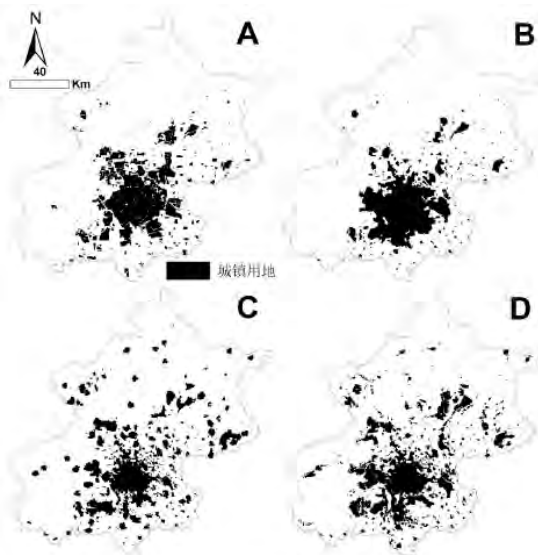


图 7-1 北京市的形态情景设置图

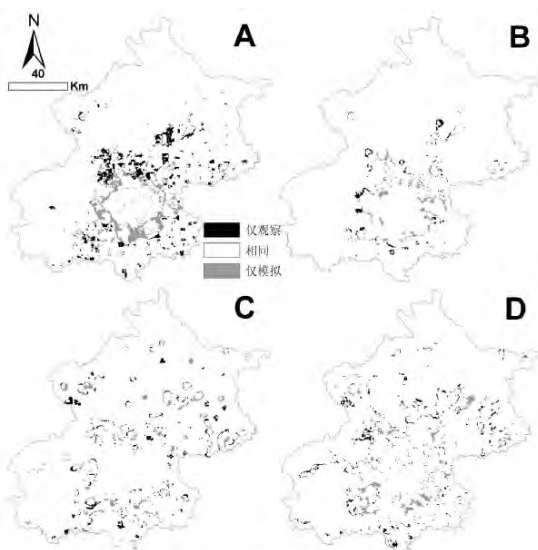


图 7-2 模拟结果与形态情景对比图

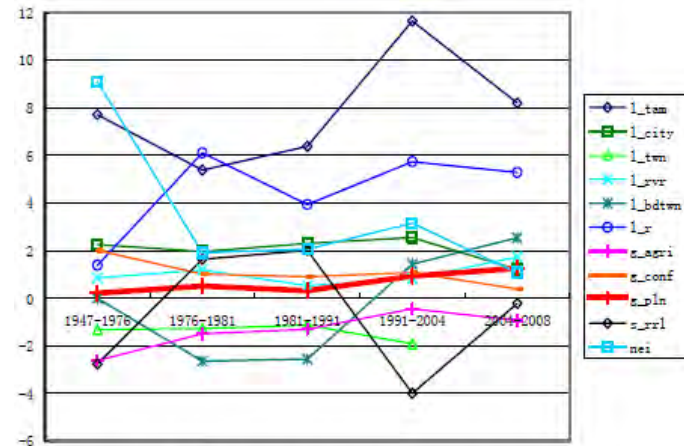


图 8-3 不同时期各Logistic回归系数的变化

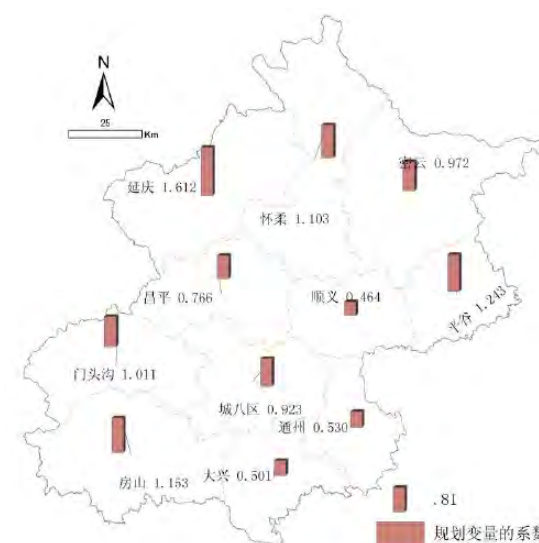


图 8-4 各区县的城市规划因素在城市扩展中的作用评价结果图

# 1 BUDEM: BUDEM2

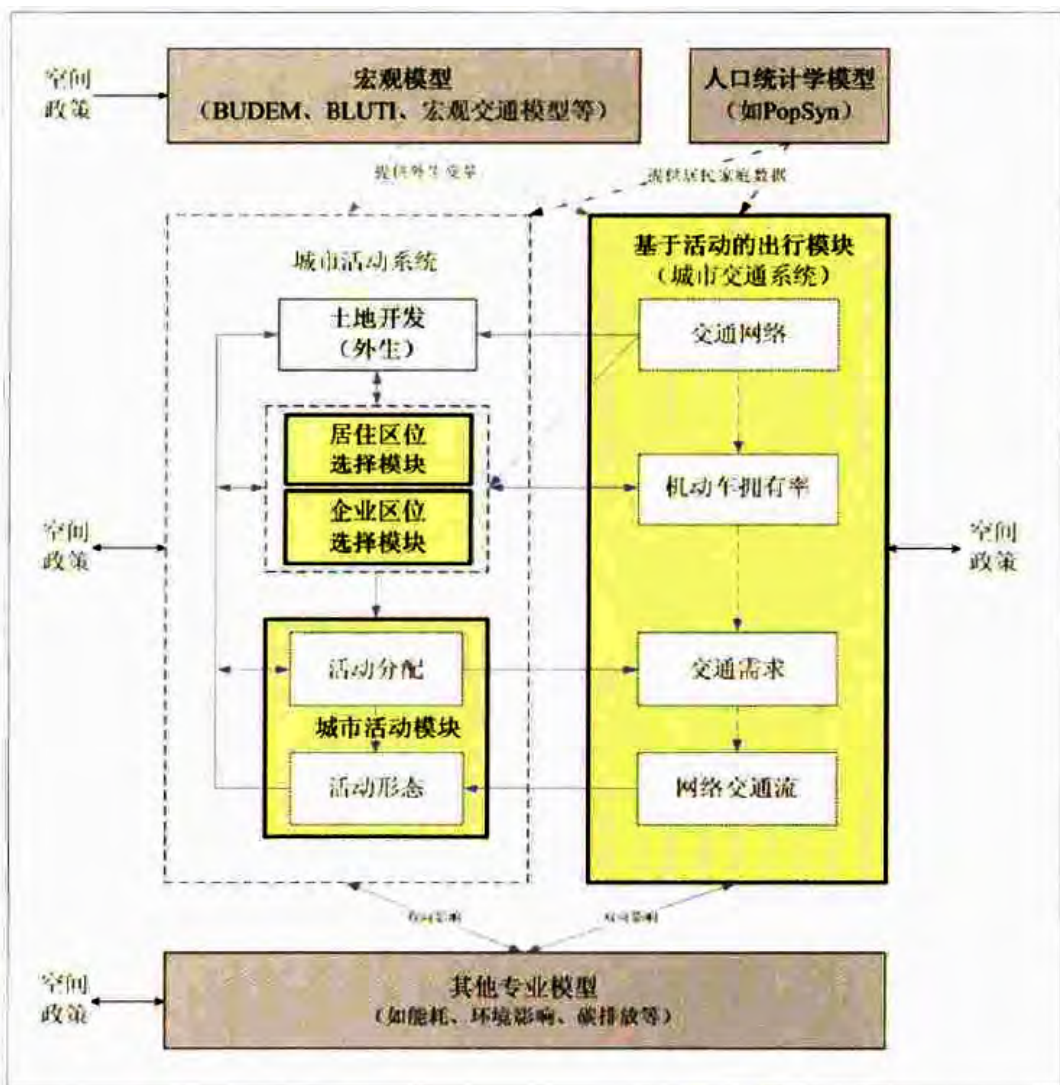


图2 模型模块构成及各模块关系图



图3 城市扩张与再开发的空间分布

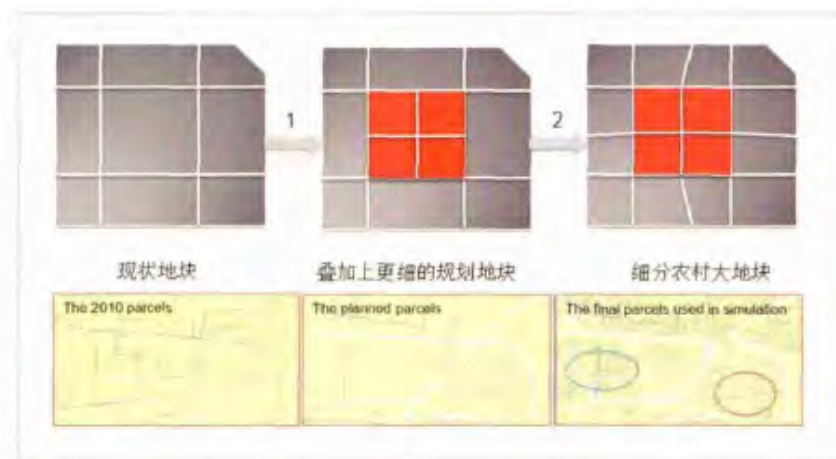


图4 地块划分步骤示意

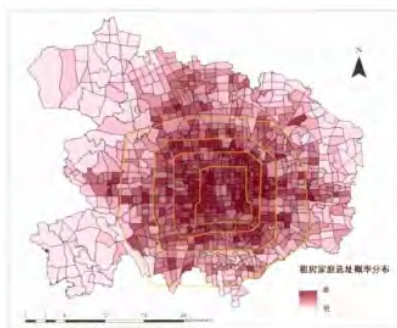


图10 租房家庭选址概率分布

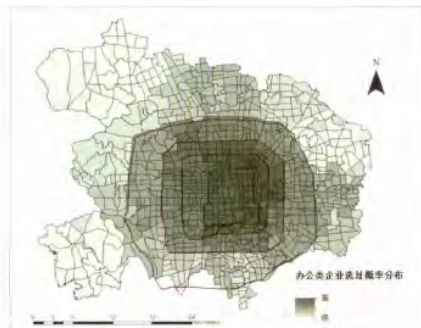


图12 现代办公类企业选址概率分布

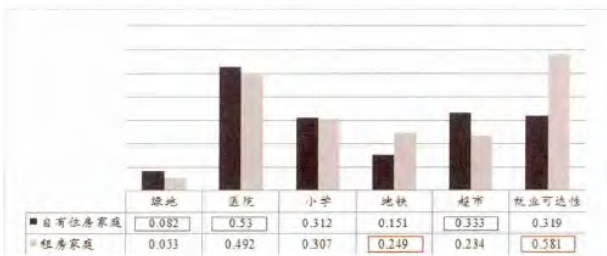


图11 自有住房家庭与租房家庭选址偏好差异 (系数绝对值)

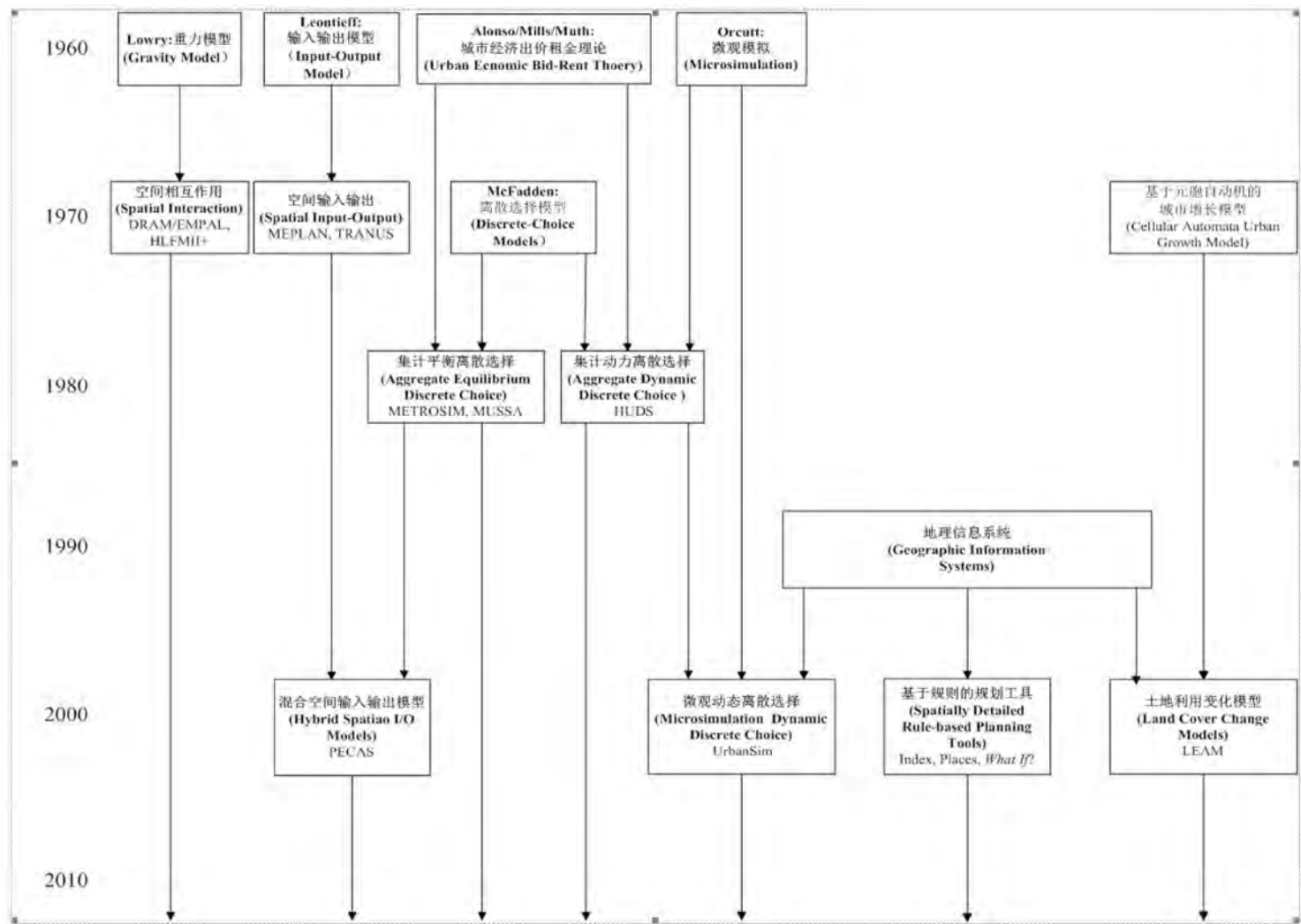


图13 社会服务类企业选址概率分布



图14 基于活动的交通出行模块

# 1 BUDEM: Applied Urban Modeling with Big Data



## Selected applied urban models

ID	NAME	CNTY	SCALE	AGE	DEVELOPER	APPROACH	T	LIT
1	POLIS	美国	小区	1960年代	旧金山湾区政府协会	空间相互作用、离散选择	静态	Association of Bay Area Governments, 2009
2	DRAM/EMPAL	美国	小区	1970年代	Stephen H. Putman	空间相互作用、离散选择	静态平衡	Putman, 1995
3	TRANUS	委内瑞拉	小区	1982年	Modelistica	空间投入产出	动态平衡	Modelistica, 1995
4	MEPLAN	英国	小区	1984年	Marcial Echenique	空间投入产出	动态平衡	Echenique等, 1990
5	TLUMP	美国	小区	1990年代	Tara Weidner	空间投入产出	动态平衡	Weidner等, 2007
6	IRPUD	德国	小区	1994年	Michael Wegener	离散选择	动态	Wegener, 1996
7	CUF	美国	DLU	1994年	John Landis	基于规则建模	动态	Landis, 1994
8	DELTA	英国	小区	1995年	David Simmonds Consultancy	离散选择	动态	Simmonds, 1996
9	Metrosim	美国	小区	1995年	Alex Anas	离散选择	动态平衡	Anas, 1994
10	UrbanSim	美国	多尺度	1996年	Paul Waddell	离散选择、微观模拟、基于个体建模	动态	Waddell, 2002
11	SLEUTH	美国	网格	1997年	Keith C. Clarke	元胞自动机	动态	Clark等, 1997
12	CUF-2	美国	网格	1998年	John Landis和 Ming Zhang	基于规则建模	动态	Landis和 Zhang, 1998ab
13	ILUTE	加拿大	地块、居民、家庭	2004年	Eric J. Miller	微观模拟、基于个体建模	动态	Miller等, 2004
14	Relu-Tran	美国	小区	2007年	Alex Anas	离散选择	动态平衡	Anas和Liu, 2007
15	PECAS	加拿大	小区	2005年	John Douglas Hunt和John E. Abraham	空间相互作用、空间投入产出	动态	Hunt和 Abraham, 2005
16	BUDEM	中国	500m网格	2009年	龙灏	元胞自动机	动态	Long等, 2009
17	MUSSA II	智利	小区	1996年	Francisco Martinez	离散选择	动态平衡	, 1996
18	GeoSOS	中国	多尺度	2011年	黎夏	元胞自动机、基于个体建模	动态	Li等, 2011
19	Agent iCity	加拿大	地块、居民、家庭	2012年	Suzana Dragicevic	基于个体建模	动态	Jumba和 Dragicevic, 2012
20	BLUTI	中国	小区	2012年	张宇	离散选择	静态平衡	张宇等, 2012

图 1 城市模型发展历程一览

# 1 BUDEM: Beijing Transportation and Land Use Integrated Model (BLUTI)

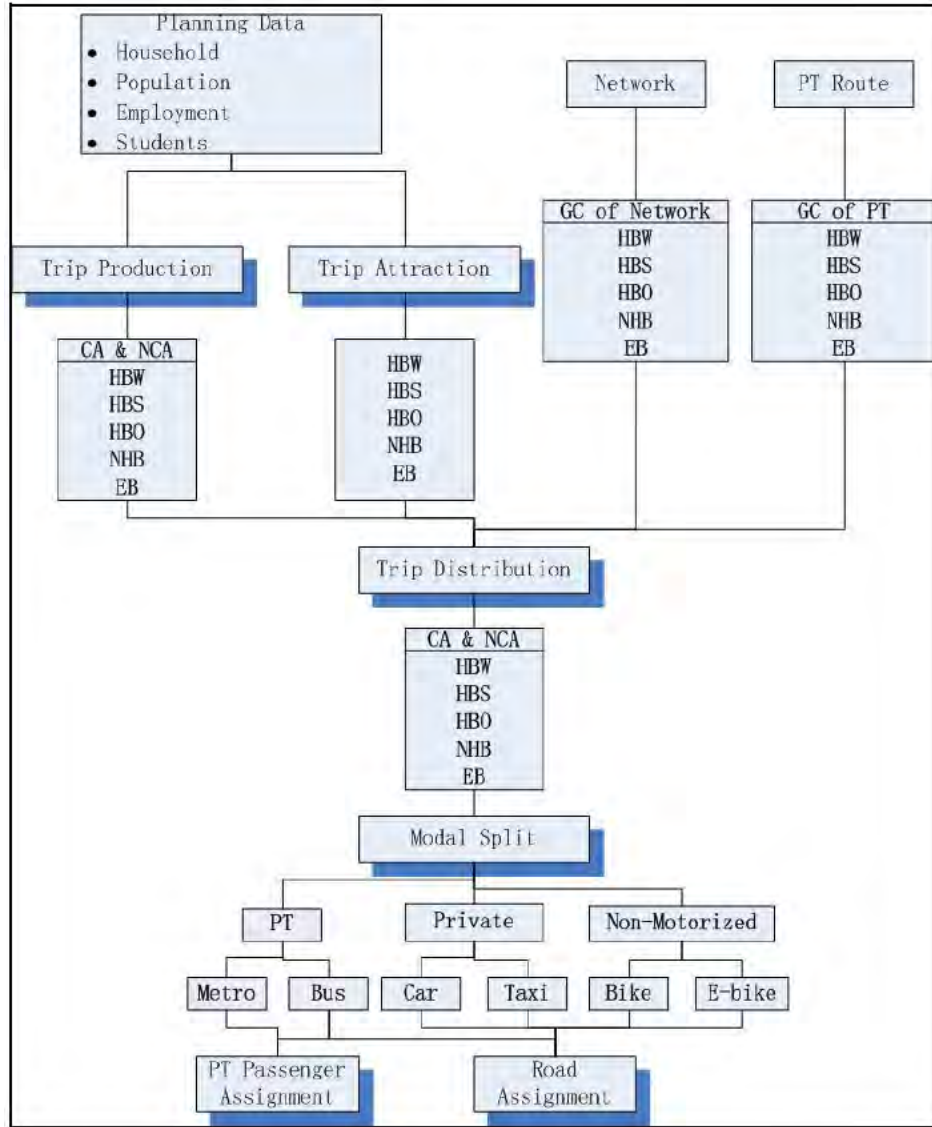


Figure 1. Frame Diagram of BMI Model Structure

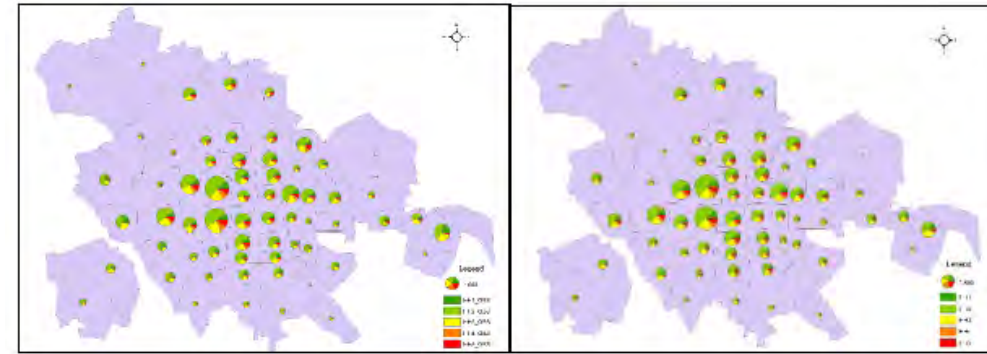


Figure 5. Comparison and Analysis of Calibration Results and Observed Values

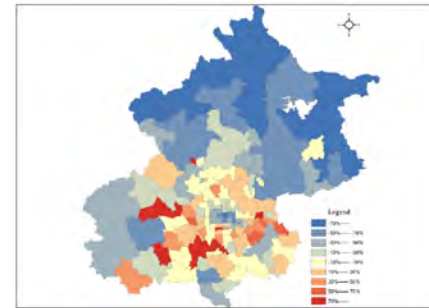


Figure 6. Differences between model data and survey data of house prices

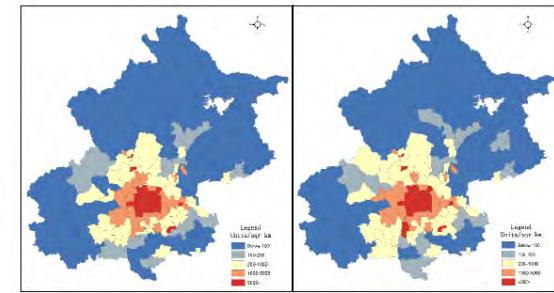


Figure 11. Comparison of based and planned residence supply density

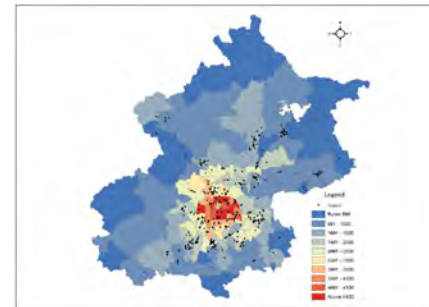


Figure 7. Distribution of relevant land prices of residences in Beijing in 2005

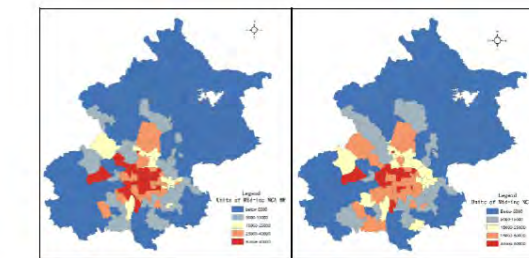
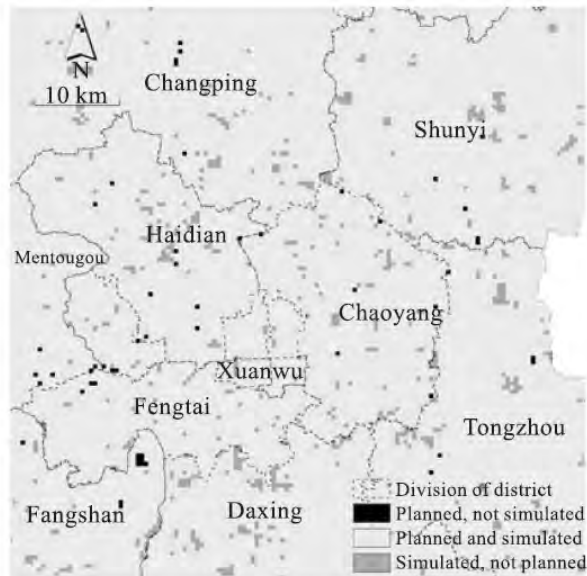
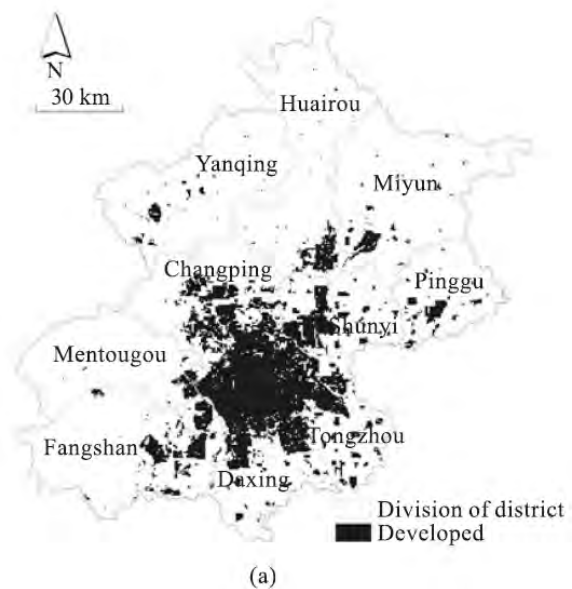


Figure 12. Comparison of based and planned Mid-Income No Car Available Household Distribution

# 1 BUDEM: BUDEM

Fig. 2 Simulated urban form for BEIJING2020 (a) and its comparative result with planned form for the Beijing central metropolitan area (b)



(b)

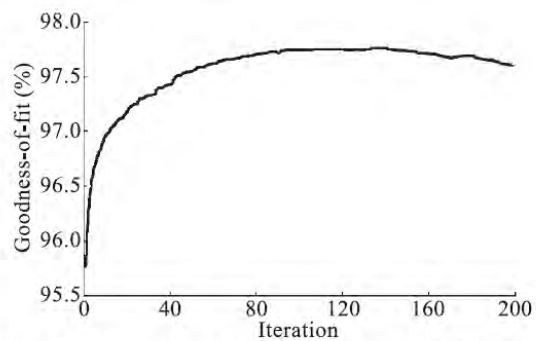


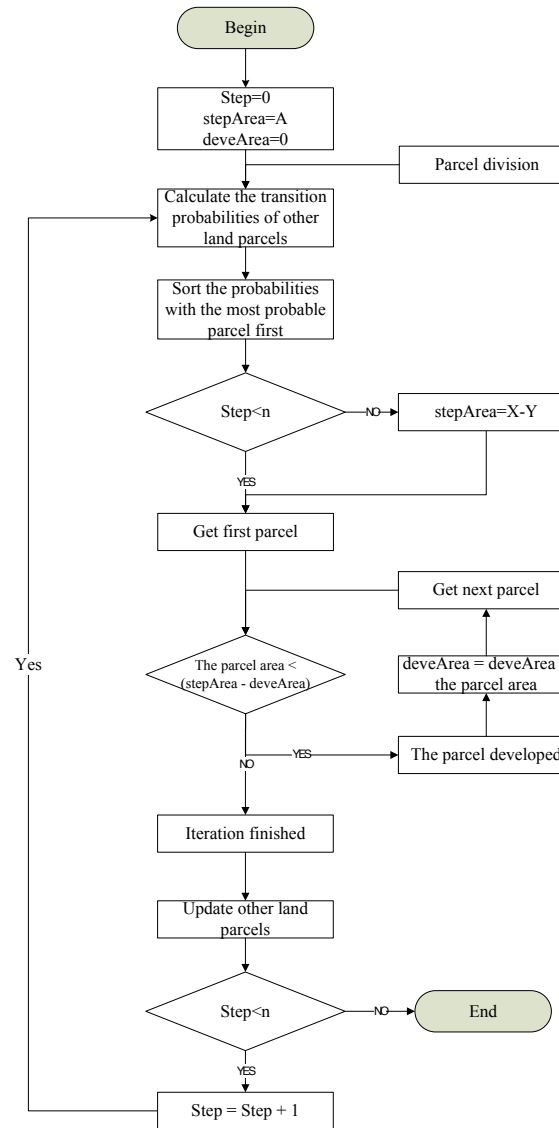
Fig. 3 Goodness-of-fit plot for the BEIJING2020 simulation



Fig. 4 Simulated urban form for BEIJING2049

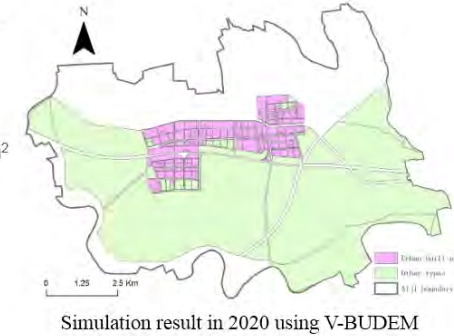
# 1 BUDEM: V-BUDEM

Type of variables	Name	Value	Description
Self-status	Isrural	0, 1	Whether the cell is rural built-up land in the previous iteration
	Isagri	0, 1	Whether the cell is agricultural land in the previous iteration
Location	d_tam	$\geq 0$	Minimum distance to Tian'anmen Square
	d_vcity	$\geq 0$	Minimum distance to important new city
	d_city	$\geq 0$	Minimum distance to new city
	d_vtown	$\geq 0$	Minimum distance to important town
	d_town	$\geq 0$	Minimum distance to town
	d_river	$\geq 0$	Minimum distance to river
	d_road	$\geq 0$	Minimum distance to road
	d_bdtown	$\geq 0$	Minimum distance to town boundaries
Government	Planning	0, 1	Whether planned as urban built-up
	con_f	0, 1	Whether in the forbidden zone
	Landresource	1-8	Land suitability classified for agriculture
Neighbor	Neighbour	0-1.0	Neighborhood development intensity



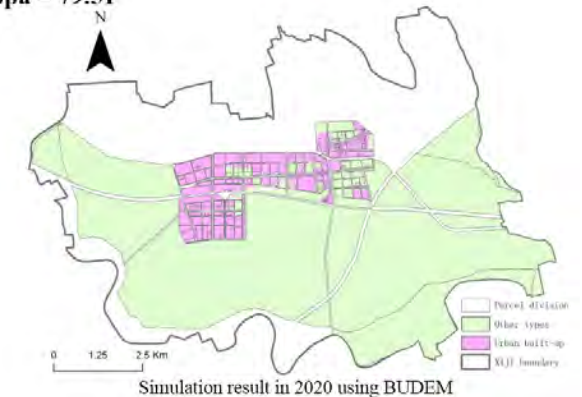
## V-BUDEM result

- **Neighborhood distance = 60 m**
  - Tested 10-100 m
- **Time step**
  - 5 times with a total of 10 years
- **Kappa = 86.52**
- **Developed area**
  - 6.95 km<sup>2</sup>
  - smaller than predicted 8.77 km<sup>2</sup>
  - Large parcels

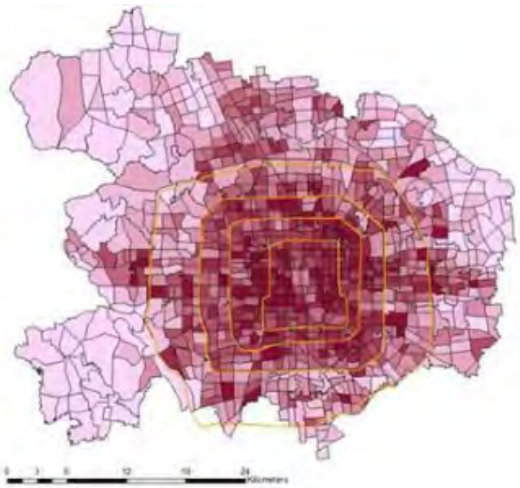


## BUDEM result

- **30\*30 m grid**
- **Kappa = 79.51**



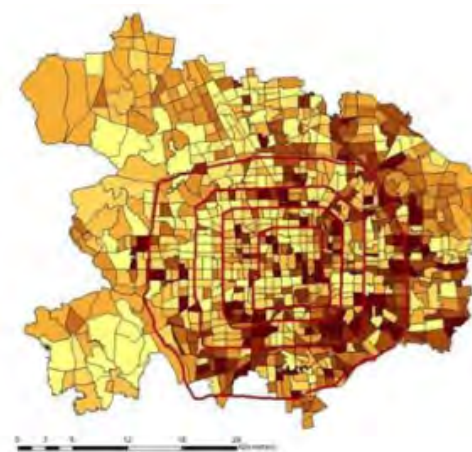
# 1 BUDEM: Residential and industrial location choice models using UrbanSim



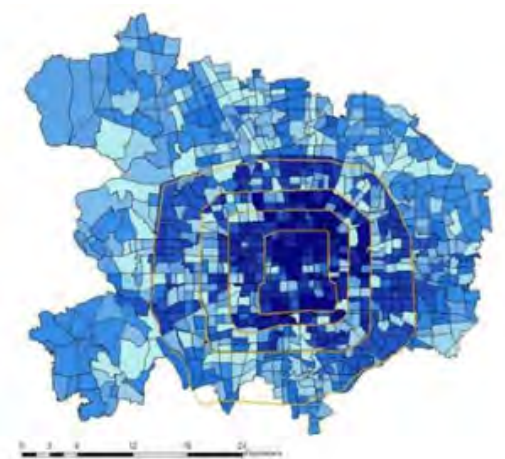
Self-owned housing families' preference



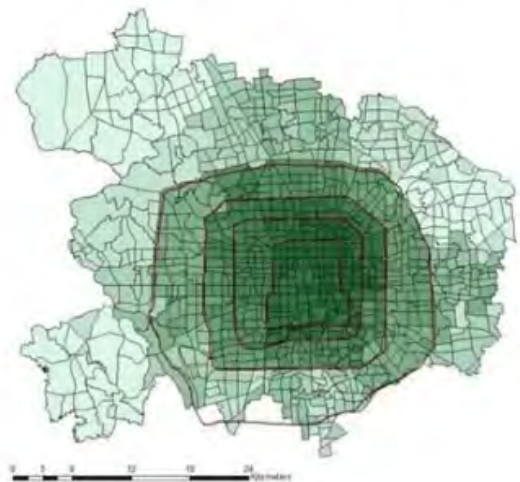
Rental housing families' preference



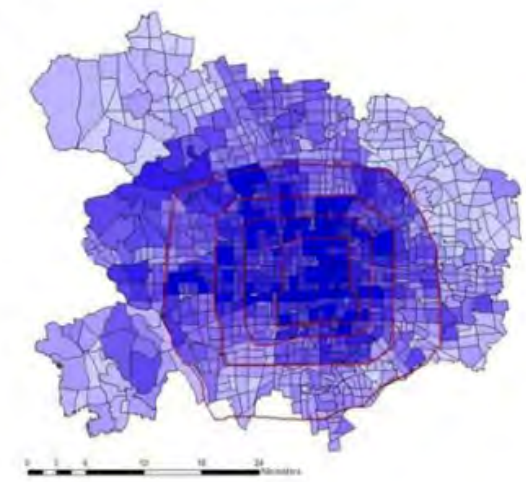
GAP of Residential



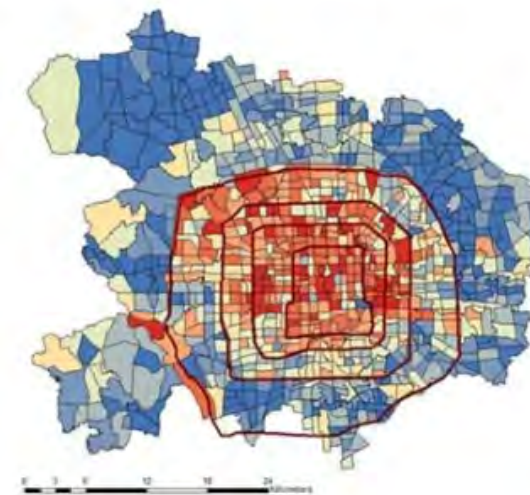
GAP of Commercial



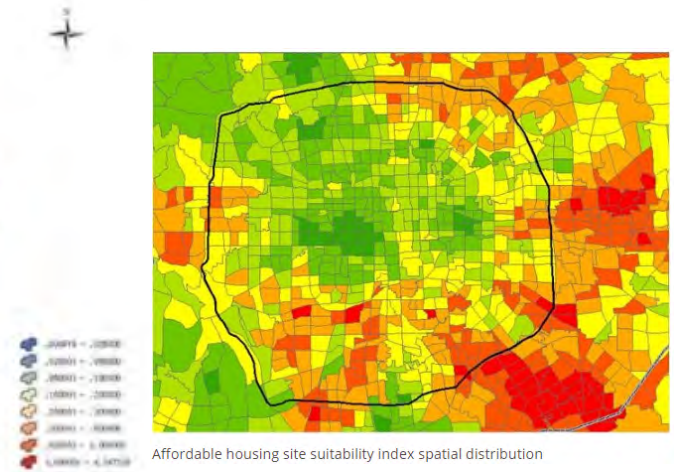
Modern service enterprises' preference



Retail firms' preference



Comparison preference between residential and industrial location choice



Affordable housing site suitability index spatial distribution

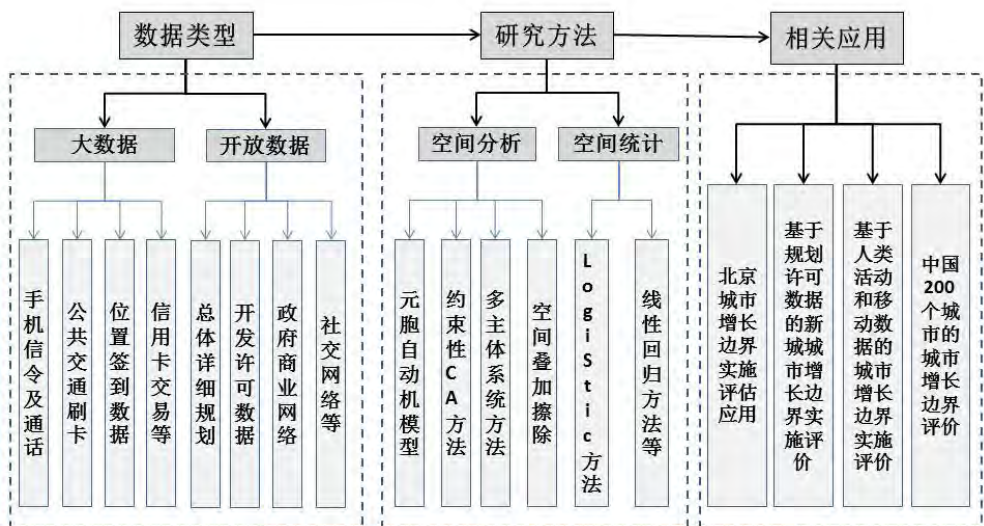
This research is based on the UrbanSim system, a platform features modelling micro individual behavior in the city system. With the spatial resolution of 1911 segments (traffic analysis zone) of Beijing (1067 segments within inner-city), the research focuses on characteristics of residential and industrial location choice behavior within the inner city, based on residential and enterprise location choice theory in urban economics and discrete choice model.



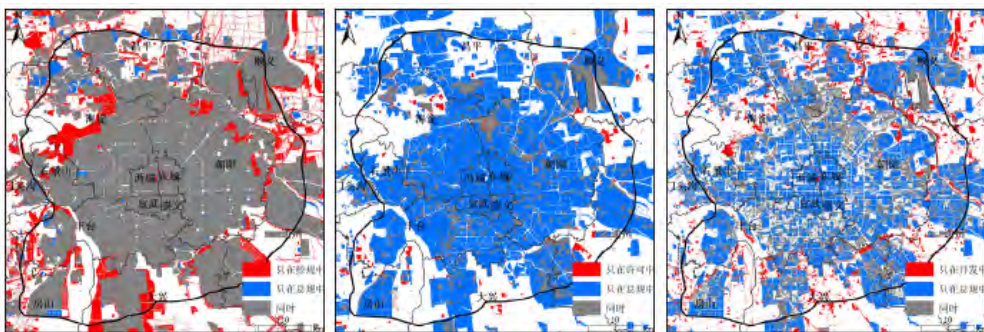
## 2 Urban Growth Boundaries

- Implementation Evaluation of Urban Growth Boundaries under the New Data Environment
- Evaluating the effectiveness of urban growth boundaries using human mobility and activity records
- Beijing Planning 100
- China UGBs
- What if Liang Chen Scenario happened?
- Borrowing Chengdu's story to rethink Beijing's new subcenter plan
- Evaluating UGBs using permits
- Evaluation on five master plans
- Establishing UGBs using constrained cellular automata
- The first green belt evaluation

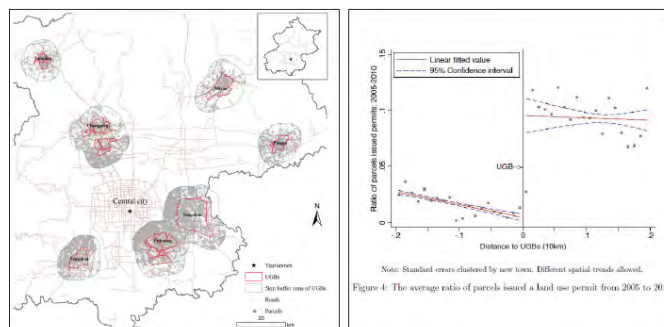
# 2 Urban Growth Boundaries : Implementation Evaluation of Urban Growth Boundaries under the New Data Environment



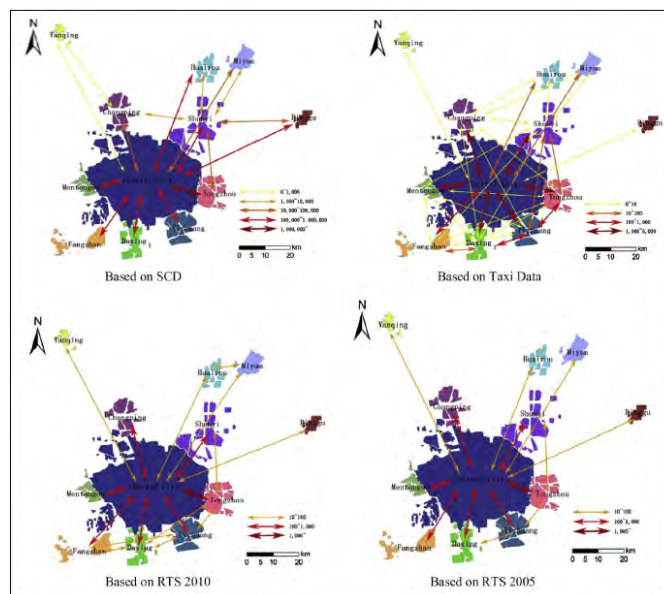
新数据环境下城市规划实施研究框架



绩效评估结果

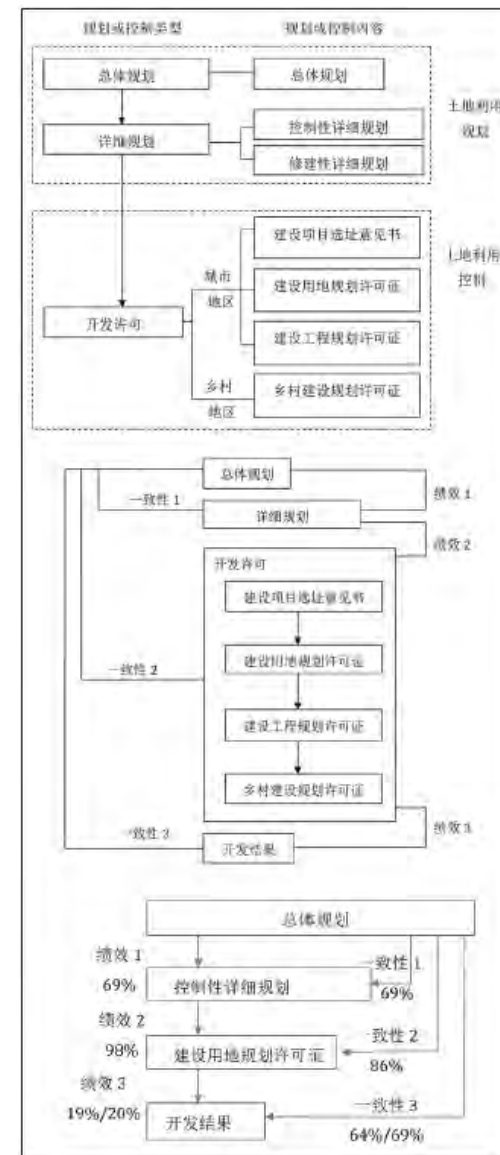


城市增长边界实施评价相关图



基于4类数据城市边界间的联系

城市增长边界实施评价框架：  
总规—控规—许可—开发



## 2 Urban Growth Boundaries : Evaluating the effectiveness of urban growth boundaries using human mobility and activity records

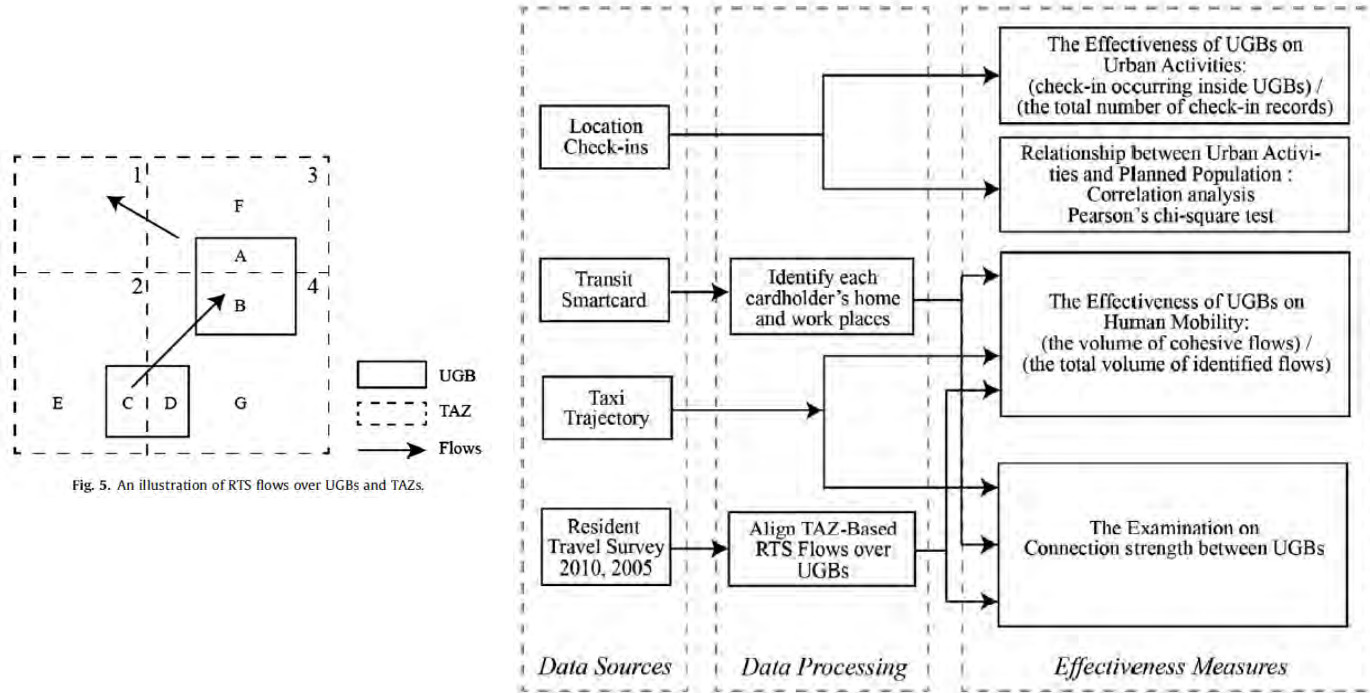


Fig. 5. An illustration of RTS flows over UGBs and TAZs.

Fig. 2. The assessment process.

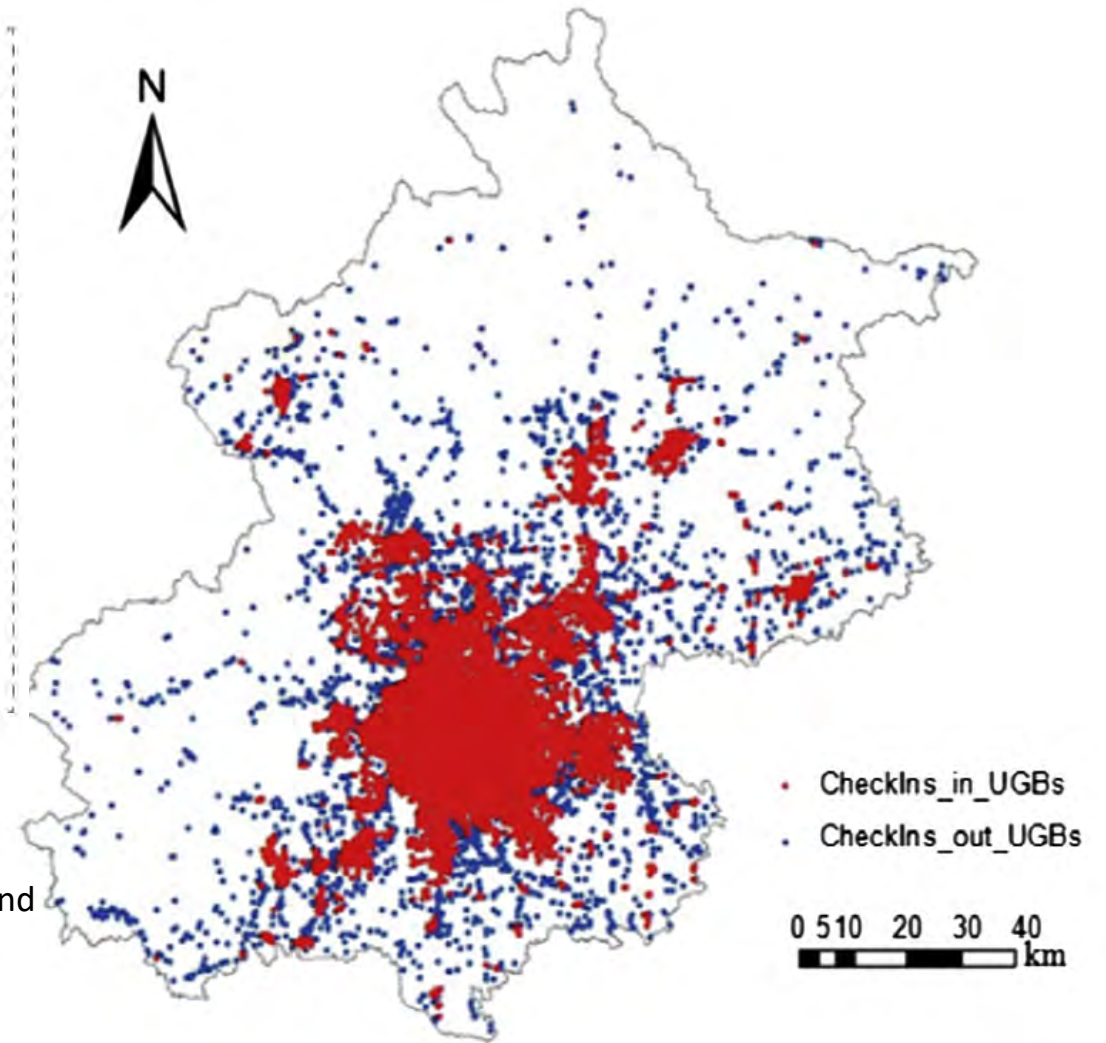


Fig. 3. Distribution of check-ins.

- We proposed a methodology to evaluate the effectiveness of Beijing’s Urban Growth Boundaries (UGBs) using human mobility and activity records (big data).
- The research applied data from location check-in, transit smart card, taxi trajectory, and residential travel survey.
- We developed four types of measures to evaluate the effectiveness of UGBs in confining human activities and travel flows, to examine the conformity of urban activities with the planned population, and to measure the activity connections between UGBs.

## 2 Urban Growth Boundaries : What if Liang Chen Scenario happened?



图1 梁陈方案  
资料来源: 梁思成, 梁思成文集(四) [M]. 北京: 中国建筑工业出版社, 1986

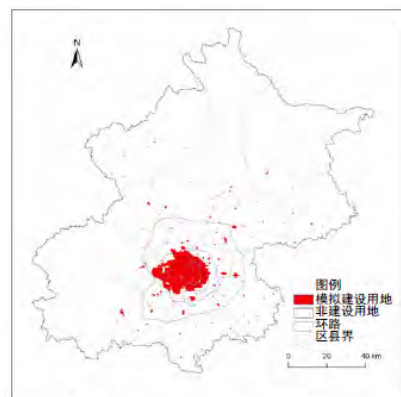


图3 1976年模拟“梁陈方案”城市形态

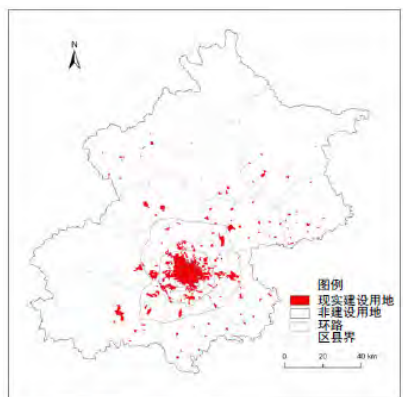


图4 1976年实际城市形态

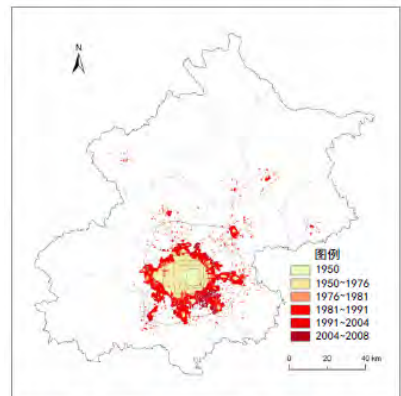


图5 模拟“梁陈方案”的城市扩张情况 (1950~2008年)

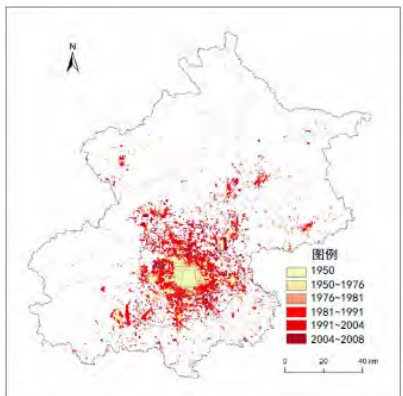


图6 实际城市扩张情况 (1950~2008年)

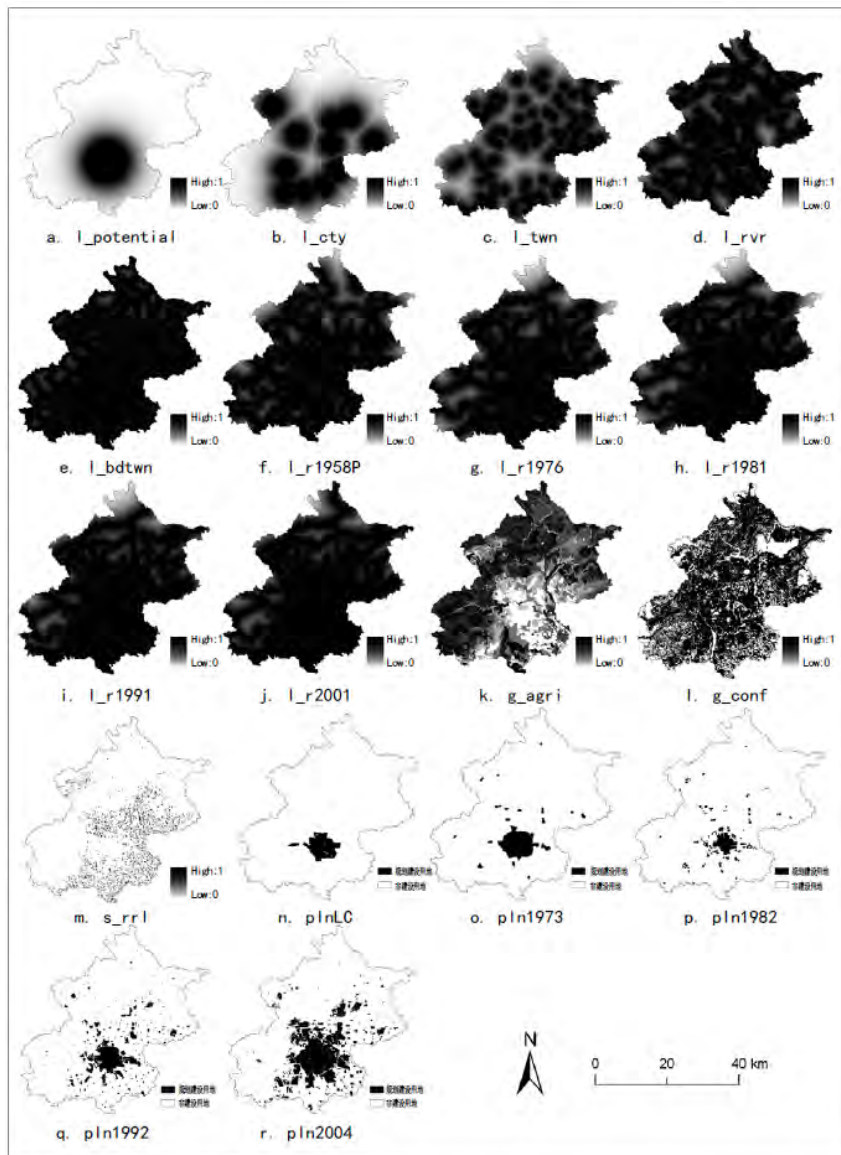


图2 基于约束变量的分析图

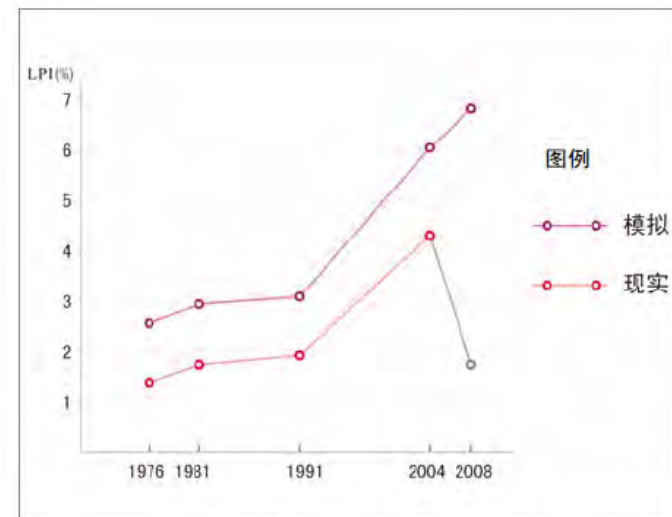


图7 不同年份建设用地最大图斑指数

## 2 Urban Growth Boundaries : Borrowing Chengdu's story to rethink Beijing's new subcenter plan

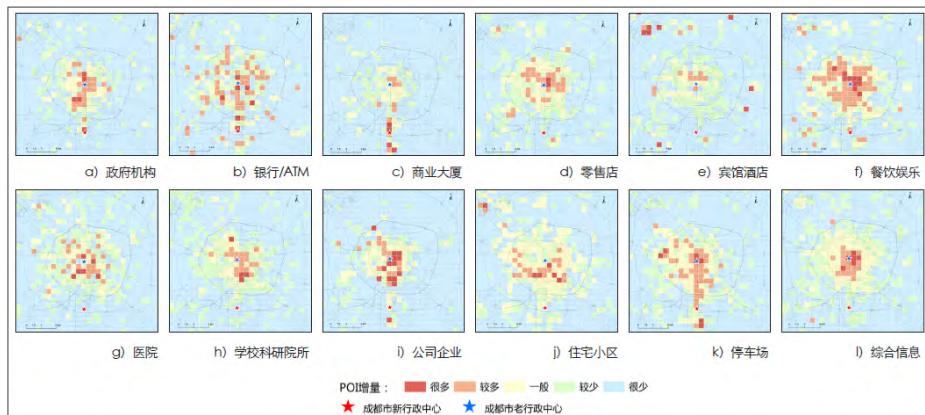


图2 地图POI数量变化分析

表1 驱动因素影响大小 (2004—2010年)

宏观约束条件	驱动因素	影响系数
区位因素	行政中心 (天安门)	15.878
	新城	2.980
	重点镇	1.044
	河流	1.322
	乡镇边界	0.995
	路网	2.968
制度因素	禁止建设区	0.691
	土地等级	-0.545
	规划建设用地	1.492
	农村建设用地	-0.191
邻域因素	邻域影响	8.000

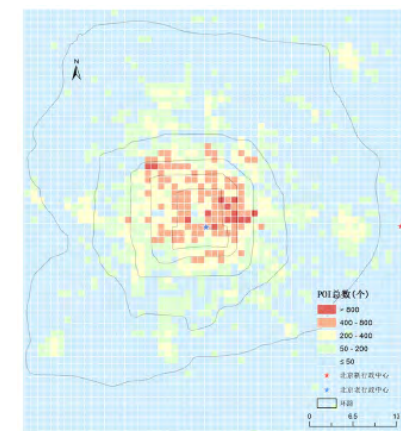


图10 地图POI总密度 (2014年)

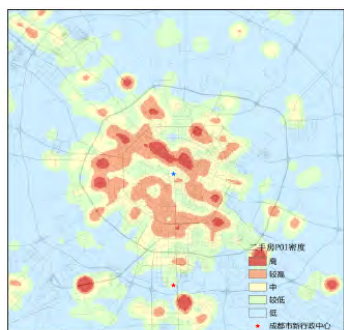


图3 二手房POI密度 (2014年)



图4 大众点评餐饮POI密度 (2014年)



a) 上午



b) 夜间

图5 百度热力图 (2015年7月)

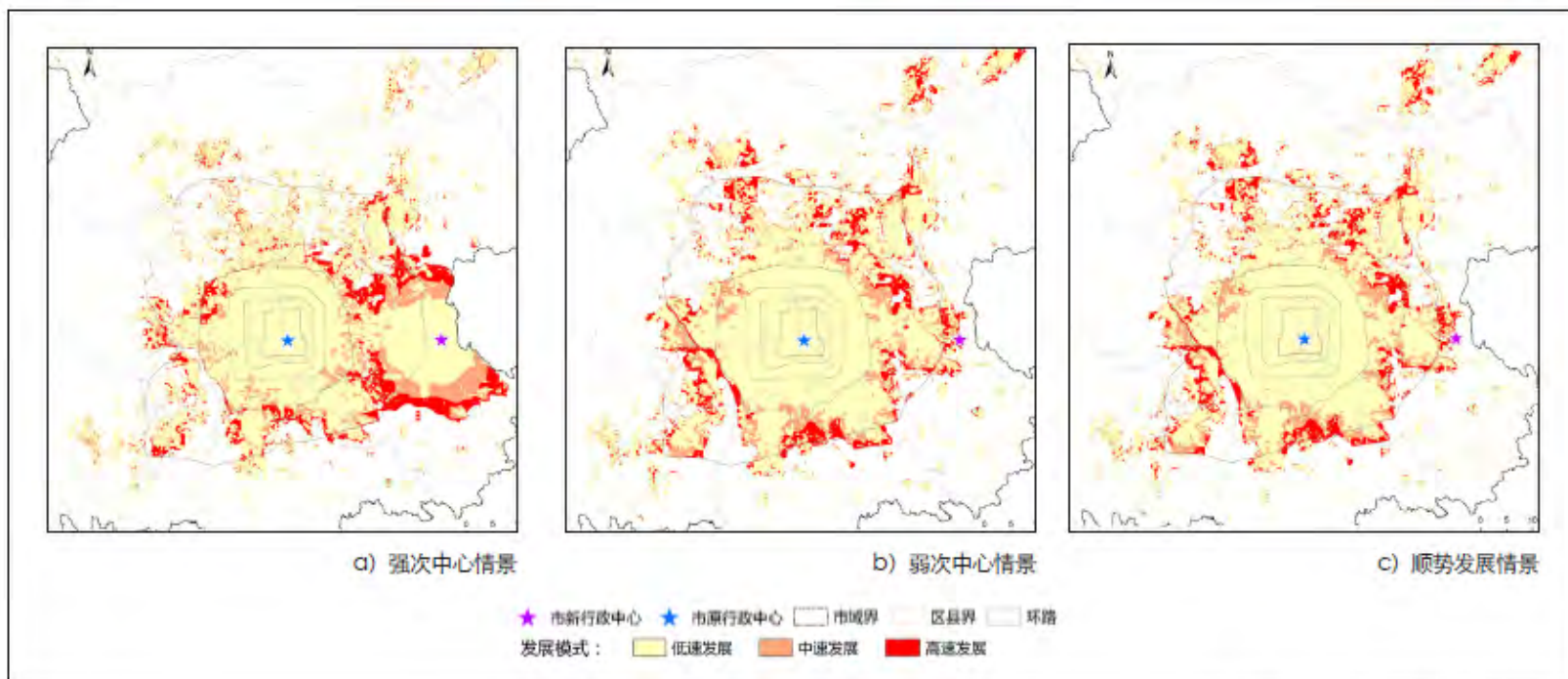


图8 2020年北京城市形态情景分析

## 2 Urban Growth Boundaries : Evaluating UGBs using permits

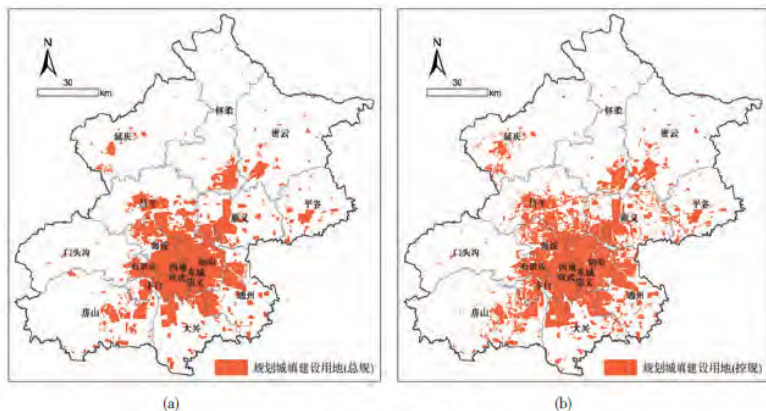
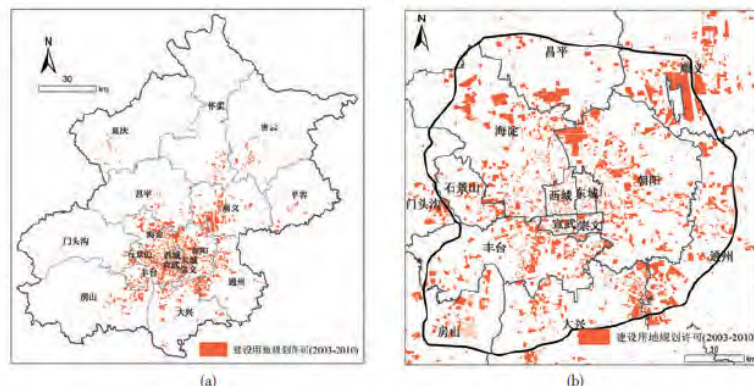


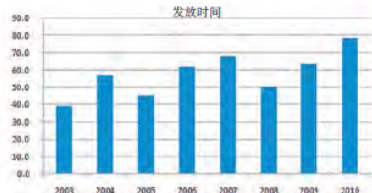
图4 规划城市增长边界

Fig.4 Planned urban growth boundaries, constructed by authors  
资料来源: 笔者绘制 (a:总体规划, b:控制性详细规划)。

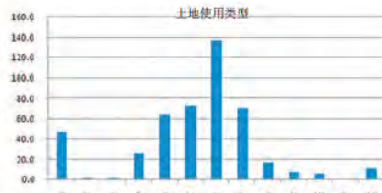


(a)

(b)



(c)



(d)

图5 北京2003到2010年的建设用地规划许可



图7 中国城市增长边界实施评估的简化框架

Fig.7 Simplified framework for the evaluation of Chinese urban growth boundaries, constructed by authors

资料来源: 笔者绘制。

表1 从总体规划到控制性详细规划的绩效 (km<sup>2</sup>)

Tab.1 Performance from master plan to detailed plans (sq. km.), constructed by authors

详细规划/总体规划	城市增长边界内	城市增长边界外
城市增长边界内	1,891	844
城市增长边界外	558	13,117

资料来源: 笔者绘制。

表2 从控制性详细规划到建设用地规划许可的绩效 (km<sup>2</sup>)

Tab.2 Performance from detailed plans to construction land use planning permits (sq. km.), constructed by authors

建设用地规划许可/详细规划	城市增长边界内	城市增长边界外
拥有许可证土地面积	456	7
没有许可证土地面积	2,279	13,668

资料来源: 笔者绘制。

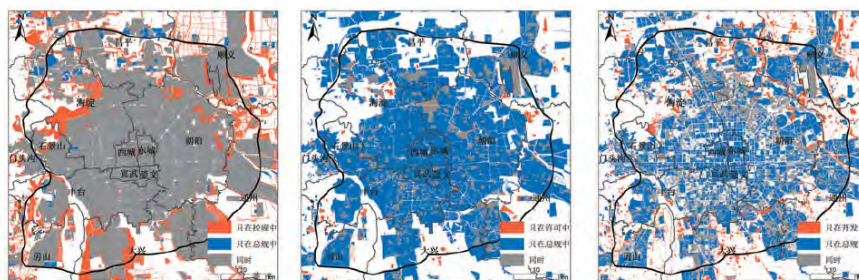


图9 一致性评估结果

Fig.9 Evaluation of conformance, constructed by authors (a: between master plan and regulatory detailed plans, b: between master plan and construction land use planning permits, c: between master plan and outcomes)

资料来源: 笔者绘制 (a 总体规划与控制性详细规划之间的一致性, b 总体规划与建设用地规划许可之间的一致性, c 总体规划与最终结果之间的一致性)。

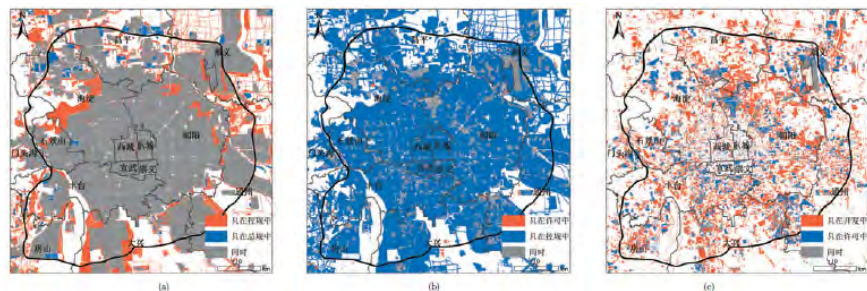


图8 绩效评估结果

Fig.8 Evaluation of performance, constructed by authors (a: from master plan to regulatory detailed plans, b: from regulatory detailed plans to construction land use planning permits, c: from construction land use planning permits to outcomes)

资料来源: 笔者绘制 (a 从总规到控规的绩效, b 从控规到建设用地规划许可的绩效, c 从建设用地规划许可到最终结果的绩效)。

表3 从建设用地规划许可到最终结果的绩效 (km<sup>2</sup>)

Tab.3 Performance from construction land use planning permits to outcomes (sq. km.), constructed by authors

最终结果/建设用地规划许可	拥有许可证土地面积	没有许可证土地面积
全部开发	198	809
已开发用地内	265	15,138
已开发用地外	149	623
已扩张用地内	314	15,324
已扩张用地外	49	186
城市更新	414	15,761
已更新用地内		
已更新用地外		

资料来源: 笔者绘制。

表4 总体规划与建设用地规划许可之间的一致性 (km<sup>2</sup>)

Tab.4 Conformance between master plan and construction land use planning permits (sq. km.), constructed by authors

建设用地规划许可/总体规划	城市增长边界内	城市增长边界外
拥有许可证土地面积	398	65
没有许可证土地面积	2,051	13,896

资料来源: 笔者绘制。

表5 总体规划与开发结果之间的一致性 (km<sup>2</sup>)

Tab.5 Conformance between master plan and outcomes (sq. km.), constructed by authors

最终结果/总体规划	城市增长边界内	城市增长边界外
全部开发	697	310
已开发用地内	1,752	13,651
已开发用地外	491	281
已扩张用地内	1,958	13,680
已扩张用地外	206	29
城市更新	2,243	13,932
已更新用地内		
已更新用地外		

资料来源: 笔者绘制。



图10 一致性和绩效的匹配率

Fig.10 Matching rates for conformance and performance, constructed by authors

资料来源: 笔者绘制。

表6 不考虑城市更新的总规、控规、建设用地规划许可和最终结果之间的一致性和绩效汇总 (km<sup>2</sup>)

Tab.6 Summary of the conformance and performance between master plan, detailed plan, construction land use planning permits and outcomes without considering urban redvelopments (sq. km.), constructed by authors

	总体规划	控制性详细规划		建设用地规划许可		
		内	外	内	外	
总体规划	一致	-	-	-	-	-
不一致	-	-	-	-	-	-
控制性详细规划	一致	1,891	844	-	-	-
不一致	-	558	13,117	-	-	-
建设用地规划许可	一致	398	65	456	7	-
不一致	-	2,051	13,896	2,279	13,668	-
最终结果	一致	149	623	522	250	491
不一致	-	314	15,324	2,213	13,425	1,958

资料来源: 笔者绘制。

表7 考虑城市更新的总规、控规、建设用地规划许可和最终结果之间的一致性和绩效汇总 (km<sup>2</sup>)

Tab.7 Summary of the conformance and performance between master plan, detailed plan, construction land use planning permits and outcomes without considering urban redvelopments (sq. km.), constructed by authors

	总体规划	控制性详细规划		建设用地规划许可		
		内	外	内	外	
总体规划	一致	-	-	-	-	-
不一致	-	-	-	-	-	-
控制性详细规划	一致	1,891	844	-	-	-
不一致	-	558	13,117	-	-	-
建设用地规划许可	一致	398	65	456	7	-
不一致	-	2,051	13,896	2,279	13,668	-
最终结果	一致	697	310	723	284	198
不一致	-	1,752	13,651	2,012	13,391	265

资料来源: 笔者绘制。

## 2 Urban Growth Boundaries : Evaluation on five master plans

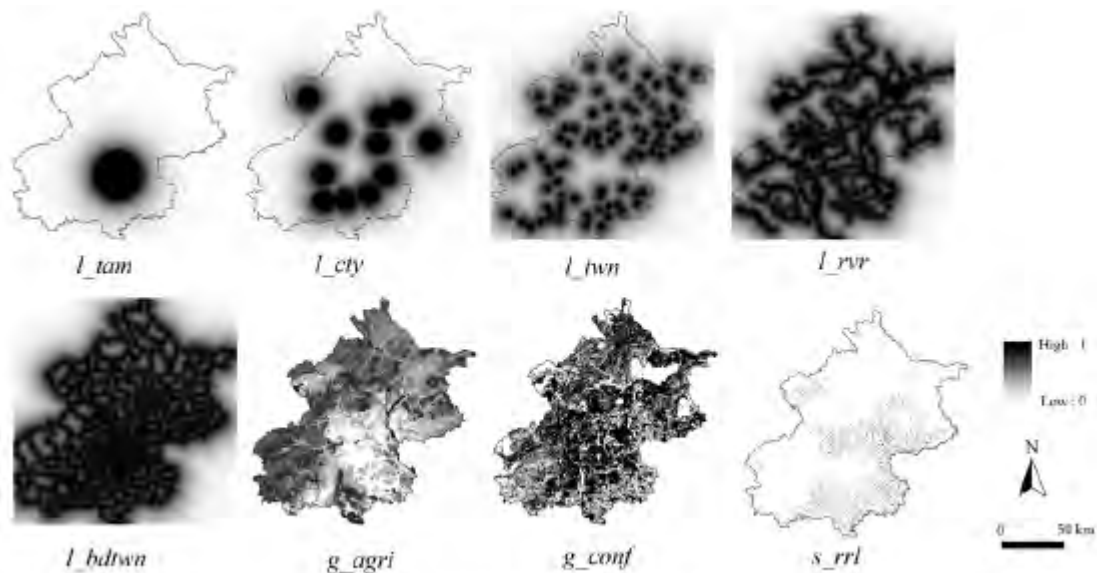


Fig. 2. Spatial distribution of spatial variables.

Table 2  
Inventory of five master plans of the BMA.

Index	g_pln58	g_pln73	g_pln82	g_pln92	g_pln04
Compilation time	1958	1973	1982	1992	2004
Implemented period	1958-2000	1973-2000	1982-2000	1991-2010	2004-2020
Spatial distribution					
Developed area (km <sup>2</sup> )	611	465	454	1079	2389
Planned population (million)	10.0	3.70-3.80 (central city)	10.0	12.5	18.0
Urban form at the end of plan	fm76	fm81	fm91	fm04	fm08
Planning implementation rate (%)	38.5	45.6	60.9	69.2	42.9
Legal development rate (%)	55.3	59.4	34.4	59.1	76.3
Overall accuracy (%)	96.0	95.7	95.7	94.8	89.8

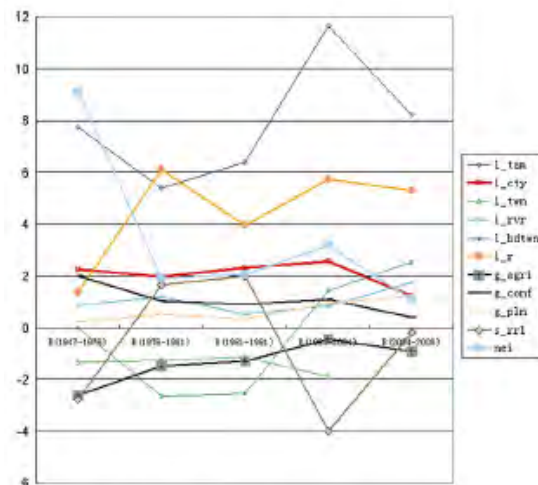


Fig. 3. Coefficients of all factors in various periods.

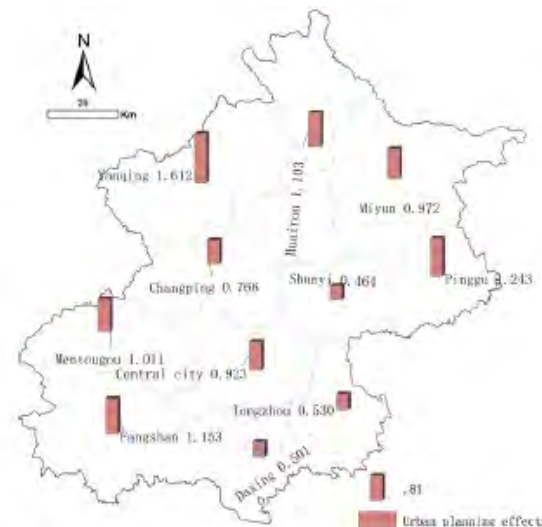


Fig. 4. Comparison of urban planning coefficients in various districts.

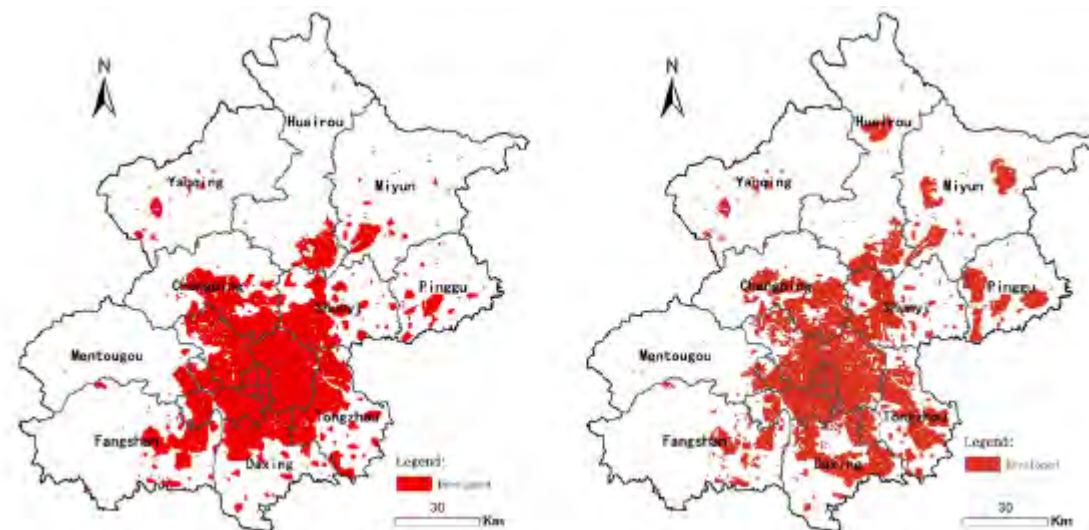


Fig. 5. Simulated urban forms by adjusting urban planning coefficient in BUDEM: the baseline scenario (left) and planning-strengthened scenario (right).

## 2 Urban Growth Boundaries : Establishing UGBs using constrained cellular automata

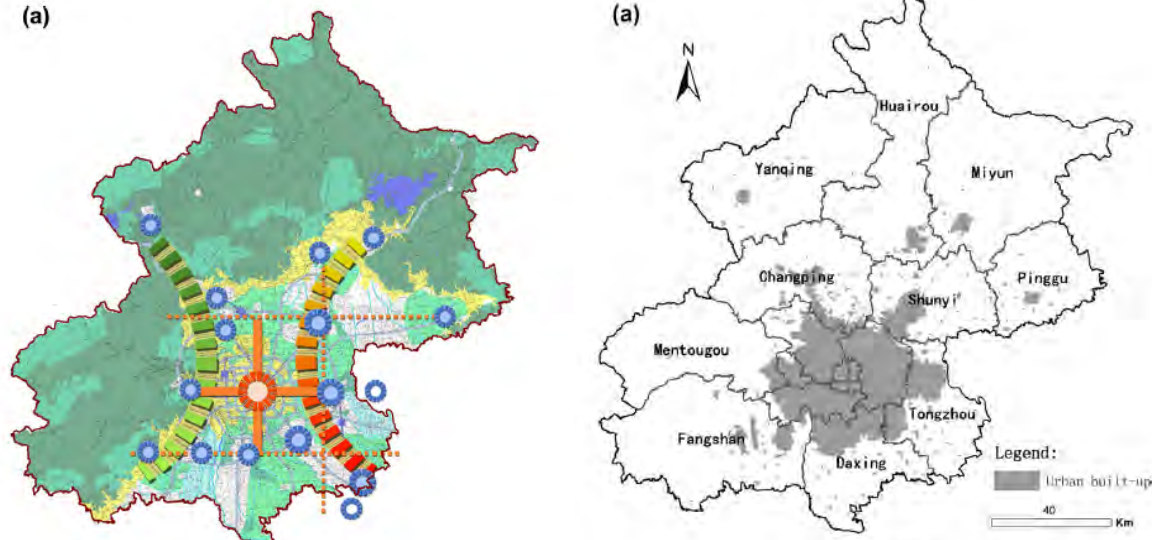


Fig. 3. The spatial structure (a) and land use pattern (b) of the BCMP (Source: BCMP).

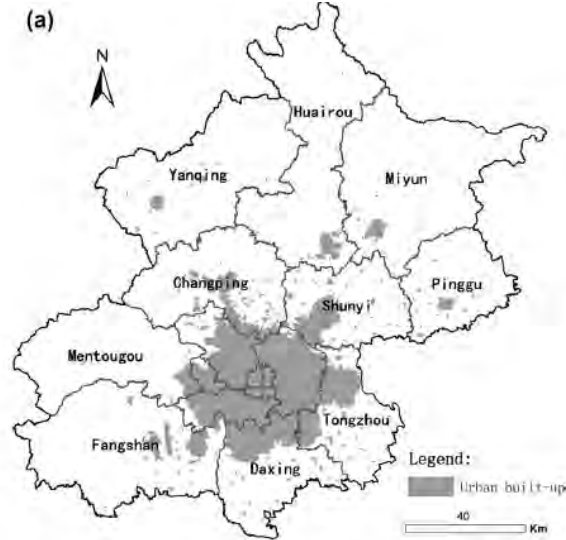


Fig. 5. Simulated urban forms in 2020 (a) in contrast with the planned forms (b).

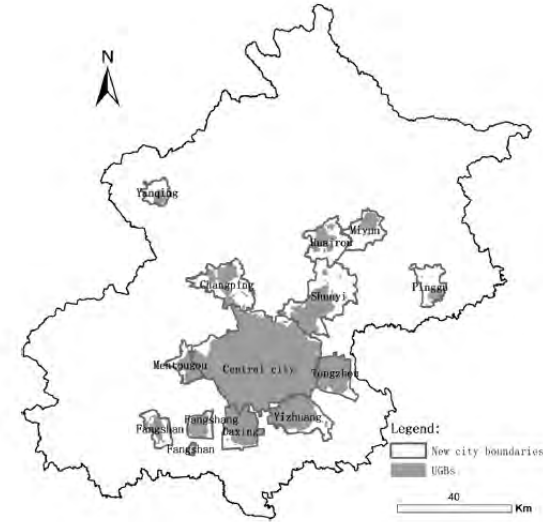


Fig. 6. The UGBs for the central city and new cities based on the constrained CA simulation.

**Table 1**  
Databases of the constrained CA in the BMA.

Type	Variable	Description	Value	Data source
Macro constraint	stepfun	Socio-economic development	>0	Socio-economic development plan or calculated from existing urban forms
Locational constraints	$a_1$	Attractiveness of Tiananmen (the downtown center)	0-1	Derived from spatial dataset in GIS
	$a_2$	Attractiveness of new cities	0-1	Derived from spatial dataset in GIS
	$a_3$	Attractiveness of towns	0-1	Derived from spatial dataset in GIS
	$a_4$	Attractiveness of rivers	0-1	Derived from spatial dataset in GIS
Institutional constraints	$b_1$	Attractiveness of roads of 1991	0-1	Interpreted from Landsat TM imagery of 1991-5-16
	$b_2$	Attractiveness of roads of 2004	0-1	Interpreted from Landsat TM imagery of 2004-5-26
	$b_3$	Construction of forbidden areas	0 or 1	Beijing Municipal Planning Committee (2007) (for detail see: JING ET AL., 2011)
Neighborhood effect	$c_1$	Stability of cultivation	0-1	Beijing Planning Commission (1988)
	$c_2$	Development intensity in the neighborhood	0-1	Calculated by CA
	$F_1$	Urban form in 1991	0 or 1	Interpreted from Landsat TM imagery of 1991-5-16
	$F_2$	Urban form in 2004	0 or 1	Interpreted from Landsat TM imagery of 2004-5-26
	$F_3$	Planned UGBs for 2020 proposed in the BCMP	0 or 1	Beijing Municipal Planning Committee et al. (2006)

**Table 2**  
UGB areas of the central city and new cities in the BMA (area unit: km<sup>2</sup>).

Name	Area in 2004	Simulated UGBs	Planned UGBs	Simulated-planned	Simulated-planned Planned (%)
The central city	708.9	1031.0	984.2	-48.8	5.0
1. Shunyi	202	157.2	190.2	-23	-12.9
2. Yuhuang	25.1	156.8	116.6	-40.2	-34.5
3. Tongzhou	42.7	133.6	105.5	-24.1	-22.0
4. Daxing	55.8	132.3	84.7	-47.6	-56.2
5. Fangshan	52.6	86.4	88.8	-2.4	-2.7
6. Changping	25.7	82.0	109.5	-27.8	-35.3
7. Mentougou	21.2	52.9	35.5	-17.4	-49.0
8. Huairou	20.0	48.8	80.0	-31.2	-39.0
9. Miyun	18.9	34.8	46.9	-12.1	-32.8
10. Pinggu	13.1	19.8	31.0	-11.2	-36.1
11. Yanqing	7.3	17.3	20.2	-2.9	-14.4
Sum	1051.7	1854.7	1897.4	67.3	3.6

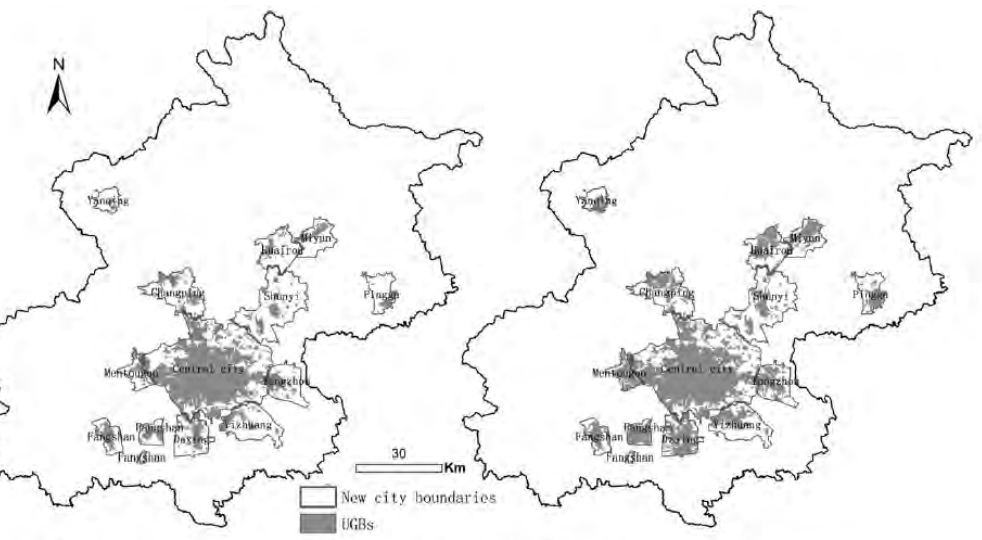
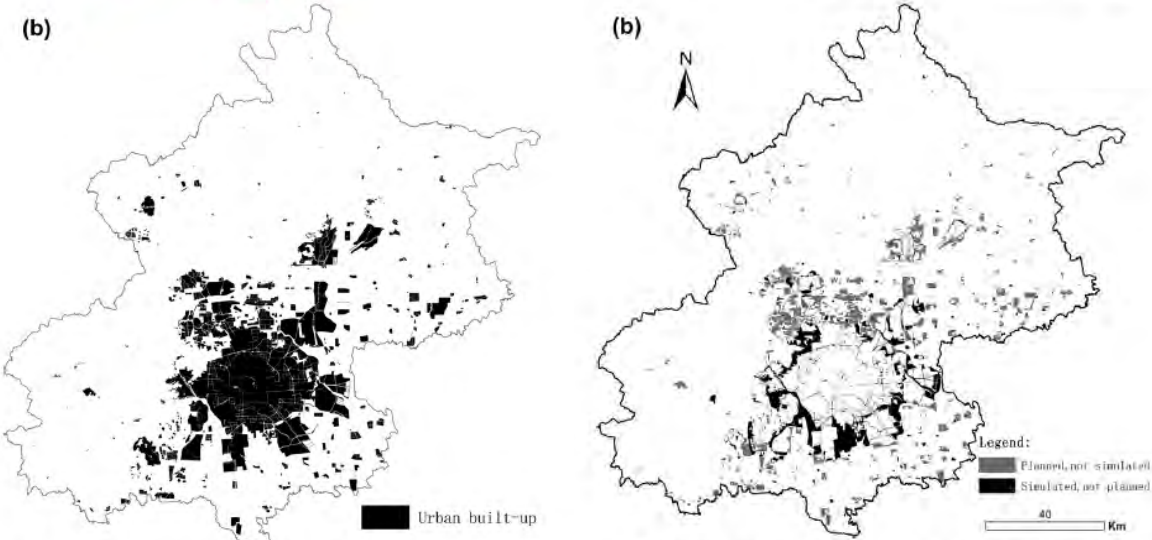


Fig. 7. Two UGB scenarios generated based on the constrained CA simulation (left: the grape-cluster scenario; right: the sustainable scenario).



## 2 Urban Growth Boundaries : The first green belt evaluation

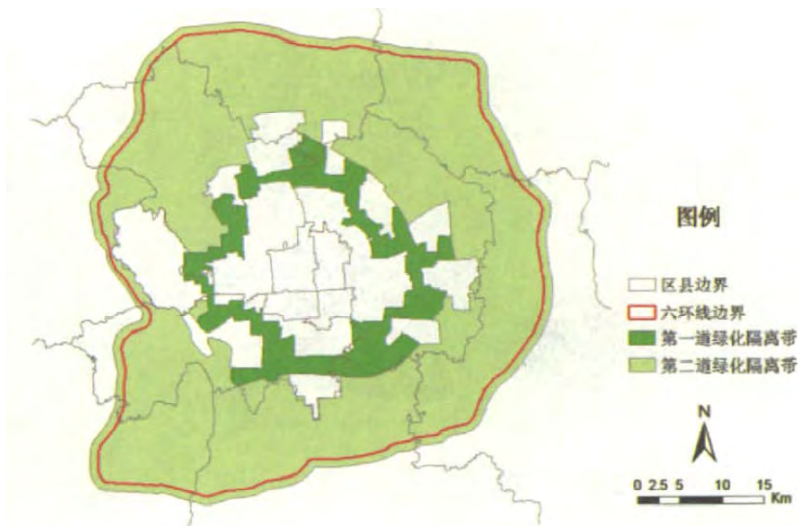


图1 北京市的绿带  
资料来源：北京市城市规划设计研究院，笔者加工绘制。

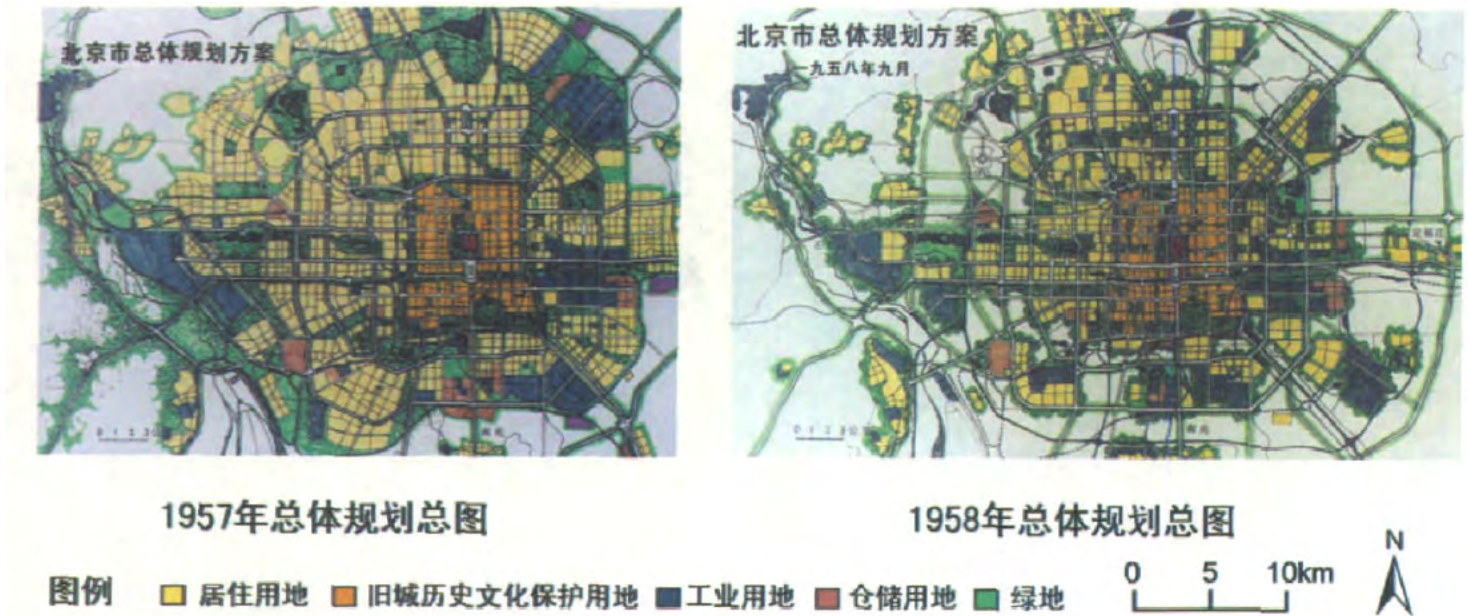


图2 1957年和1958年北京总体规划方案

表1 北京市绿带内涵和面积变化

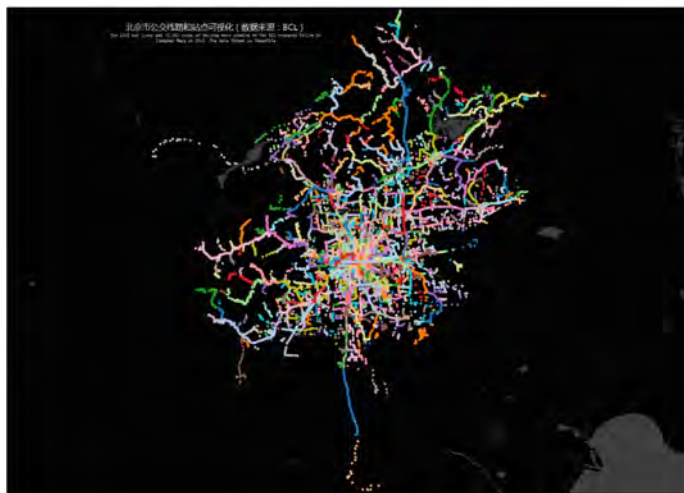
年代(年)	内涵
1958	非建设用地
1983	非建设用地, 60% 用地为树
1994	允许建设体育和娱乐设施
2000	允许建设高新技术产业和休闲

表2 第一道绿化隔离带内绿地空间构成比例变化 (%)

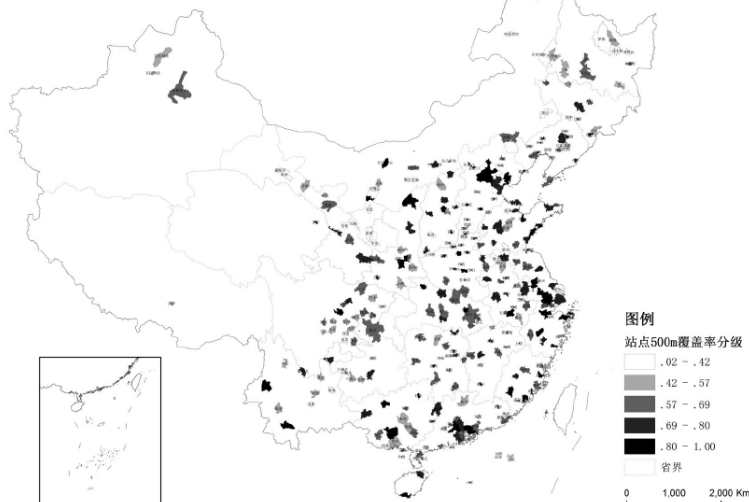
数据来源	用地类型						绿地比例报告值	绿色空间比例
	建设用地	农田	水域	林地	灌草地	其他用地		
1994年京政发[1994]7号文件	33.3	54.2	4.2	8.3	—	—	8.3	66.7
1998年规划市区绿化隔离地区调查报告	49.1	25.6	2.9	15.8	—	6.6	15.8	44.3
2005年TM遥感影像	49	8	1	18	20	4	18~38	47

### 3 Bus Landscapes

- Revealing group travel behavior patterns with public transit smart card data
- Big data for intrametropolitan human movement studies: A case study of bus commuters based on smart card data
- The coverage ratio of bus station and spatial feature evaluation in Chinese major cities
- A review of urban studies using transit smart card data
- Community detection using SCD
- Commuting pattern identification
- Discovering functional zones
- Extreme transit behaviors
- Bus stops and lines in Beijing
- Understanding urban poverty of Beijing using bus/metro smart card records
- Mobility and Stability
- Losers and Pareto Optimality in Optimizing Commuting Patterns
- Outside the ivory tower
- Excess Commuting in Beijing



全国313个城市公交站点覆盖率空间分布图



Extreme travelers	Kernel density of housing ratio	Kernel density of job ratio	Commuting trips	Typical trips
EBs	 (10.3 k)	 (9.4 k)	 (4.9 k)	
NOs	 (31.6 k)	 (25.0 k)	 (17.5 k)	
TIs	 (6.7 k)	 (6.7 k)	 (6.7 k)	
RIs	 (25.4 k)	 (7.8 k)	 (2.7 k)	
Legend				

Mobility patterns of four types of extreme travelers from the SCD

# 3 Bus Landscapes: Revealing group travel behavior patterns with public transit smart card data

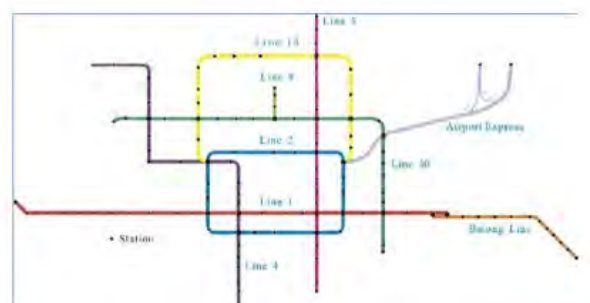
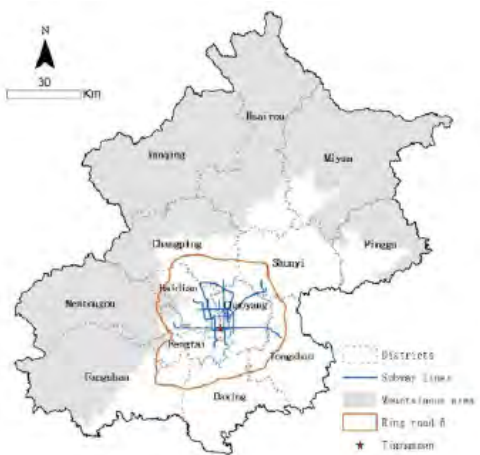


Fig. 2. Beijing metropolitan area (A) and subway map (B), in 2010. Note: the subway pattern in A was mapped according to the real situation; the subway pattern in B gives an abstract representation of the network and was mapped according to the map produced by Beijing Subway Operation Company.

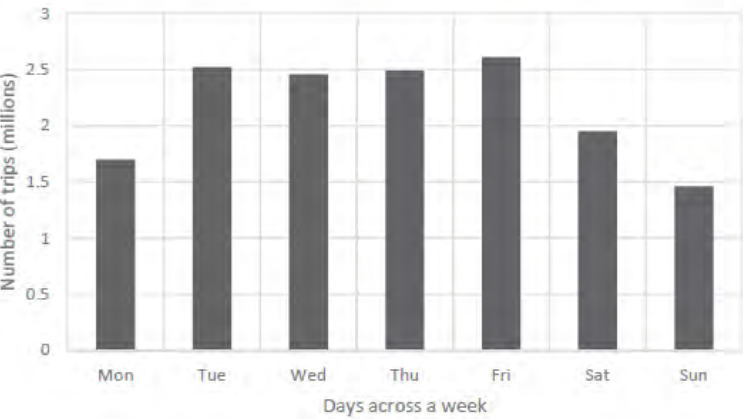


Fig. 3. Number of trips over the study period of one week. The X-axis represents the day of the week (from Monday 5 April 2010 to Sunday 11 April 2010).

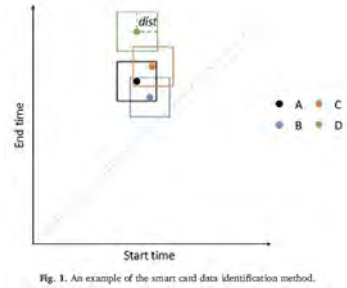


Fig. 1. An example of the smart card data identification method.

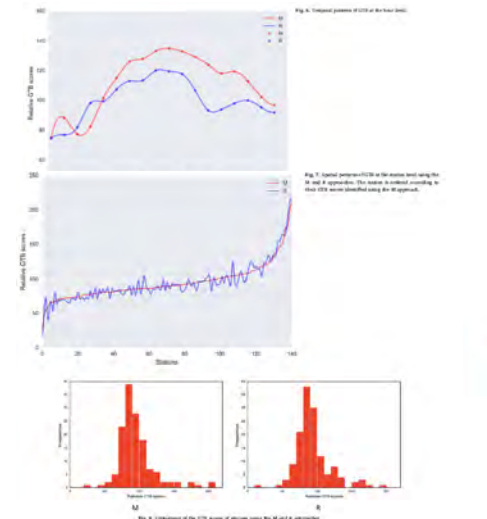


Fig. 7. Relative pattern of GTB of the two lines.

Fig. 8. Spatial pattern of GTB at the same time using the M and R approaches. The scores in red color according to the M approach and blue color according to the R approach.

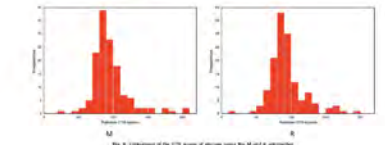


Fig. 9. Comparison of the GTB scores of stations using the M and R approaches.

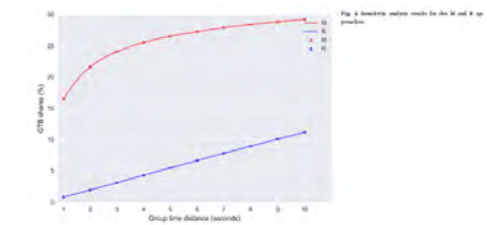


Fig. 6. Descriptive analysis results for data M and R approaches.

Table 2 Percentage (percentage) of group trips by group size

Group size	2	3	4	5	6	7	8	9-14	15 and
Percentage using the M approach	75.00	12.40	4.80	1.20	0.40	1.20	0.20	0.20	100.00
Percentage using the R approach	65.00	6.00	0.40	0.00	0.00	0.00	0.00	0.00	100.00

Table 3 Percentage (percentage) of group members by number of group trips

Number of group trips	1	2	3	4	5	6	7	8-14	15 and
Percentage using the M approach	71.20	20.40	1.10	0.20	0.00	0.00	0.00	0.00	100.00
Percentage using the R approach	80.00	9.00	1.00	0.00	0.00	0.00	0.00	0.00	100.00

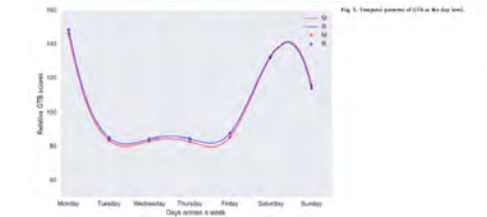


Fig. 8. Relative pattern of GTB of the two lines.



Fig. 9. Ten stations with highest and lowest GTB scores using the M and R approaches.

### 3 Bus Landscapes: Big data for intrametropolitan human movement studies: A case study of bus commuters based on smart card data

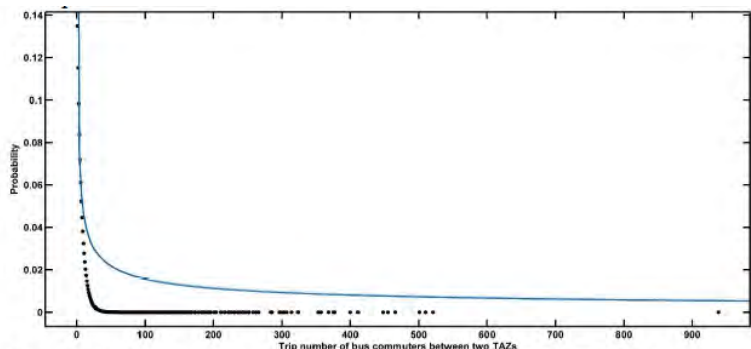


Figure 2. OD flow distribution. Plots of the histogram of the number of trips between two traffic analysis zones (TAZs). The black dots denote actual trip number; while the blue curve is a power law fit.

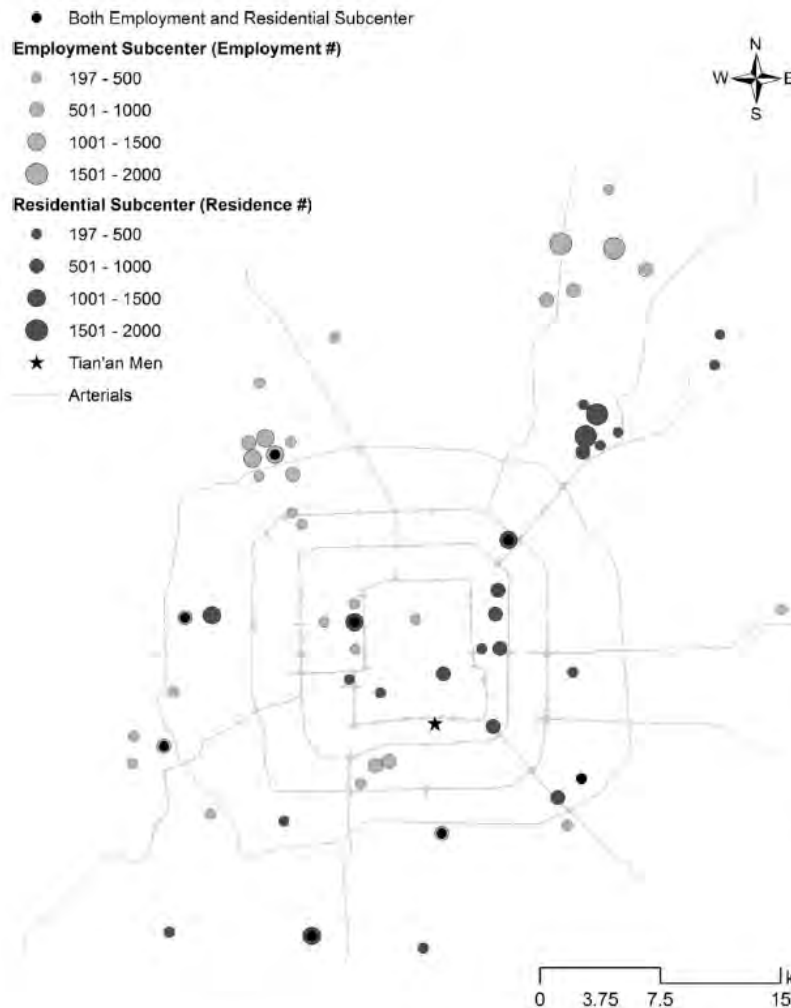


Figure 4. Subcenters of Bus Commuters in Beijing

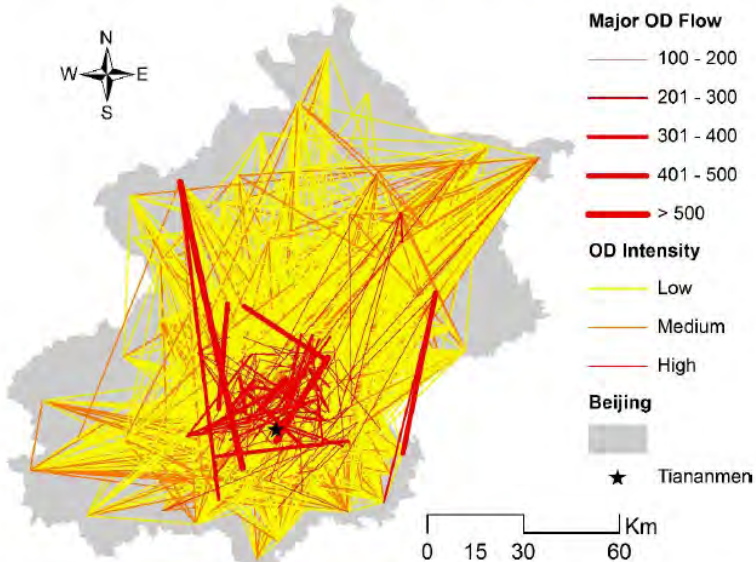


Figure 3. Visualization of OD flows for bus commuters between residence and employment locations. Major OD flows are categorized based on normalized trips.

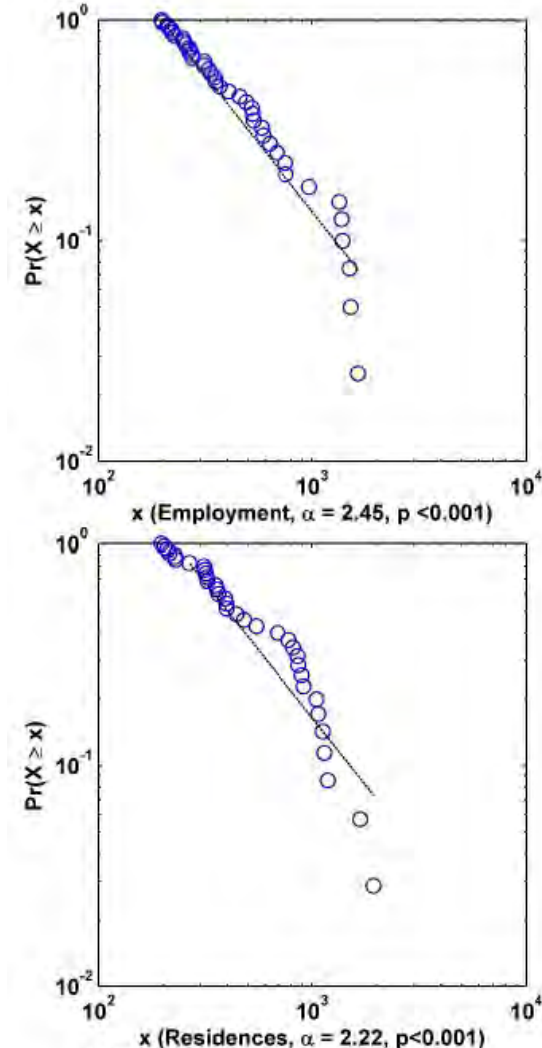


Figure 5. Power-distributions of subcenters

# 3 Bus Landscapes: The coverage ratio of bus station and spatial feature evaluation in Chinese major cities

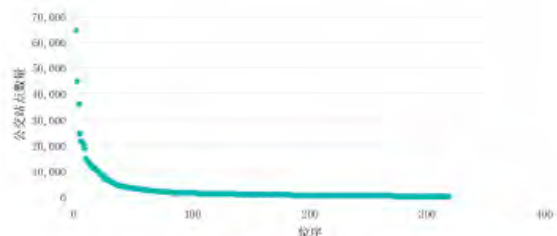


图3 各城市公交站数量的位序关系  
Fig.3 The rank of bus stations' number in different cities  
资料来源: 笔者自绘



图4 城镇建设用地图识别流程  
Fig.4 Flow chart of the proposed framework  
资料来源: 笔者自绘

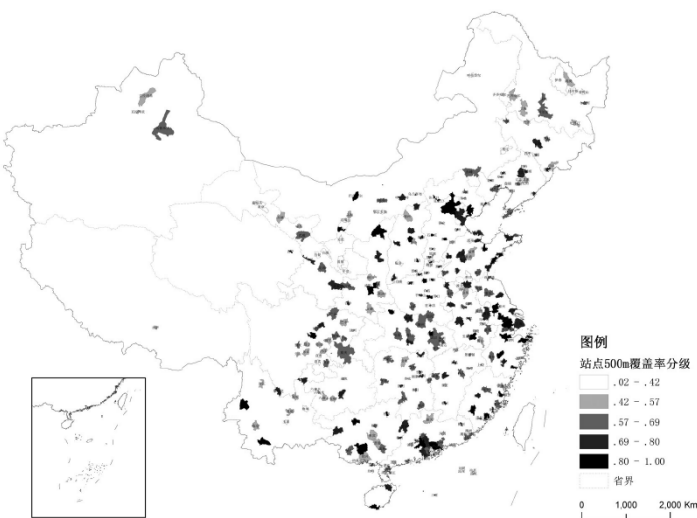


表1 城市公交站500米服务区覆盖率排名(前25)  
Tab.1 The rank of 500m bus coverage ratio in different cities (Top 25)

排名	城市名称	覆盖率	排名	城市名称	覆盖率
1	佛山	0.97	26	邢台	0.85
2	常州	0.95	27	孝感	0.84
3	石家庄	0.92	28	西宁	0.84
4	西安	0.91	29	衡水	0.84
5	三亚	0.90	30	南宁	0.84
6	郑州	0.89	31	柳州	0.83
7	深圳	0.89	32	桂林	0.83
8	廊坊	0.89	33	厦门	0.82
9	宁波	0.89	34	潍坊	0.82
10	金华	0.88	35	漯河	0.82
11	温州	0.88	36	唐山	0.82
12	无锡	0.88	37	青岛	0.82
13	成都	0.88	38	银川	0.82
14	福州	0.88	39	镇江	0.81
15	沧州	0.87	40	普洱	0.81
16	杭州	0.87	41	太原	0.80
17	绍兴	0.87	42	佛山	0.80
18	舟山	0.86	43	东莞	0.80
19	河池	0.86	44	十堰	0.80
20	北京	0.86	45	德州	0.80
21	扬州	0.86	46	安阳	0.80
22	龙岩	0.85	47	乌兰察布	0.80
23	苏州	0.85	48	广州	0.80
24	长治	0.85	49	日照	0.80
25	巴彦淖尔	0.85	50	榆林	0.80

资料来源: 笔者自绘

表2 部分城市公交站覆盖率对不同半径服务范围敏感性表  
Tab.2 The sensitivity of bus stations coverage in different radius

名称	市区人口	城镇建设用地面积(平方千米)	300m	500m	800m	不同排名标准差
佛山	382.35	142.21	1	1	3	0.94
常州	230.47	174.60	2	2	1	0.47
石家庄	258.25	212.75	3	3	4	0.47
成都	554.18	506.49	4	13	29	10.34
西安	672.68	318.00	5	4	16	5.44
郑州	472.80	335.38	6	6	11	2.36
深圳	1054.74	863.43	7	7	8	0.47
西宁	129.45	75.00	8	28	22	8.38
福州	192.06	220.22	9	14	17	3.30
温州	149.66	150.37	10	11	10	0.47

资料来源: 笔者自绘

表3 各城市公交站覆盖率与各指标回归分析结果(N=267)  
Tab.3 The result of regression analysis of bus station coverage and related index (N=267)

指标	标准化后的回归系数	t	显著水平
(常量)		30.734	0.000
市区人口密度(人/km <sup>2</sup> )	0.256	4.454	0.000
万人拥有公共汽车辆数	0.103	1.624	0.106
人均城市道路面积(m <sup>2</sup> )	-0.092	-1.442	0.150
公交站密度(个/km <sup>2</sup> )	0.287	5.138	0.000
市区人均GDP(万元/人)	0.164	2.626	0.009

资料来源: 笔者自绘

表4 部分城市人口、公交站点覆盖率与覆盖情况示意图(500米服务半径)

Tab.4 Population, bus station coverage ratio and spatial distribution of bus station coverage in part of cities (500m service radius)

城市	上海	北京	重庆	深圳	武汉
人口(万人)	2380	2069	1780	1055	825
覆盖率	0.75	0.86	0.60	0.89	0.68
城市	天津	广州	西安	成都	南京
人口(万人)	816	678	673	554	553
覆盖率	0.71	0.80	0.91	0.88	0.77
城市	汕头	沈阳	郑州	哈尔滨	杭州
人口(万人)	533	522	473	471	445
覆盖率	0.60	0.76	0.89	0.63	0.87
城市	长春	青岛	济南	四平	昆明
人口(万人)	380	364	352	341	332
覆盖率	0.73	0.82	0.78	0.31	0.57

资料来源: 1、上表中城市数据来源于《中国城市统计年鉴2013》; 2、上表中国为笔者自绘  
备注: 1、上表图片中地级及以上级别城市边界是市辖区范围, 县级市为整个市域范围;  
2、上表中国并非等比例尺缩放。

### 3 Bus Landscapes: A review of urban studies using transit smart card data

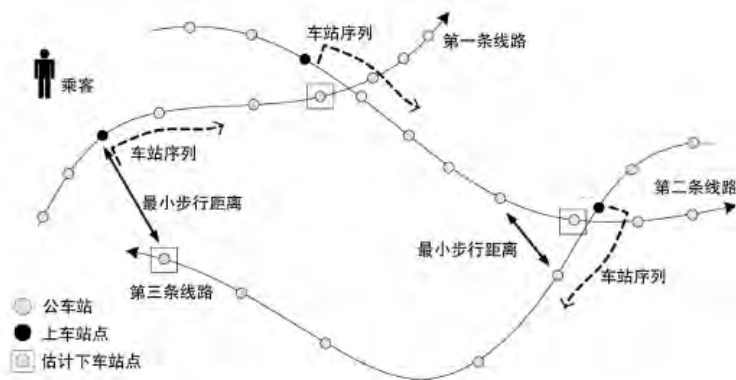


图1 对一般和最终出行下车点的估计模型

Fig.1 The alighting location estimation model for "normal" and "last" trips  
来源: Trépanier等(2007).

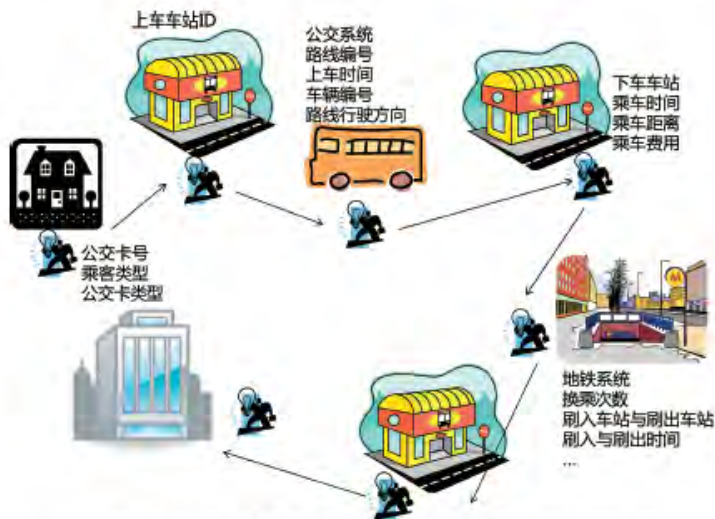


图2 公共交通智能卡记录所包含的个人及出行信息

Fig.2 Personal and travel information captured in smart card transactions  
来源: 笔者自绘.

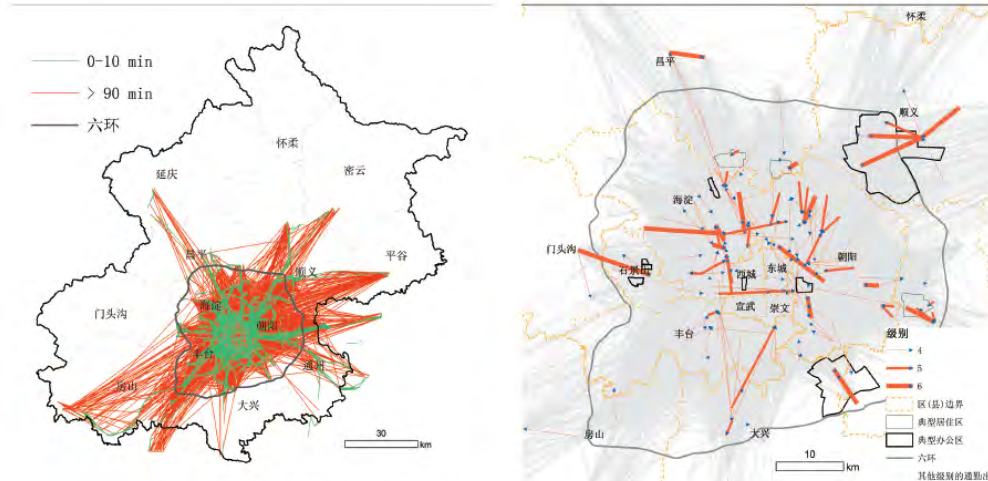


图3 基于公交刷卡数据识别的北京通勤出行 (左: 极端出行时间的通勤出行; 右: TAZ尺度的通勤链接)

Fig.3 Commuting trips identified from Beijing SCD (a) extreme commuting trips (b) commuting trips aggregated at the TAZ level  
来源: 龙温等(2012).

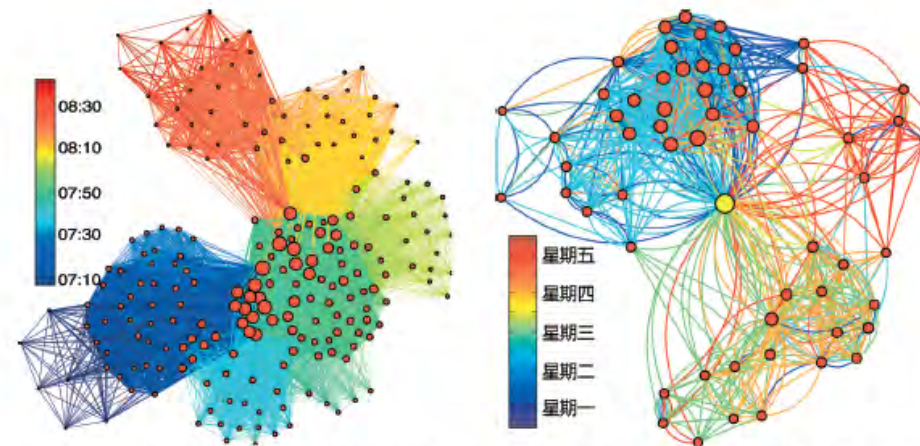


图4 在一辆公交车上的乘客相遇网络 (a) 及个体一周内“熟悉的陌生人”网络 (b)

Fig.4 (a) Temporal encounter network on a single vehicle and (b) Aggregated "familiar stranger" network for an individual  
来源: Sun等(2013).

### 3 Bus Landscapes: Commuting pattern identification

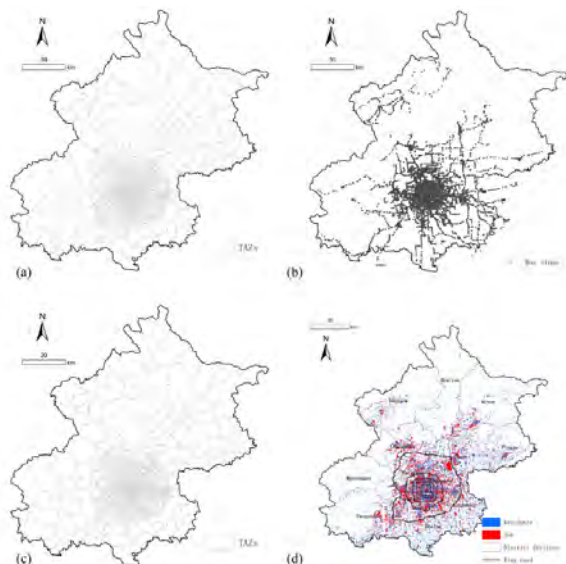


Fig. 1. Bus routes (a), bus stops (b), traffic analysis zones (TAZ) (c), and land use patterns (d) of the BMA. Note: Maps are from the Beijing Institute of City Planning. Some bus routes and stops are outside the BMA, as shown in (a) and (b), since some frequent travelers inside the BMA actually live outside the BMA, in neighboring towns of Hebei province. In the TAZ-level analysis conducted in this paper, trips outside the BMA are not counted due to the lack of TAZ data. The five nested circles in (d) represent the second, third, fourth, fifth, and sixth ring roads of Beijing. The star in the central area represents Tian'anmen Square.

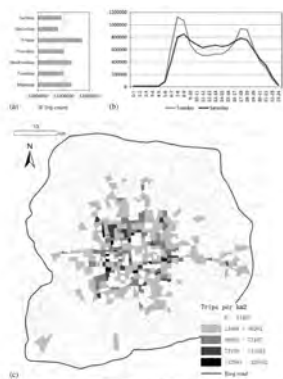


Fig. 2. Distribution of bus routes and stops by TAZ. (a) Total number of bus routes (left) and bus stops (right) by TAZ. (b) Distribution of bus routes and stops by TAZ size. (c) Density of bus routes and stops by TAZ.

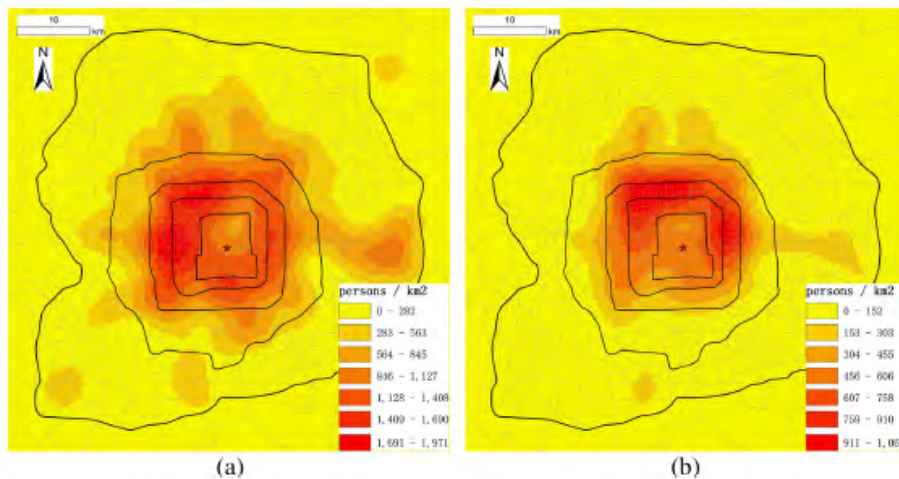


Fig. 9. Identified home (a) and job (b) kernel density maps in the central BMA. Note: This figure only represents data from bus smart cardholders.

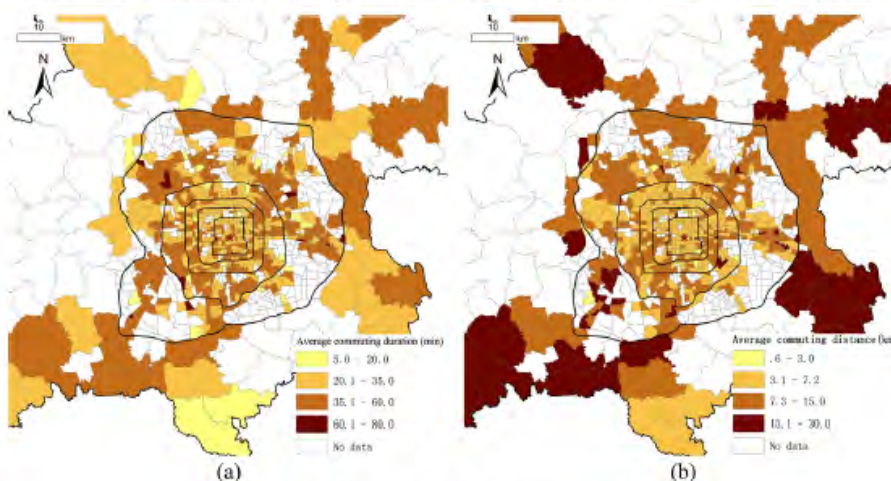


Fig. 11. Average commuting duration (a) and distance (b) by TAZ in Beijing.

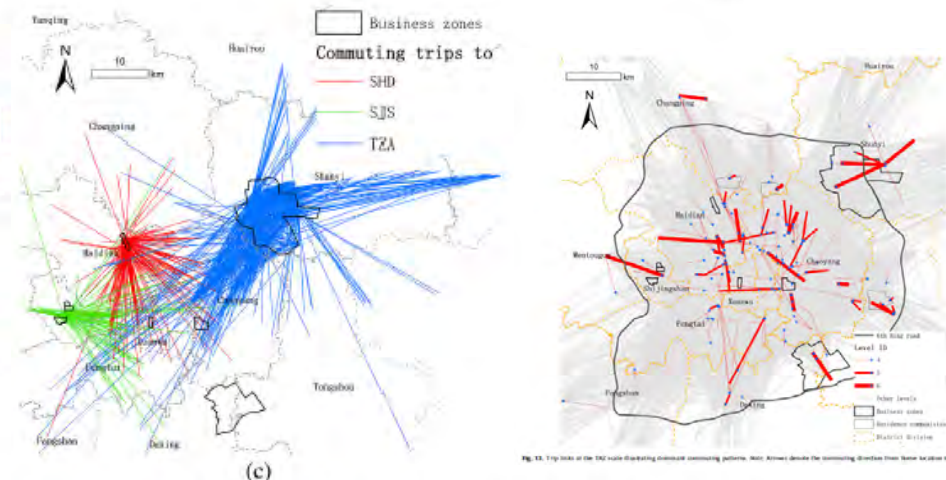
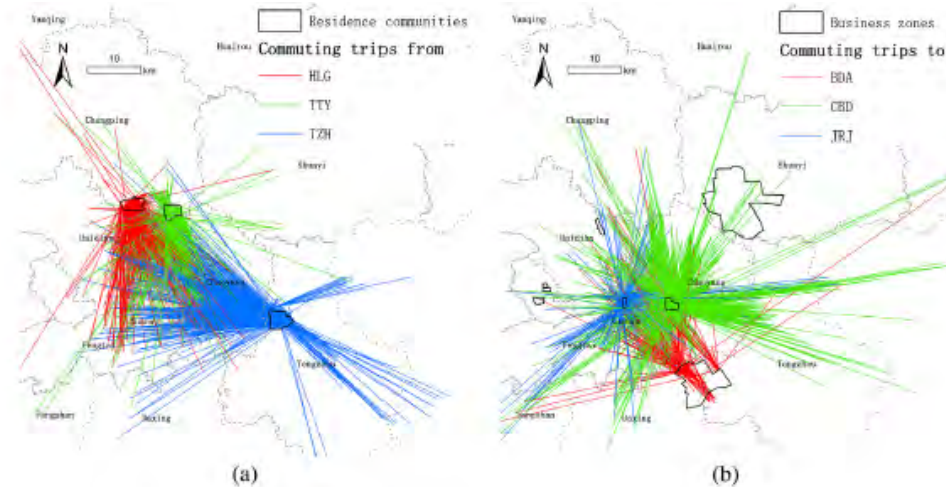


Fig. 14. Commuting trips (a) from three main residential communities; (b and c) to six major business zones. Note: HLG = Huilongguan community, TTY = Tiantongyuan community, TZH = Tongzhou community, CBD = Central Business District, SHD = Shangdi Industrial Park, BDA = Beijing Development Area at Yizhuang, TZA = Tianzhu Airport, JRT = Jinrongjie (financial district), and SJS = Shijingshan Park.

### 3 Bus Landscapes: Discovering functional zones

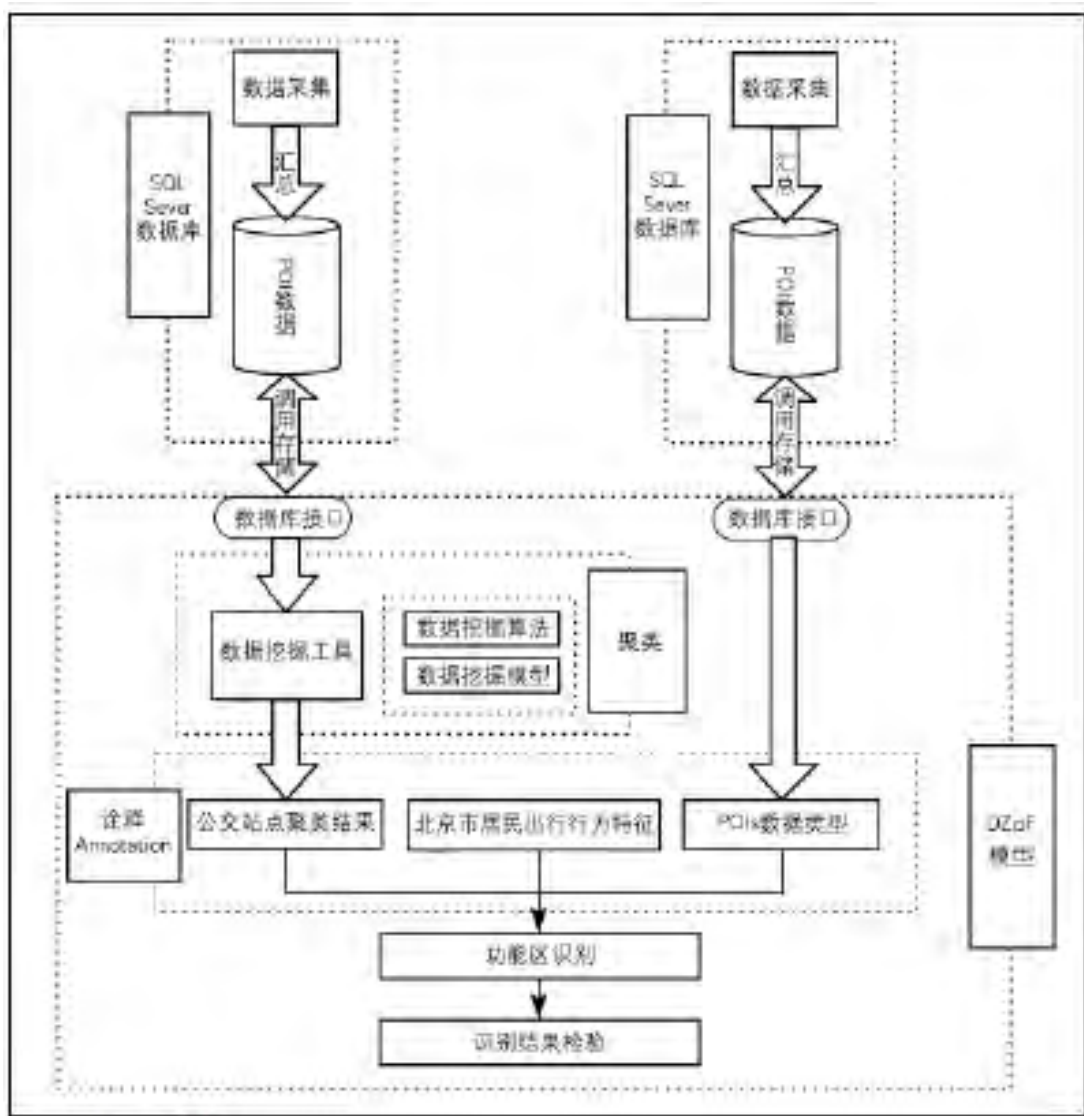


图5 技术路线  
Fig.5 Technical route

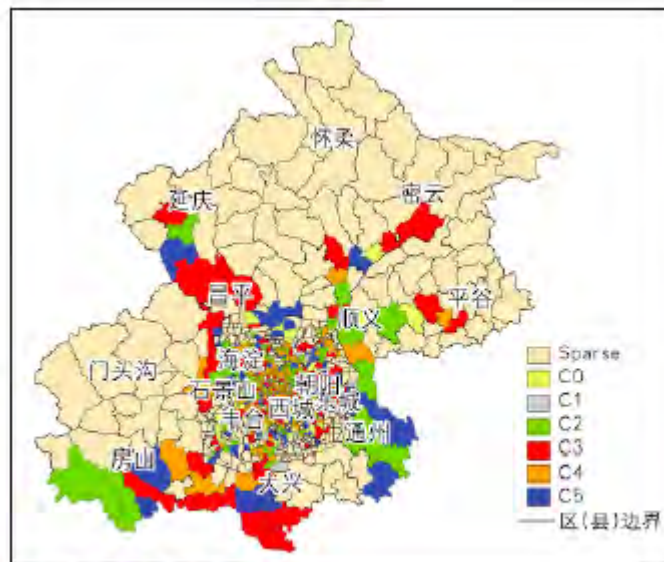


图6 北京市功能区  
Fig.6 Functional zones of Beijing

表1 EM聚类所得功能区的兴趣点特征值(FD:频数密度, RCR:类别比排名)  
Tab.1 Overall POIs feature vector and ranking of functional zones formed by EM (FD: Frequency Density, RCR: Rank of Category Ratio)

兴趣点分类	C0		C1		C2		C3		C4		C5	
	FD	RCR	FD	RCR	FD	RCR	FD	RCR	FD	RCR	FD	RCR
汽车服务	-0.077	7	-0.025	6	0.073	9	0.03	19	0.021	18	-0.02	6
汽车销售	-0.075	6	0.034	2	-0.006	19	0.089	14	0.073	13	-0.063	12
汽车维修	-0.005	3	0.032	3	0	18	0.119	9	0.084	12	-0.012	4
摩托车服务	0.063	1	0.006	5	0.057	13	0.085	15	0.041	16	-0.117	1
餐饮服务	-0.186	18	-0.109	13	0.142	1	0.149	7	0.205	5	-0.095	18
购物服务	-0.173	16	-0.141	16	0.039	15	0.214	3	0.107	11	-0.051	10
生活服务	-0.156	13	-0.157	18	0.099	5	0.216	2	0.114	10	-0.026	7
体育休闲服务	-0.16	14	-0.114	14	0.124	2	0.095	10	0.307	1	-0.057	11
医疗保健服务	-0.106	9	0.013	4	0.06	12	0.187	5	0.056	15	-0.004	3
住宿服务	-0.183	17	-0.14	15	0.075	8	0.187	4	0.18	6	-0.034	8
风景名胜	-0.129	12	-0.076	11	0.042	14	-0.033	20	0.167	8	-0.075	15
商务住宅	-0.073	5	-0.094	12	0.072	10	0.152	6	0.07	14	-0.018	5
政府机构及社会团体	-0.124	11	-0.18	20	0.082	6	0.135	8	0.224	2	-0.11	20
科教文化服务	-0.202	19	-0.173	19	0.068	11	0.067	18	0.22	3	-0.095	17
交通设施服务	-0.173	15	-0.076	10	0.111	4	0.089	13	0.17	7	-0.066	13
金融保险服务	-0.214	20	-0.057	8	0.114	3	0.094	11	0.216	4	-0.105	19
公司企业	-0.12	10	-0.144	17	0.075	7	0.069	17	0.117	9	0.017	2
道路附属设施	-0.008	4	-0.039	7	0.031	16	0.092	12	-0.036	20	-0.068	14
地名地址信息	0.015	2	0.039	1	0.016	17	0.084	16	0.021	17	-0.079	16
公共设施	-0.102	8	-0.068	9	-0.048	20	0.214	1	-0.036	19	-0.044	9

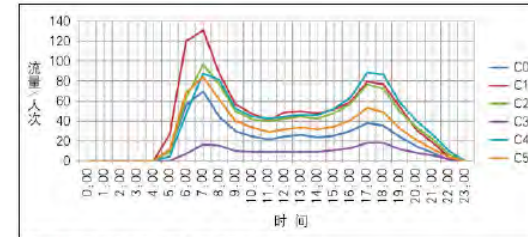


图7 EM聚类所得各簇的工作日上车流量  
Fig.7 The inflows on work days of clusters formed by EM

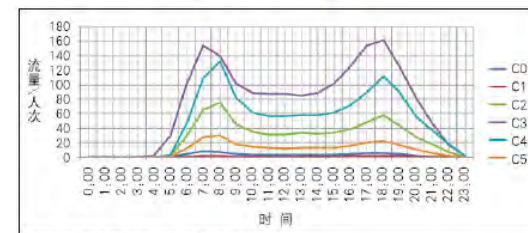


图8 EM聚类所得各簇的工作日下车流量  
Fig.8 The outflows on work days of clusters formed by EM

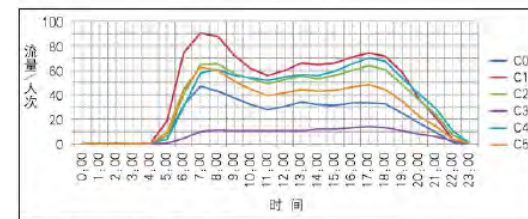


图9 EM聚类所得功能区的休息日上车流量  
Fig.9 The inflows on weekends of functional zones formed by EM

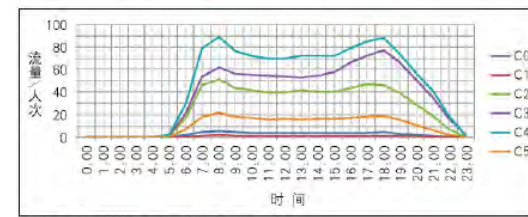
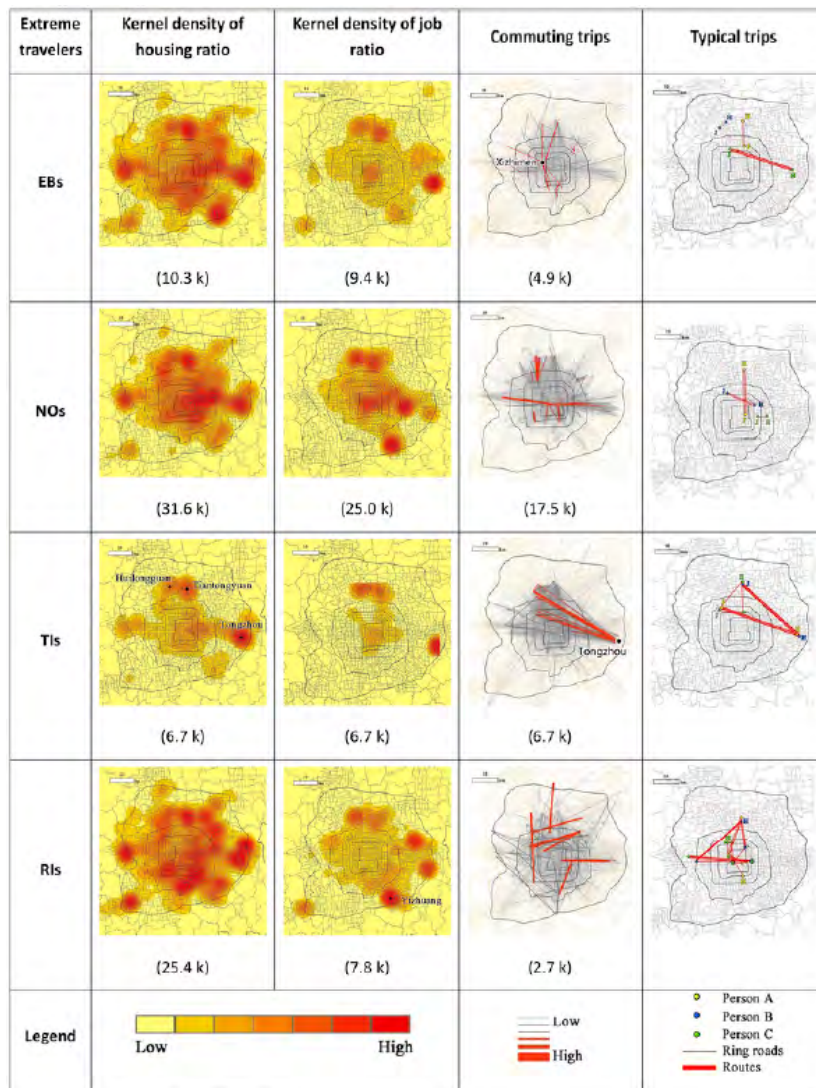


图10 EM聚类所得功能区的休息日下车流量  
Fig.10 The outflows on weekends of functional zones formed by EM



### 3 Bus Landscapes: Extreme transit behaviors



**Table 5**  
Travel purposes of each identified extreme traveler from the 2010 survey.

Type	EBs	NOs	TIs	RIIs	ABs
Sleep/Rest	0.4%	0.4%	0.0%	0.2%	0.1%
Shopping	1.0%	0.4%	0.0%	6.9%	1.4%
Pick-up or Drop-off Others	1.0%	0.0%	0.0%	11.7%	4.6%
Accompany Others	0.0%	0.0%	0.0%	0.4%	0.2%
Taking Delivery of Goods	0.6%	0.0%	0.0%	1.3%	0.4%
Go Home	1.3%	66.2%	0.0%	0.7%	44.4%
Have Meals	1.3%	0.0%	0.0%	31.2%	2.4%
Work	60.2%	2.1%	100.0%	2.4%	21.9%
Official Travel	0.9%	0.0%	0.0%	10.0%	0.9%
Go to Class/Study	11.8%	0.0%	0.0%	5.5%	3.9%
Personal Affairs	6.8%	0.0%	0.0%	0.5%	2.6%
Homework/Take Care of the Family	0.6%	0.0%	0.0%	10.8%	0.1%
Recreation, Entertainment and Fitness	10.9%	0.4%	0.0%	0.2%	6.4%
Visit Relatives and Friends	1.8%	0.0%	0.0%	3.1%	10.1%
Others	1.2%	0.4%	0.0%	15.1%	0.6%

Note: The trip purpose of EBs, NOs, TIs, RIIs, and ABs is for the first trip, last trip, commuting trip, all trips, and all trips in a day, respectively.

**Table 6**  
Selected socioeconomic characteristics of extreme travelers from the 2010 survey.

Extreme travelers	EBs (676)	NOs (236)	TIs (627)	RIIs (100)	ABs (116,142)
% annual household income $\geq$ 100 k CNY	4.9	4.2	6.7	5.0	7.4
% renting house	11.0	17.8	20.4	16.0	16.1
# average household car ownership	0.22	0.21	0.25	0.22	0.31
% higher education (undergraduate and graduate)	14.2	18.2	33.5	25.0	21.1
% Beijing Hukou	87.0	82.2	74.8	83.0	82.4
% public-sector employees	13.5	7.6	15.8	7.0	10.4
% fulltime workers	60.9	84.7	94.4	42.0	45.9
% fulltime students	12.7	2.1	1.3	1.0	7.3
% retirees	20.9	5.9	0.8	38.0	29.1

Note that numbers in brackets are the total count of extreme travelers. The *t*-test between each type of extreme travelers and ABs for each indicator reveals a significant difference ( $p < 0.05$ ).

### 3 Bus Landscapes: Losers and Pareto Optimality in Optimizing Commuting Patterns

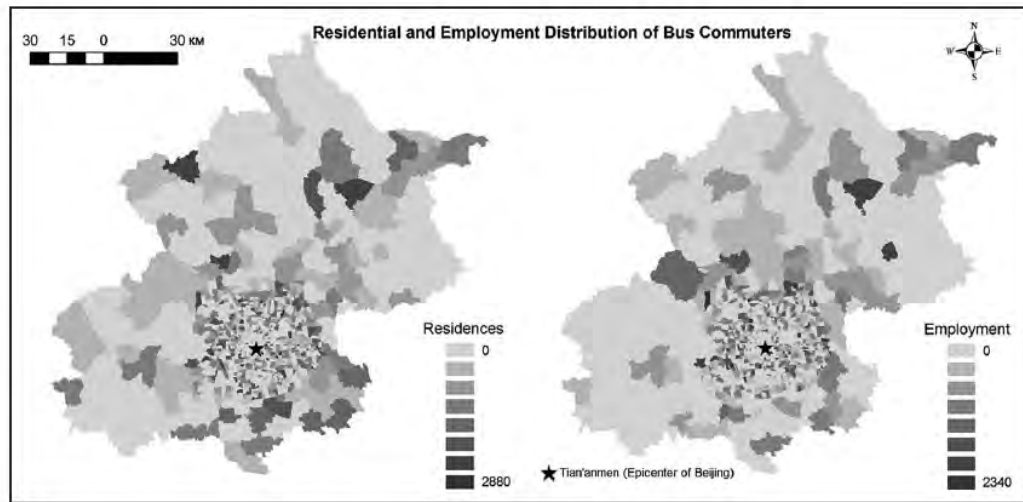


Figure 3. Distribution of bus commuters' residences and employment.

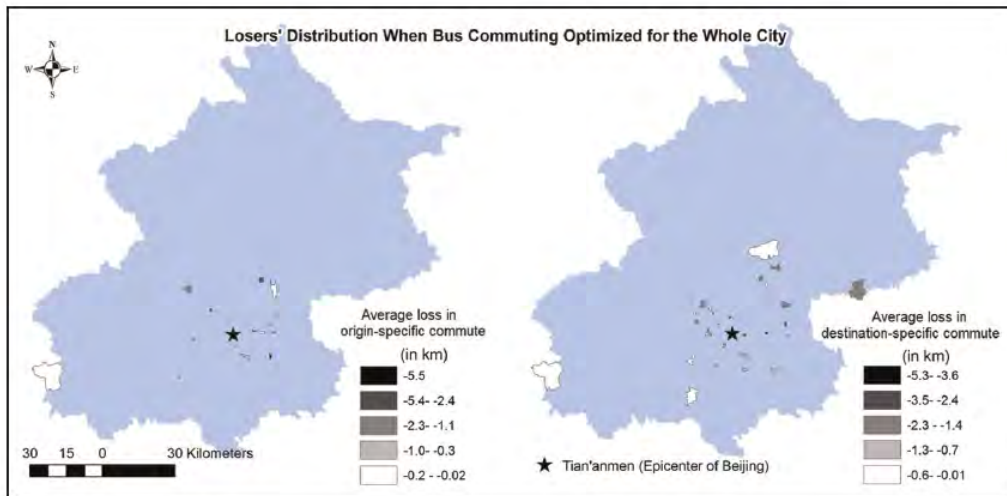


Figure 4. Distribution of the losers when bus commuting optimised.

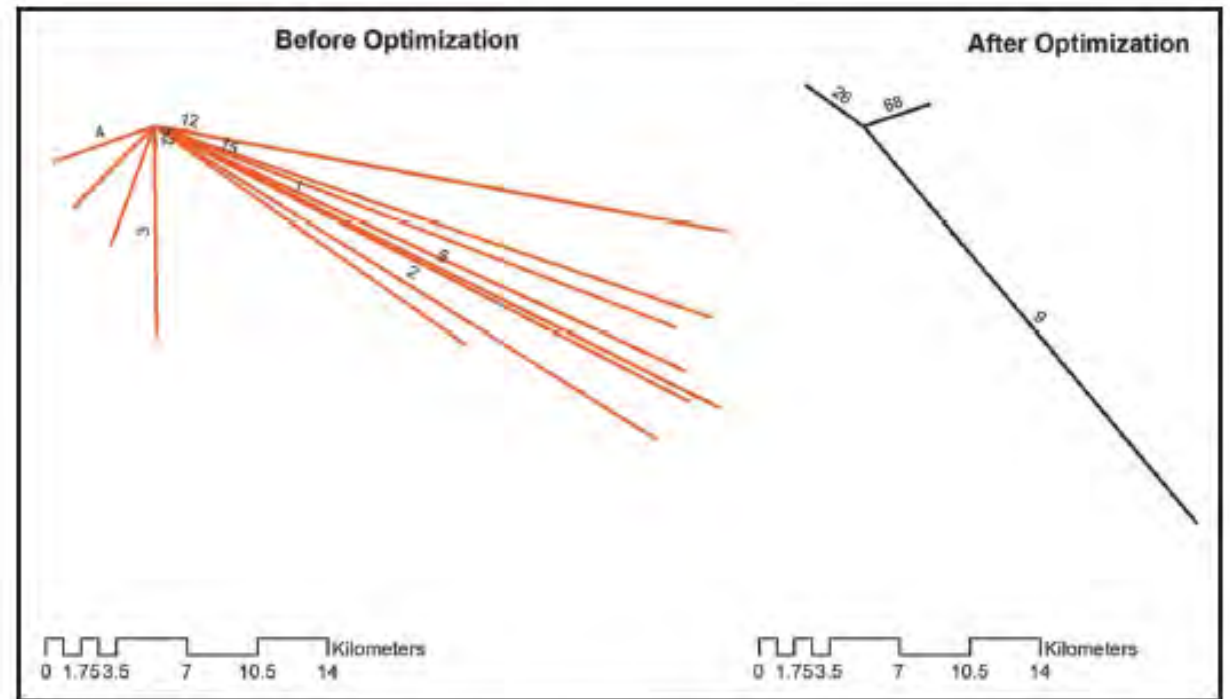


Figure 5. Table 6. Commute distances of TAZ 289 before and after optimisation.

Commutedistance(km)	Number of resident workers	
	Before the optimisation	After the optimisation
<4.05	1	9
4.05–8.1	93	0
8.1–12.2	8	94
12.2–16.3	0	0
>16.3	1	0

### 3 Bus Landscapes: Outside the ivory tower

#### Destination Hotspots

- High
- Medium
- Low
- ★ Tiananmen Square
- Beijing Major Road
- 985 University Campuses

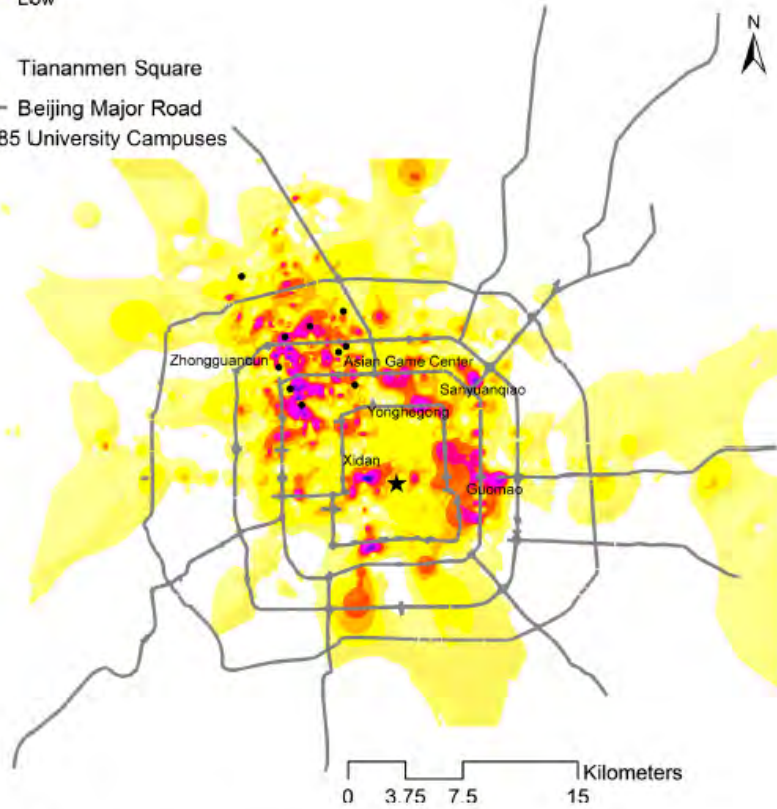


Figure 1. Top student transit trip destinations.

#### OD Volume

- 100 - 1000
- 1001 - 2500
- 2501 - 5000
- >5000
- Trip Destinations from 985 Universities and Adjacent Areas
- ★ Tiananmen Square
- Beijing Major Road



Figure 2. Distribution of all transit trips from the campuses.

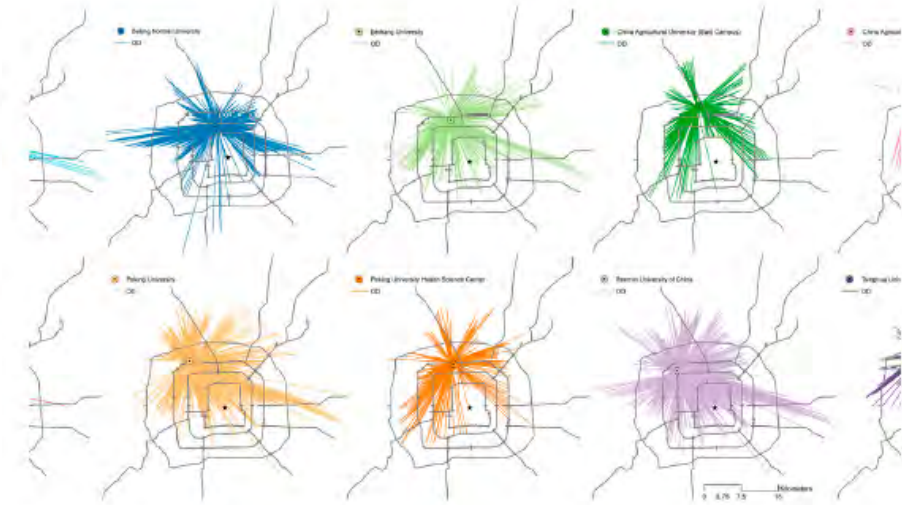


Figure 3. All transit trips between the campuses and different destinations.

### 3 Bus Landscapes: Excess Commuting in Beijing

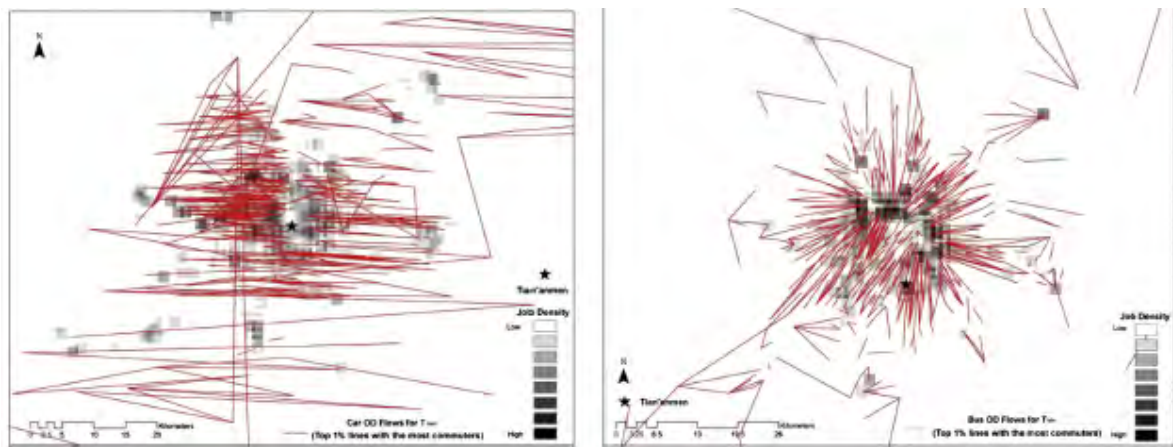


Fig. 2. Top 1% of origin-destination flows for the minimum solution ( $T_{min}$ ) by car and public transport.

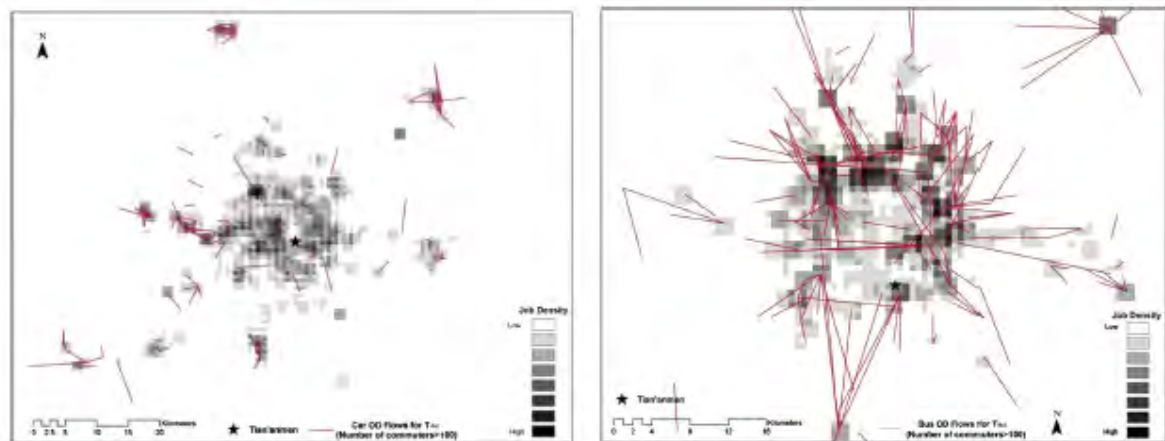


Fig. 3. Origin-destination flows for the actual pattern of trip making ( $T_{act}$ ) by car and public transport.

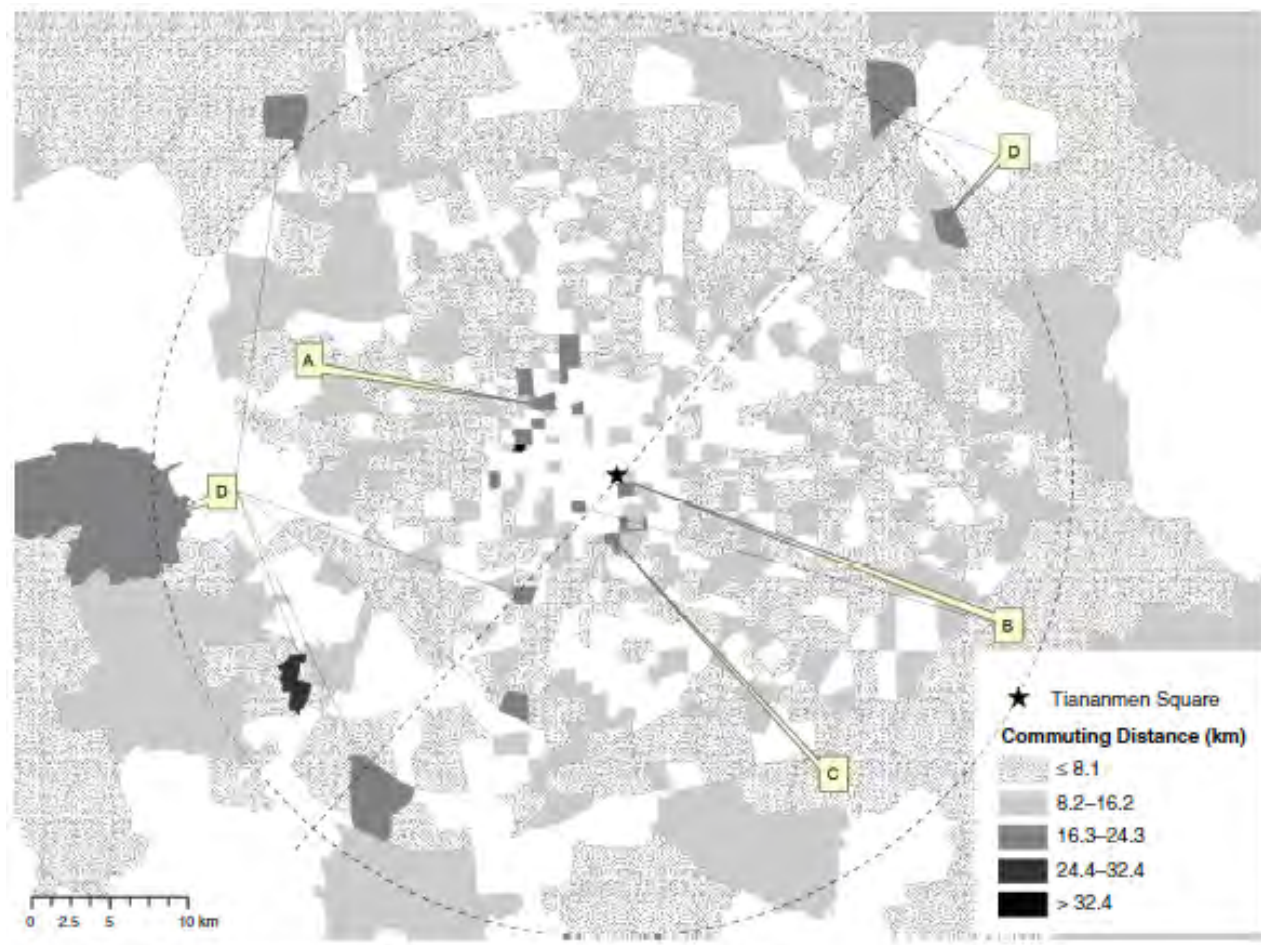
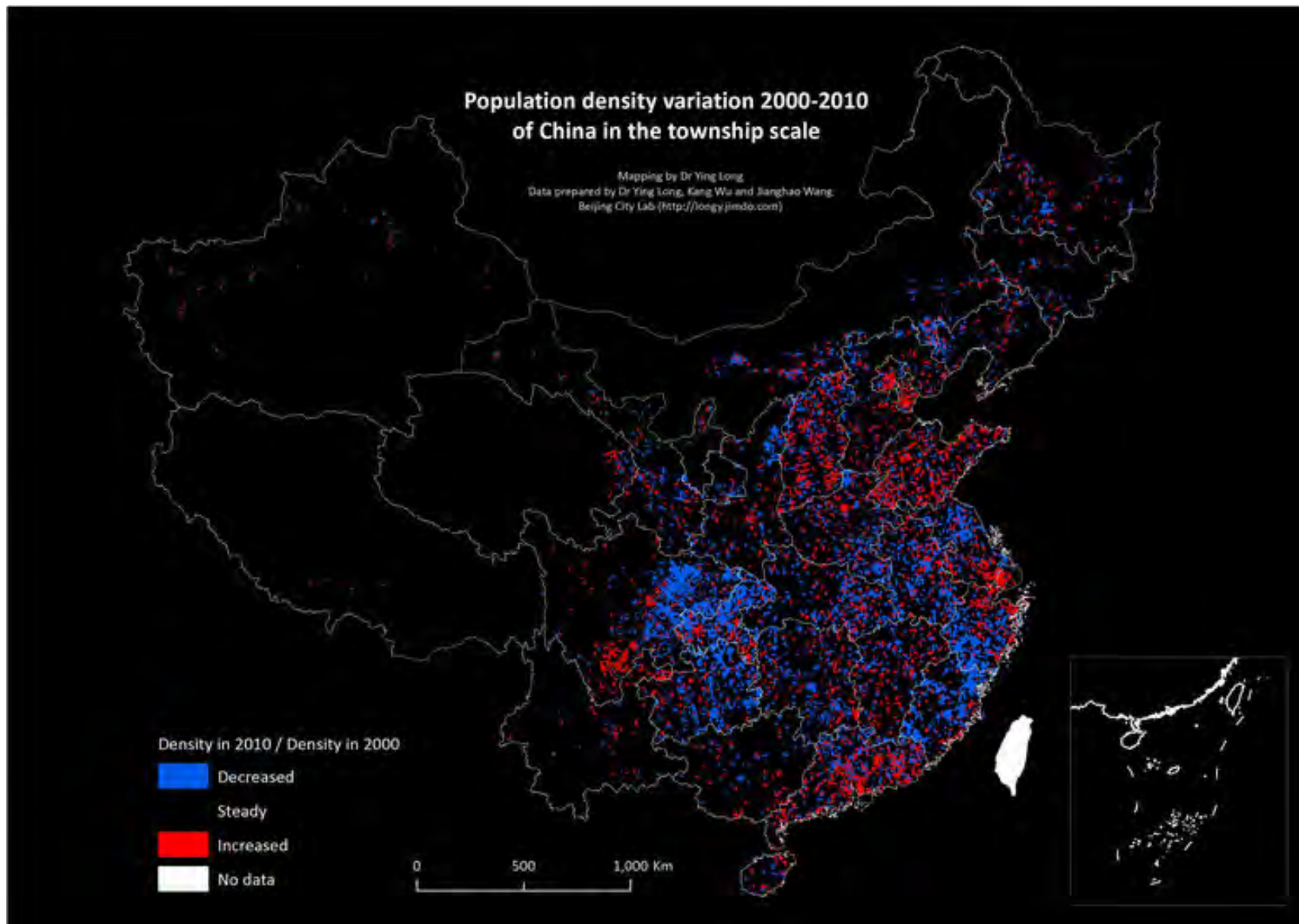
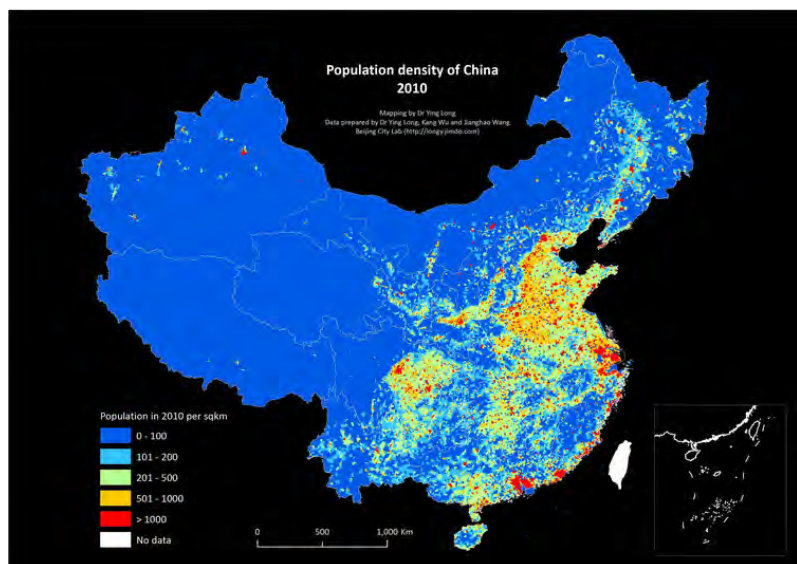
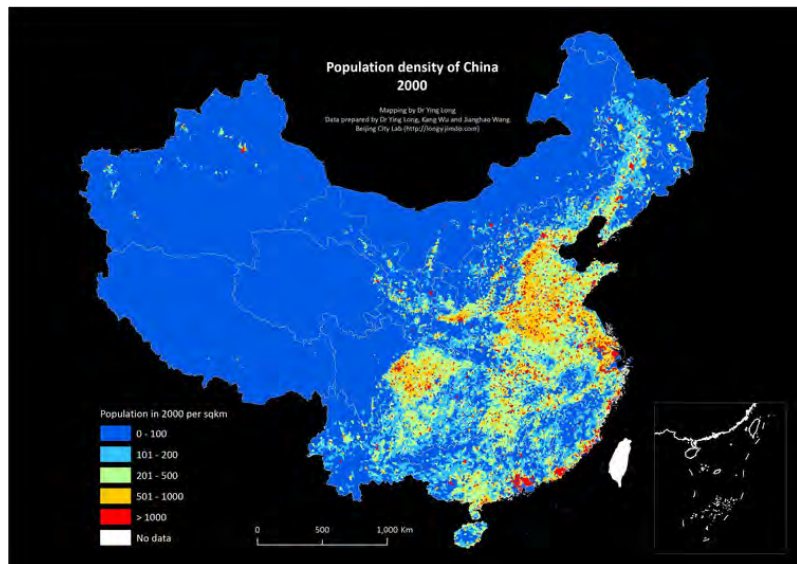


FIGURE 2 Mean commuting distances by TAZ in Beijing (TAZs without data not mapped).

# 4 Population China



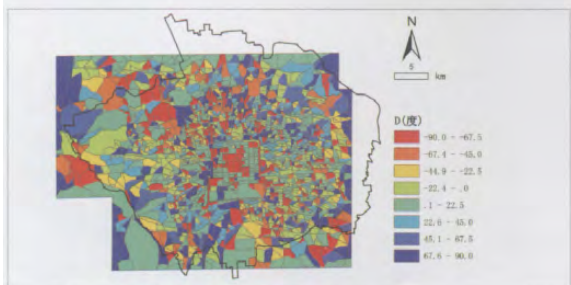
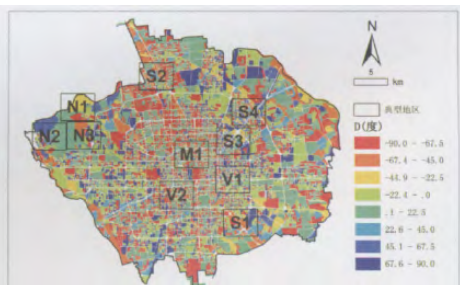
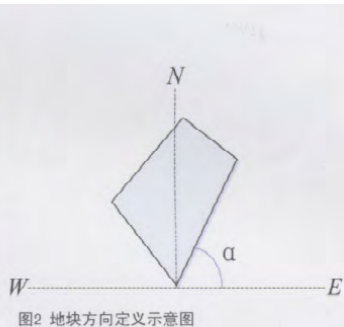
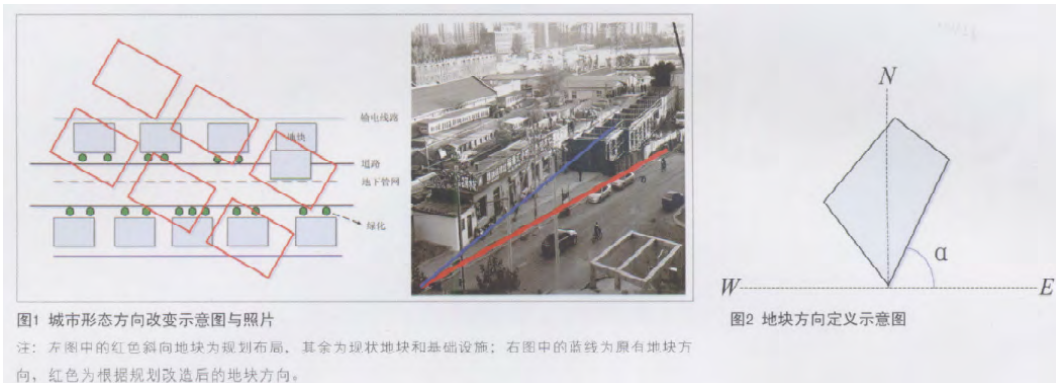


## 6 Urban Form

- Parcel Direction
- An agent based model for low carbon urban form
- Human mobility and urban form
- Identifying required policies for a desired urban form
- Rediscovering Chinese cities through the lens of land use pattern

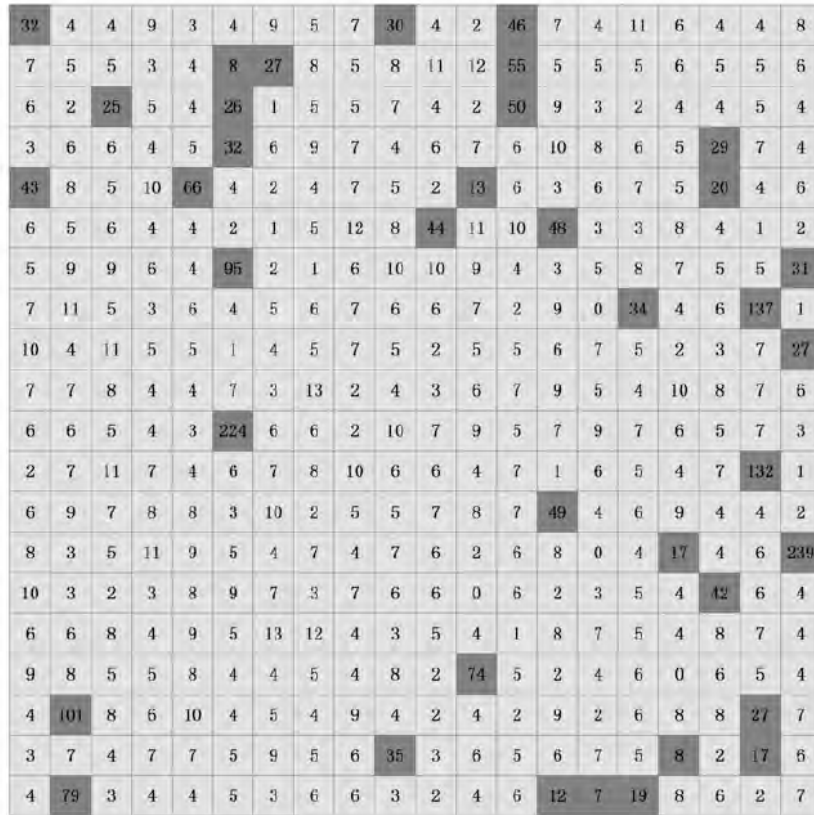
# 6 Urban Form: Parcel Direction

原论文中就是这样的图片，找不到更清晰的了





## 6 Urban Form: An agent based model for low carbon urban form



The commercial parcel  
 The residential parcel

Fig. 13.3 A generated urban form in the hypothetical city (the number in each residential parcel is the FAR value, and the number in each commercial parcel is the number of working persons)

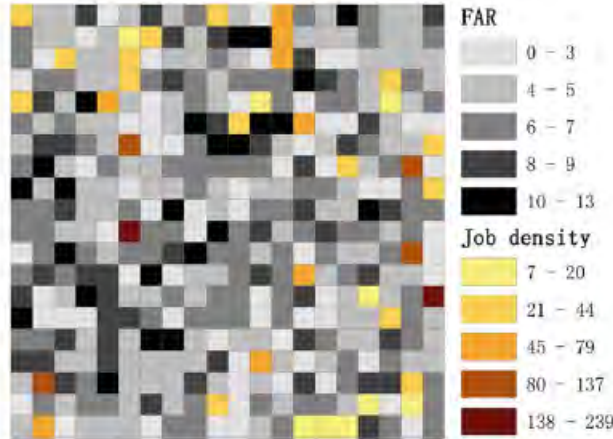


Fig. 13.6 FAR distributions for an exemplified urban form with the results of job location choice

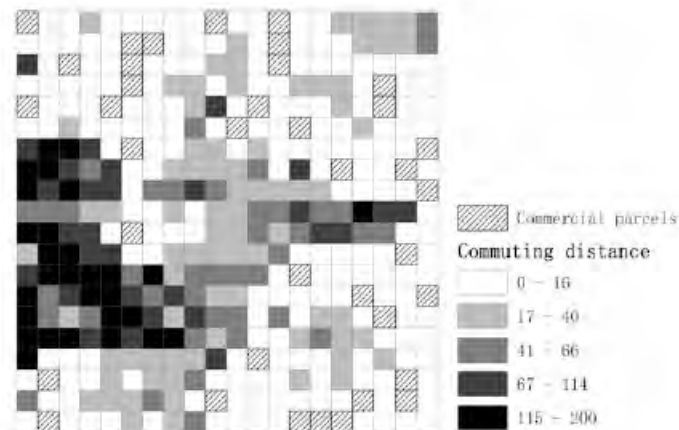


Fig. 13.7 The commuting distance map for an exemplified urban form

Table 13.4 Simulation results of commuting distance for urban forms with various shapes

Shape	Shape	Min	Max	Ave	Std. Dev.
Square		9,186	27,848	17,300	2,932
Rectangle		6,943	33,187	16,801	4,904
Circle		7,419	25,750	13,460	2,906
Poly-clusters		6,583	47,535	14,948	4,910

Note: The parcel in each urban form may differ from the others due to different map scales

# 6 Urban Form: Identifying required policies for a desired urban form

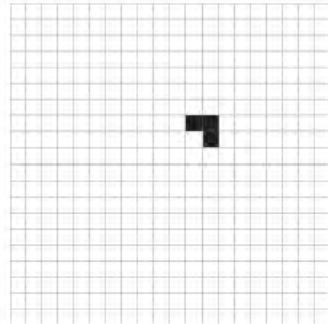
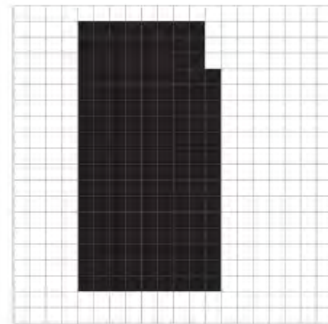
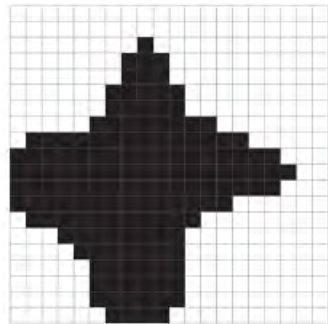


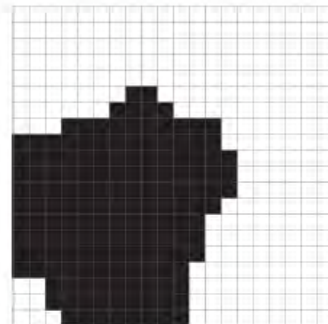
Figure 1. The initial urban form of the virtual space. Cells in black denote development as urban built-up lands. Cells in white denote undeveloped areas.



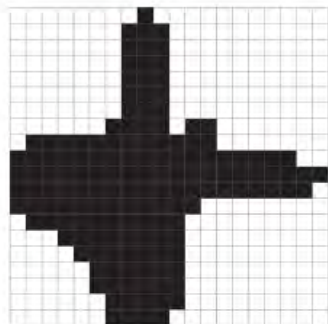
(a)



(b)



(c)



(d)

Figure 2. Forms 1–4, in (a)–(d), respectively, of predefined urban forms in the virtual space.

Table 1. Inventory of constraints and their detailed descriptions.

Geometry type	Constraint type	Name	Descriptions
Point	positive	PP	promoting urban growth, such as town centers, subway stations, and public service centers
	negative	NP	restricting urban growth, such as geological disaster sites, pollution sources, solid waste and wastewater treatment facilities, and other NIMBY (not-in-my-backyard) facilities
Line	positive	PL	promoting urban growth, such as road networks and rivers
	negative	NL	restricting urban growth, such as high-voltage power lines and seismological fault lines
Polygon	positive	PG1	promoting urban growth, such as officially planned areas and special policy zones
	negative	PG2	restricting urban growth, such as ecologically protected areas and steep areas
		NG1	
		NG2	

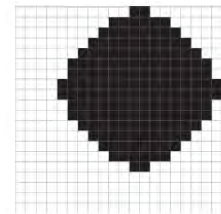
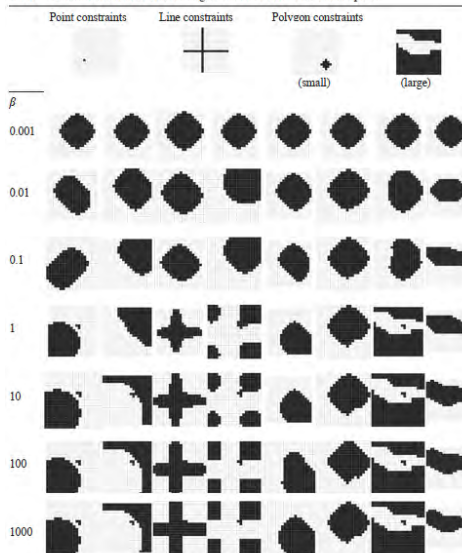


Figure 3. The simulated urban form with no constraint in the virtual space.

Table 2. Simulation results of various single constraint tests in the virtual space.



Note: In some urban forms with constraint PG2, the number of developed cells exceeded 150 because of the number of promoted cells for PG2 exceeded 200.  
\* See subsection 3.2 and table 1 for details.

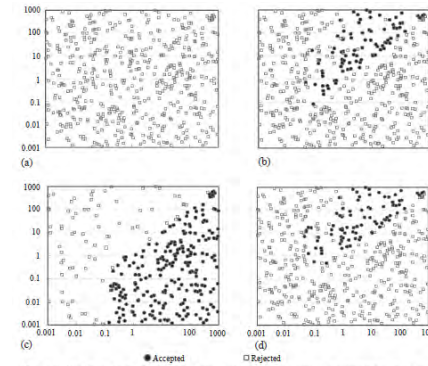


Figure 6. Scatter plots of policy parameters identified for two combined constraints in the virtual space, when the x axis is  $x_i$ , y axis is  $x_c$ , and 'accepted' indicates  $\kappa > 80\%$ . (a) Form 1, possibility of the urban form  $P = 0\%$ ; (b) form 2,  $P = 17.8\%$ ; (c) form 3,  $P = 46.4\%$ ; (d) form 4,  $P = 17.8\%$ .

Table 3. RSA results for four forms in the virtual space.

Sensitivity	Form 1	Form 2	Form 3	Form 4
$x_i$	na	3.169	7.762	2.872
$x_c$	na	4.161	4.066	5.080

Note: All are significant (2-tailed) at the 0.001 level; na—not applicable.

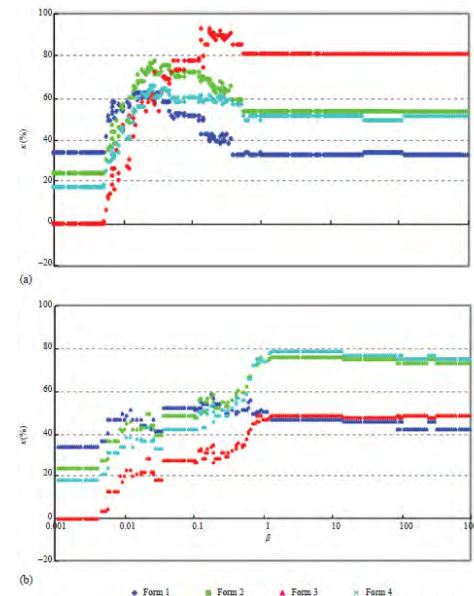


Figure 5. [In color online] Scatter plots of  $\alpha$  and  $\beta$  for (a) positive point constraint and (b) positive line constraint in the virtual space.

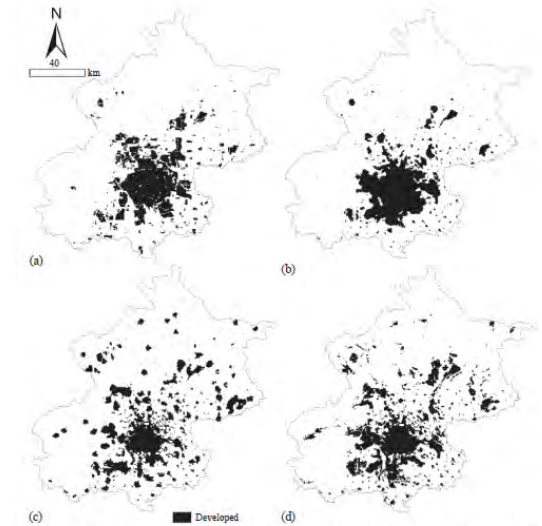


Figure 7. Four alternative plans for the Beijing Metropolitan Area: (a) alternative A; (b) alternative B; (c) alternative C; (d) alternative D.

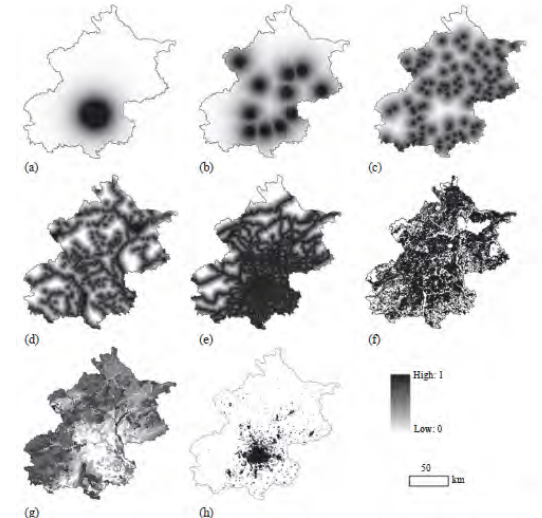
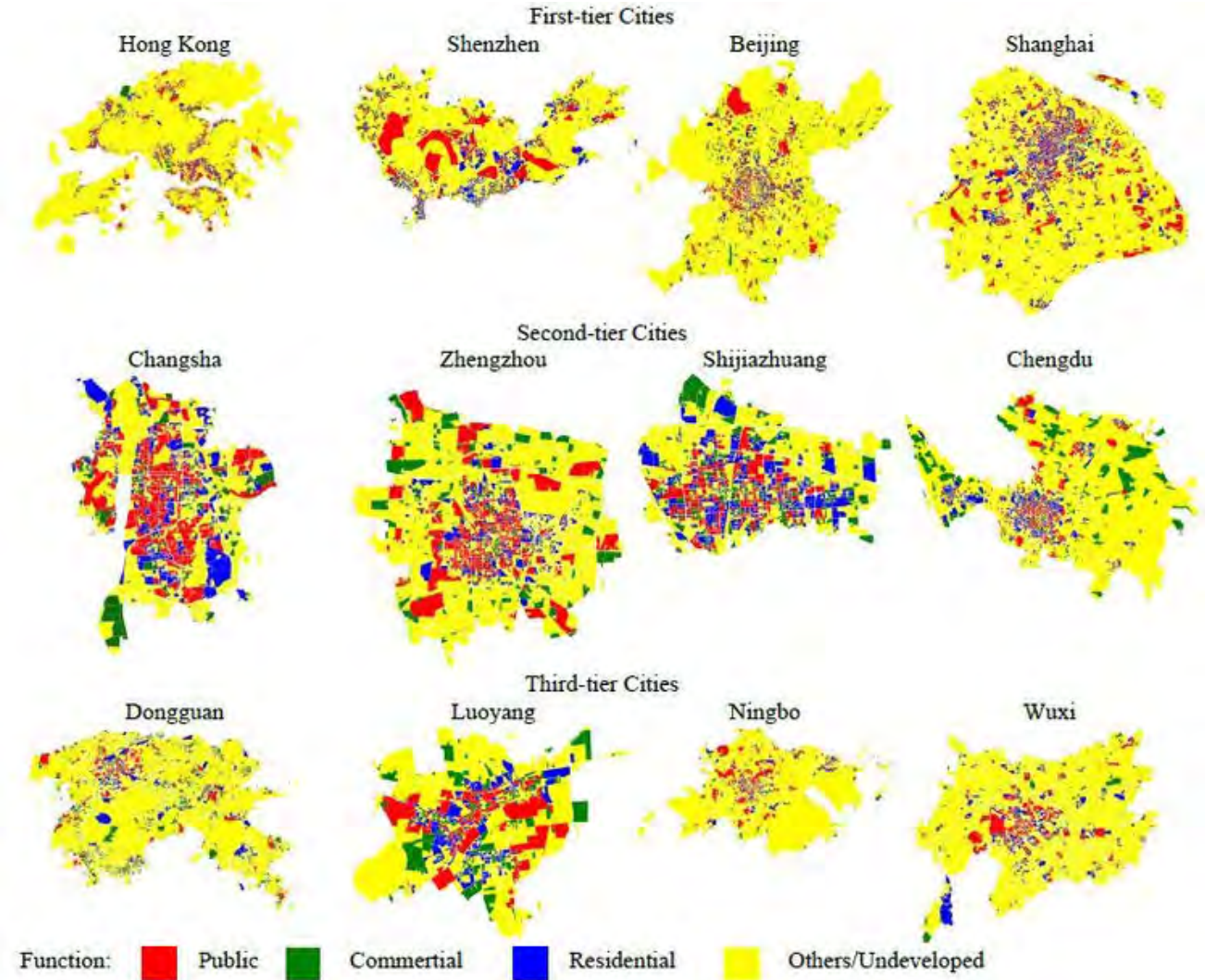


Figure 8. (a)–(g) Show spatial constraint  $\alpha_n$ – $\alpha_n$  (see table 4) and (h) shows the urban form in 2006 in the Beijing Metropolitan Area. Black represents 1, white represents 0, and gray represents a value between 0 and 1.

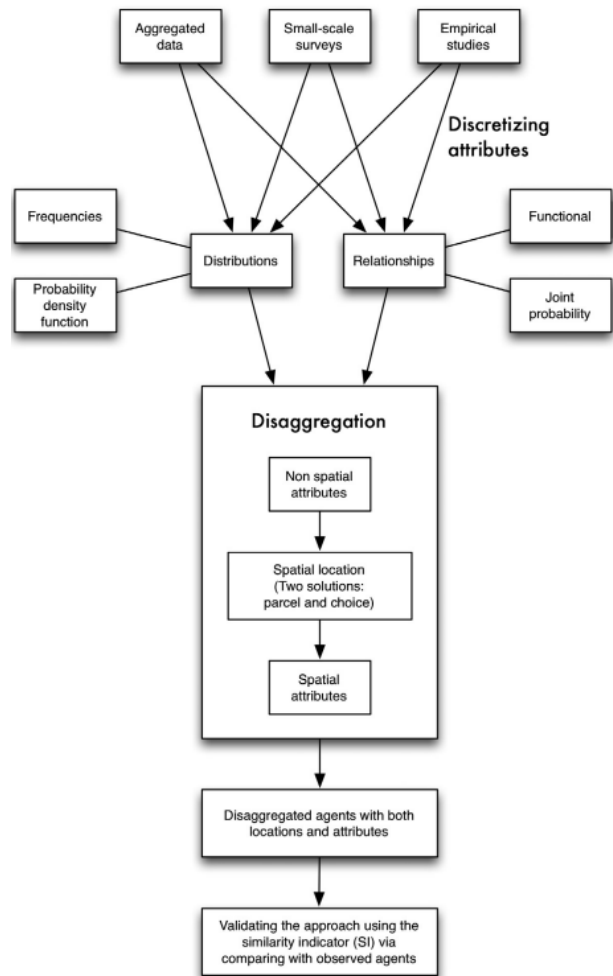
## 6 Urban Form: Rediscovering Chinese cities through the lens of land use pattern

Urbanization is a dynamic phenomenon involving significant changes in land use. Due to the nature of top-down and bottom-up combined urbanization, Chinese cities exhibit a more complex and multidimensional urban land use pattern. This paper presents a novel method to model the spatial dynamics of urban land use pattern in China by employing multi-measurements, which include Spatial Entropy and Dissimilarity Index, and a combination of cellular-automata (CA) modeling. The study extracts 61 sets of urban land use images of year 2011 and classifies them into three integrated categories (Residential, Commercial and Public) to analyze urban land use pattern in China. Spatial metrics were used to compare the structural and functional differences of cities through land use pattern, quantify the spatial properties of urbanization, and show the impacts of urbanization on land use. The new integrated method can better reveal the complex spatial characterization of urbanization in China, where government still plays an important role of facilitating the urbanization process. The results show that cities exhibit distinctive spatial differences of fragmentation, and they are expanding rapidly and becoming less compact but more dispersed. The factors that drive a disperse-aggregation process of urbanization are debated in the context of China's urban evolution in recent years. The new method provides an effective approach to improve our understanding on land use pattern, as well as contributing towards better planning and governance.

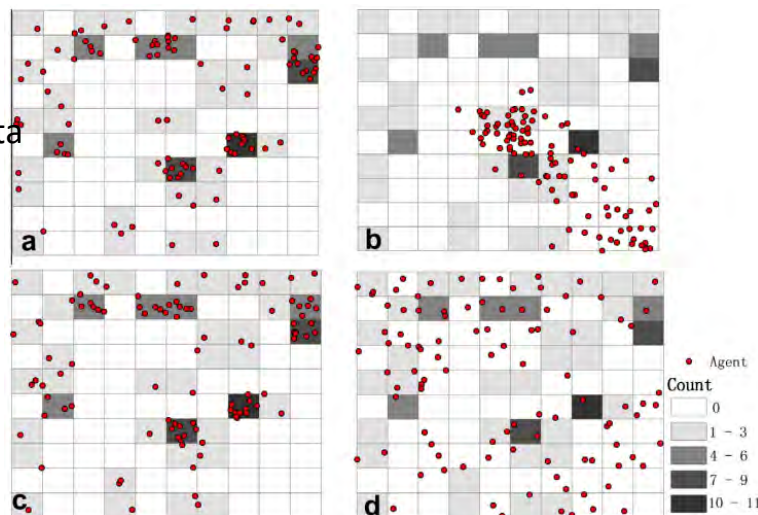


# 7 Population Synthesis : Agenter: a tool for population synthesis

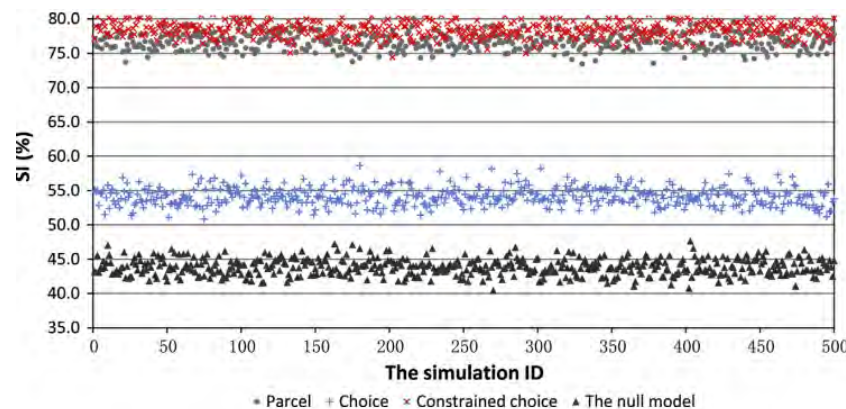
- Agenter: a tool for population synthesis
- Population synthesis using Agenter and PopGen
- Population spatialization and synthesis with open data



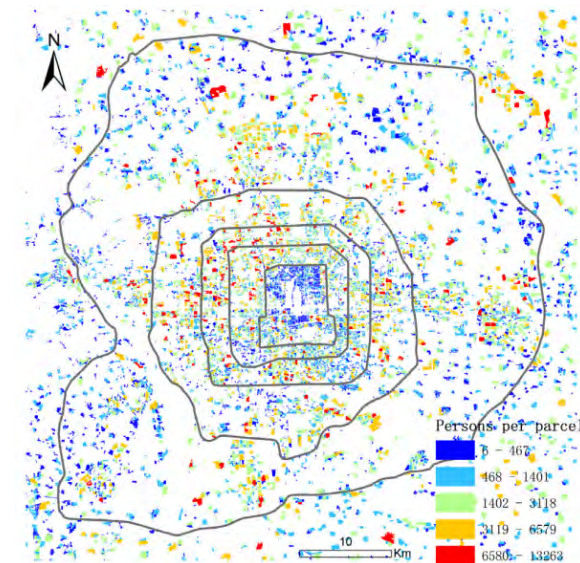
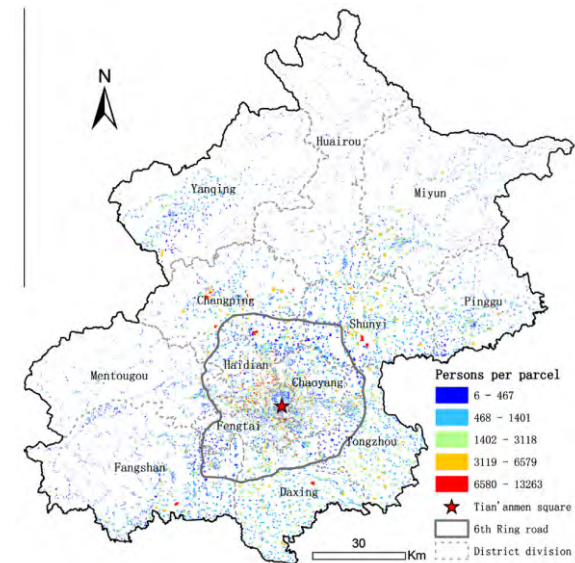
Flowchart of the disaggregation approach



Mapping disaggregated agents using various solutions: (a) parcel; (b) choice; (c) constrained choice; (d) null model. Note: The point for the location of each agent does not correspond to actual spatial distribution. It only shows which parcel the agent is in. The color of the parcel indicates the observed agent count, as in Fig. 2. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)



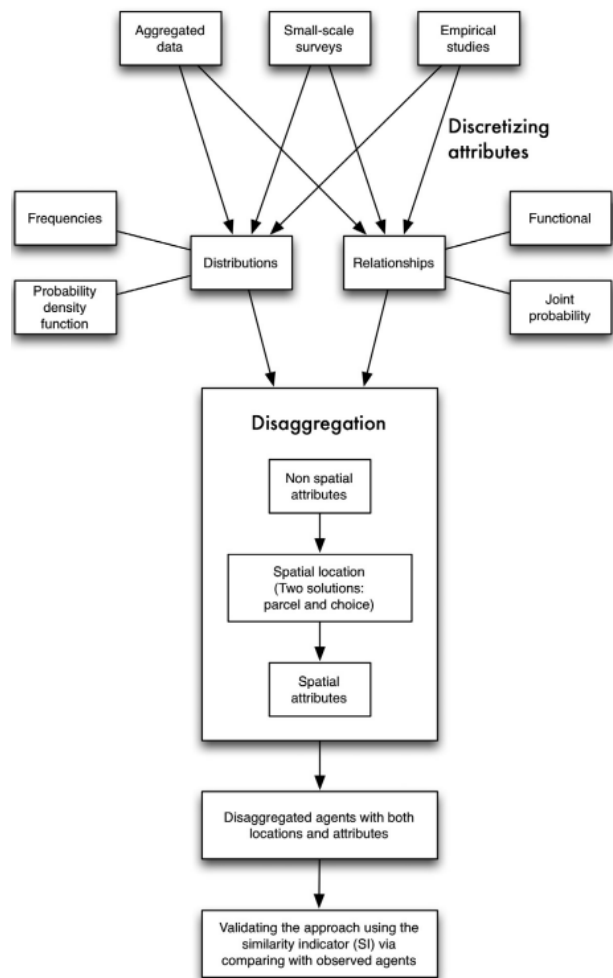
Comparison of disaggregated results generated using the Agenter model and the null model.



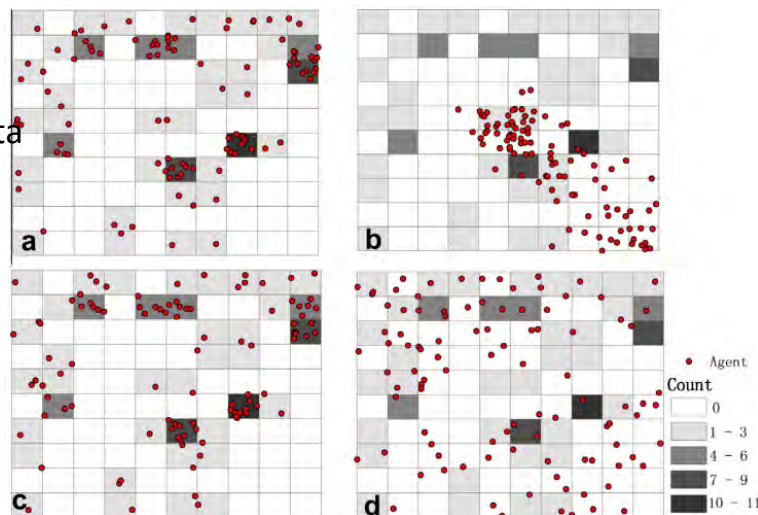
Residential parcels in the BMA.

# 7 Population Synthesis

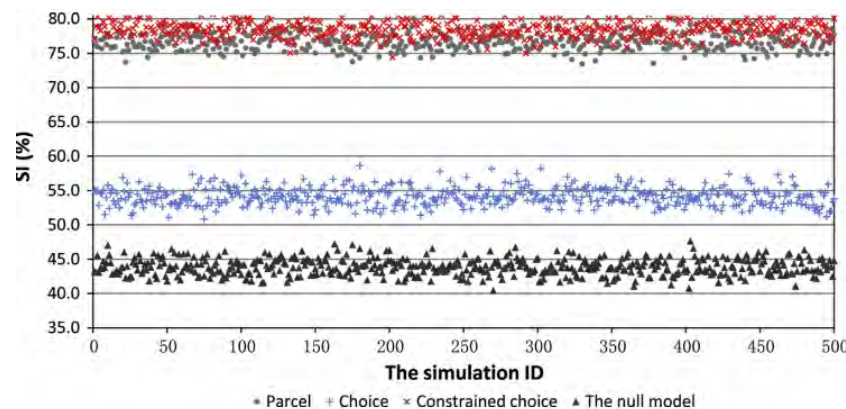
- Agenter: a tool for population synthesis
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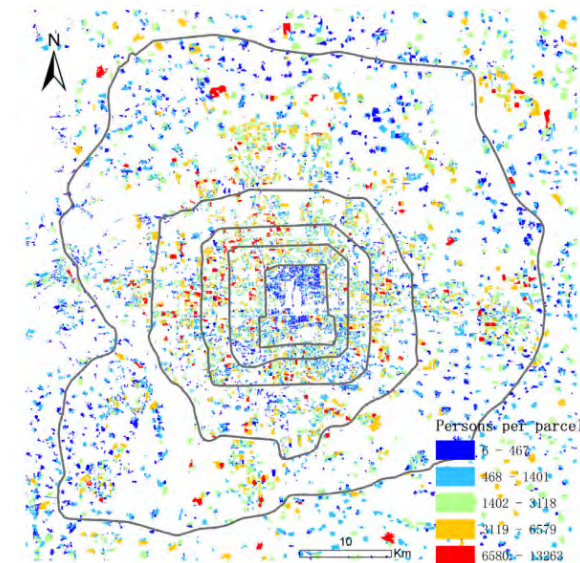
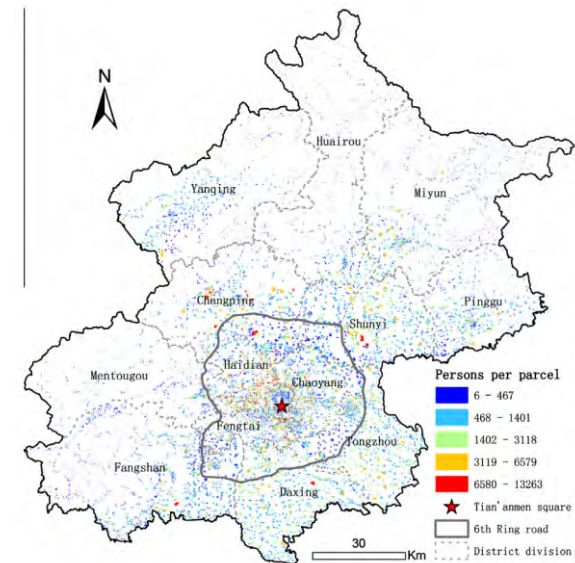
Flowchart of the disaggregation approach



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Comparison of disaggregated results generated using the Agenter model and the null model.

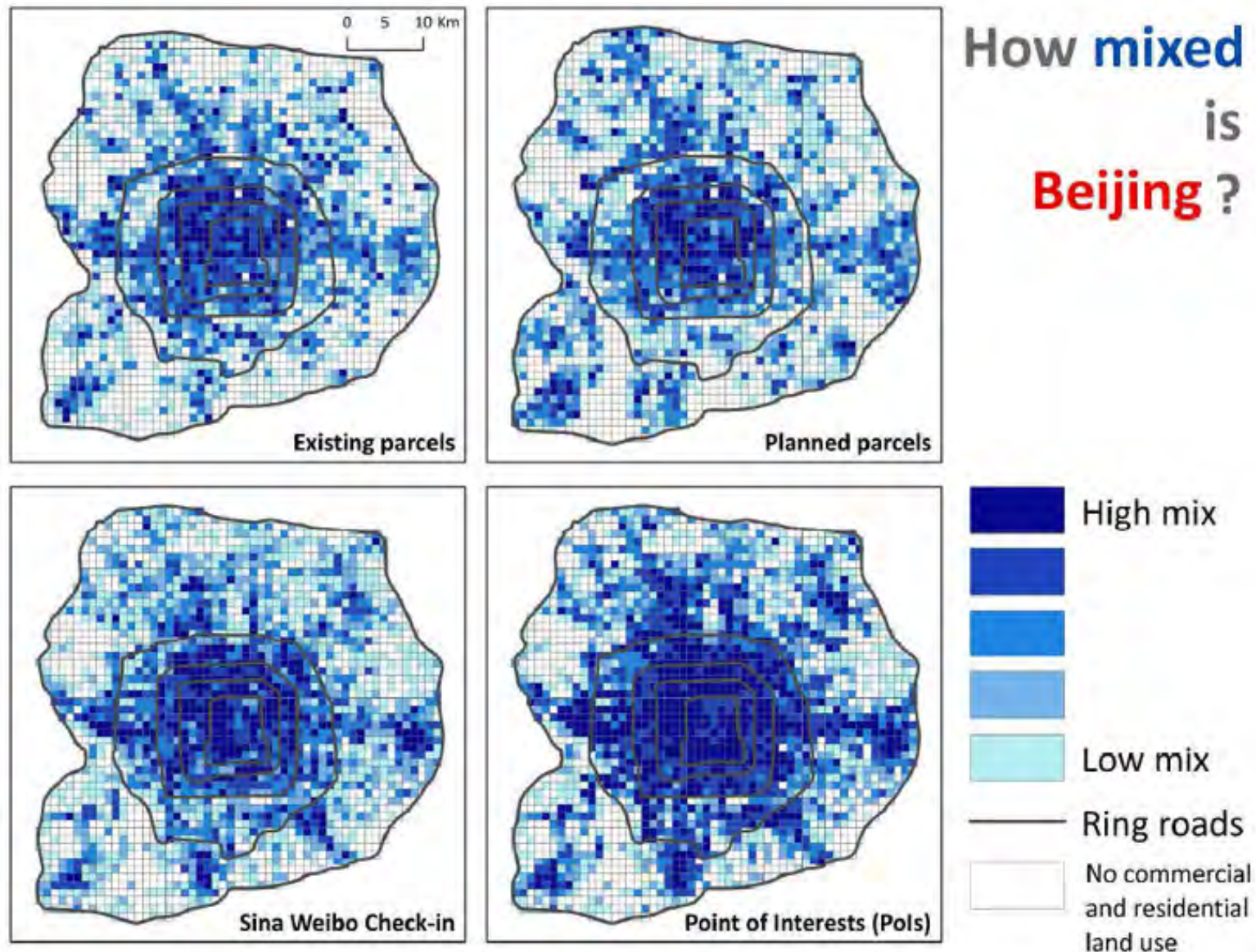


Residential parcels in the BMA.

## 8 Social Network Mining

- How mixed is Beijing?
- Community of Chinese planners
- Virtual human activities

Figure 1 reveals a consistent pattern of mixed land use in Beijing computed from different data sources, and reflects the effectiveness of urban planning implementation (Long et al. 2012): the mixing of land use is higher in the city center and much lower in the periphery; the spatial extents of planned and actual urban activities largely overlap; and there exists a lack of residential and commercial activities (i.e., blank grids) along several axes in the city periphery. Moreover, central-city land use captured by check-in and Poi data are more mixed, as check-ins and Poles entail additional information about heterogeneous land use within parcels. We therefore suggest that, check-in and Poi data – with fine-grained locational information – would be supplement to conventional ways of measuring urban land use.



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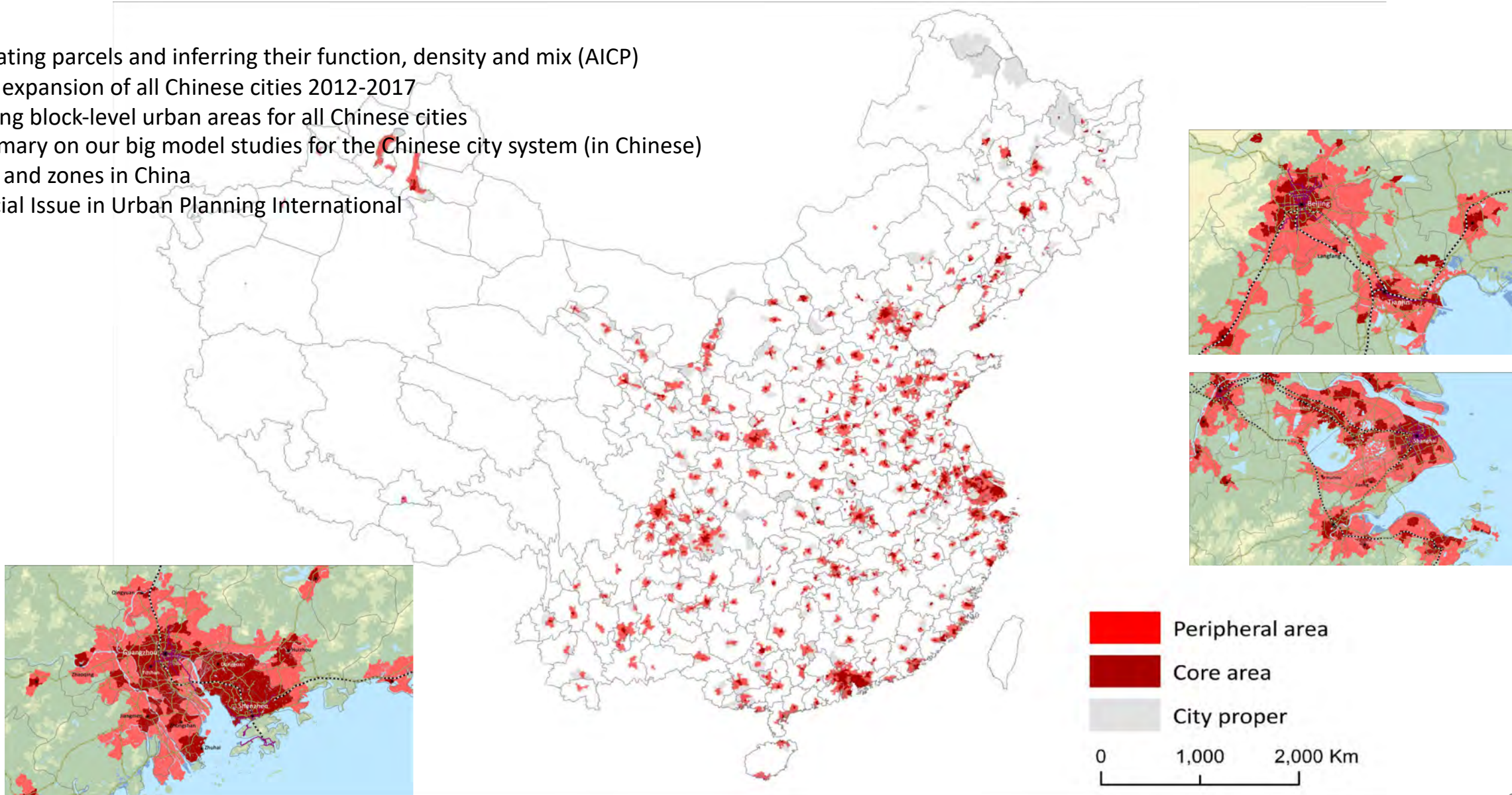
## 9 Big Model

### Big Model

- Generating parcels and inferring their function, density and mix (AICP)
- Urban expansion of all Chinese cities 2012-2017
- Mapping block-level urban areas for all Chinese cities
- A summary on our big model studies for the Chinese city system (in Chinese)

### New cities and zones in China

- A Special Issue in Urban Planning International



# 9 Big Model

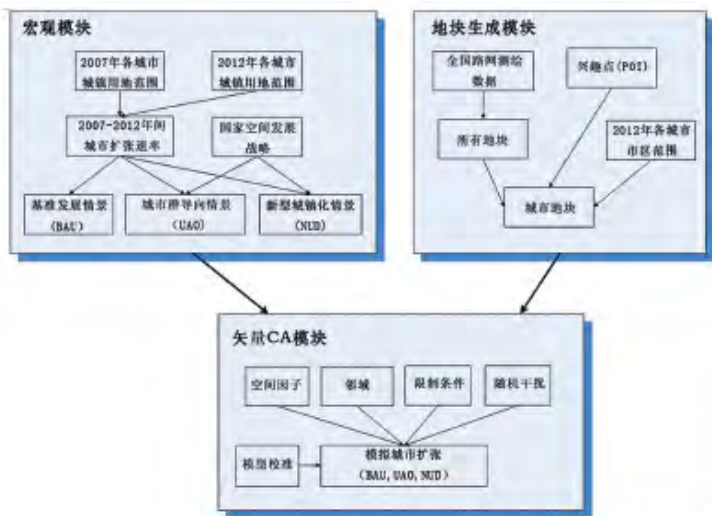


图5 MVP-CA模型的框架体系

Fig.5 The structure and flow diagram of MVP-CA  
资料来源: 笔者自绘。

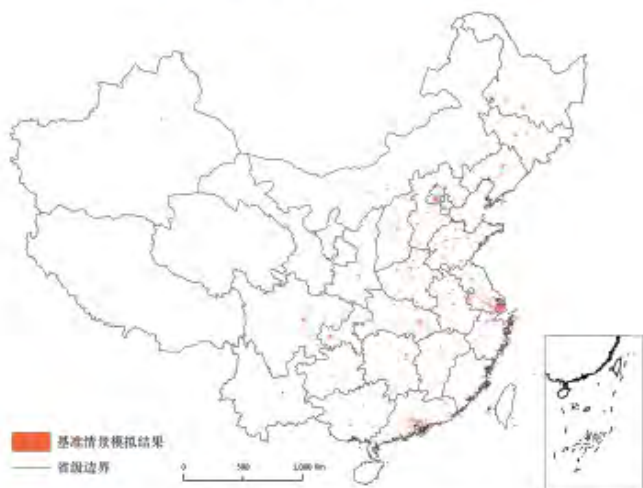
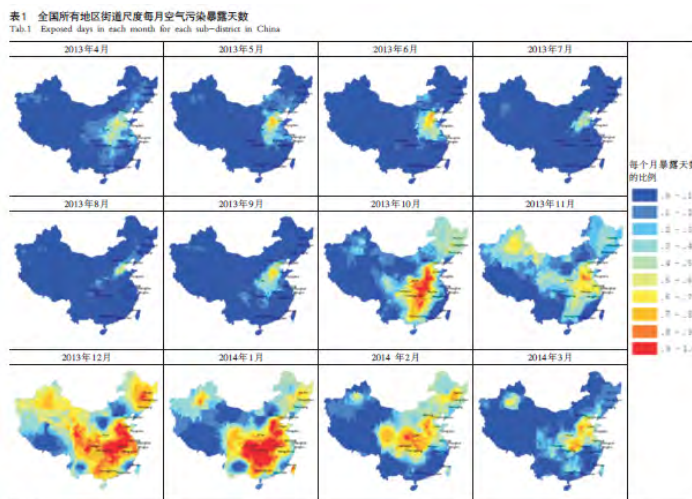


图6 中国所有城市的扩张模式 (BAU情景模拟)

Fig.6 Urban area of all Chinese cities, and urban expansion patterns of the entire China for BAU scenarios  
资料来源: 笔者自绘。



资料来源: 笔者自绘。

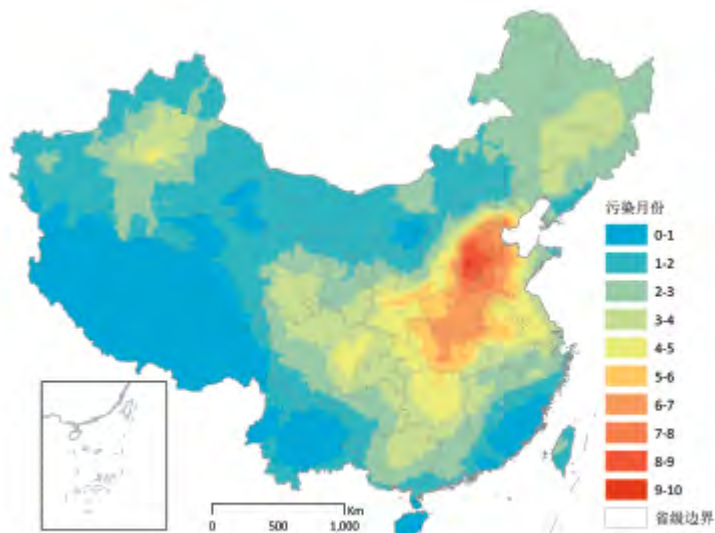


图7 全国所有地区街道尺度的全年空气污染暴露月数

Fig.7 The number of total exposed months for each sub-district in China  
资料来源: 笔者自绘。



图8 规划建设用地边界划图 (部分)

Fig.8 The profile of raw figures for planned UGBs (partially shown)  
资料来源: 笔者自绘。

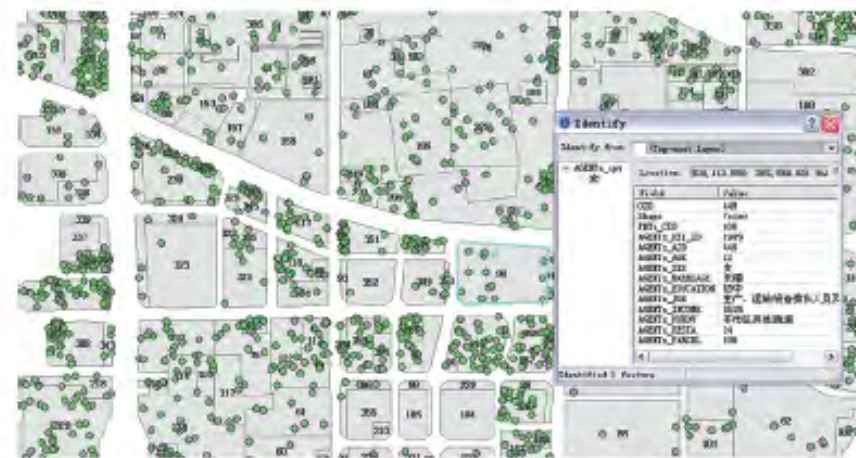


图9 北京都市圈个体属性空间分布图 (部分)

Fig.9 The distribution of individual attributes of Beijing urban area (partially shown)  
资料来源: 笔者自绘。



# 9 Big Model : Generating parcels and inferring their function, density and mix (AICP)

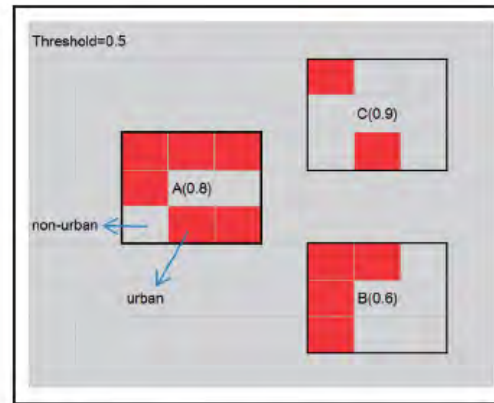
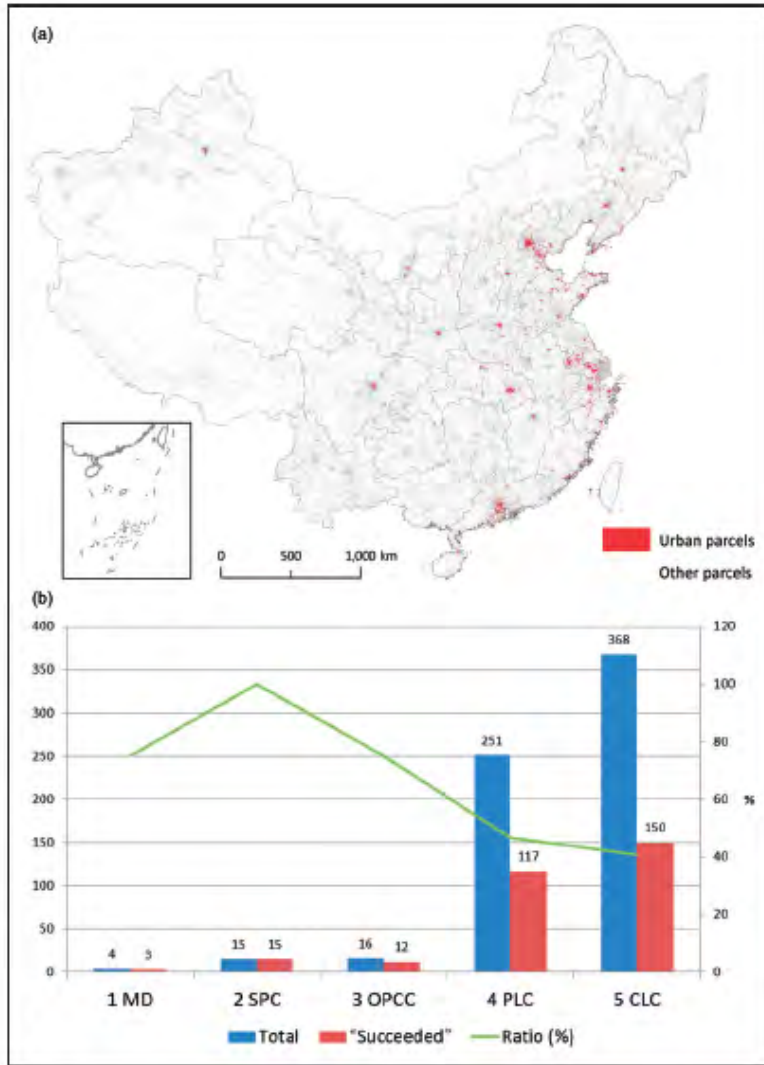


Figure 4. Examples of identifying urban parcels using constrained cellular automata. The parcels under investigations are labelled as A, B, and C, and the rectangles in black refer to individual parcels' neighborhoods. The numbers in parentheses denote individual parcels' probability of being urban based on their attributes.

Table 2. Comparison of selected OpenStreetMap (OSM) and Beijing Institute of City Planning (BICP) parcels in Beijing (R = ring road).

Parcels	Parcel count	Average size (ha)	Overlapped with BICP (71.2%)	Spatial distribution (in terms of area, km <sup>2</sup> )					
				within R2	R2-R3	R3-R4	R4-R5	R5-R6	beyond R6
OSM	7 130	17.2	1194.2 km <sup>2</sup>	42.5	74.0	113.4	263.5	666.5	519.9
BICP	5 781	2.9	-	48.6	69.7	99.8	229.5	687.9	544.4
OSM/BICP	0.12	5.93	-	0.87	1.06	1.14	1.15	0.97	0.95

Table 3. The comparison of OpenStreetMap (OSM) and Survey (ORDNANCE) urban parcels for 297 cities.

Data	Urban area (km <sup>2</sup> )	Parcel count	Average parcel/patch size (ha)	Intersected with survey-based results (km <sup>2</sup> )
OSM	25 905	82 645	31.3	15 053
Survey	25 670	260 098	10.0	-

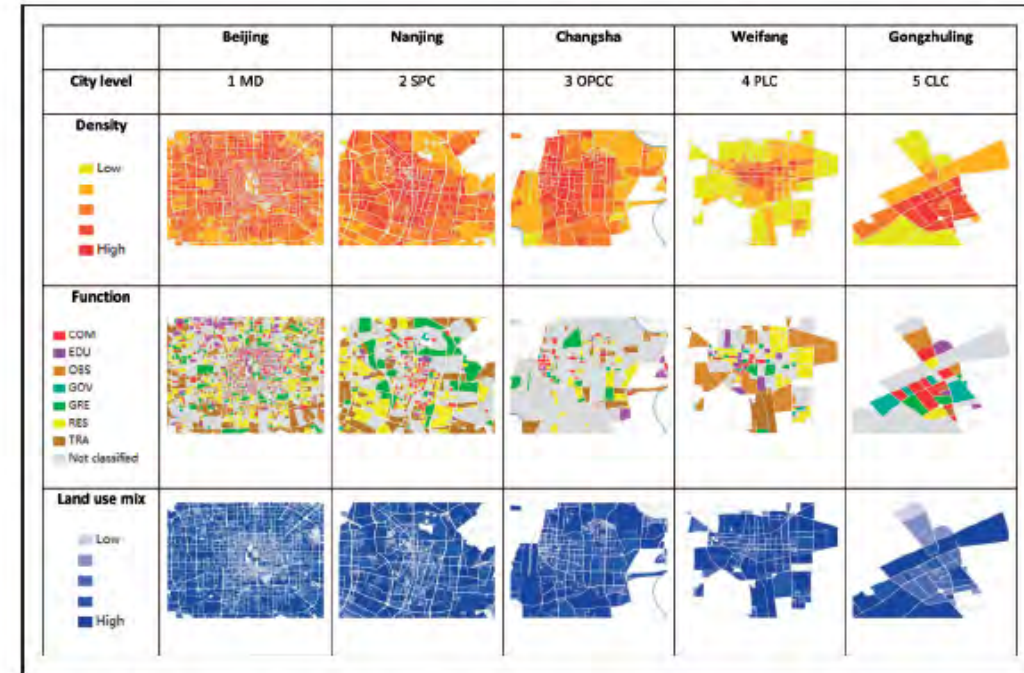
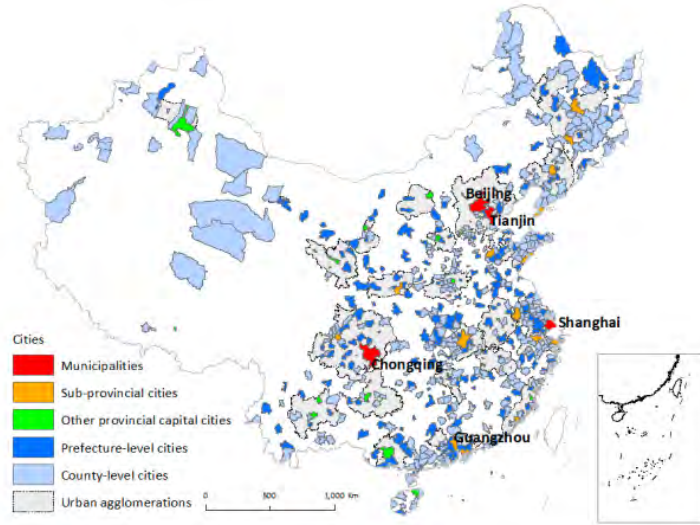


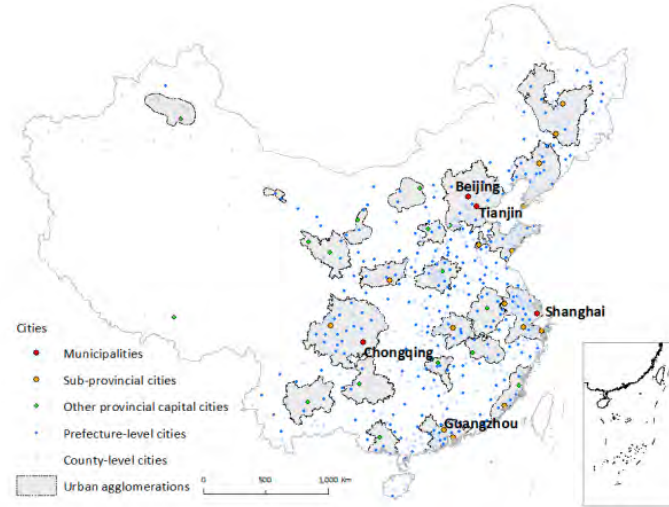
Figure 6. The generated parcels and their attributes in typical cities of China.

Figure 5. All generated parcels and urban parcels in China: (a) spatial distribution; (b) the profile of 'successfully processed' cities.

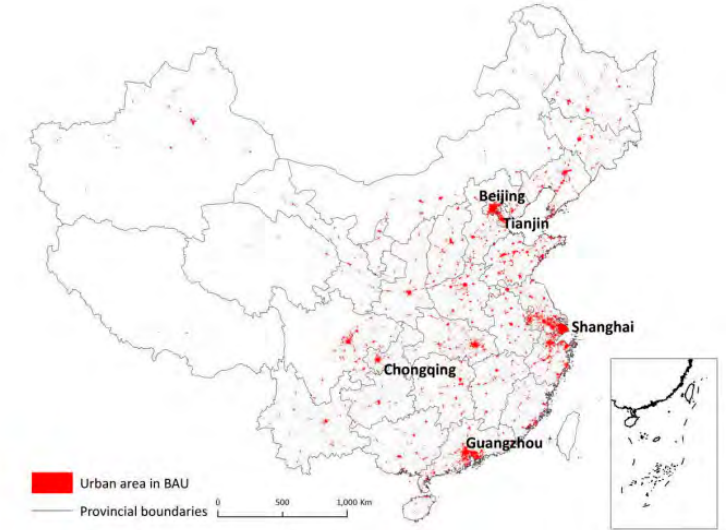
# 9 Big Model: Urban expansion of all Chinese cities 2012-2017



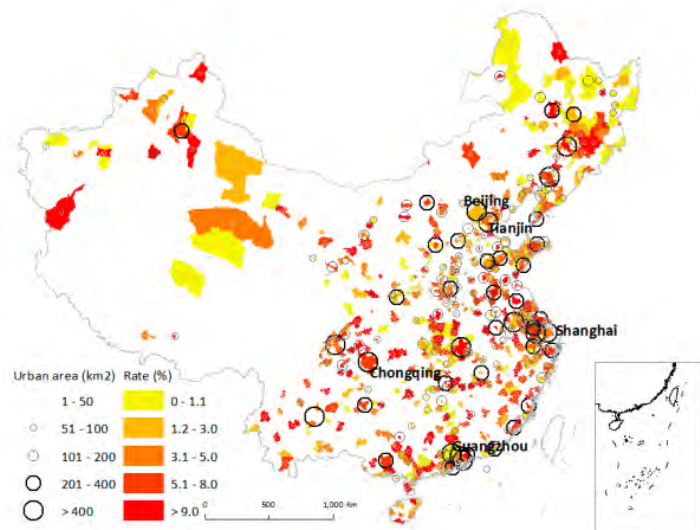
Administrative boundaries of Chinese cities



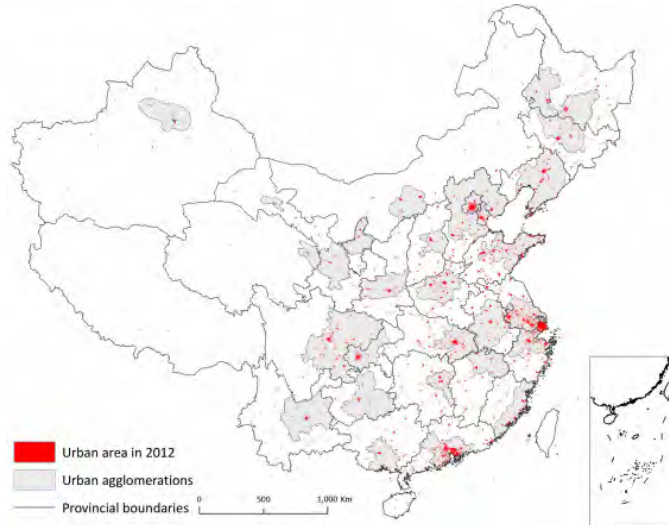
The urban agglomerations in China



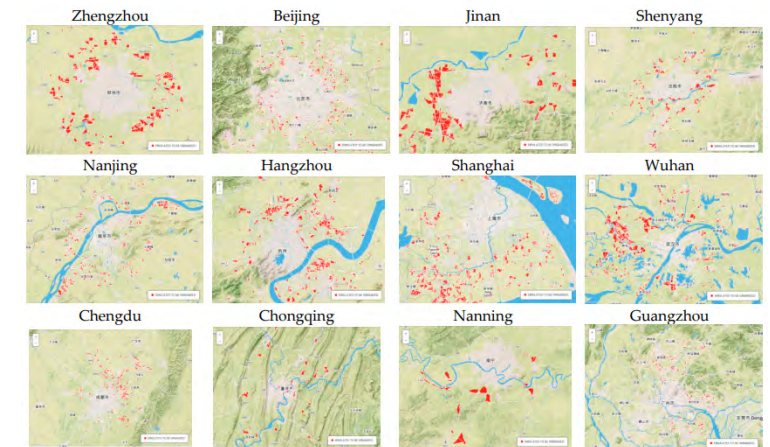
Urban expansion patterns of the whole area of China for the BAU scenario. (We only list one scenario in this figure, as it is difficult to reveal the differences between the three proposed scenarios for the whole China with a small map. For more vivid difference between scenarios of the whole China, please refer to Table 2 and online visualization.)



Urban land area in 2012 and the urban expansion rate during 2007–2012 for all Chinese cities.



Urban land areas of all Chinese cities.



# 9 Big Model: Mapping block-level urban areas for all Chinese cities

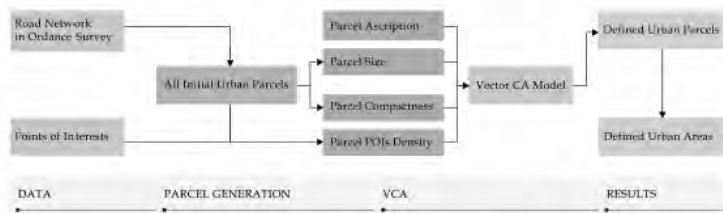


Figure 1. Flowchart of the proposed framework. Note: VCA = vector cellular automata.



Figure 3 The interaction maps to select urban blocks at  $t$  and  $t+1$  time: (A) the initial blocks enclosed by urban streets; (B) identification of initial urban blocks (in red); (C) captured urban blocks at  $t$  time (in red); (D) selection of new urban blocks at  $t+1$  time (in blue). (Color figure available online.)

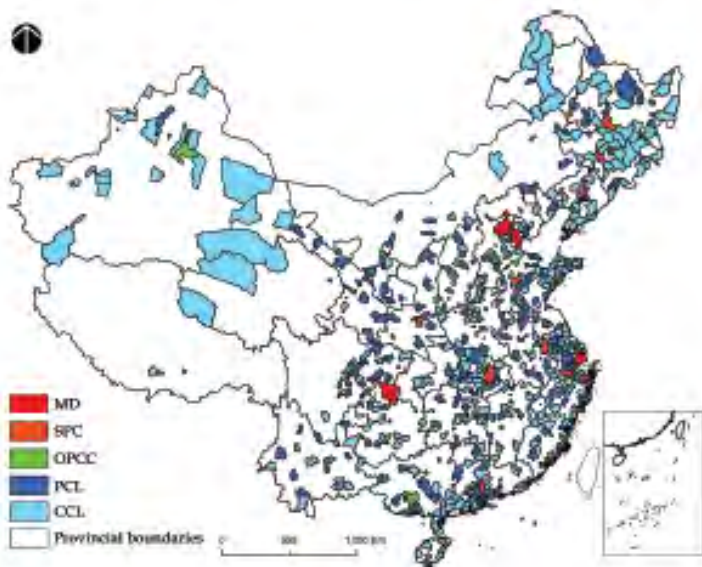


Figure 5. Administrative areas of Chinese cities. Note: MD = municipalities directly led by the nation; SPC = subprovincial cities; OPCC = other provincial cities; PCL = prefecture-level cities; CCL = county-level cities. (Color figure available online.)

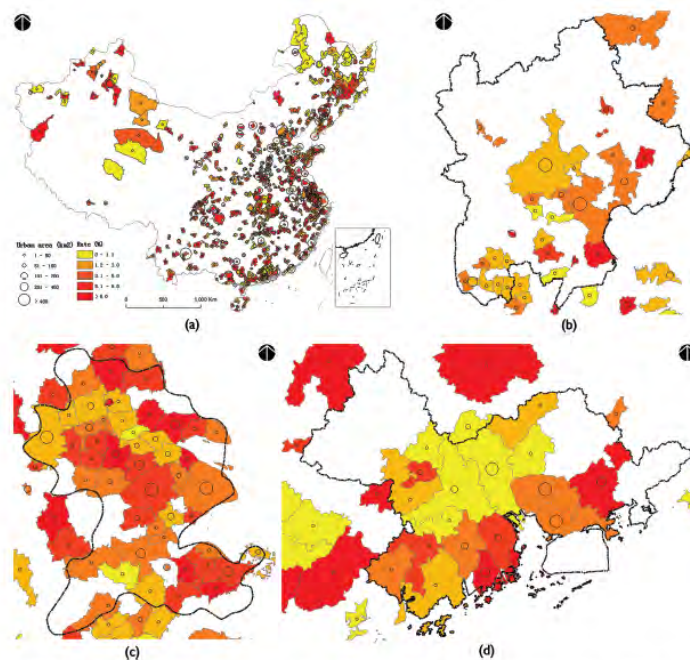


Figure 6. Total urban area in 2012 at the city level. (A) China; (B) Beijing-Tianjin-Hebei (BTH); (C) Yangtze River Delta (YRD); (D) Pearl River Delta (PRD). Note: The urban expansion rate during 2007-2012 for each city is also mapped in this figure to show the historical urban expansion of Chinese cities. (Color figure available online.)

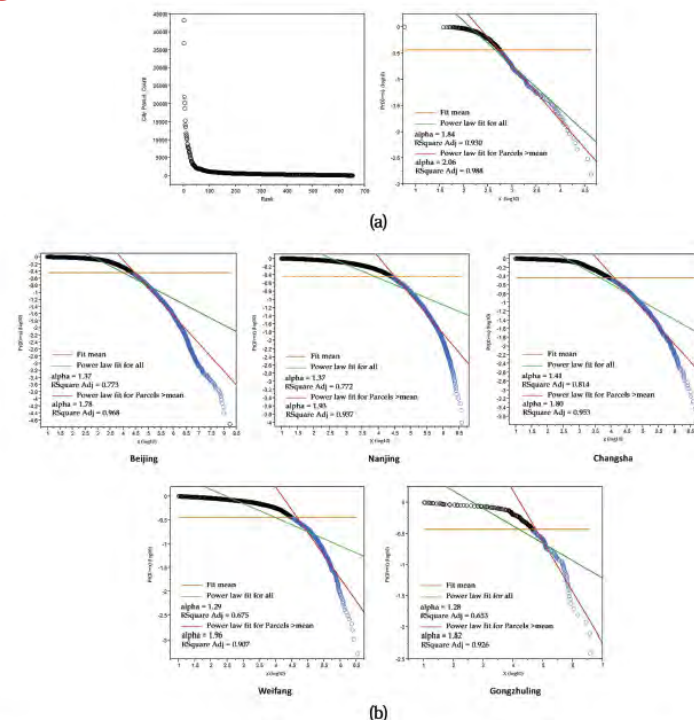


Figure 9. Power law distributions (A) in terms of the block numbers for all 654 cities; (B) in terms of block size for typical cities. (Color figure available online.)

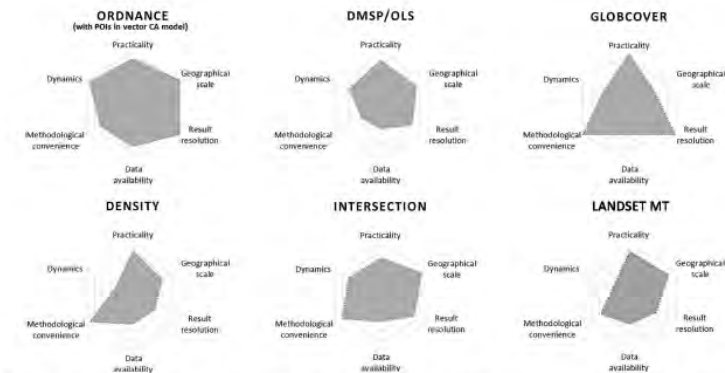


Figure 11. Comparison between existing methods of delineating urban areas. Note: POIs = points of interest; CA = cellular automata; DMSP/OLS = xxxxxxx xxxxxxx xxxxxxx xxxxxxx xxxxxxx xxxxxxx xxxxxxx.

# 9 Big Model: A summary on our big model studies for the Chinese city system (in Chinese)

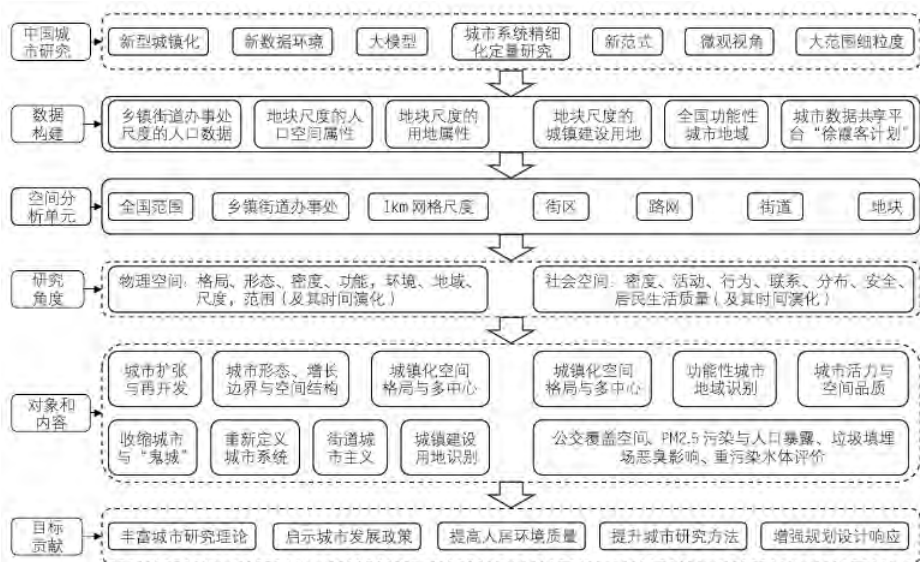


图2 “大模型”研究范式总体框架及其实证研究

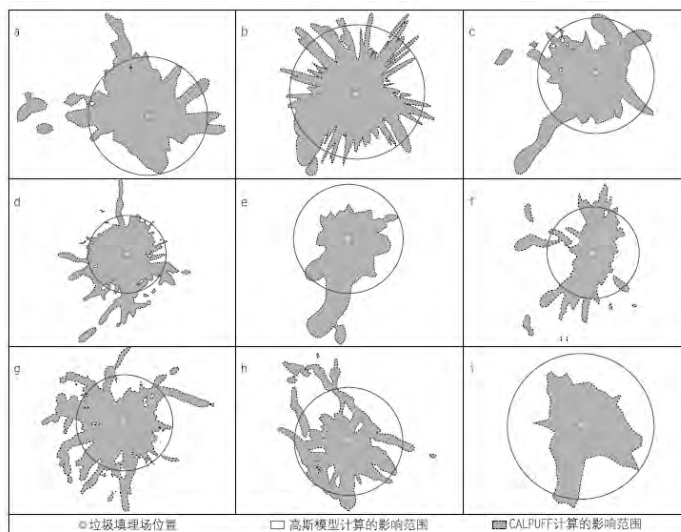


图13 CALPUFF模型和地面点源连续高斯模型影响范围比较

注: a-北京六里屯垃圾填埋场; b-上海老港生活垃圾处置场; c-南昌市麦园垃圾处理场; d-广州兴丰生活垃圾卫生填埋场; e-深圳市下坪固体废物填埋场; f-重庆长生桥垃圾卫生填埋场; g-成都市固体废物卫生处置场; h-西安江村沟垃圾填埋场; i-西宁沈家沟垃圾填埋场。

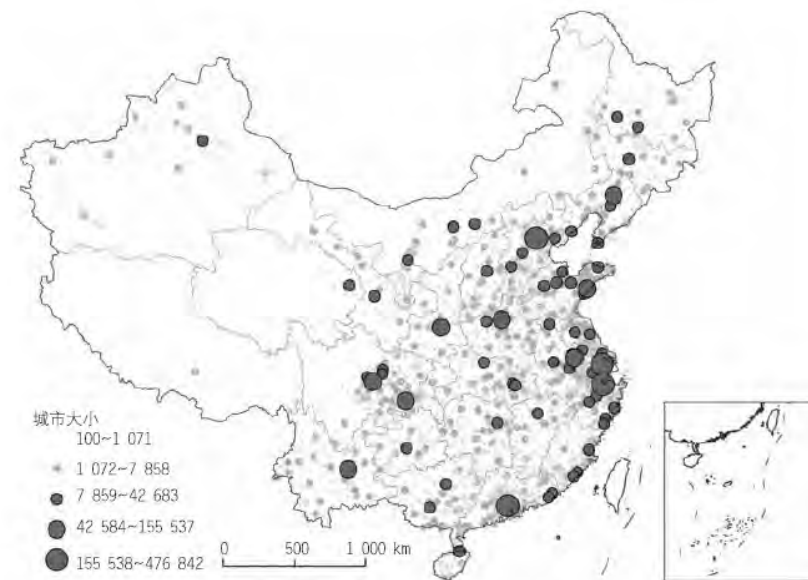
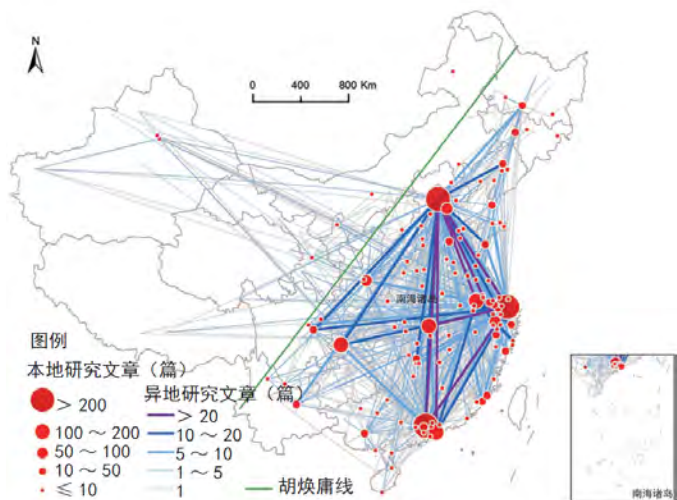


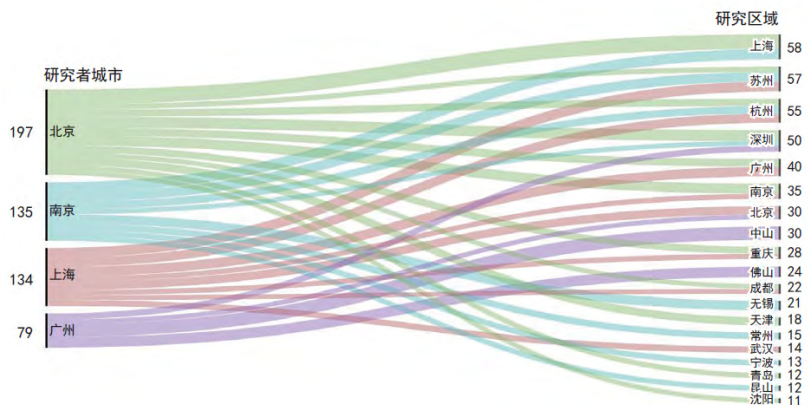
图15 重新定义的中国城市系统

注: 城市大小为道路交叉口数量。  
资料来源: 龙瀛和吴康 (2016)。

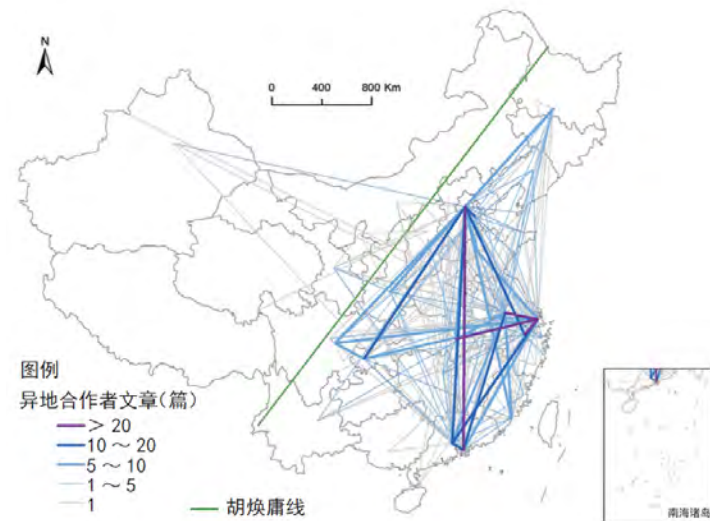
# 11 Urban Network Analysis



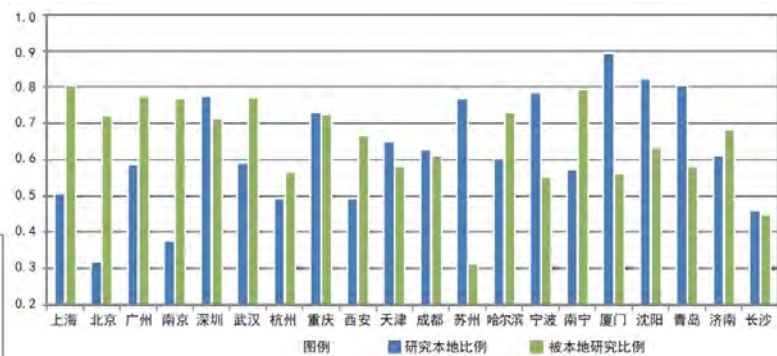
知识产出—消费网络格局(无向联系)



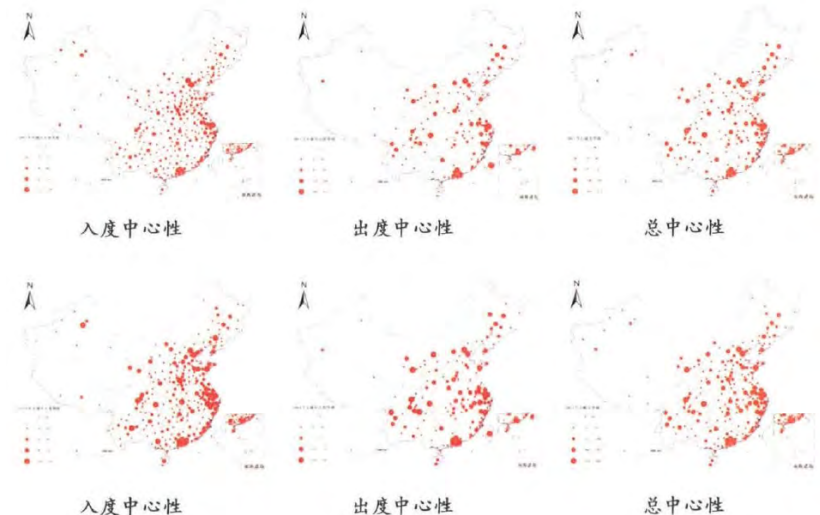
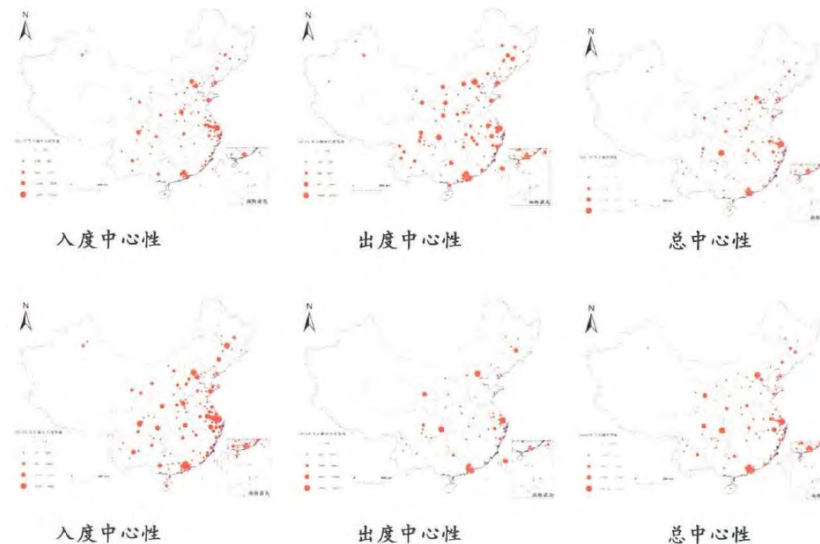
城市增长边界实施评价相关图



合作者城市联系强度



本地研究比例



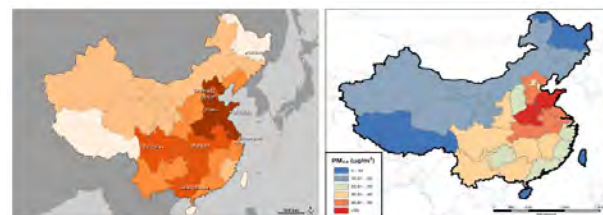
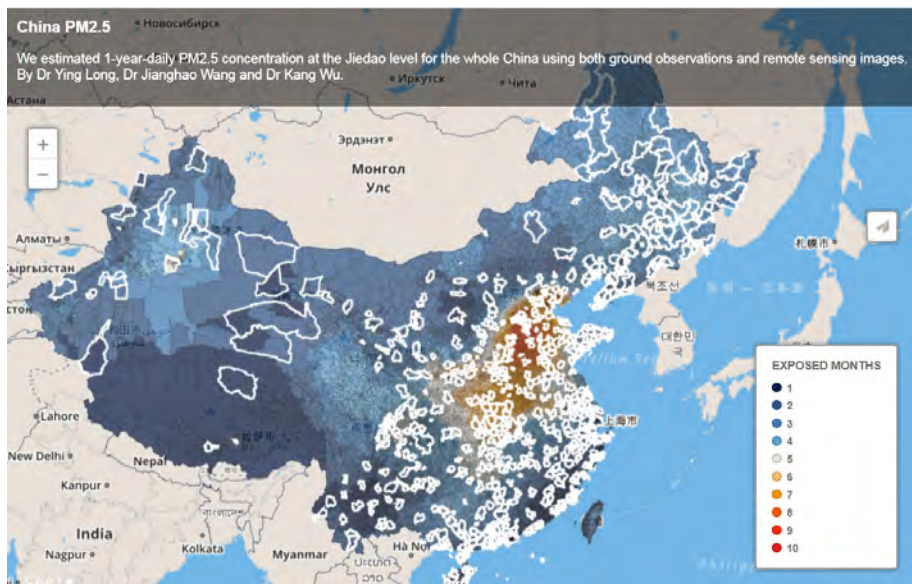
2011年 (上) 和2014年 (下) 节点城市网络层级图——基于有联系的城市数量

## 12 AM10:00

We retrieved hot spots of human activities from Baidu for ten Chinese cities on AM10:00, June 20, 2014. Equipped with big data, the gallery enables us sensing urban structure and activities of each city in the same spatial scale at the same time.



## 13 PM2.5

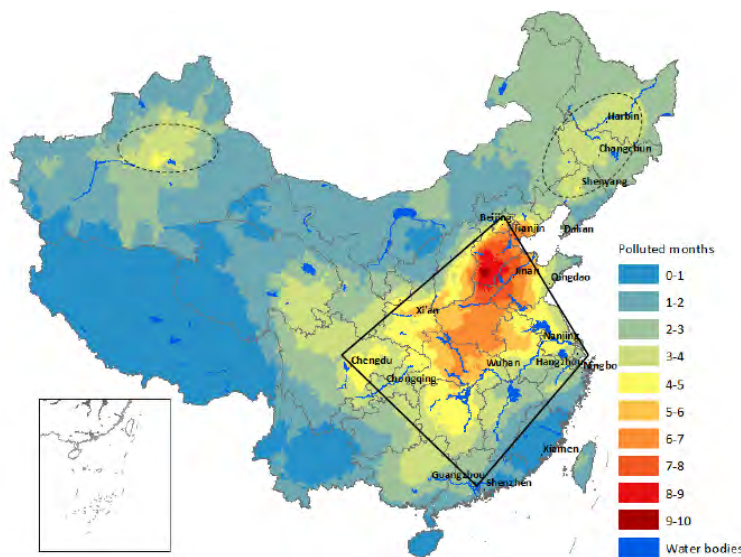
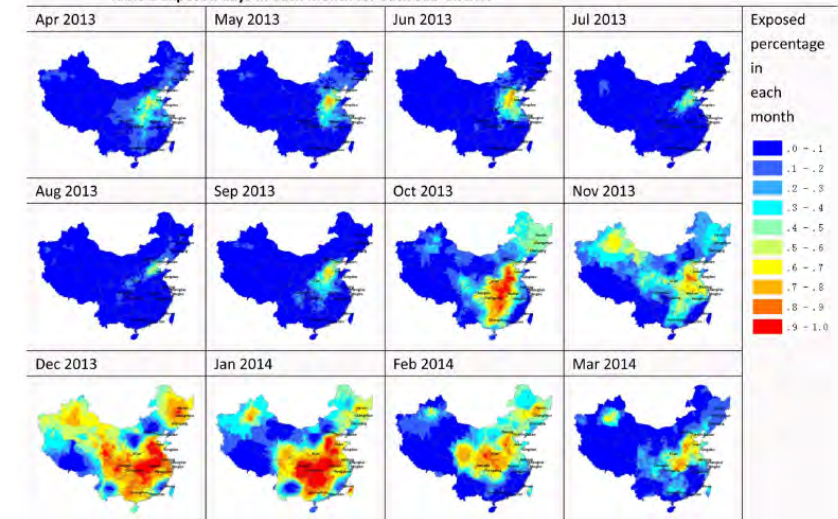


中国2008-2010分省PM<sub>2.5</sub>年均浓度图

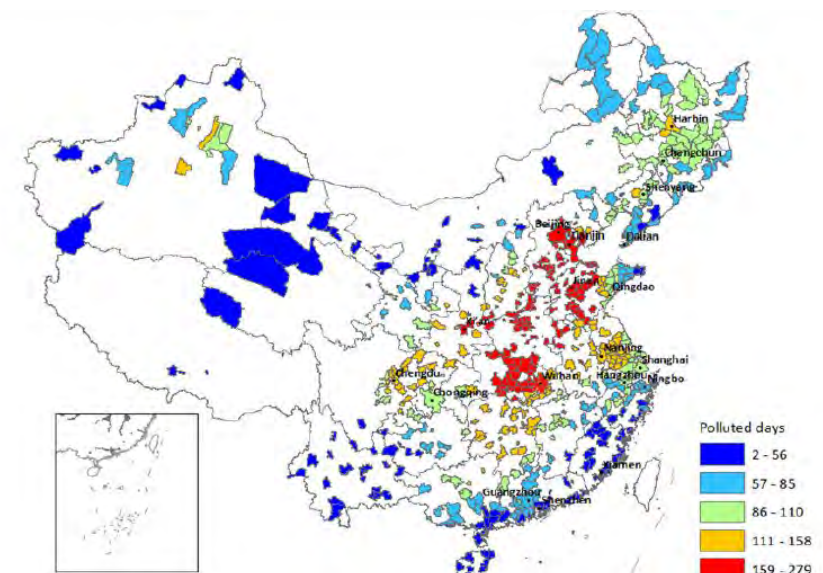
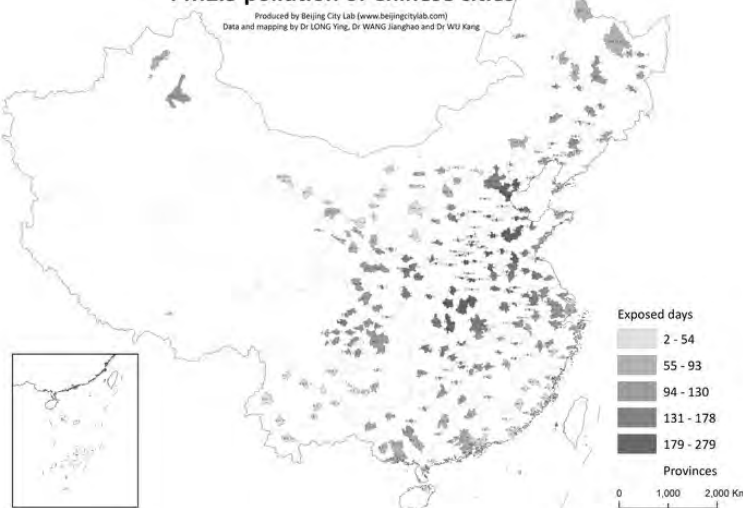
中国2007年中国各省人口加权PM<sub>2.5</sub>年均浓度图

	达标比重 (%) -环保部	达标比重 (%) -BCL	PM <sub>2.5</sub> 年均浓度 (μg/m <sup>3</sup> ) -环保部	PM <sub>2.5</sub> 年均浓度 (μg/m <sup>3</sup> ) -BCL	达标城市数-环 保部	达标城市数- BCL
京津冀	37.5	40	106	107	0	0
#北京	48	55.89	89	84	-	-
长三角	64.2	72.88	67	64	1	0
#上海	67.4	75.89	62	60	-	-
珠三角	76.3	85.48	47	44	0	2
#广州	71	82.19	53	50	-	-

Table 1 Exposed days in each month for each sub-district

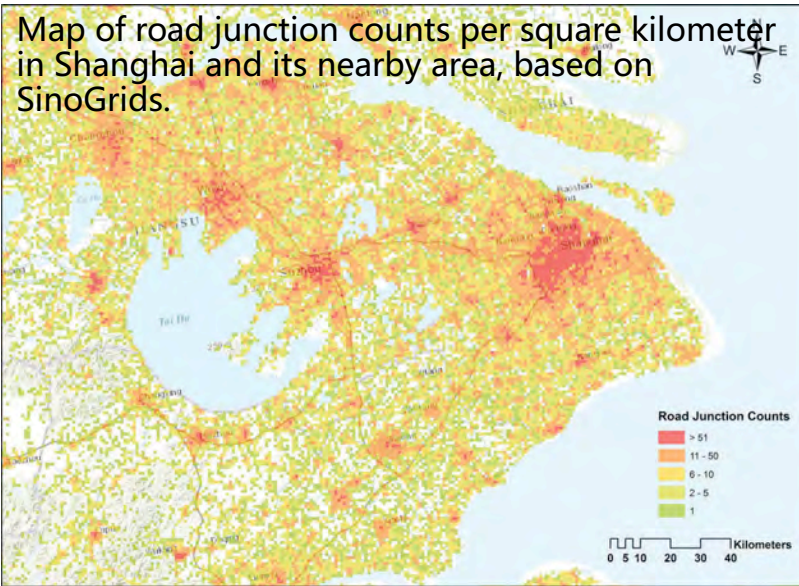


PM<sub>2.5</sub> pollution of Chinese cities

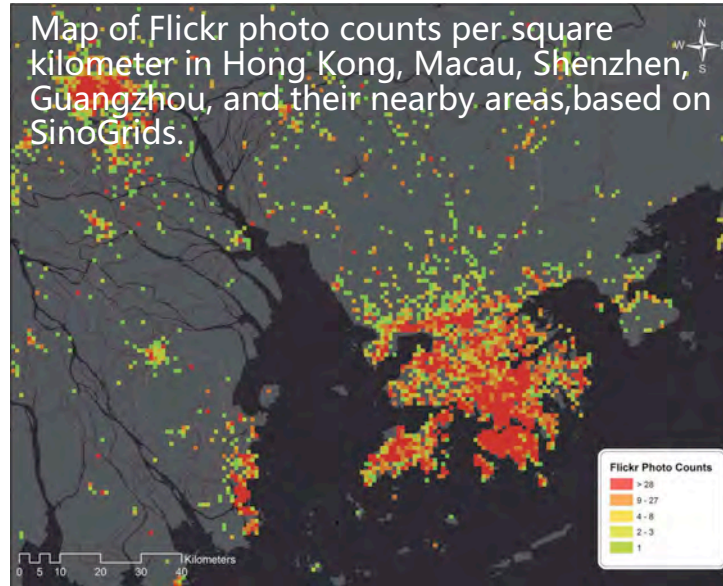


# 14 SinoGrids

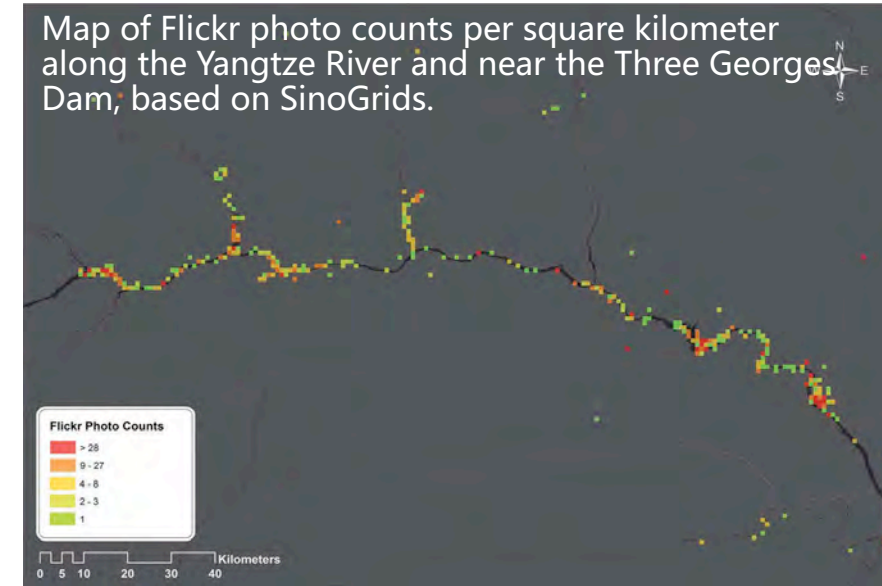
Map of road junction counts per square kilometer in Shanghai and its nearby area, based on SinoGrids.



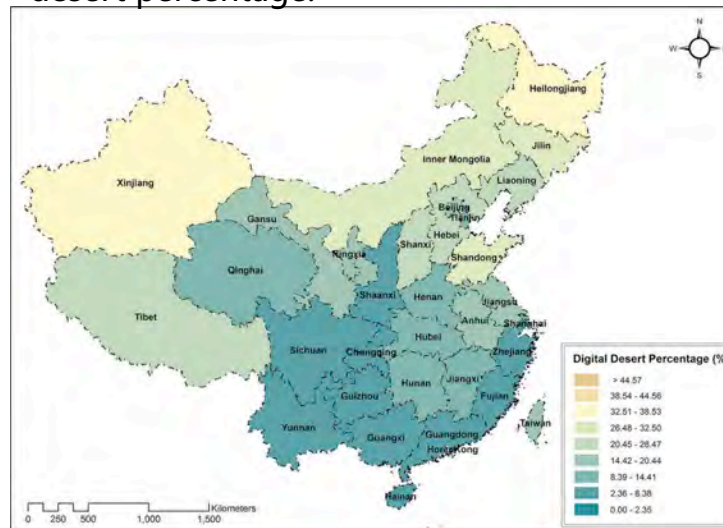
Map of Flickr photo counts per square kilometer in Hong Kong, Macau, Shenzhen, Guangzhou, and their nearby areas, based on SinoGrids.



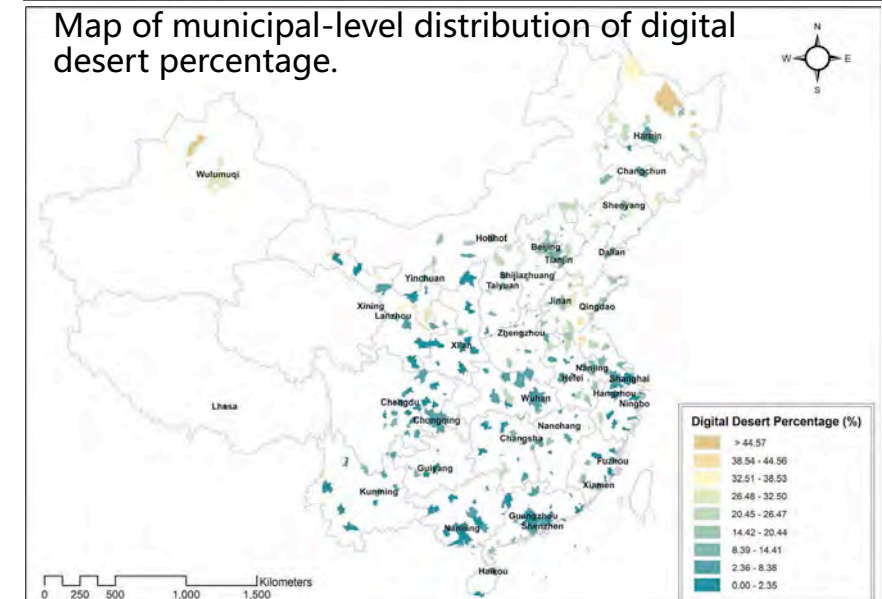
Map of Flickr photo counts per square kilometer along the Yangtze River and near the Three Georges Dam, based on SinoGrids.



Map of provincial-level distribution of digital desert percentage.



Map of municipal-level distribution of digital desert percentage.



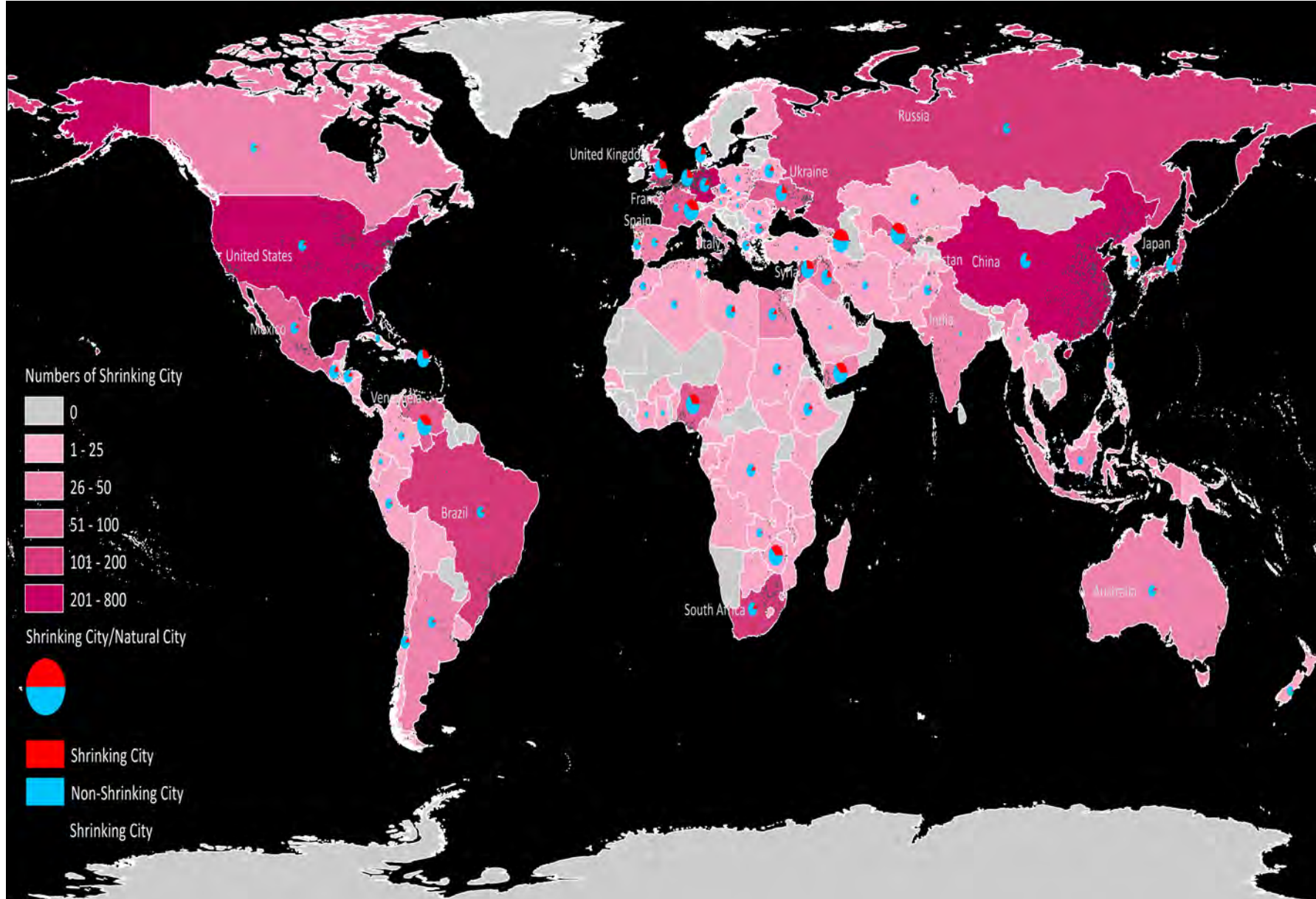
Online interactive mapping of digital deserts in and around Beijing (left) and Shanghai (right).



**15 Shrinking Cities : Night time light variation 2013-2016 (blue for decreasing)**



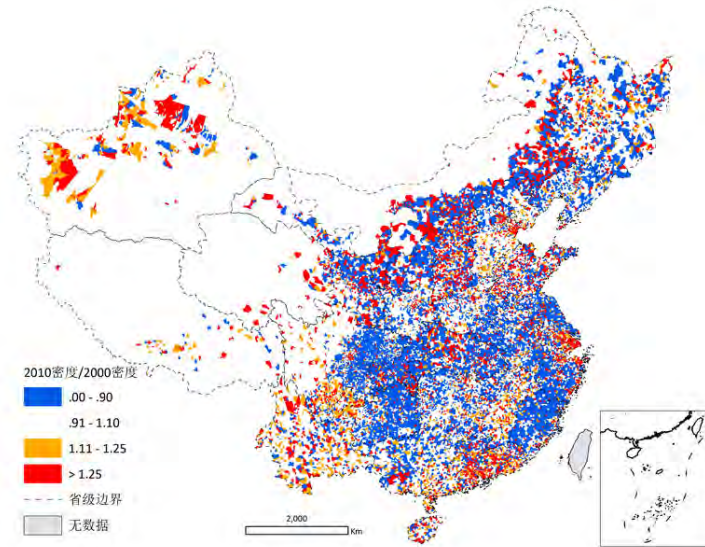
# 15 Shrinking Cities



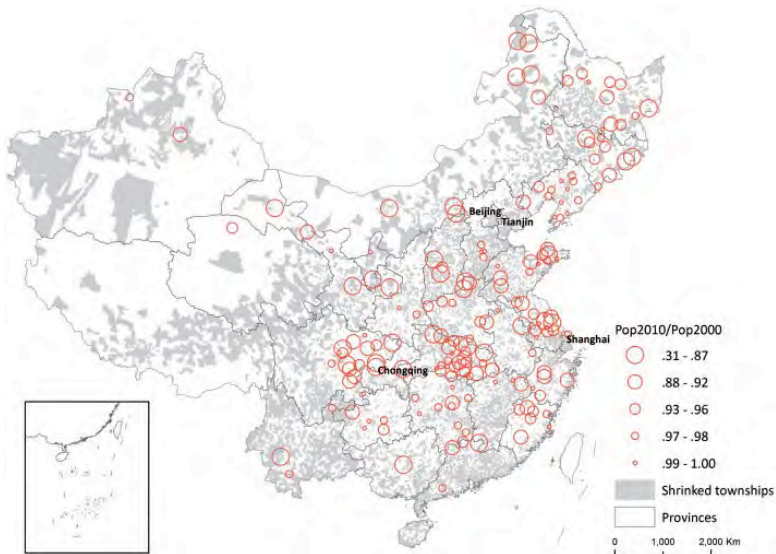
# 15 Shrinking Cities



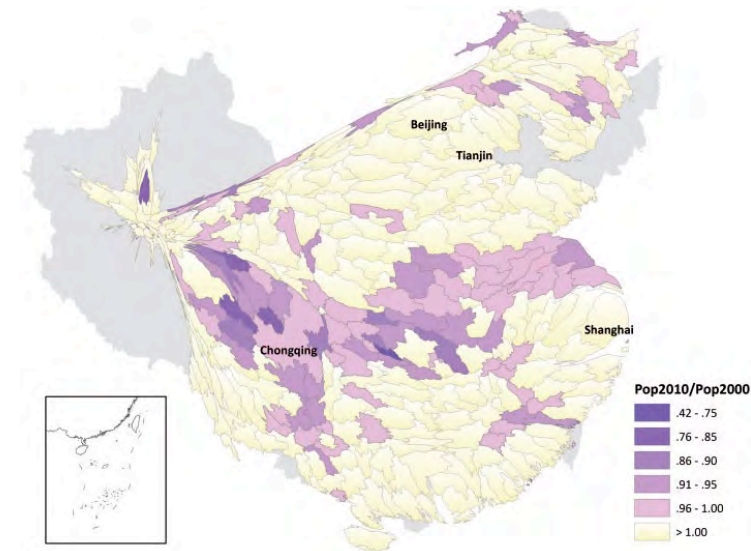
Shrinking Cities in China 2000-2010



Decreased population density at the township and city levels



Shrinking territories at the township and city levels in China (Pop2010  $\frac{1}{4}$  population in 2010, Pop2000  $\frac{1}{4}$  population in 2000).



Prefectural level population variation in China.

# 15 Shrinking Cities : Qiqihar Case Study



图1 研究范围——齐齐哈尔市中心城区 (图片来源: 作者绘制)



图2 多年街景点空间分布图 (图片来源: 作者绘制)

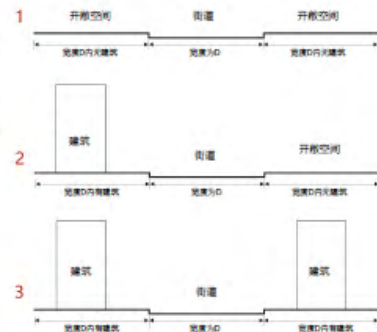


图3 街道空间分类 (图片来源: 作者绘制)

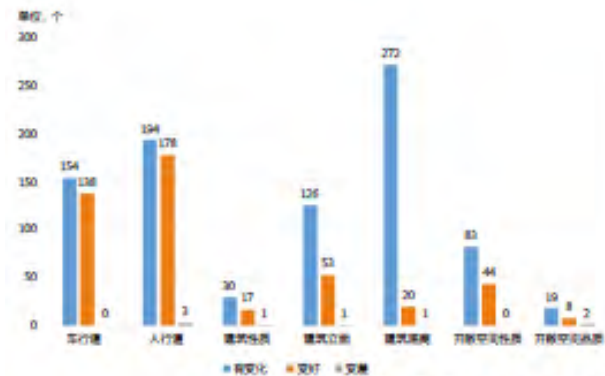


图5 各中类主观变化结果统计 (图片来源: 作者绘制)

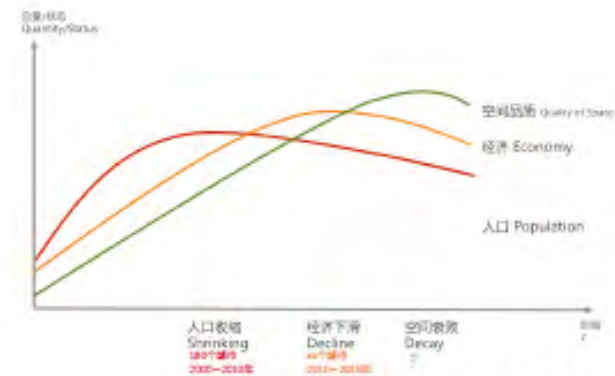


图4 客观识别与主观评价举例 (图片来源: 作者绘制)

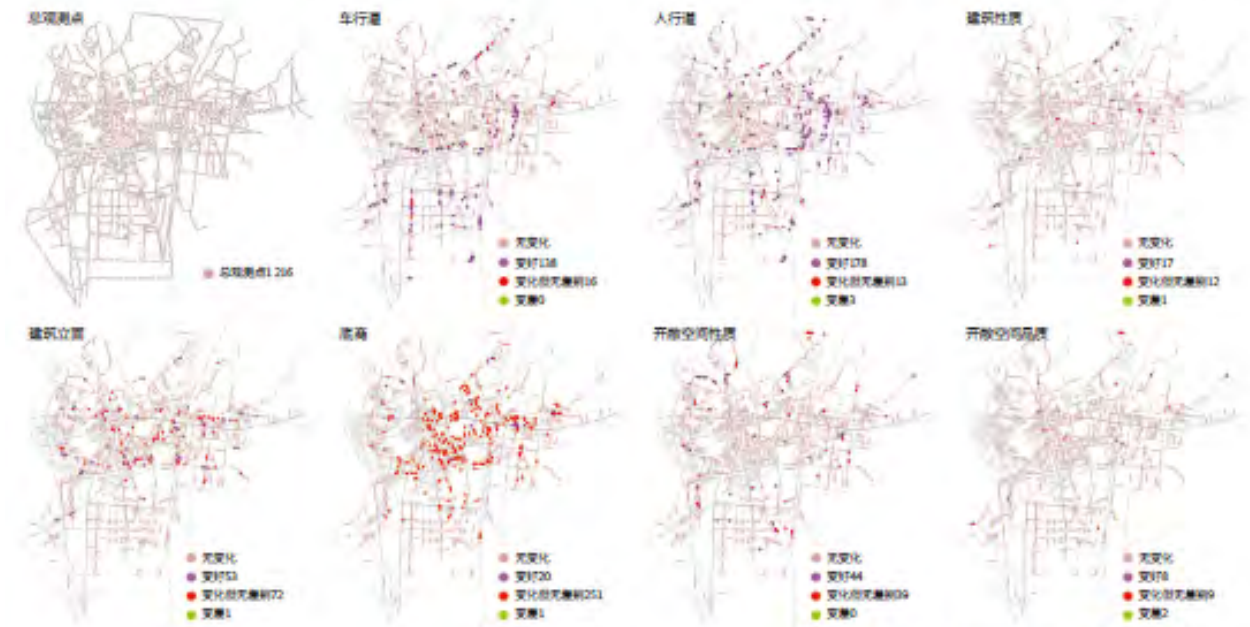
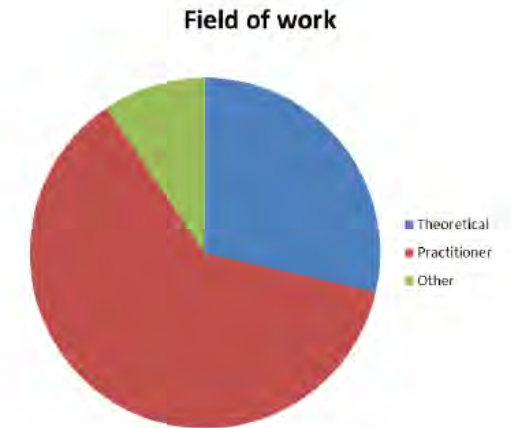
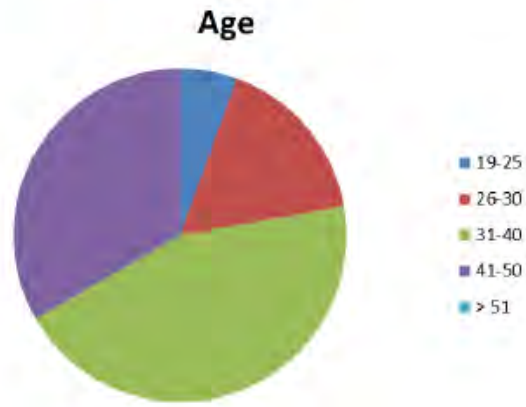
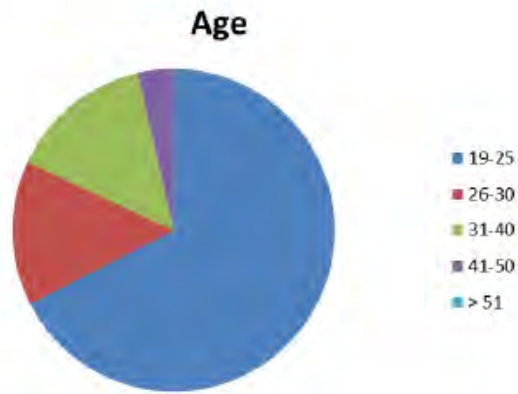
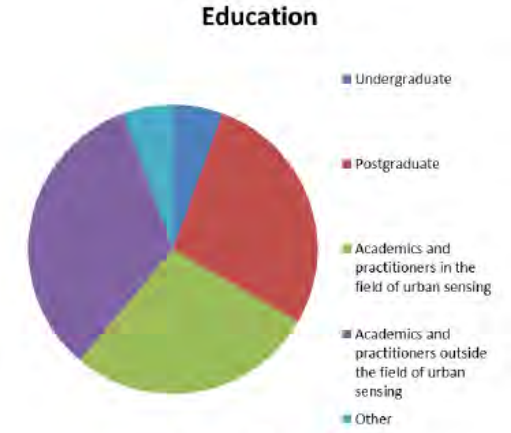
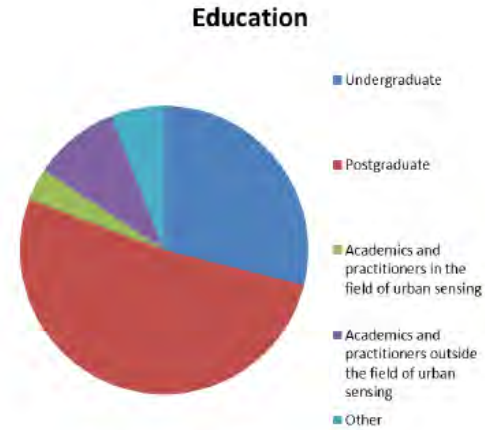
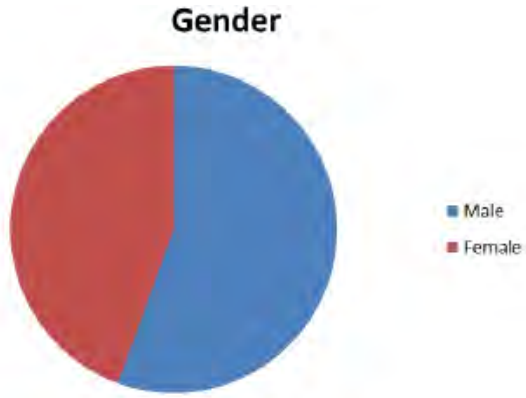
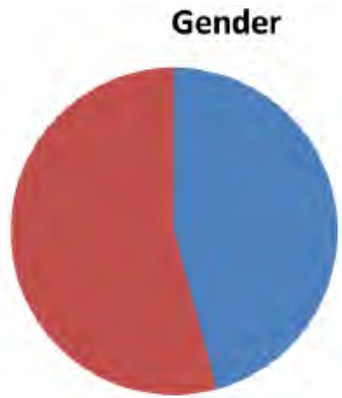
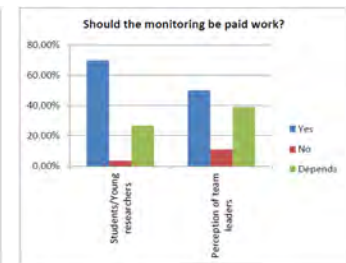
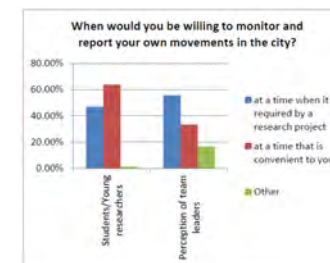
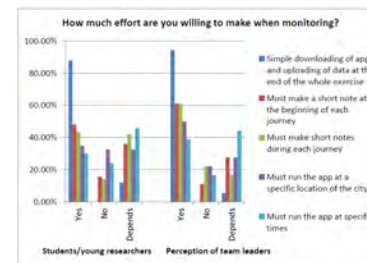
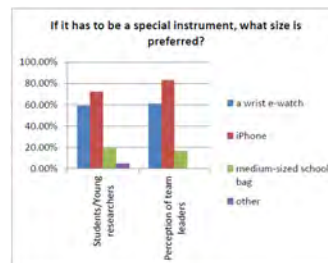
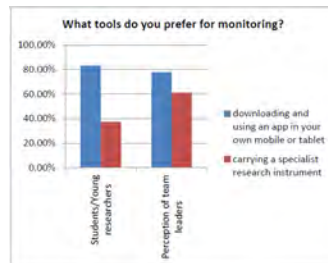
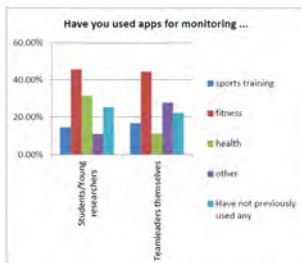
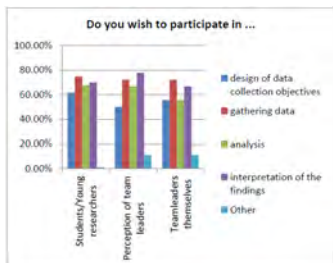


图6 各中类主观评价的空间分布 (图片来源: 作者绘制)

# 16 Participatory Urban Sensing



Summary profiles of survey respondents –students and young researchers on the left column and senior team leaders on the right

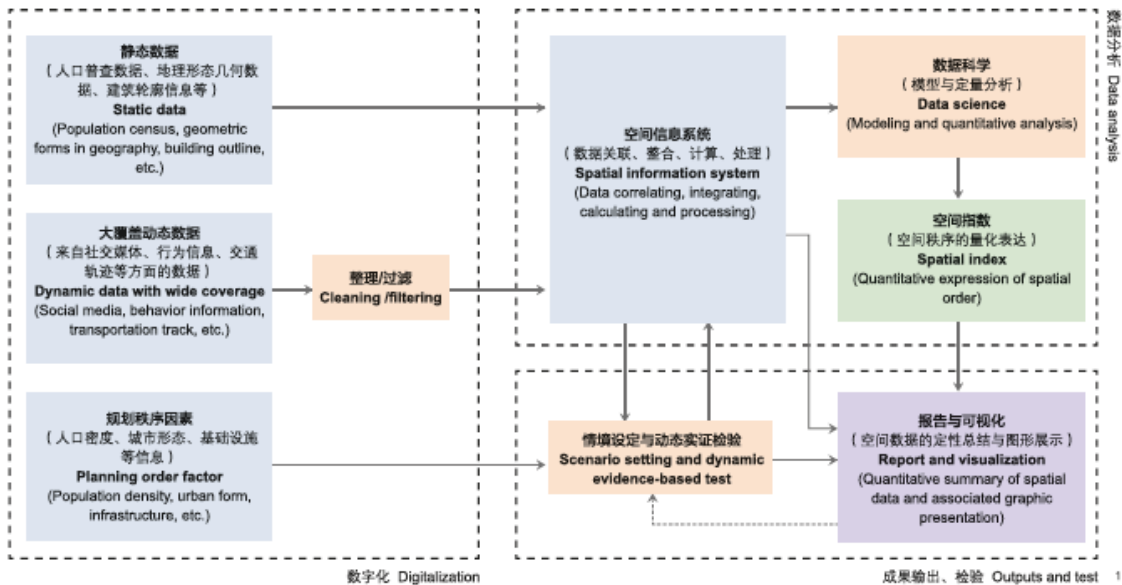


# 17 Data Augmented Design : Creating better built environment with data, method and techniques 上海城市设计挑战赛

- Background
- Existing changes and future cities: A survey
- Materials for downloading
- DAD for urban design
- A special issue in Beijing Planning Review
- Research Network of DAD



# 17 Data Augmented Design: Materials for downloading



1. 新数据环境下对城市秩序理解的一般流程
1. General Process of understanding of urban orders in the new data environment



数据信息

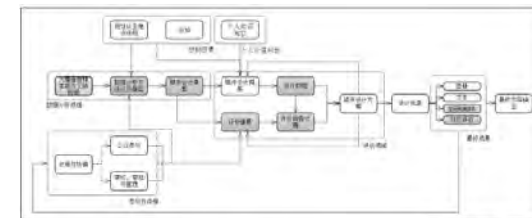
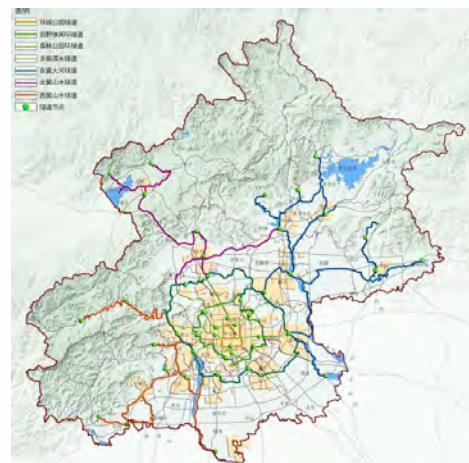
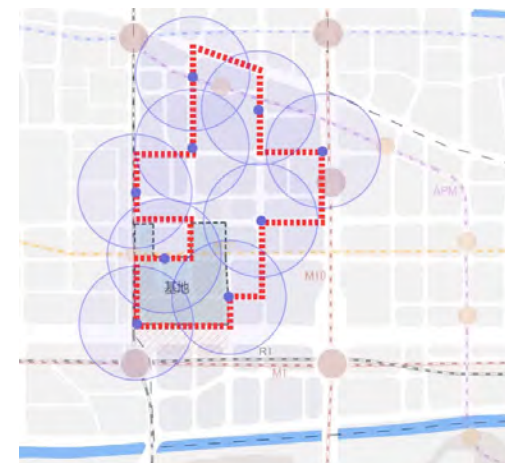


图1 DAD的一般流程



初步设计方案



基于刷卡数据的公交站点规划布局

# 17 Data Augmented Design: DAD for urban design

表1 基于新数据支持总体城市设计的框架体系

尺度/维度	区域/城市/片区/乡镇街道办事处	街区/地块	街区/地块内部	街道	街道内部
开发: 遥感解译的土地利用, 用地现状图(规划), 土地利用图(国土)	城镇用地面积, 建设强度, 生态安全格局, 适宜开发土地 [城市扩张速度, 城市扩张规模]	开发年代, 是否适宜开发	肌理变化	角度变化	
形态: 分等级路网, 道路交叉口, 建筑物, 土地出让/规划许可, 街景	基于道路交叉口的城市判断, 建筑面积, 路网密度, 交叉口密度, 开放空间比例 [再开发比例, 扩张比例]	尺度, 紧凑度, 基于建筑的城市形态类型, 建筑密度, 容积率, 是否为开放空间, 开放空间类型, 可达性 [再开发与否, 扩张与否]	是否有小路, 建筑分布规律, 是否有内部围墙 [历史道路构成]	长度, 区位, 量线性, 建筑贴线率, 界面密度, 橱窗比, 宽高比, 可达性, 铺装, 建筑色彩 [历史上是否存在]	建筑分布特征
功能: 兴趣点, 用地现状图(规划), 土地利用图(国土), 街景	各种功能总量及比例, (城镇建设用地上) 各种公共服务覆盖率/服务水平, 职住平衡水平, 产业结构/优势/潜力	用地性质, (各种) 功能密度, 功能多样性, 主导功能, 第二功能, 各种公共服务设施可达性, 市井生活相关的功能密度	(各种) 功能分布特征 (单面, 双面, 三面还是四面), 内部功能相比总功能(内部+临街)占比, 界面连续性	(各种) 功能密度, 功能多样性, 主导功能, 第二功能, 各种公共服务设施可达性, 市井生活相关的功能密度, 步行指数 (walk score), 绿化, 等级	(各种) 功能分布特征 (交叉口附近还是中间)
活动: 普查人口, 企业, 手机, 微博, 点评, 签到, 公交卡, 位置照片, 百度热力图, 高分辨率航拍图	总体分布特征, (城镇建设用地上) 各等级活动所占面积比例, 人口/就业密度体现的多中心性, 联系所反映的多中心性: 平均通勤时间/距离, 各种出行方式比例	(不同时段) 的活动密度, 微博密度, 点评密度, 签到密度, 与之产生联系的地点, 人口密度, 就业密度, 热点时段, 通勤时间/距离	活动分布特征(内部还是边缘), 内部联系特征	(不同时段) 的活动密度, 与之产生联系的街道, 点评密度, 热点时段, (各类型) 交通流量, 选择度与整合度, 限速	活动分布特征(交叉口附近还是中间)
活力: 街景, 点评, 手机, 位置照片, 微博和房价等	平均心情, 整体意象, 整体活力, 幸福感	平均心情, 平均消费价格, 好评率, 意象, 市井活力, 平均房价, 居住隔离程度		平均消费价格, 好评率, 设计品质, 风貌特色, 活力, 意象, 平均房价	

注: 表中 [ ] 特别给出了简单指标变化之外的指标, 此表也适用于城市规划与设计方案的评价

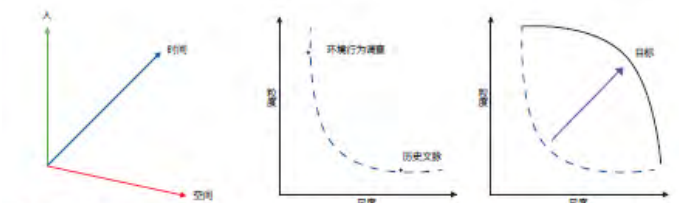


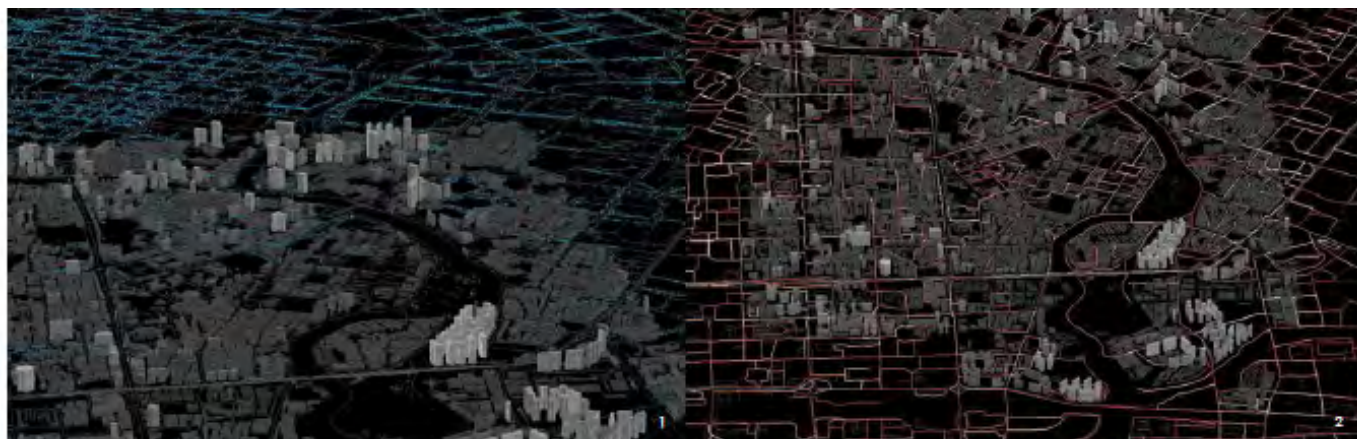
图1 大尺度城市设计的TSP模型



图3 动态街景数据提供了人的尺度的城市街道空间的变化 (图片来源: 腾讯地图)



图4 Spacematrix关注的九种基于建筑物的城市形态 (图片来源: 参考文献[9])





## 17 Data Augmented Design: A special issue in Beijing Planning Review

### 新数据环境下的城市：品质、活力与设计

北京城市实验室 (Beijing City Lab, BCL) 成立于2013年10月, 专注于运用跨学科方法量化城市发展动态, 为更好的城市规划与管理提供可靠依据, 最终建立起可持续城市发展所需要的方法学基础。BCL的研究主题以“新城镇化规划”中的人居环境质量为核心, 希望对中国快速城镇化时期的人居环境质量进行全面的度量与监测, 为国家决策提供依据和保障。

BCL坚持定量城市研究的创立理念, 持续组织交流新数据环境城市研究在理论与实践上的最新实践。北京城市实验室年会作为其组织活动的重要组成部分, 自2014年起每年举办, 通过邀请海内外相关领域专家学者介绍学科发展的动态前沿, 同时对海内外参会人员一律免费开放, 从第一届实施

至今, 受到社会各界的广泛关注与积极参与。BCL2016年会在北京清华同衡规划设计研究院举办, 年会以“新数据环境下的城市: 品质、活力与设计”为主题, 聚焦新数据、新方法和新技术, 关注城市空间品质与城市活力, 就新数据环境下量化城市研究在理论与实践上的最新成果进行交流, 对向全社会普及与强化以营造品质和活力为目的的城市规划设计有重要意义。本专辑收录了BCL2016年会的部分文章, 旨在对“新数据环境下的城市: 品质、活力与设计”这一主题进行初步探讨。

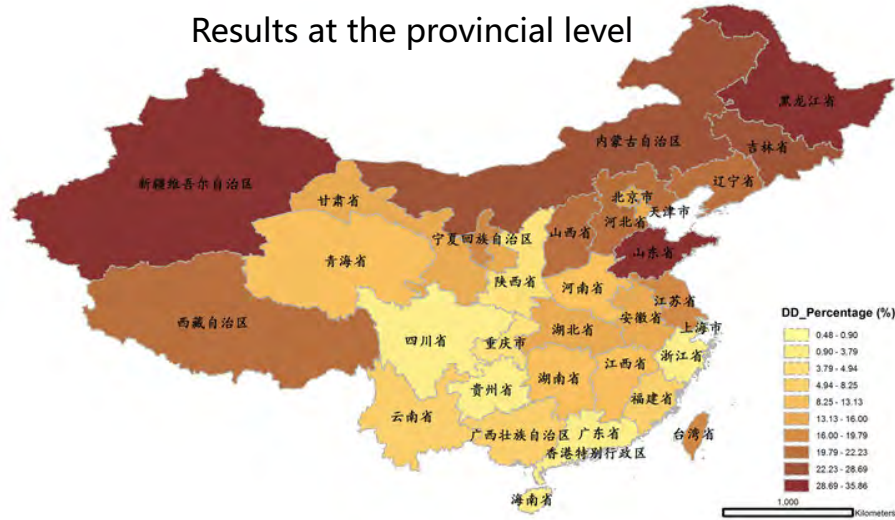
北京城市实验室 (Beijing City Lab, BCL)  
本刊编辑部

话题  
—  
THEME

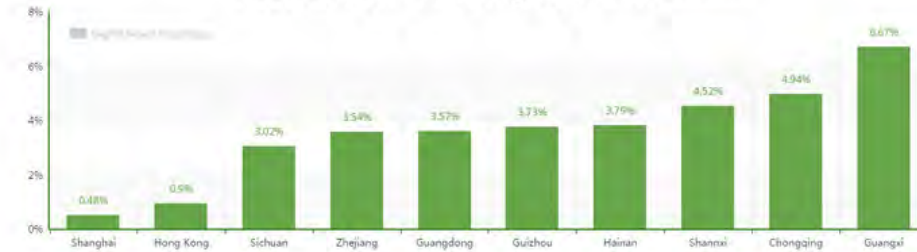
BCL坚持定量城市研究的创立理念, 持续组织交流新数据环境城市研究在理论与实践上的最新实践。北京城市实验室年会作为其组织活动的重要组成部分, 自2014年起每年举办, 通过邀请海内外相关领域专家学者介绍学科发展的动态前沿, 同时对海内外参会人员一律免费开放, 从第一届实施至今, 受到社会各界的广泛关注与积极参与。BCL2016年会在北京清华同衡规划设计研究院举办, 年会以“新数据环境下的城市: 品质、活力与设计”为主题, 聚焦新数据、新方法和新技术, 关注城市空间品质与城市活力, 就新数据环境下量化城市研究在理论与实践上的最新成果进行交流, 对向全社会普及与强化以营造品质和活力为目的的城市规划设计有重要意义。本专辑收录了BCL2016年会的部分文章, 旨在对“新数据环境下的城市: 品质、活力与设计”这一主题进行初步探讨。

# 18 Digital Desert

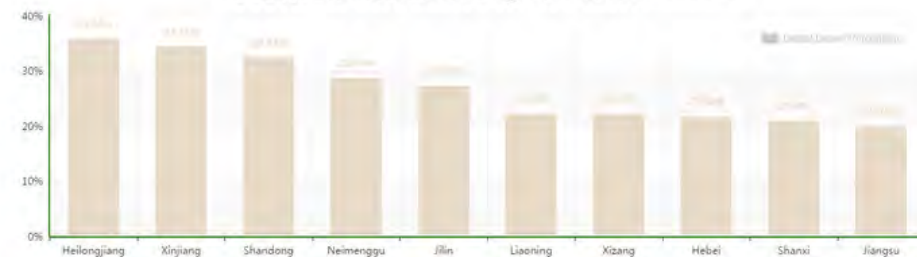
Results at the provincial level



Provinces with Least Digital Deserts



Provinces with Most Digital Deserts



Results at the city proper level



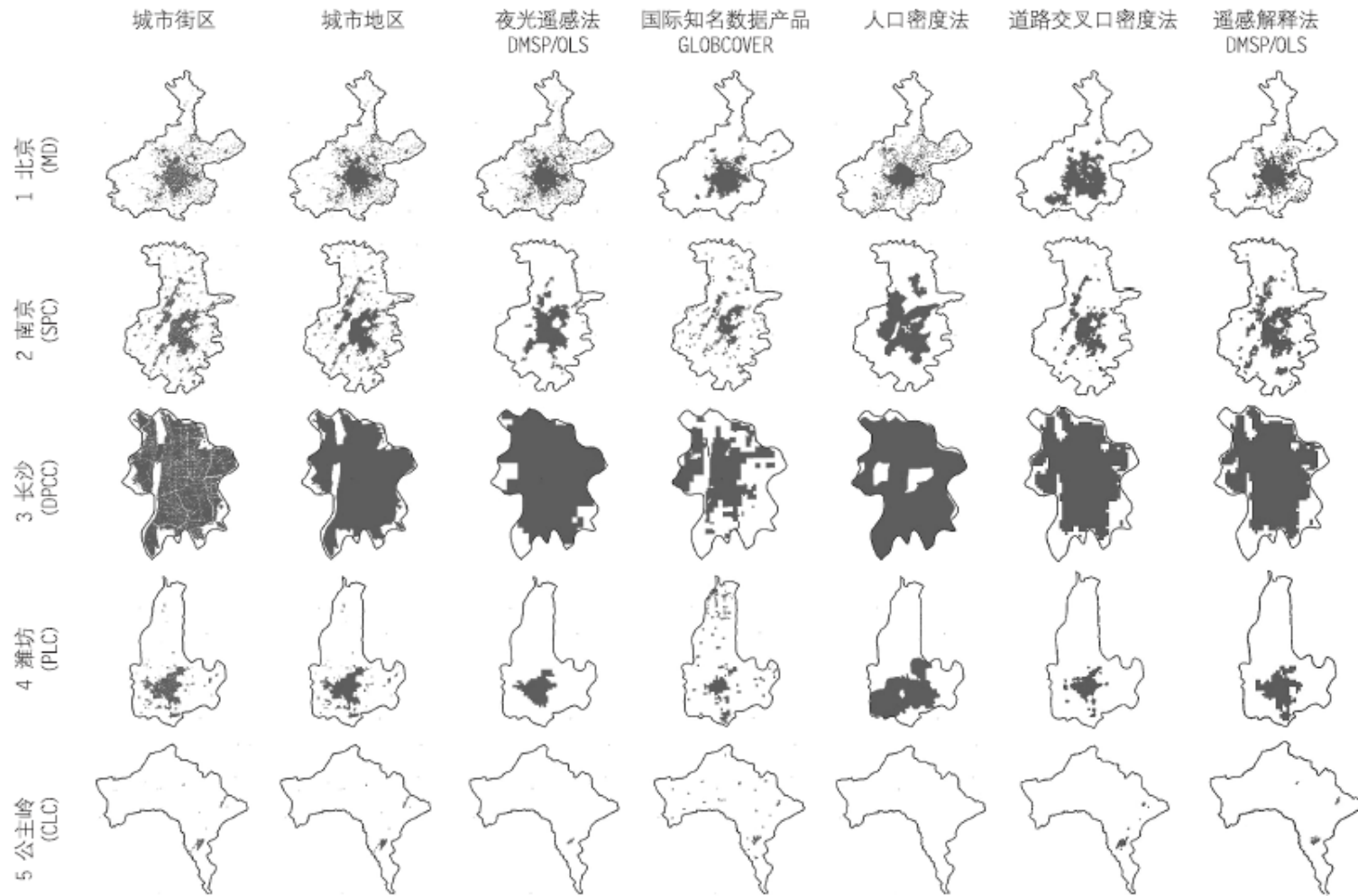
Cities with Most Digital Deserts



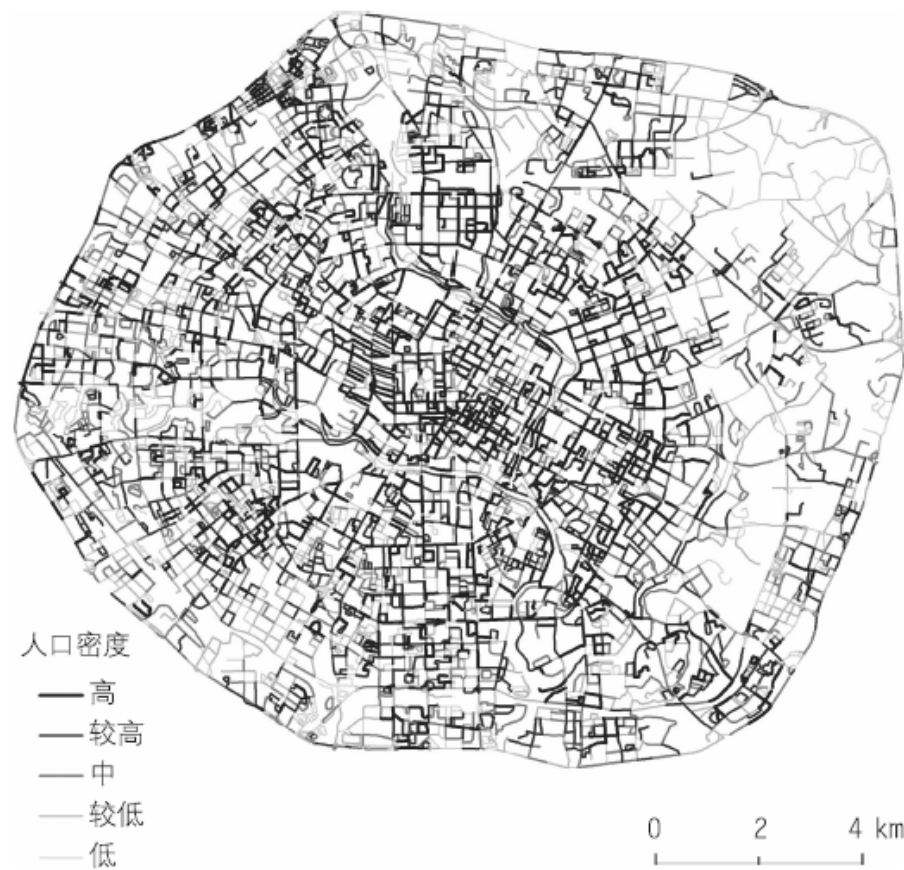
## 19 New Data Environment

- Progress of Applications of New Data in Urban Planning and Studies
- Special issue on Big/Open Data for Urban Management in Journal of Urban Management
- Four transformations of quantitative urban studies in the new data environment
- Understanding urban China with open data
- Special issue on Urban Planning International
- Geography in the new data environment

# 19 New Data Environment: Progress of Applications of New Data in Urban Planning and Studies



大模型应用：对中国多城市建成区界定对比



大模型应用：成都街道活力量化评价

# 19 New Data Environment: Special issue on Big/Open Data for Urban Management in Journal of Urban Management

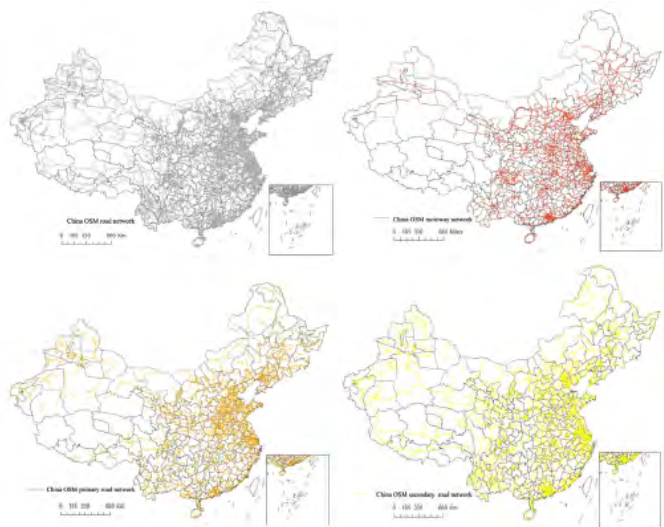


Fig. 1. Spatial distribution of China's OSM road network.

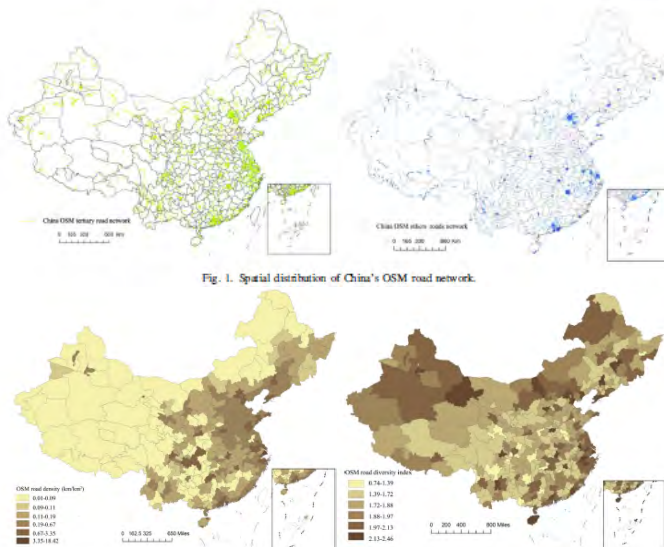


Fig. 2. Spatial distribution of OpenStreetMap road density in China.

Fig. 5. Spatial distribution of OpenStreetMap road diversity in China.

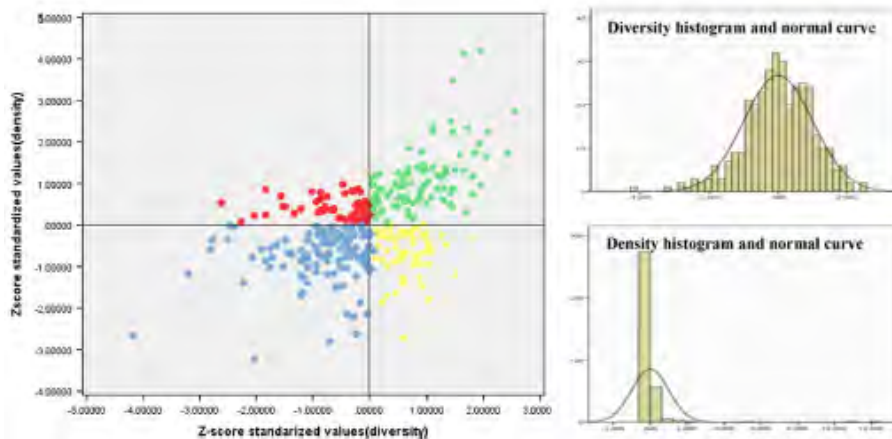


Fig. 6. Scatter diagram and histogram of OpenStreetMap road diversity.



Fig. 3. Different OSM road types for the Forbidden City.

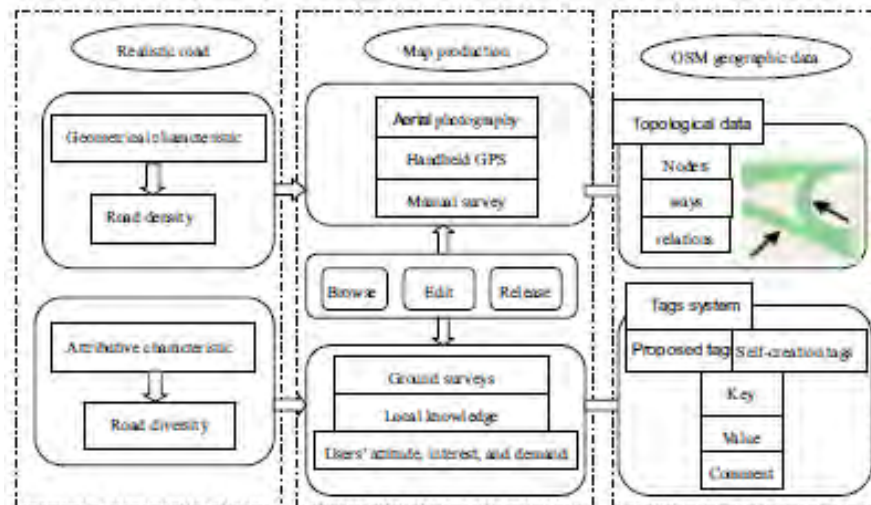


Fig. 7. Influential factors and the mechanism for OpenStreetMap road density and diversity.



Fig. 4. Different OSM road types in Zhang Jiajie.

# 19 New Data Environment: Four transformations of quantitative urban studies in the new data environment

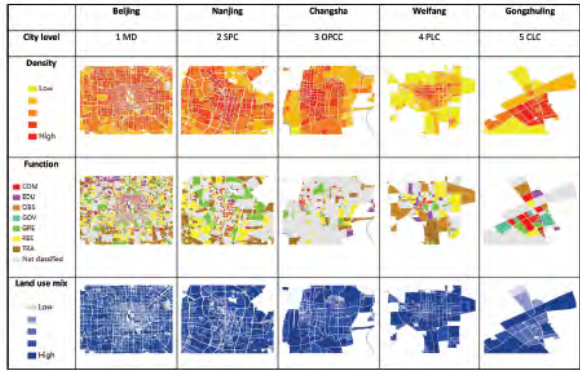


Figure 2: Derived land use map of cgr cities using MWP-CA

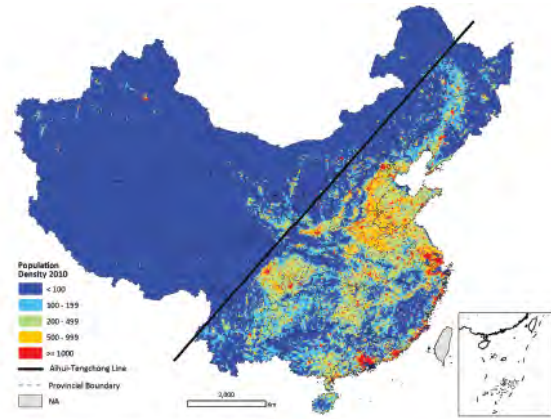


Figure 4: Distribution of population density at sub-district level in 2010

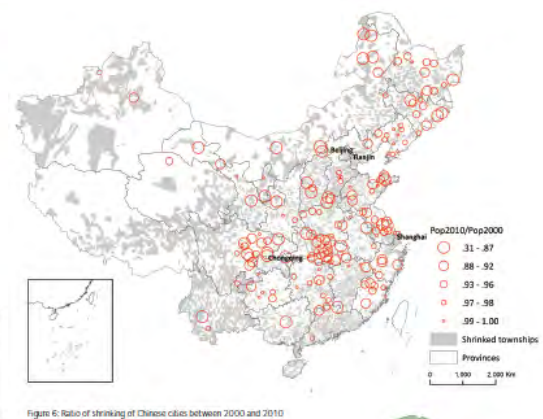


Figure 6: Ratio of shrinking of Chinese cities between 2000 and 2010

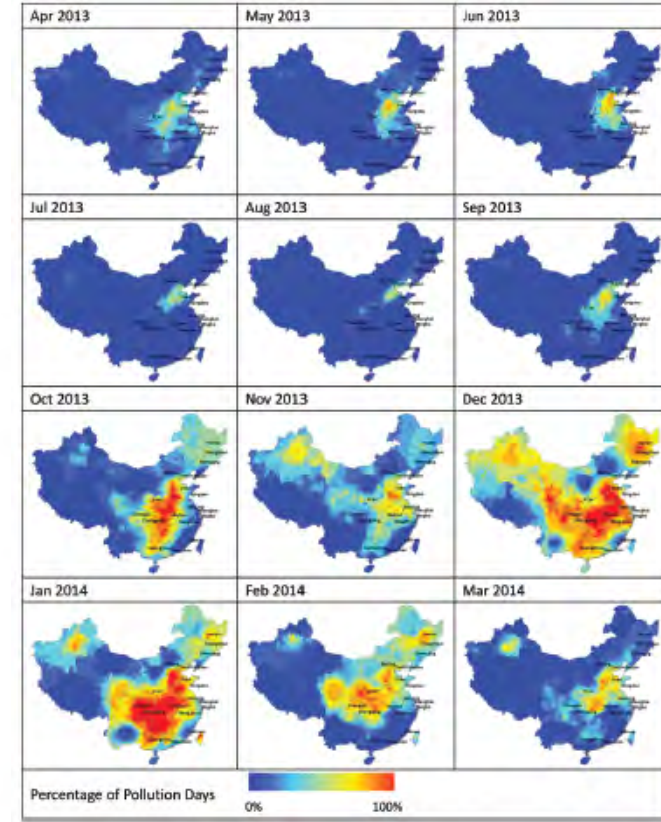


Figure 8: Exposed days in each month for each sub-district

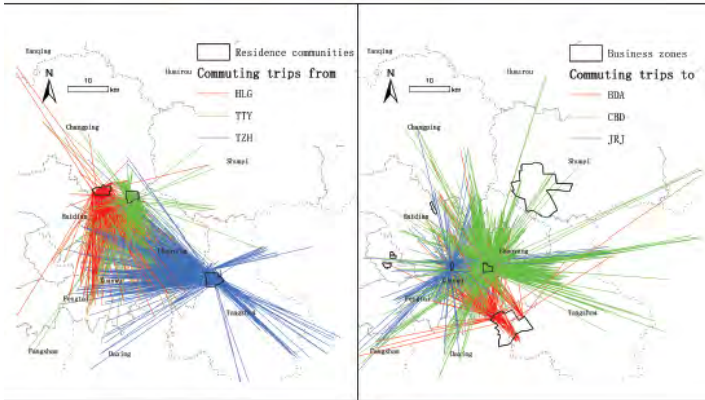


Figure 3: Commute pattern in typical areas

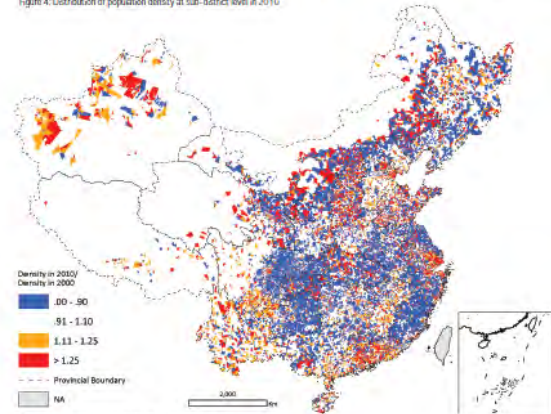


Figure 5: Population density ratio between 2000 and 2010

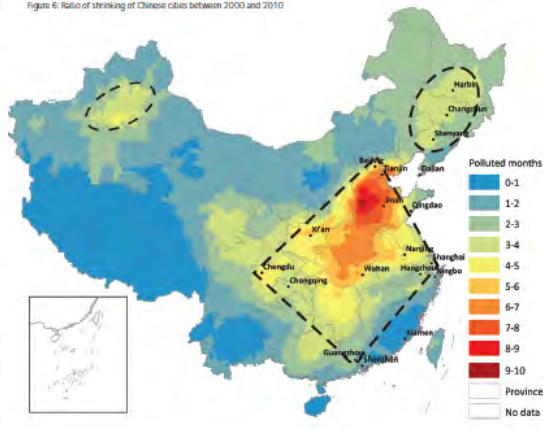


Figure 7: Urban environment at the spatial scale: The number of polluted months in a year for each Chinese sub-district violating national PM2.5 standard

# 19 New Data Environment: Understanding urban China with open data

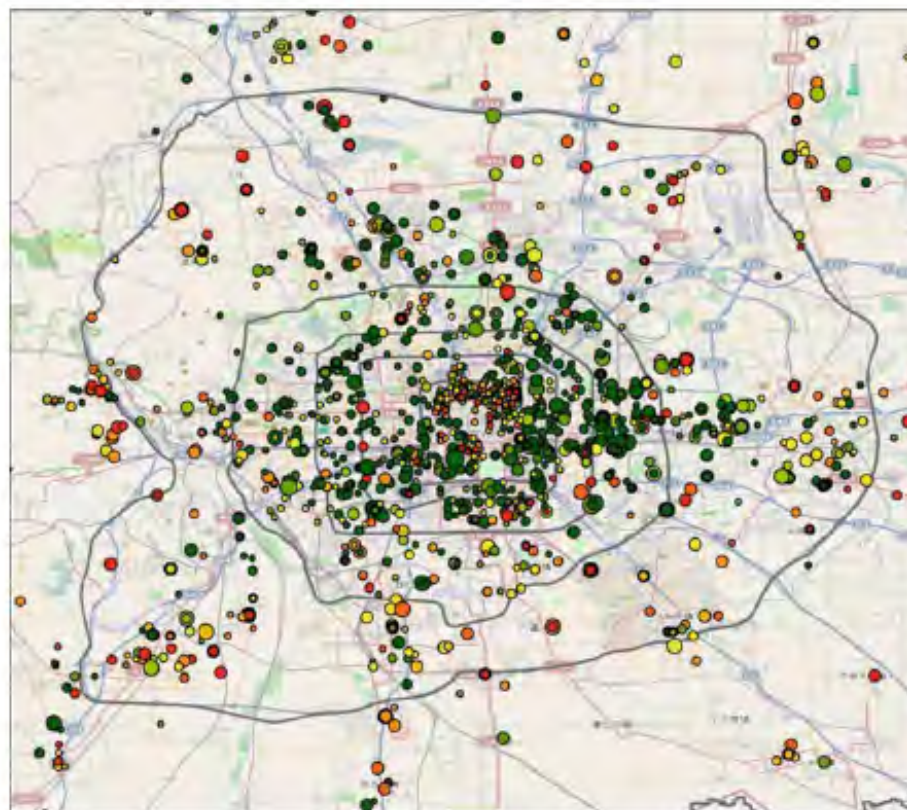
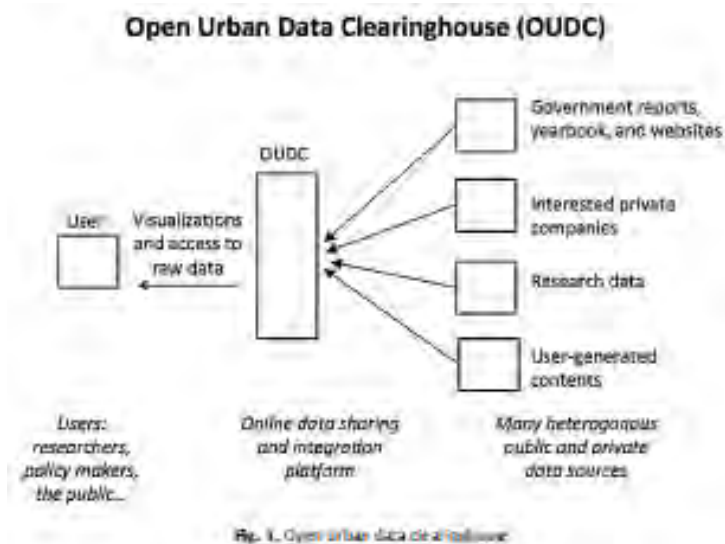


Fig. 12.10 Planned housing floor space by site

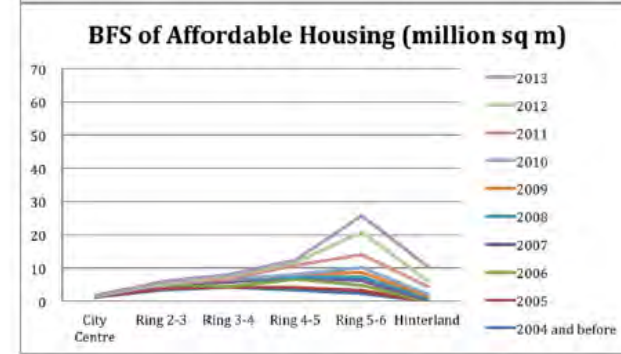
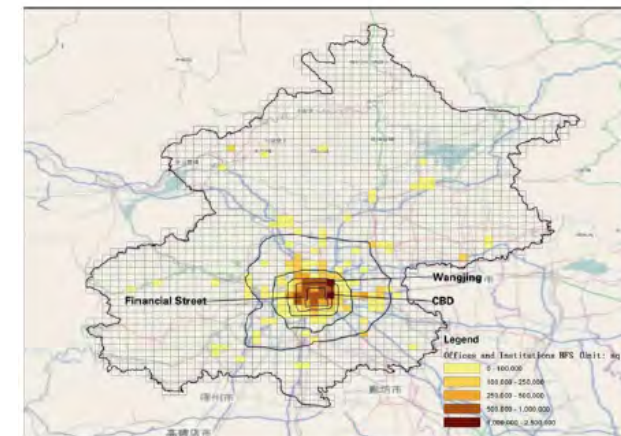


Fig. 12.21 Comparison of planned BFS distribution of market housing and affordable housing

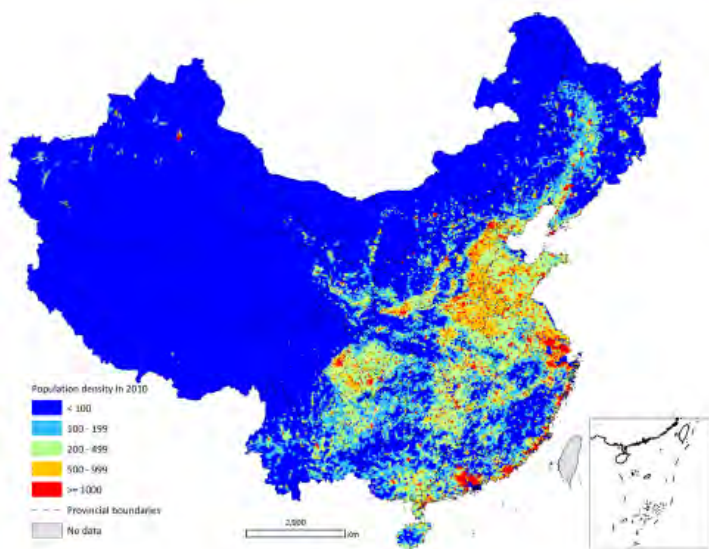


Fig. 2. Population density at sub-district level

# 19 New Data Environment: Special issue on Urban Planning International



图 7 米兰地铁 GPS 轨迹 (a) 城中心到东北部 (b) 的簇状轨迹

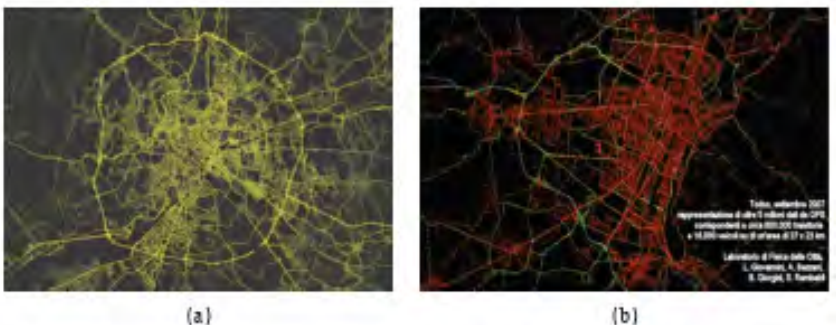


图 8 (a) 罗马私家车 GPS 总量 (b) 都灵车速分布 (红到蓝)

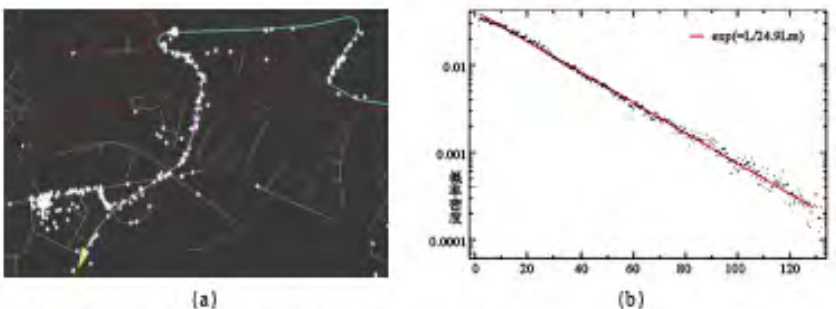


图 9 轨迹重建 (a) 以及出行行为统计 (b)

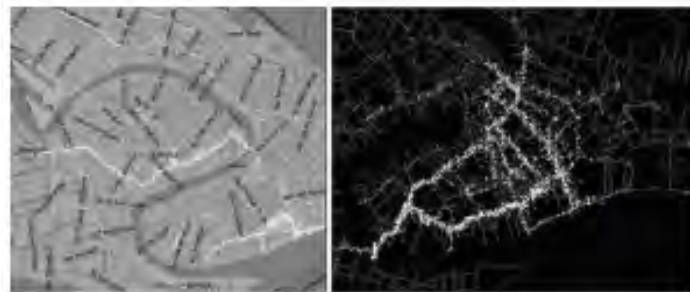


图 10(左)与(右) 2007 年 威尼斯运河不同空间尺度的步行轨迹重塑



图 11 二维与三维步行动态

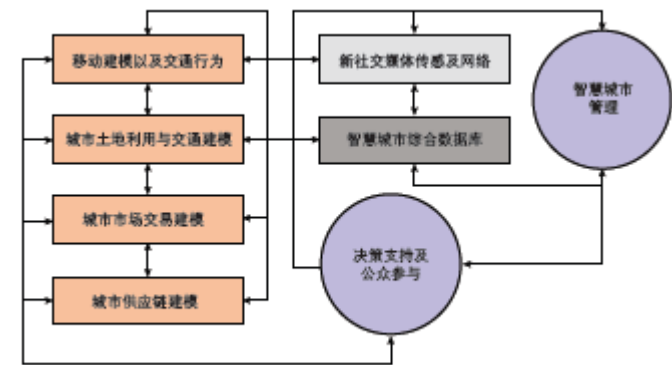


图 12 FuturiCT 智慧城市项目架构



# 19 New Data Environment: Geography in the new data environment

表1 15大类商品类别编号及其销售额和订单量占比

编号	类别	销售额百分比 (%)	订单量百分比 (%)	编号	类别	销售额百分比 (%)	订单量百分比 (%)
1	个人化妆	2.9	4.8	9	汽车用品	1.7	1.8
2	图书、音像、数字商品	2.5	4.4	10	电脑、办公	22.4	10.8
3	家具、家装、家纺、厨具	7.5	8.6	11	营养保健	1.1	1.3
4	家用电器	13.0	6.6	12	户外运动	2.0	2.3
5	彩票、旅行、充值、票务	7.6	23.5	13	鞋服、箱包、特产、奢侈品	4.9	3.1
6	手机、数码	15.7	8.7	14	食品饮料、酒类、生鲜	4.0	5.4
7	服饰内衣、珠宝首饰	5.8	8.1	15	未知	0.2	0.1
8	母婴、玩具乐器	6.7	10.8				

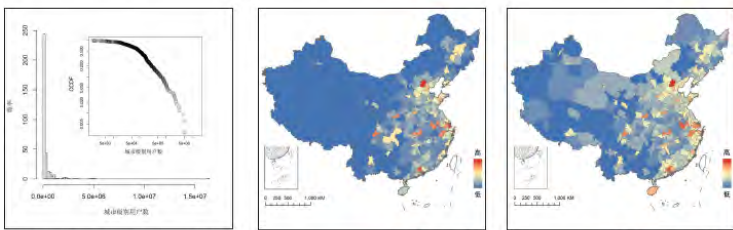


图1 不同城市用户数量柱状图及互补累积频率分布图 图2a) 用户空间分布图 图2b) 用户人口占比空间分布图

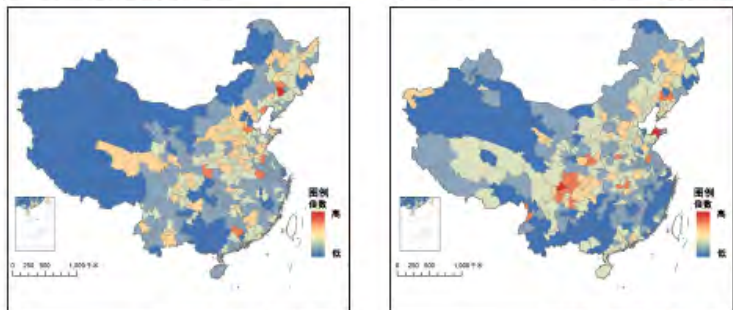


图6a) 各城市用户增长倍数 图6b) 各城市订单量增长倍数

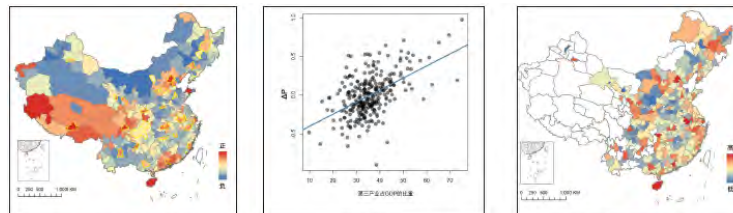


图7a) 实际总销售额减去预测总销售额的值的空间分布 (图中黄色边线城市为省会城市和直辖市) 图7b) 第三产业占GDP比重与关系 图7c) 285个城市第三产业占GDP比重的空间分布

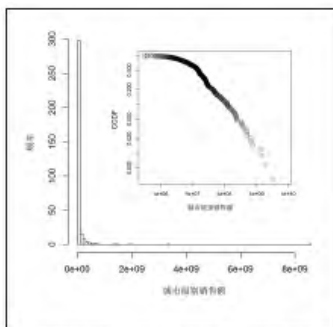


图3a) 不同城市销售额的柱状图和互补累积频率分布图

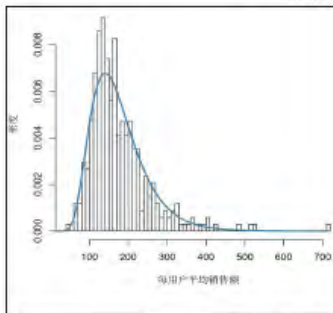


图4a) 用户人均销售额柱状图

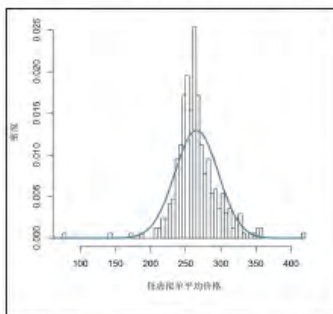


图5a) 不同城市每虚拟单平均价格柱状图

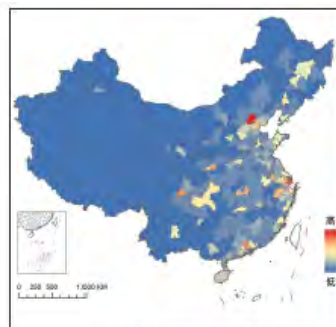


图3b) 不同城市销售额空间分布图

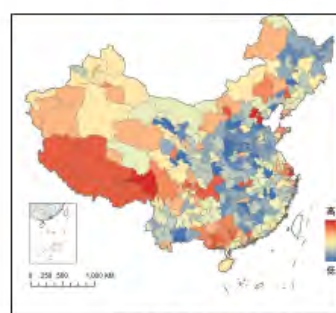


图4b) 用户人均销售额空间分布图

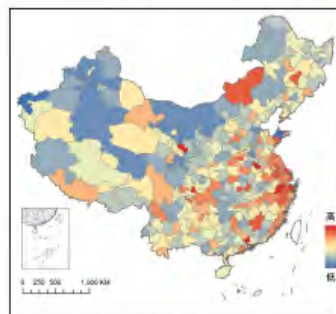


图5b) 不同城市每虚拟单平均价格空间分布图

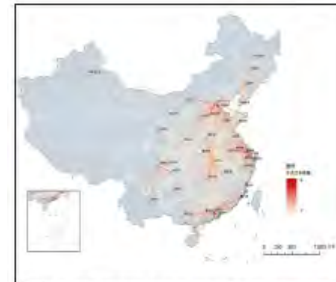


图8a) 各个仓库所在城市发往各个城市订单量示意图

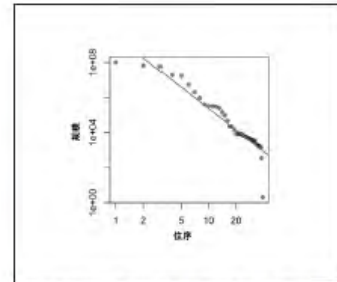


图8b) 各城市仓库的发货量大小与其排名大致遵循“位序—规模”法则 (N=39)



图9a) 每个城市对应的联系强度最大的仓库在城市

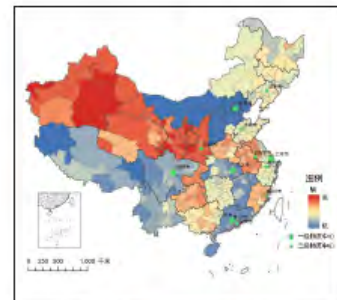


图9b) 各城市订单的发货仓库混合程度 (摘)

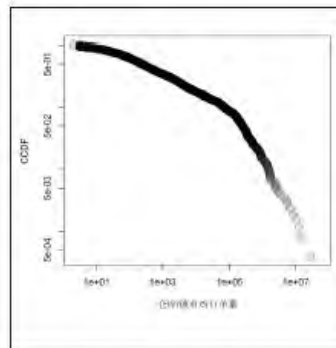


图10a) 仓库/城市对之间的订单量的互补累积频率图

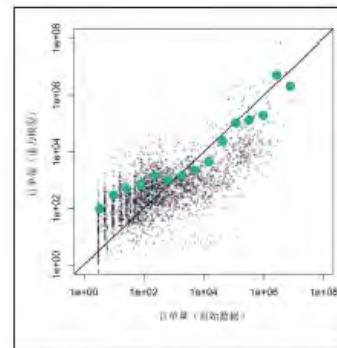
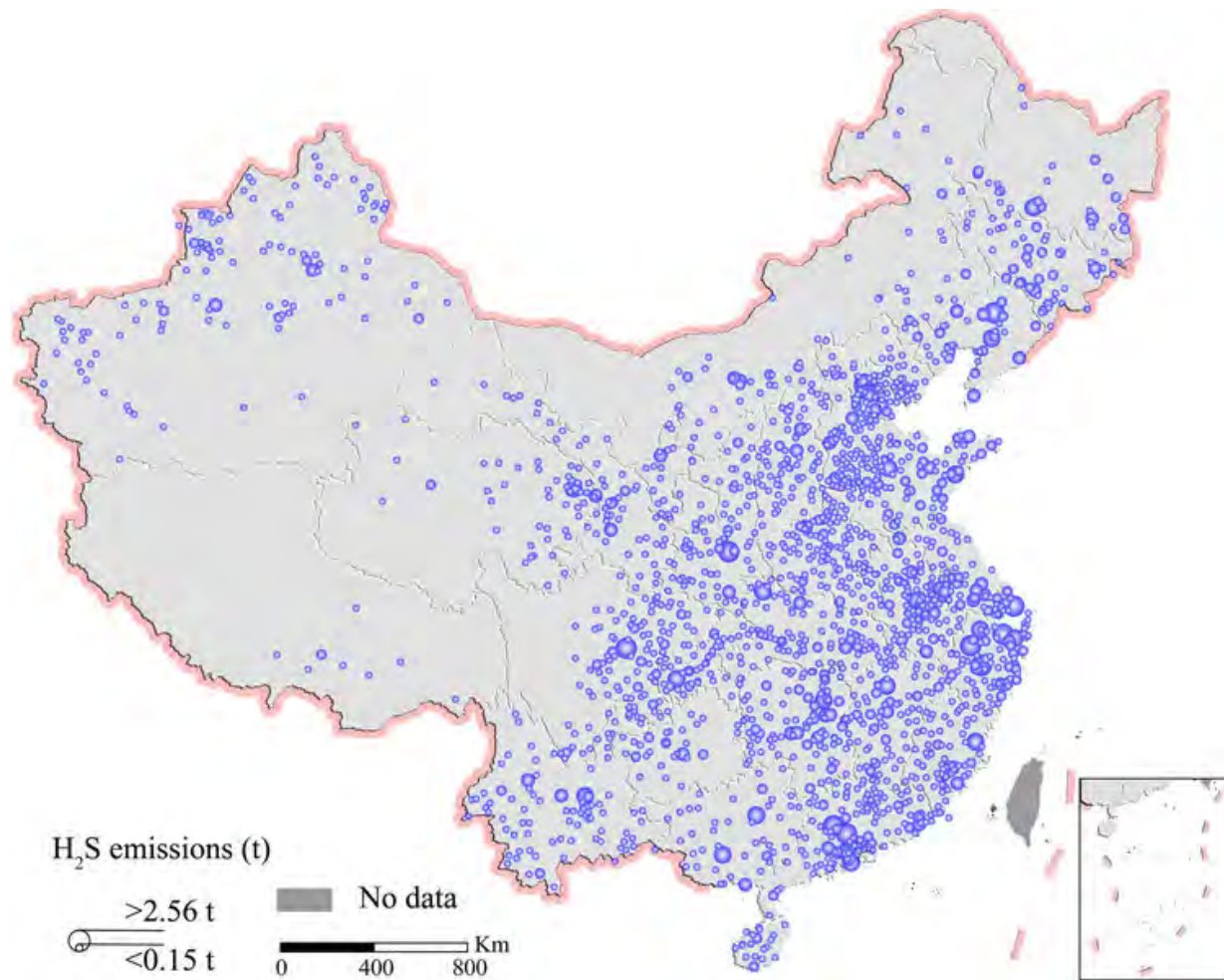
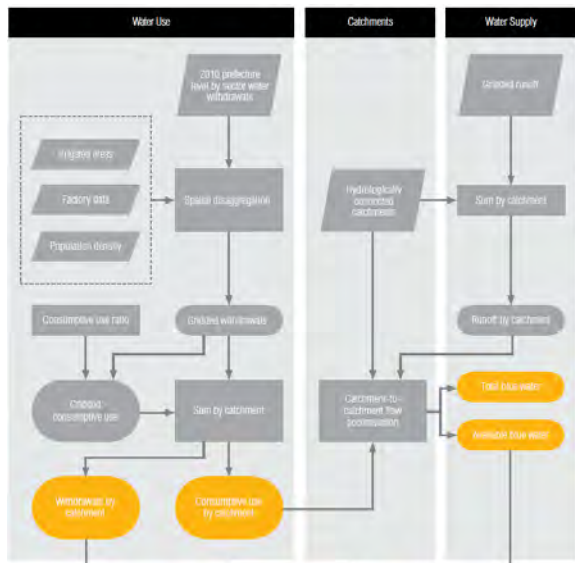


图10b) 仓库/城市对的订单实际值

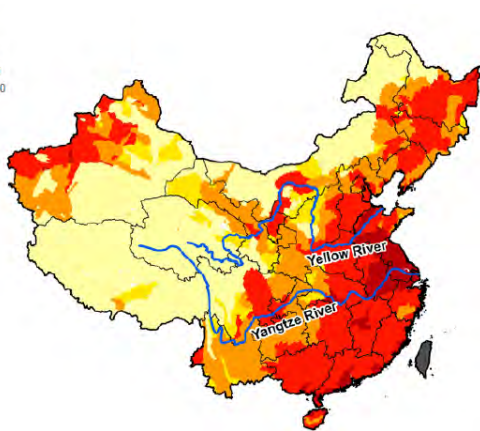
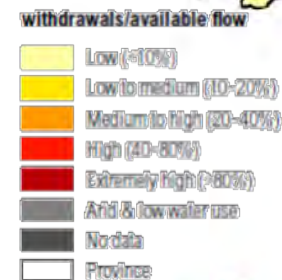
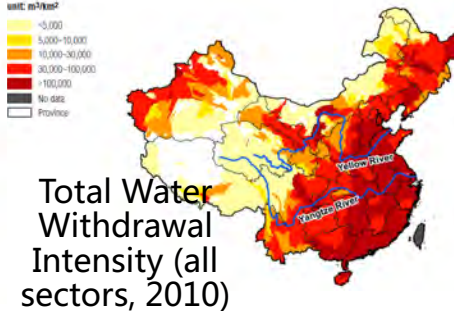
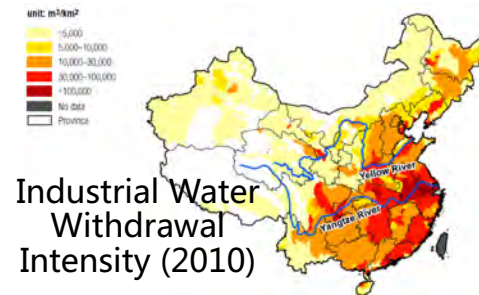
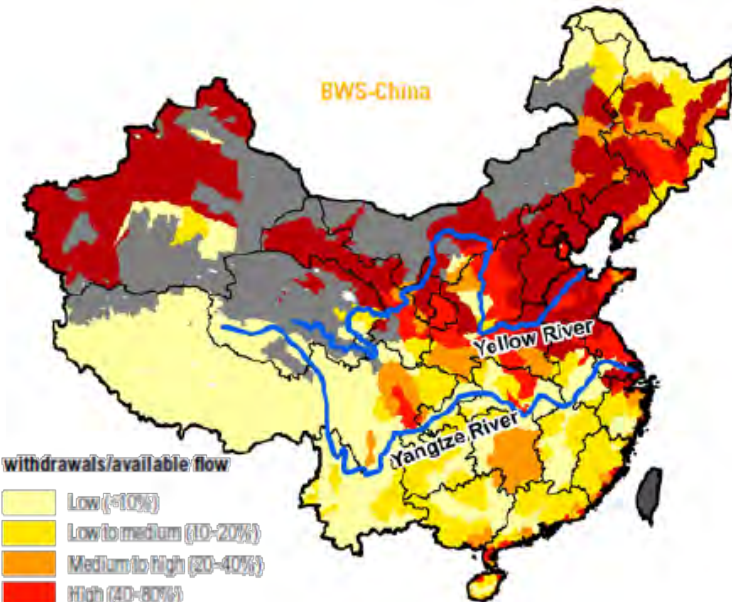
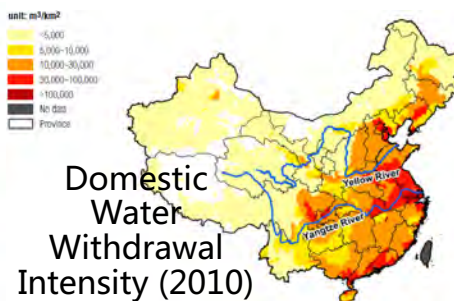
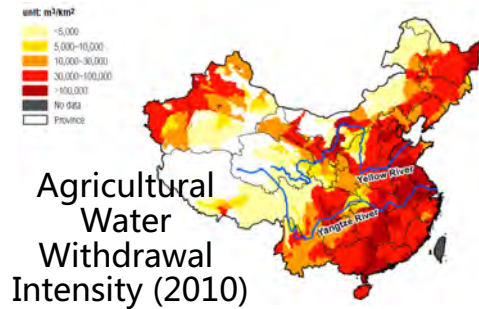
# 20 NIMBY



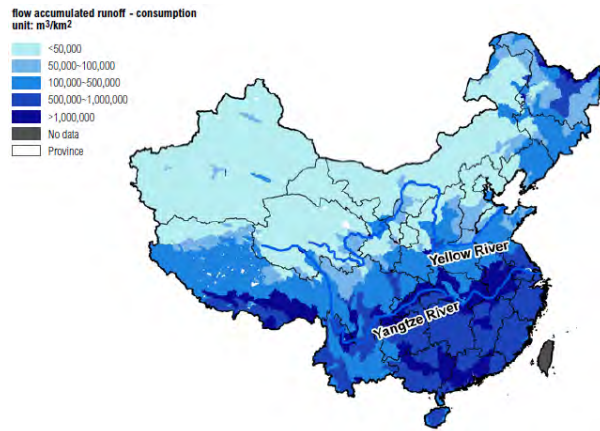
# 21 Baseline Water Stress



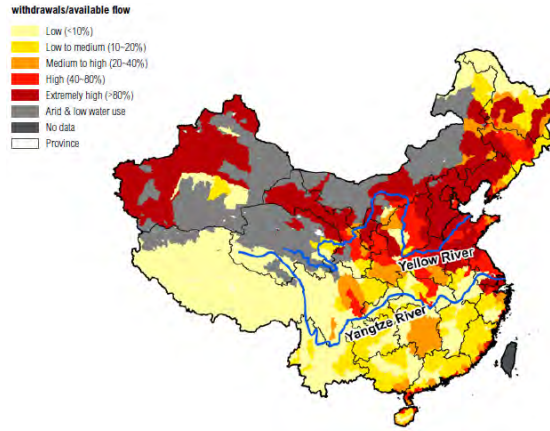
BWS-China Workflow



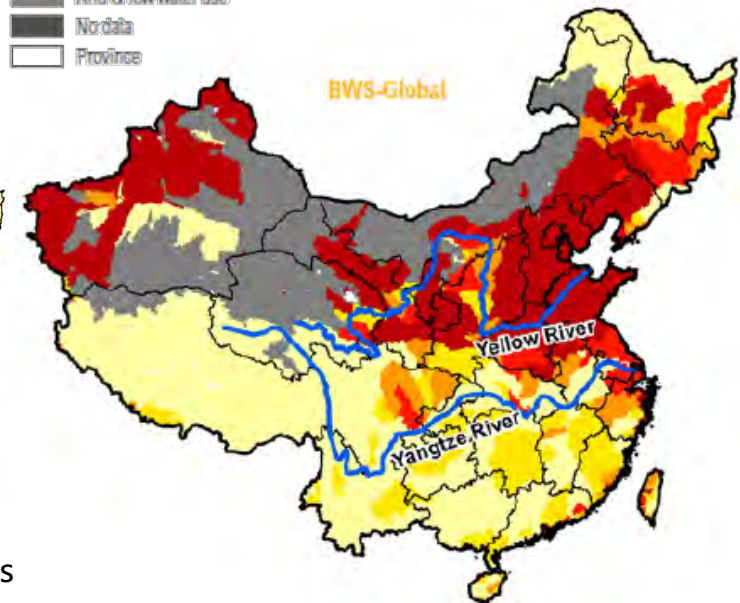
Consumptive Use Intensity (2010)



Available Blue Water Intensity (2010)



Freshwater Baseline Water Stress China (2010)



## 22 Street Urbanism

- Street vibrancy and its impact factors: A case study in Chengdu
- Large-scale Evaluation for Street Walkability
- A special issue on street walkability in Shanghai Planning Review



**现实的变化、未来的城市**

信息技术对城市的运行方式产生了巨大的影响，改变了我们的出行、就业、交通和休闲方式，个人的时间碎片化，电子商务及物流的崛起、家庭娱乐设备增多，也产生了诸如网约车、上门服务、共享单车等手机应用程序(APP)。当今的城市还有哪些变化，未来的理想城市需要什么，还没有系统的探讨。

本调查包含四个开放问题，旨在汇集大家对所熟悉城市的认识和对本家城市的判断，最终形成建设性报道，以对当代的城市设计模式进行反思和探讨。

本问卷的填写不需要任何规划设计背景知识，感谢对我们居住的城市的支持！

Q1: 观察城市的变化 (各个方面)

Q2: 未来的城市模式 (各个方面)

图2 “现实的变化、未来的城市”在线调查问卷

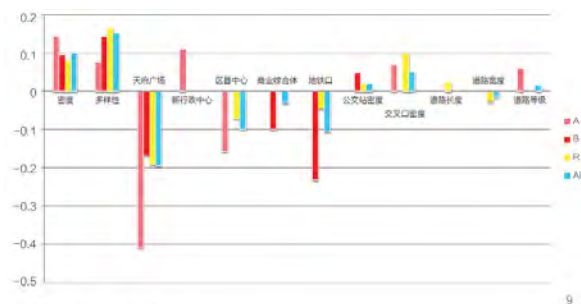
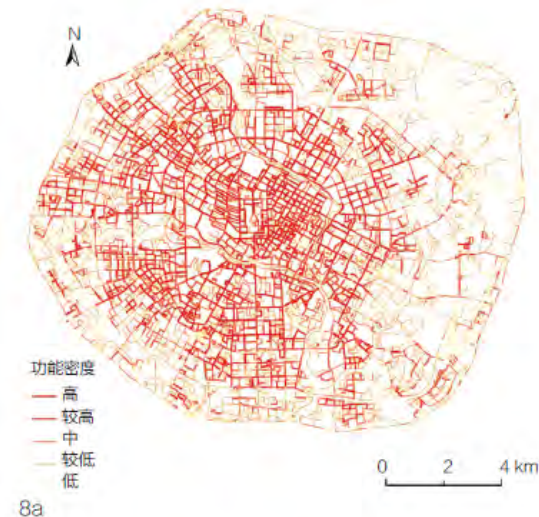
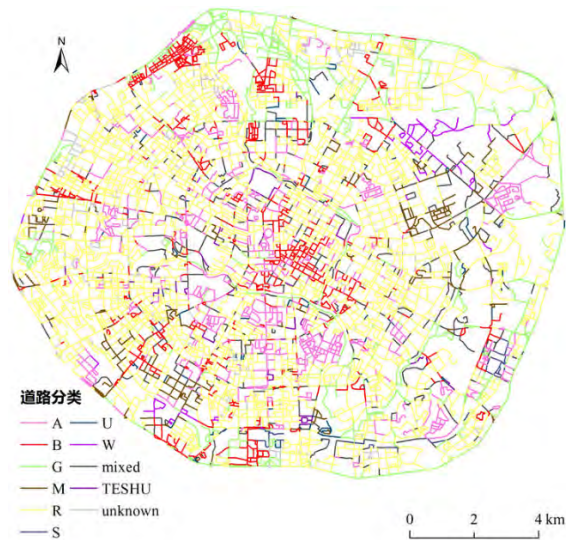


图3 调查结果示意 (现实城市部分)



图4 调查结果示意 (未来城市部分)

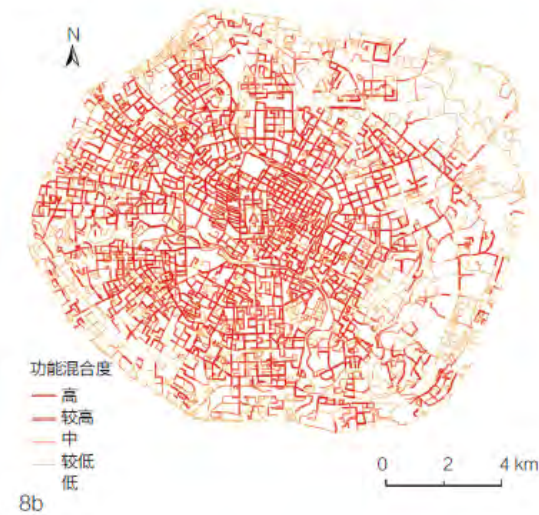
## 22 Street Urbanism : Street vibrancy and its impact factors: A case study in Chengdu



8 街道功能密度与功能混合度  
a 功能密度 b 功能混合度  
9 活力构成因素回归分析

表2 三环内不同性质街道数量与评价长度

三环内街道性质	A	B	G	M	R	S	U	W	TESHU	mixed	unknown
总条数 (条)	1045	1067	795	337	4921	59	105	68	62	433	534
总长度 (km)	174.3	147.6	159.4	64.4	903.6	11.1	18.7	19.2	12.6	107.0	60.7
平均长度 (m)	165.8	138.3	200.4	191.2	183.6	188.5	177.6	282.5	204.0	247.0	113.7



# 22 Street Urbanism : Large-scale Evaluation for Street Walkability

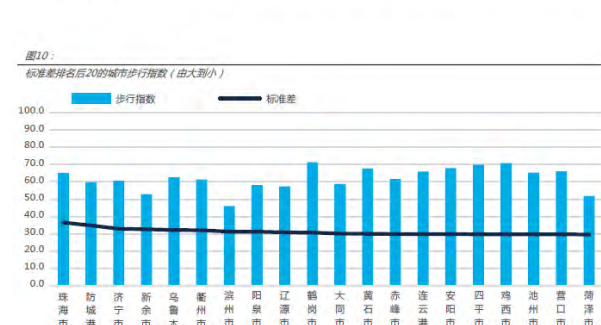
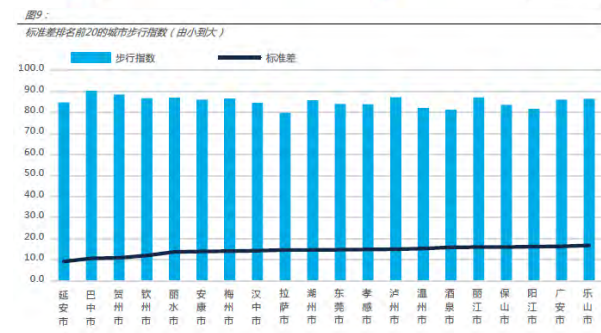
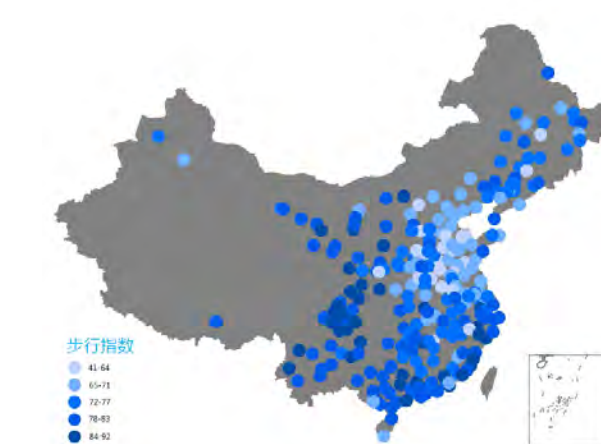
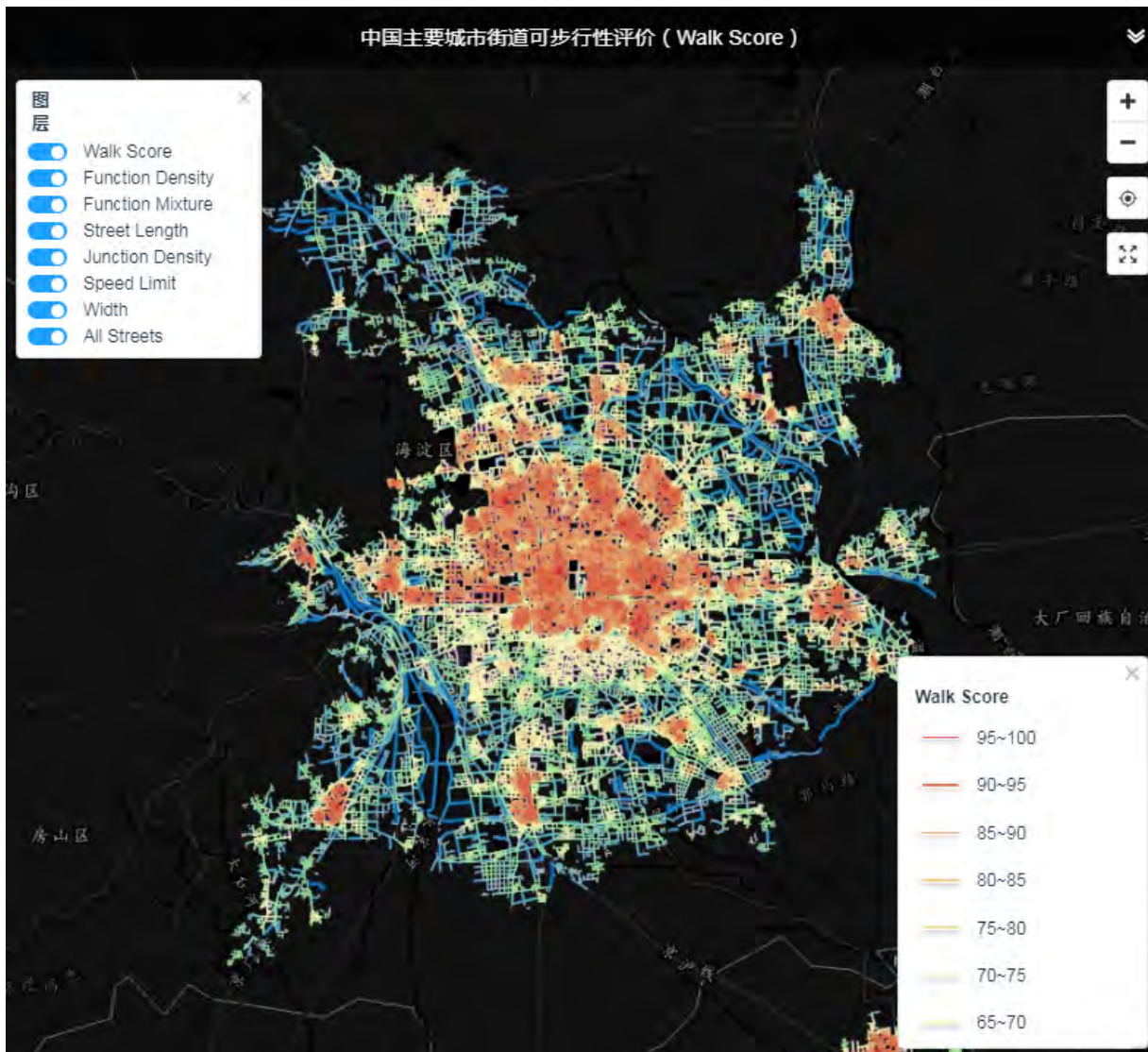


图13: 深圳市街道步行指数地图



图11: 不同规模的陆路式蔓延城市及其边界形态



图7: 行人步行范围的城市

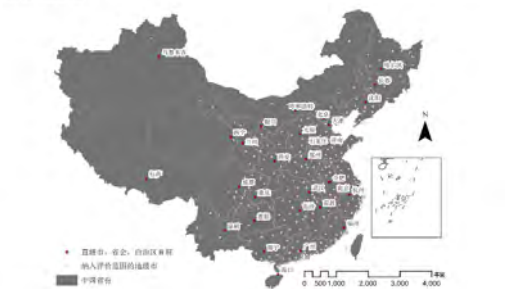


图3: 步行友好城市



5 中国城市步行友好性评价——基于街道功能与步行环境的研究

# 22 Street Urbanism : A special issue on street walkability in Shanghai Planning Review

## 卷首语

本期特邀组稿人: 龙瀛 陈泳

龙瀛 清华大学建筑学院 副教授  
陈泳 同济大学建筑与城市规划学院 教授



街道是城市交通的载体和城市公共空间的重要构成要素, 邻里单位、城市意象和新城市主义等经典城市理论都对街道作了不同的诠释。2016年2月出台的《中共中央国务院关于进一步加强城市规划建设管理工作的若干意见》中的第16条“优化街区路网结构”更是提出对街道和街区要特别关注。在国外, 近年来在经济转型、精明增长等背景下, 全球许多城市的街道得以复兴, 街道公共空间的功能被人们认知, 全球多个城市也都提出街道设计手册/指南/导则, 并开展街道复兴的实践。为此提升街道空间环境品质是当前城市建设的重要内容, 对街道进行深入研究具有深刻意义。

本期主题旨在从“街道可步行性 (street walkability)”这一维度对街道空间进行多方位的研究。步行活动既是交通方式的一种, 也是生活方式的一部分, 对其载体——街道的可步行性 (亦为街道功能的重要组成部分) 进行针对现状的客观审视和面向未来的品质提升具有理论、方法和实践等多个层面的意义, 这也与健康城市理念提倡身体活动 (physical activity) 相契合。2016年, 上海市规划和国土资源管理局组织编制的《上海市街道设计导则》, 对街道可步行性进行了有益的探索和研究。

组织本期主题主要有三方面原因: 一、中国发展较快的大城市, 已经进入了需要重新审视街道可步行性的阶段, 这些城市已开展了如步道系统规划、绿地系统建设等实践; 二、当下的中国城市街道空间发生了巨大变化, 受商业综合体、电子商务和机动交通等多方面影响, 城市街道空间的活力受到多方面因素剥夺, 预示着以往针对街道可步行性研究的适用性需要格外重视; 三、街道可步行性研究的数据环境和技术手段, 因为信息通信技术的影响, 已经发生了较大的变化, 研究能力也得到较大的提升。

本期主题是国内街道可步行性研究一次系统性的探索, 从多个维度, 如可步行性的国际经验借鉴、客观测度、外在影响和规划设计实践等方面, 介绍国内外针对街道可步行性的最新研究进展, 作者来自国内知名高校及规划设计机构, 研究方法涵盖现场调查、文献调研、空间分析和大数据分析等。希望这些研究能够得到读者共鸣, 为读者提供研究素材和启示。

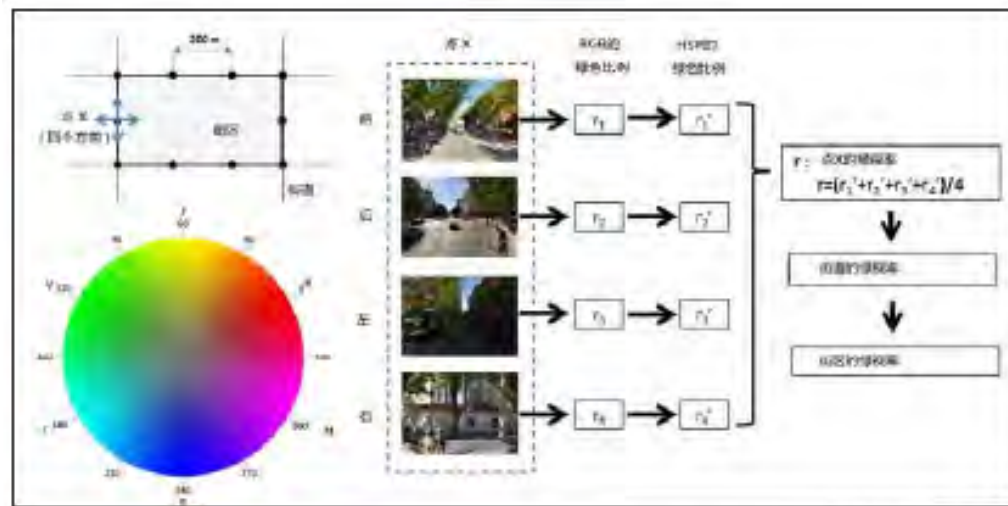


图3 绿视率计算框架  
资料来源: 作者自绘。

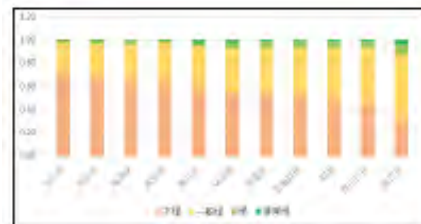


图6 不同等级绿化的街道的区县占比  
资料来源: 作者自绘。

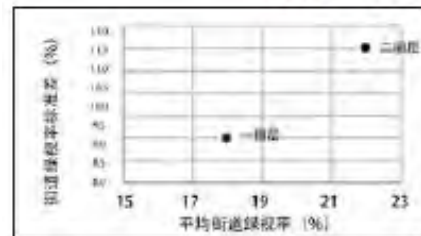


图7 一、二圈层平均绿视率和标准差分布  
资料来源: 作者自绘。

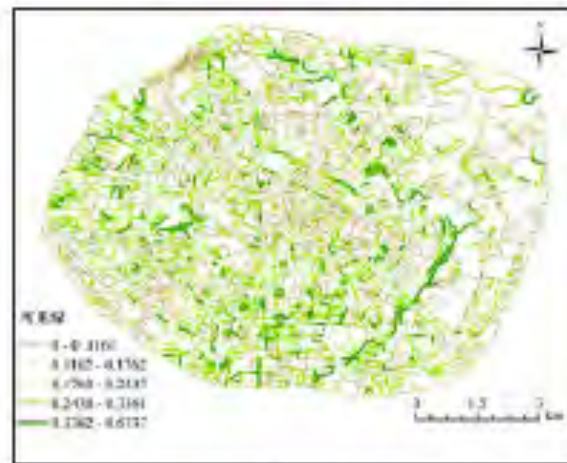


图8 街道平均绿视率空间分布  
资料来源: 作者自绘。

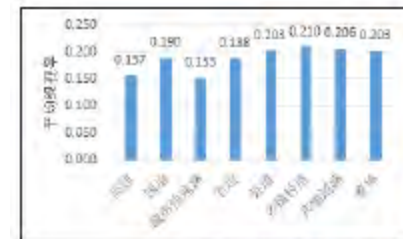


图9 不同等级街道平均绿视率  
资料来源: 作者自绘。

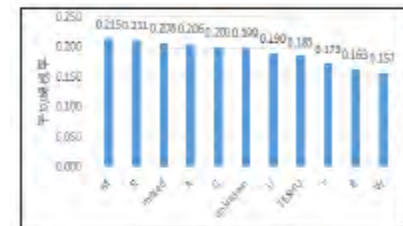


图10 不同性质的街道平均绿视率  
注: A: 公共管理与公共服务用地, B: 商业服务业设施用地, M: 工业用地, R: 居住用地, W: 物流仓储用地, S: 道路与交通设施用地, U: 公用设施用地, G: 绿地与广场用地, mixed: 混合型, TESHU: 其他用地, unknown: 未知。  
资料来源: 作者自绘。



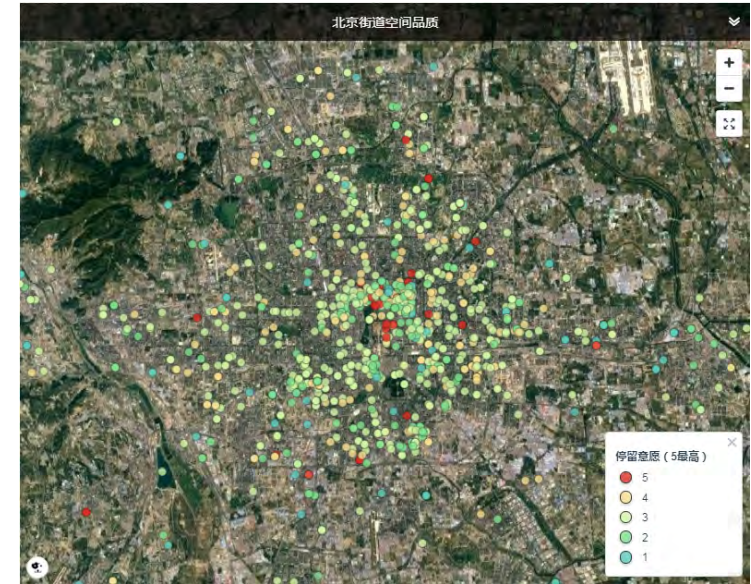
图11 回归结果——标准系数  
注: A: 公共管理与公共服务用地, B: 商业服务业设施用地, R: 居住用地。  
资料来源: 作者自绘。

## 23 Human scale urban form

- CFP: Special issue of Landscape and Urban Planning
- Human-Scale Urban Form: Measurements, Performances, and its Urban Planning & Design Interventions
- Beijing vs Shanghai
- Sensing street greenery with street view pictures
- The quality of street space
- A special issue on quality and vitality of urban space in the new data environment in Planners
- A special issue on quality of public space in the new data environment in Urban Architecture
- Urban Smellscape



## 23 Human scale urban form



# 23 Human scale urban form: Beijing vs Shanghai



图1 主观评分样片

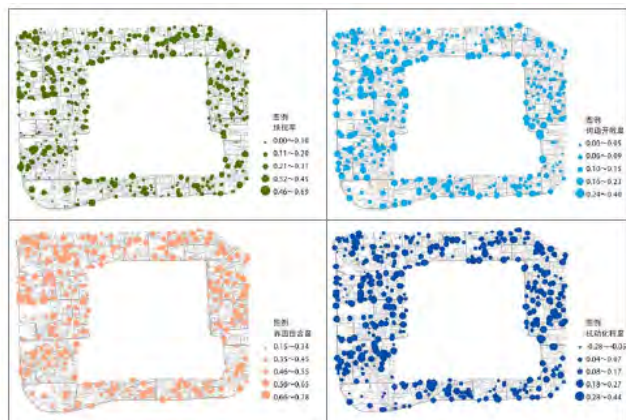


图2 北京街道样本的空间构成

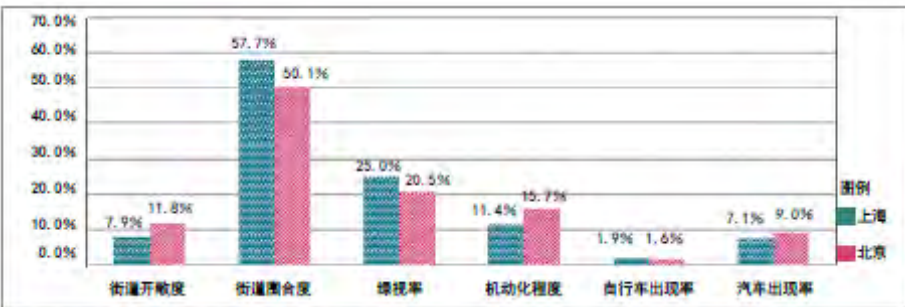


图6 北京、上海的街道要素客观构成对比

表3 北京、上海街道主观评价得分一览

	围合性 (0, 1)	人性化尺度 (0, 1)	通透性 (0, 1)	整洁度 (0, 1)	意象化 (0, 1)	总分 (0, 5)
北京平均值	0.71	0.59	0.49	0.67	0.20	2.67
北京标准值	0.45	0.49	0.50	0.47	0.40	1.09
上海平均值	0.78	0.67	0.61	0.84	0.32	3.22
上海标准值	0.41	0.47	0.49	0.37	0.47	1.18

表2 上海街道主观评价统计

总分	1	2	3	4	5
该分值的街道数量占街道总量的比例/%	8.0	20.2	30.0	25.60	16.20
分项指标得分在总分中的比例/%	35.0	42.6	88.7	93.75	100.00
围合度	7.5	35.6	66.0	93.00	100.00
人性化尺度	0	52.5	54.7	69.50	100.00
通透性	62.5	69.3	78.7	97.70	100.00
整洁度	0	2.0	13.3	46.90	100.00
意象化					

表1 北京街道主观评价统计

总分	0	1	2	3	4	5
该分值的街道数量占街道总量的比例/%	0.6	12.0	35.0	31.8	13.8	6.8
分项指标得分在总分中的比例/%	0	16.7	62.9	88.1	91.3	100.0
围合度	0	6.7	46.3	72.3	91.3	100.0
人性化尺度	0	18.3	37.1	55.3	72.5	100.0
通透性	0	58.3	53.7	68.6	92.8	100.0
整洁度	0	0	1.7	18.9	53.6	100.0
意象化						



图3 北京0~5分典型街道

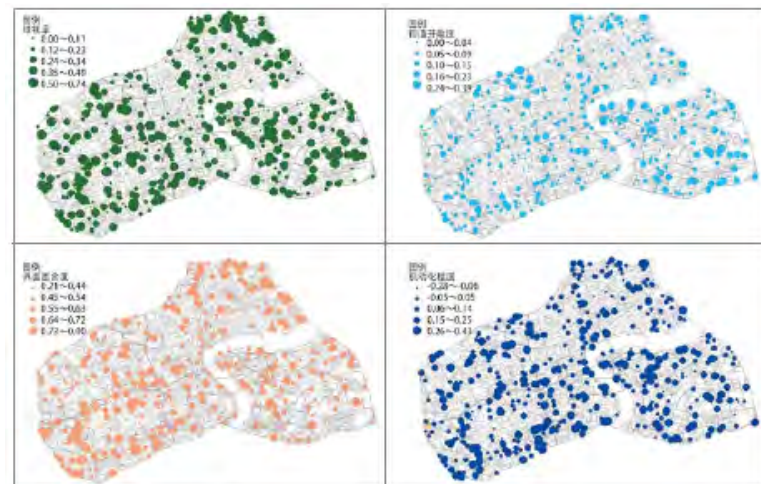


图4 上海街道样本的空间构成



图5 上海1~5分典型街道

# 23 Human scale urban form: Sensing street greenery with street view pictures



Fig 2. Roads/streets of the study area in Beijing in 2014.  
doi:10.1371/journal.pone.0171110.g002

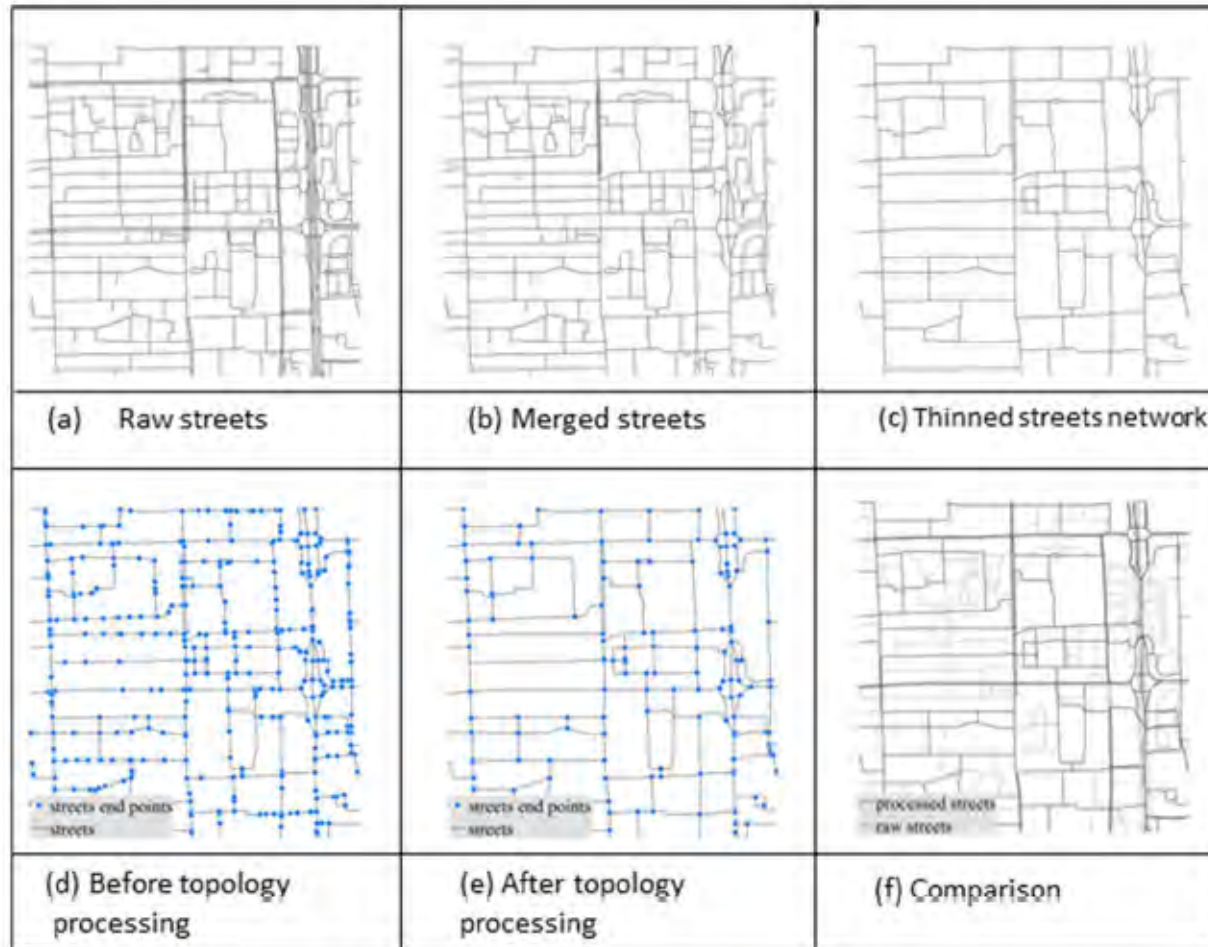


Fig 4. Process for simplifying street segments.

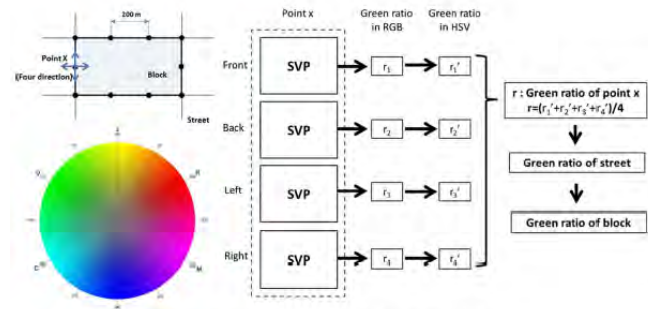


Fig 3. Framework for analyzing street greenery in a typical area (SVP = street view picture).  
doi:10.1371/journal.pone.0171110.g003

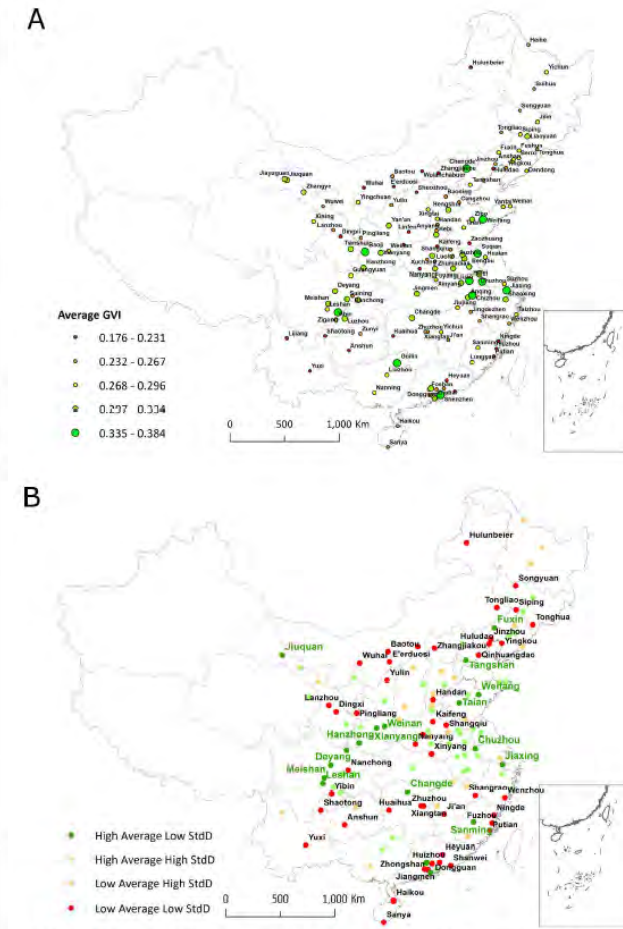


Fig 5. Spatial distribution of the average street GVI of each city (a) and the four types of cities classified (b).

## 23 Human scale urban form



## 23 Human scale urban form: 城市形态→空间品质→城市活力

### 形态

基于街景图片和人工智能的图像分割与要素识别

基于三维建筑物和空间分析的街道空间测度

+

### 品质

基于审计平台和眼动仪的小规模人工标注

基于小样本标注和人工智能的大规模评价

→

### 活力

基于公共空间分布和GIS的城市活力评价

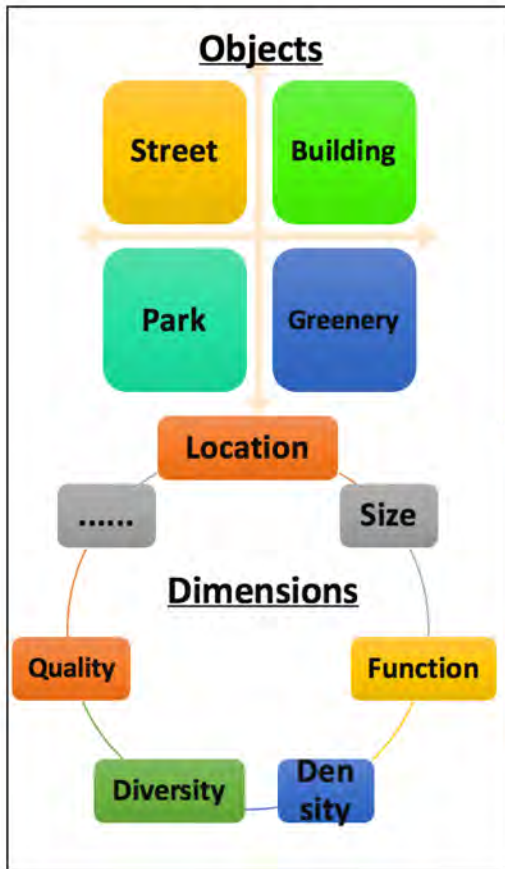
基于大数据和空间分析的城市活力评价

### 研究问题

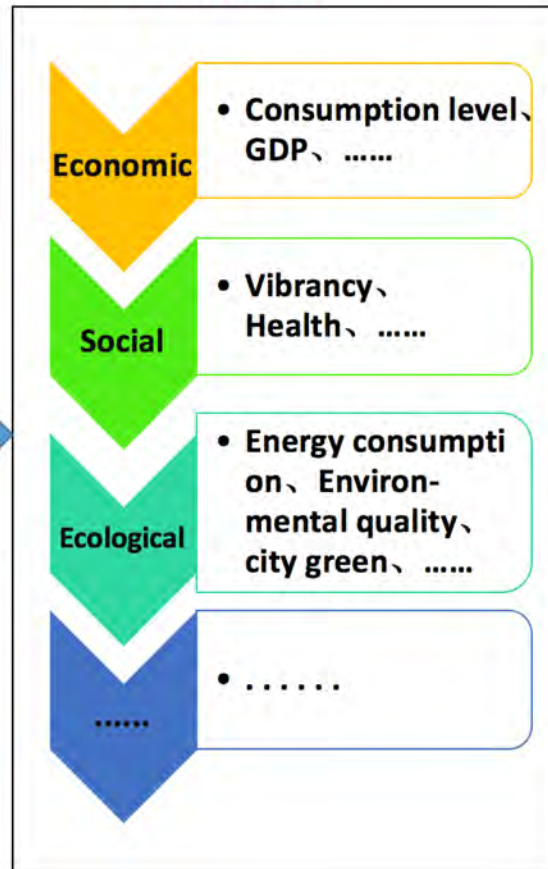
- 城市形态如何影响城市空间品质感知
- 城市形态与品质如何影响城市活力

## 23 Human scale urban form

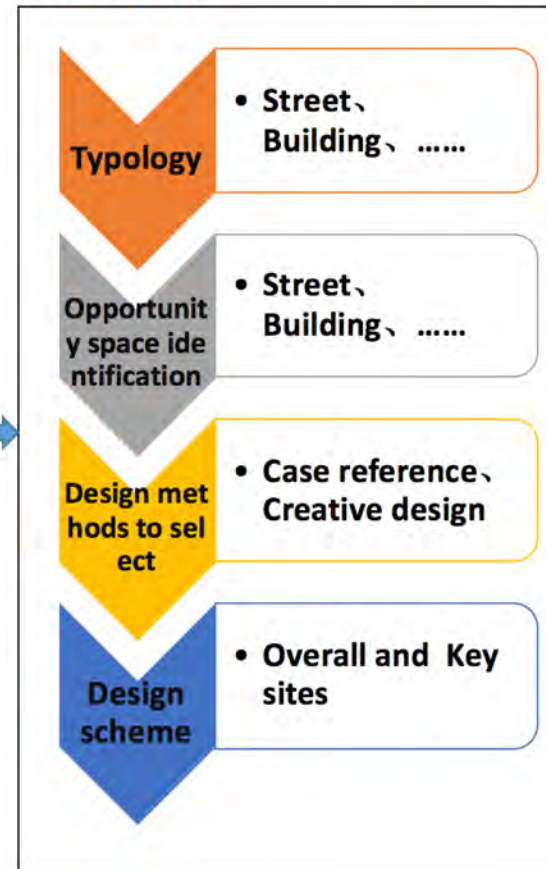
### Measurement



### Performance evaluation



### Spatial intervention (design)



- A scale gap between our quantitatively understanding our world
  - DNA→Cell→Organ→Human body→Building → ?
  - →Parcel/block→City→Country ...
- The “human-scale” means a fine scale characterized by human body and its surroundings, i.e., a scale can be directly visible, touchable, and appreciable in a person’s daily lives.

## 23 Human scale urban form: Quality of street space evaluation using street view pictures



seg\_14E.jpg



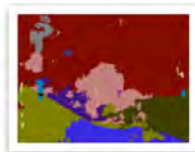
seg\_14N.jpg



seg\_14S.jpg



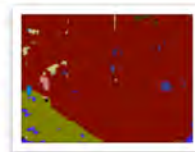
seg\_14W.jpg



seg\_15E.jpg



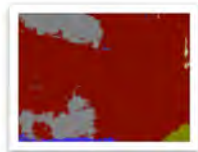
seg\_15N.jpg



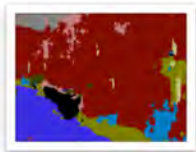
seg\_15S.jpg



C.



seg\_16E.jpg



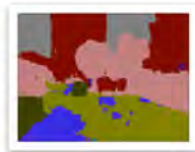
seg\_16N.jpg



seg\_16S.jpg



seg\_16W.jpg



seg\_17E.jpg



seg\_17S.jpg



seg\_17W.jpg



D.



seg\_18N.jpg



seg\_18S.jpg



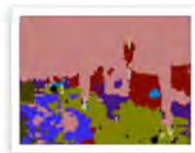
seg\_18W.jpg



seg\_19E.jpg



seg\_19N.jpg



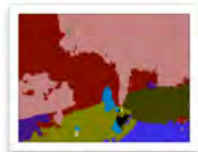
seg\_19S.jpg



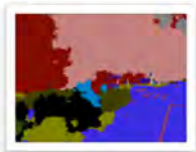
seg\_19W.jpg



E.



seg\_20N.jpg



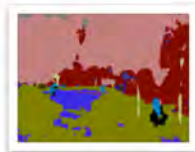
seg\_20S.jpg



seg\_20W.jpg



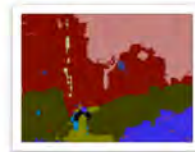
seg\_21E.jpg



seg\_21N.jpg



seg\_21S.jpg

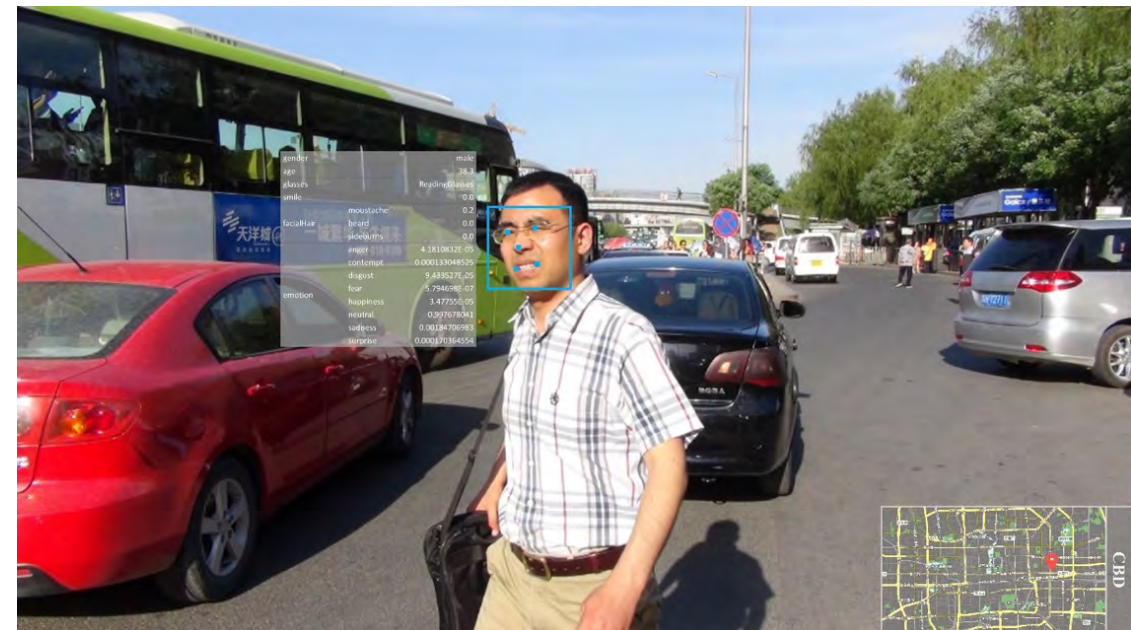


seg\_21W.jpg



F.

# 23 Human scale urban form: Monitoring local scale activities using ubiquitous sensors



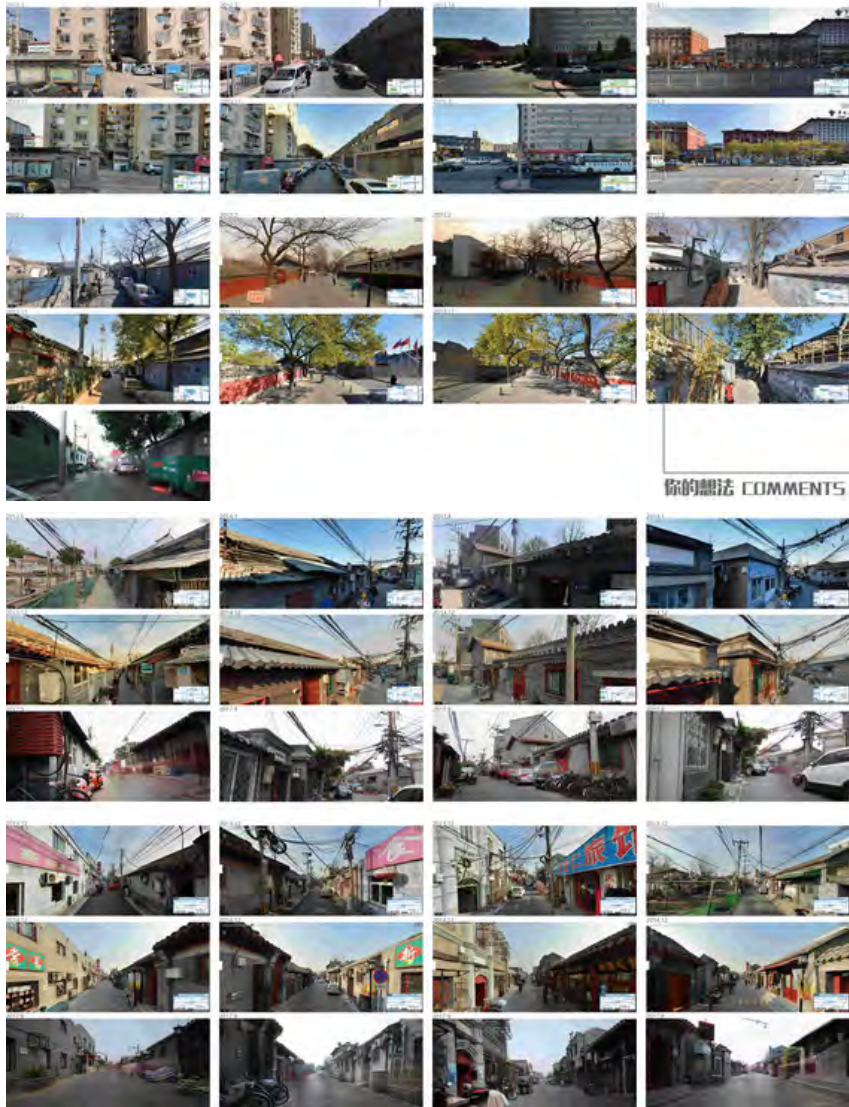


# 24 Ten Seconds

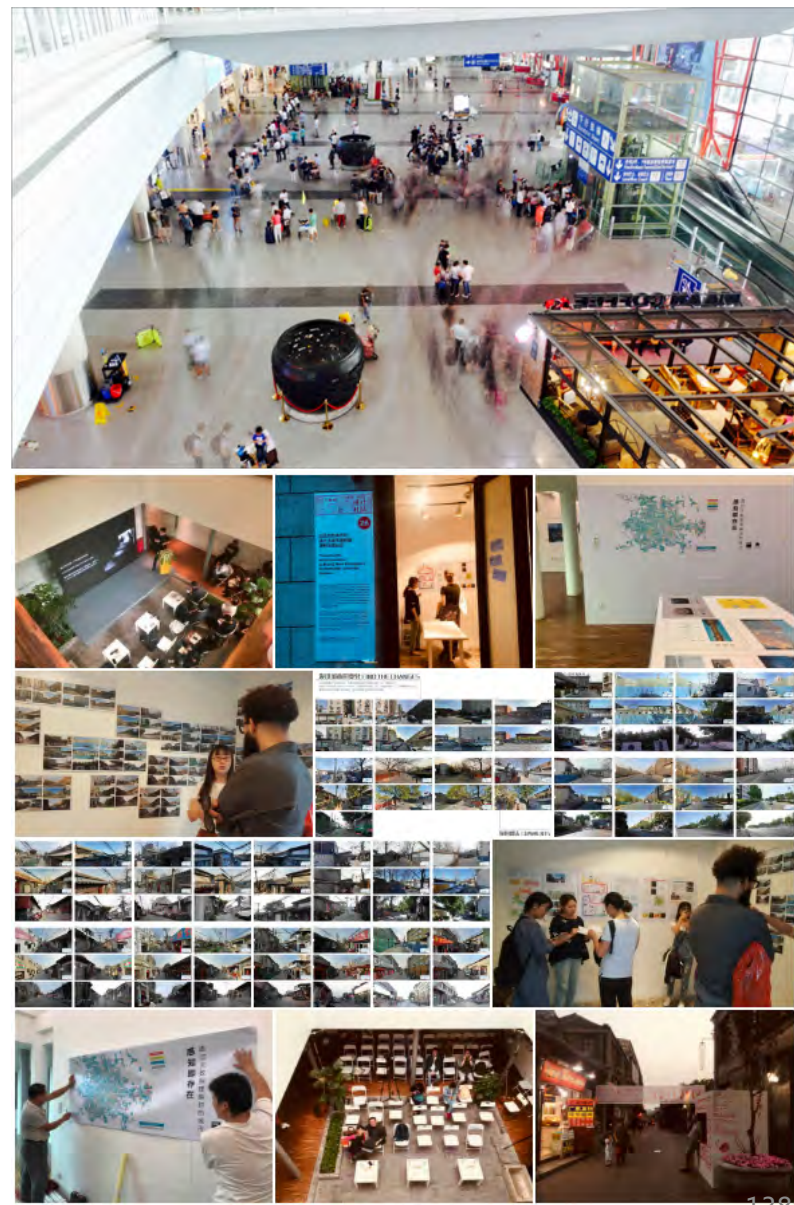
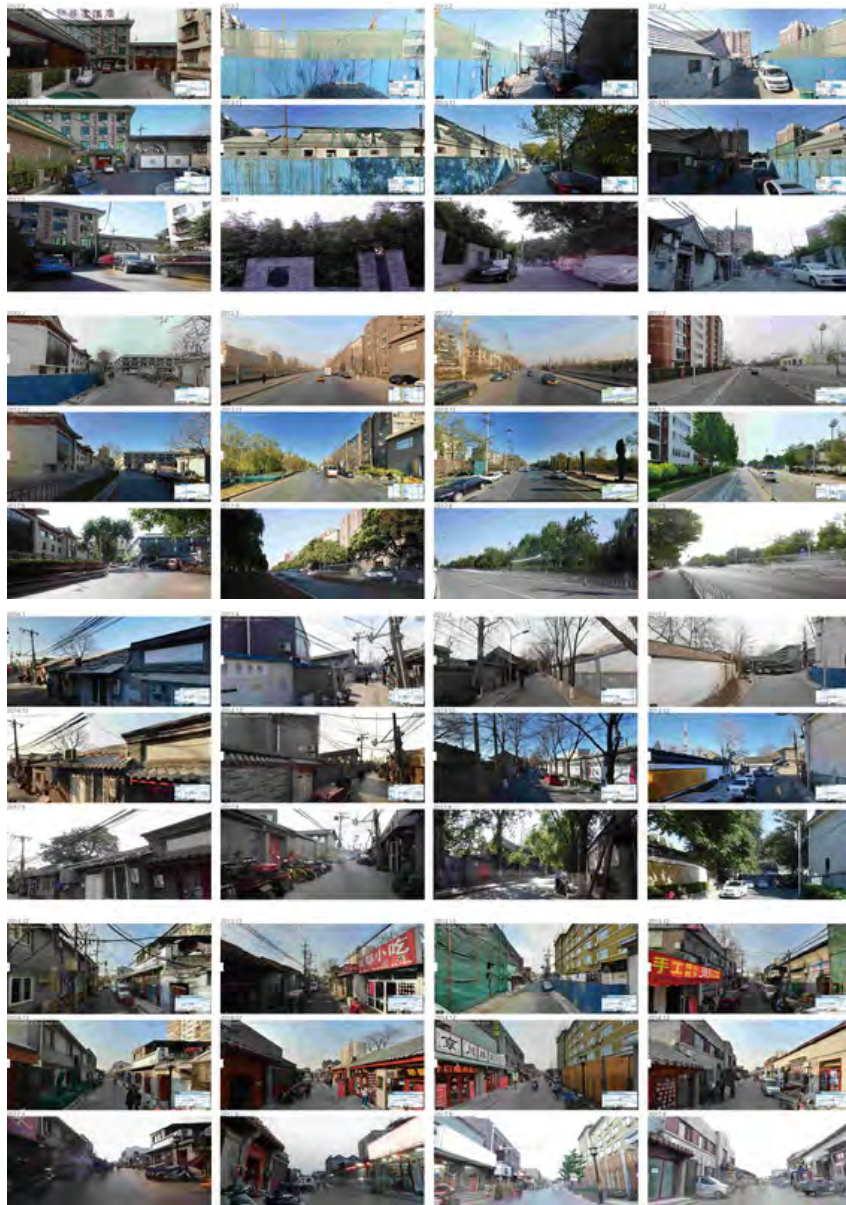
没有多余内容了，都是图片

### 发现城市的变化 FIND THE CHANGES

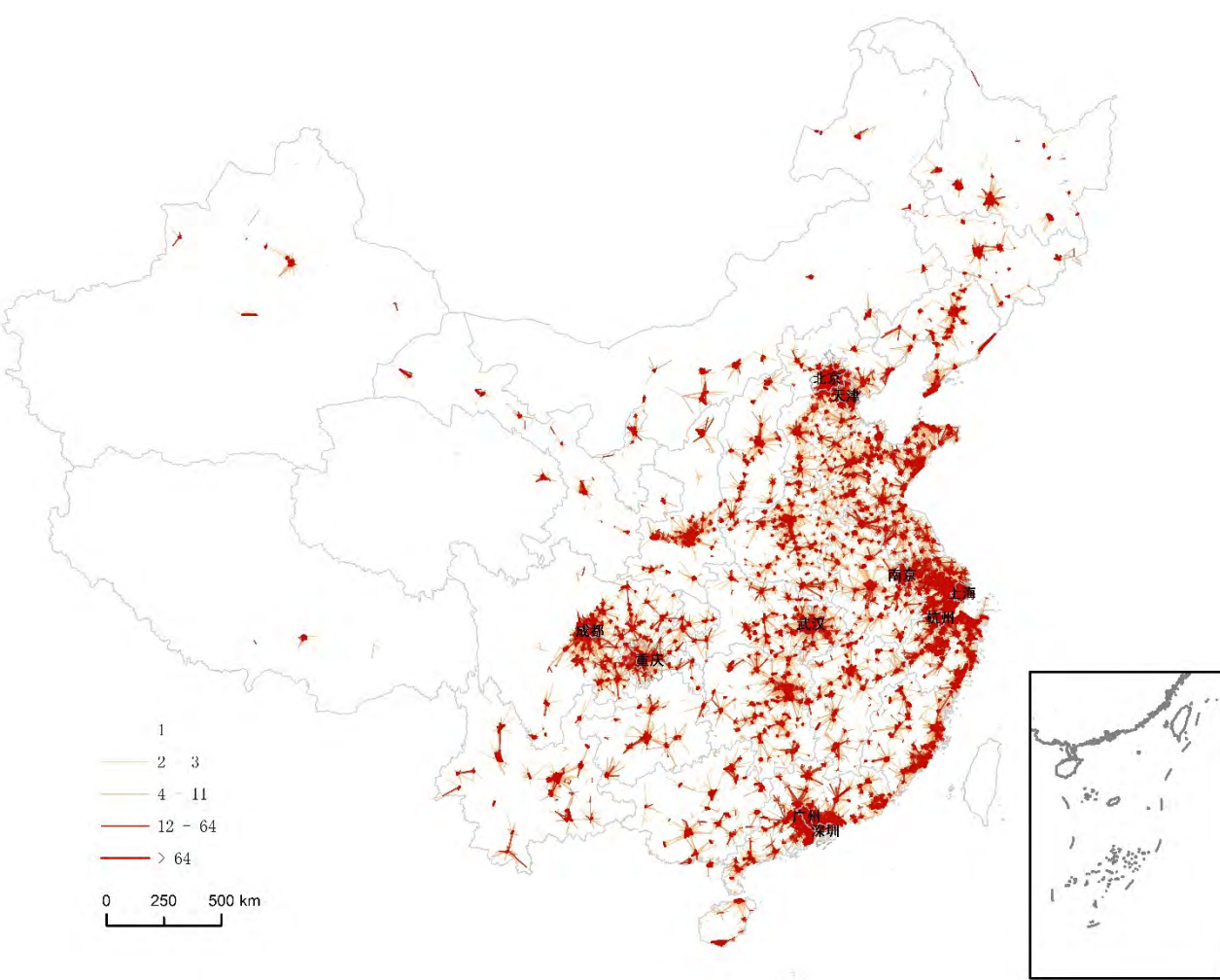
通过观察城市变化和对比，发现城市变化的痕迹。在同一个地点，用不同的视角和不同的时间，记录城市的变化。在时间的流逝中，城市的面貌和人们的生活也在不断地改变。



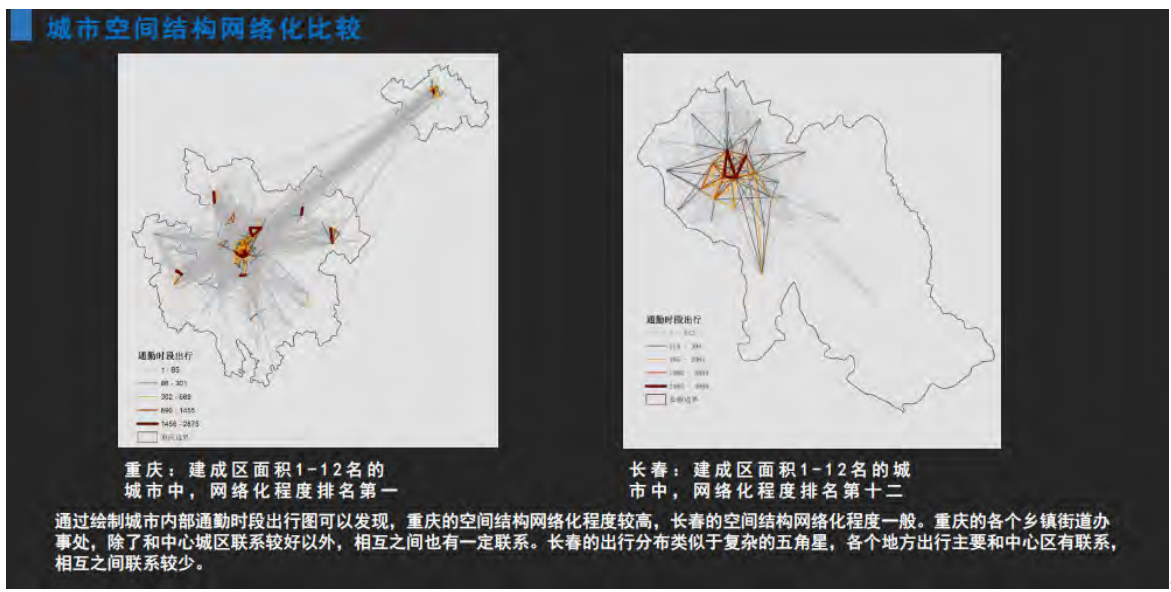
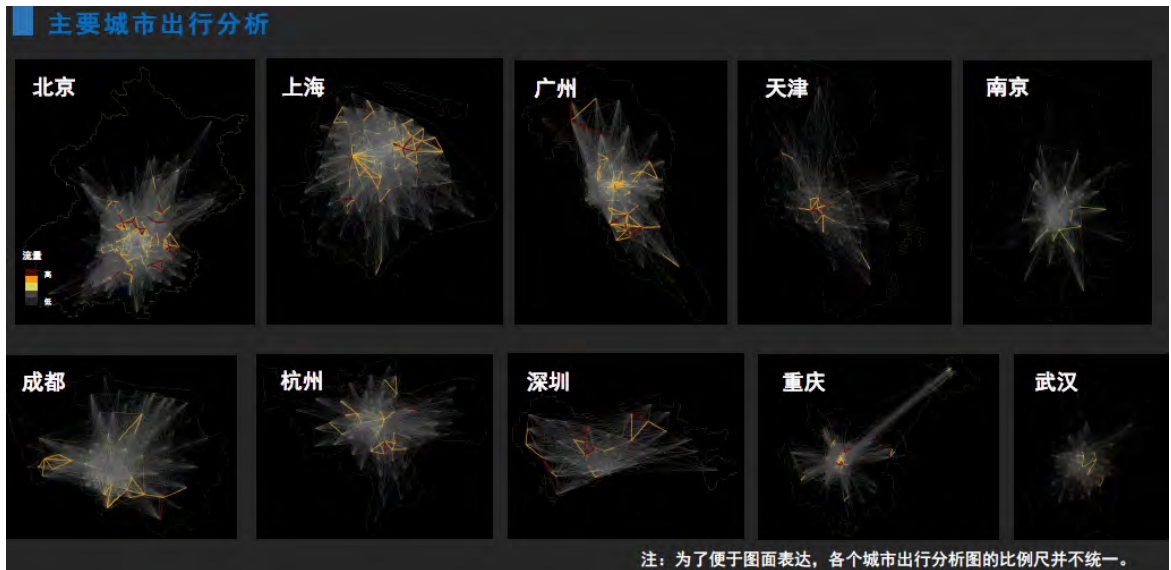
你的想法 COMMENTS



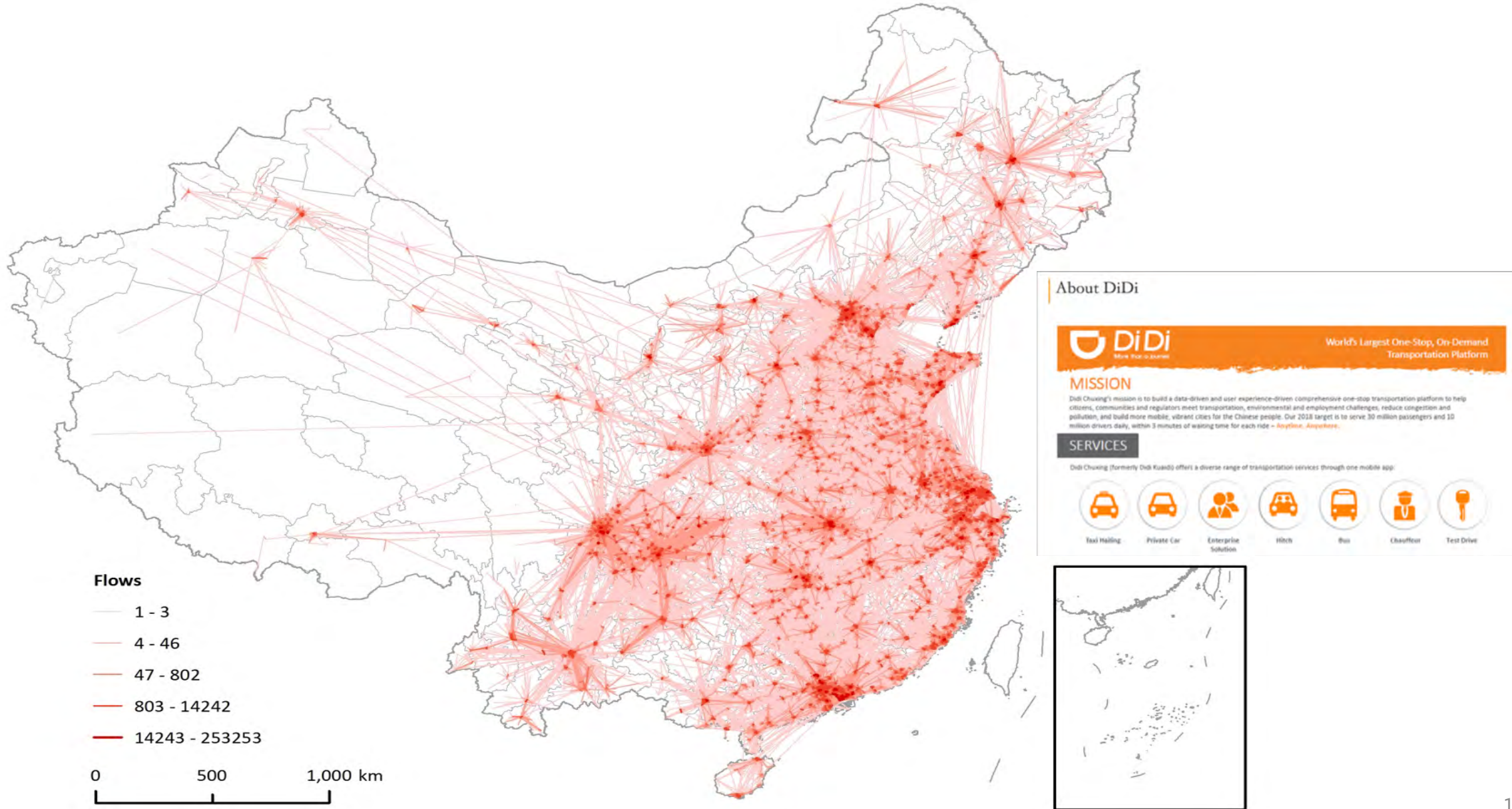
# 25 Urban China using Didi Records



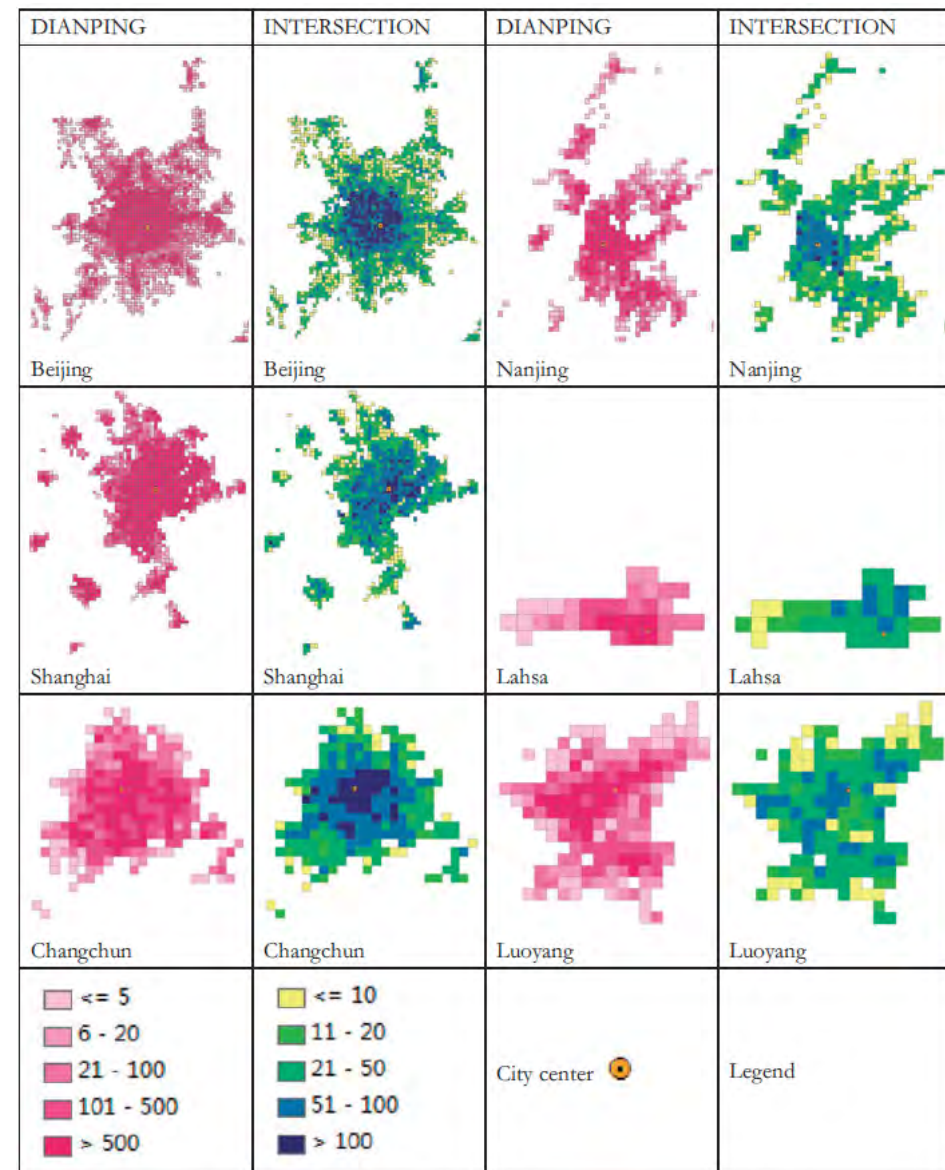
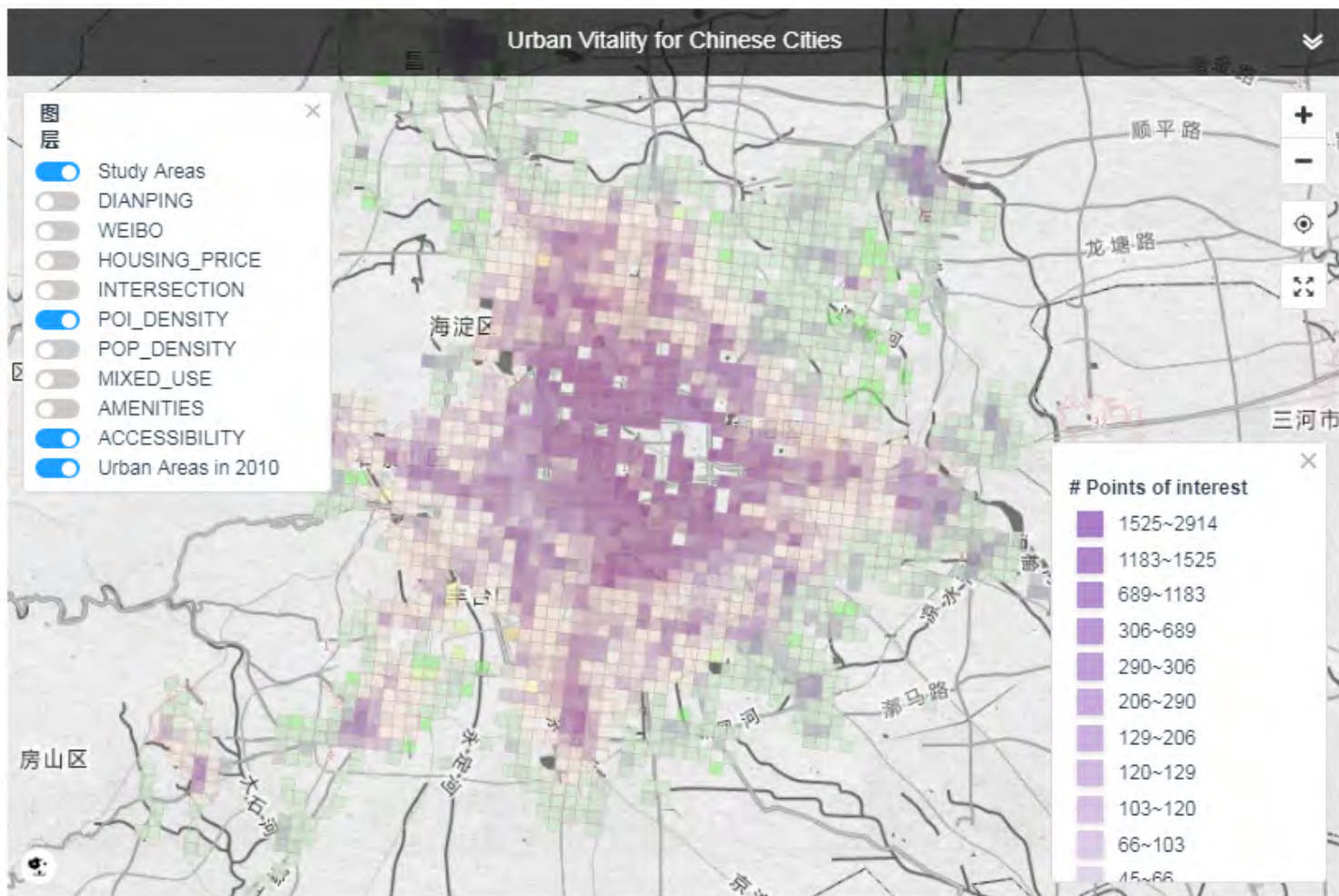
Understanding Urbanizing China with Massive Didi Records



# 25 Urban China using Didi Records: Understanding Chinese city system using massive Didi records



## 26 Urban Vitality and Urban Design



Showing economic vitality (DIANPING) and intersection density (INTERSECTION) for typical Chinese cities.

27 Wilderness

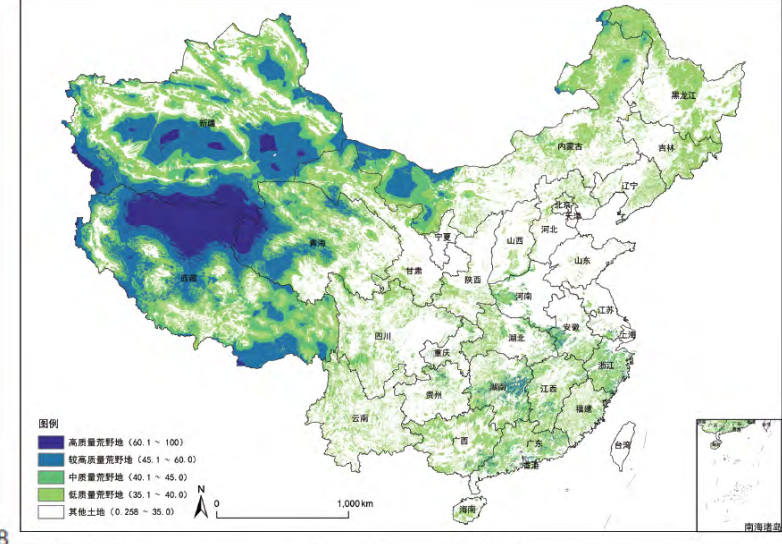
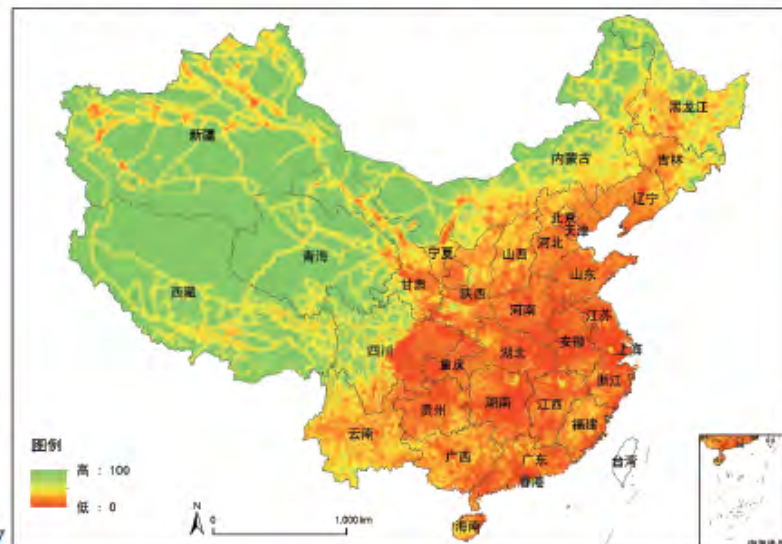
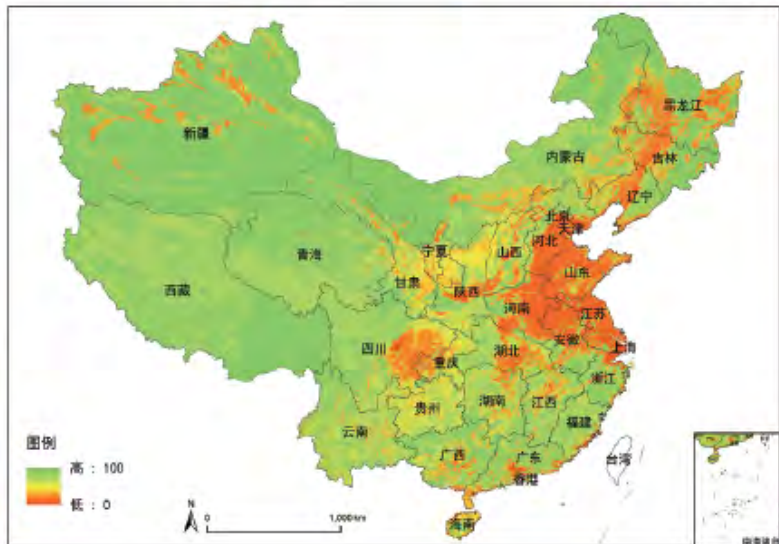
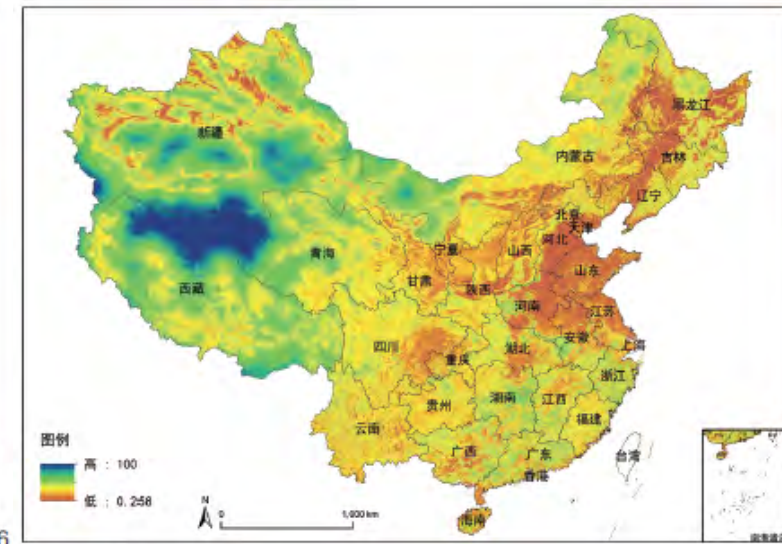
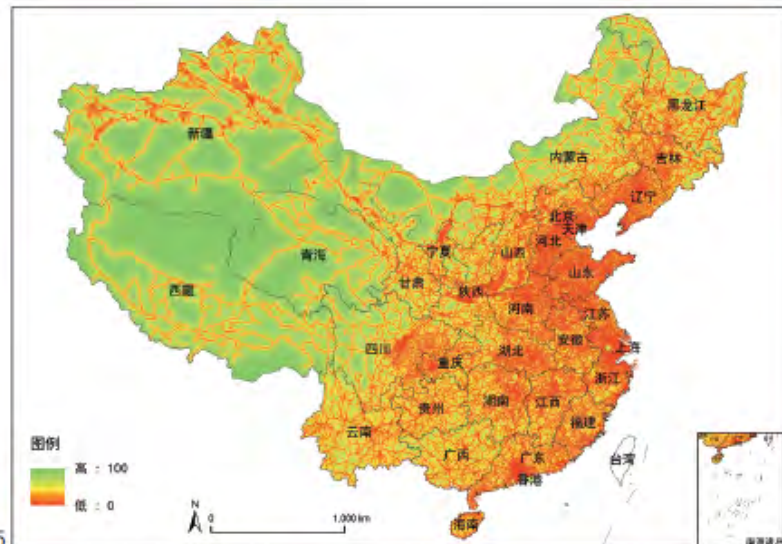
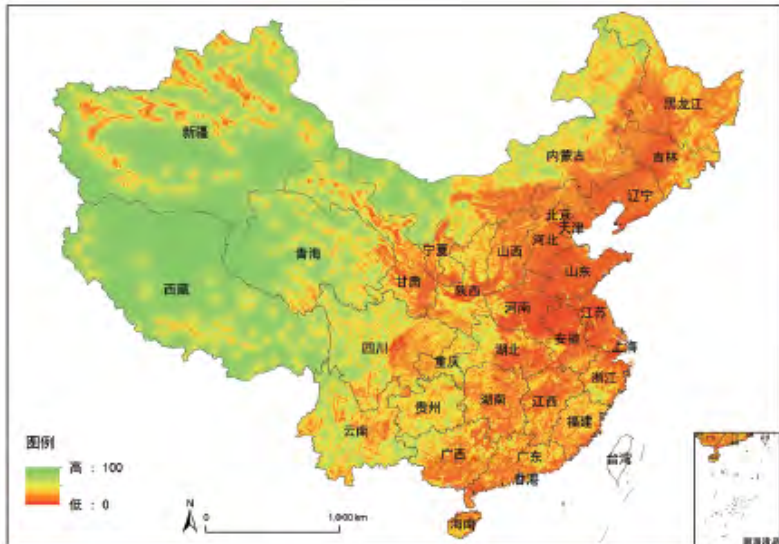


图5 距聚居点遥远度评价图  
图6 距道路遥远度评价图  
图7 生物物理自然度评价图  
图8 外观自然度评价图

图9 中国荒野度指数(WQI)地图  
图10 中国荒野地图

# 28 Polycentric China

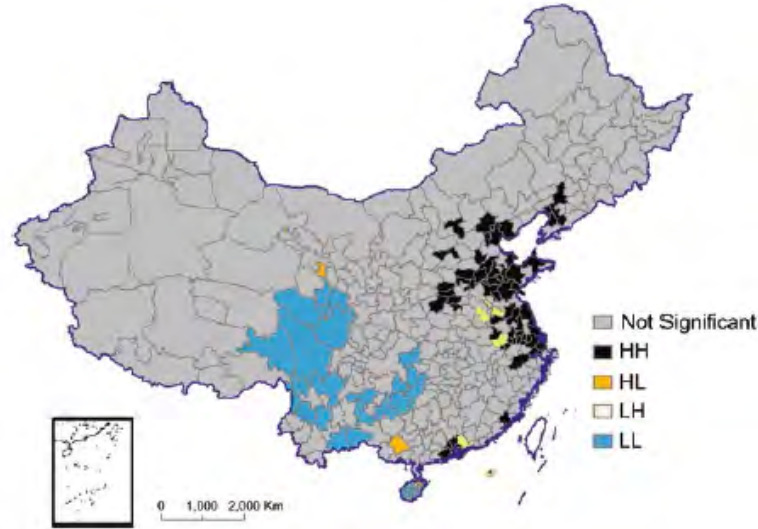
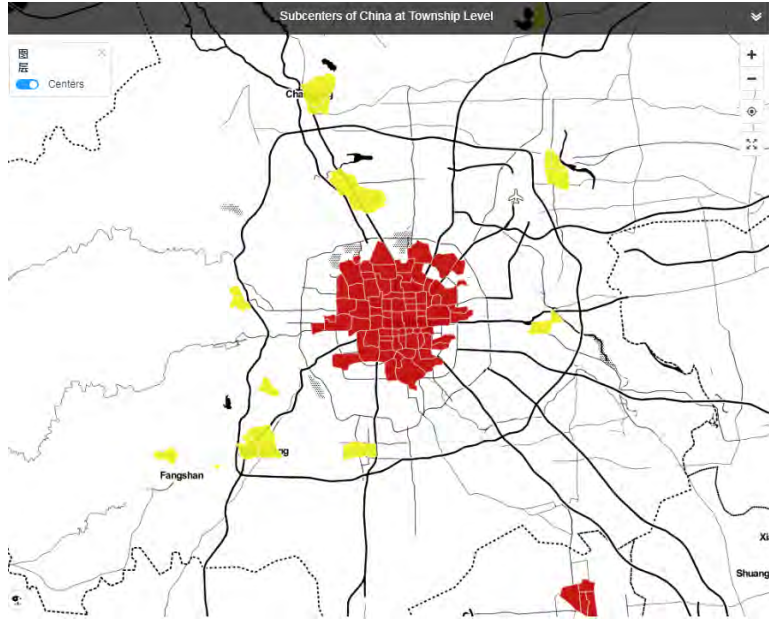


Fig. 8.15 Cold-hot agglomeration pattern of scale of nationwide urban centers

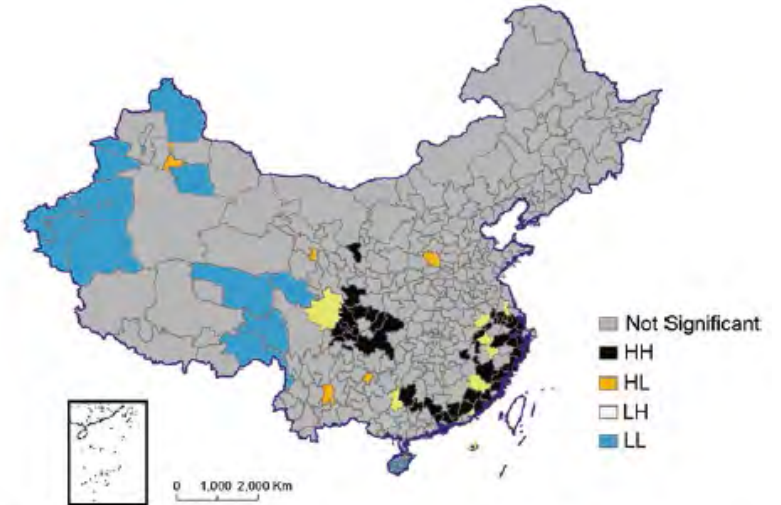


Fig. 8.17 Cold-hot agglomeration pattern of function of nationwide urban centers

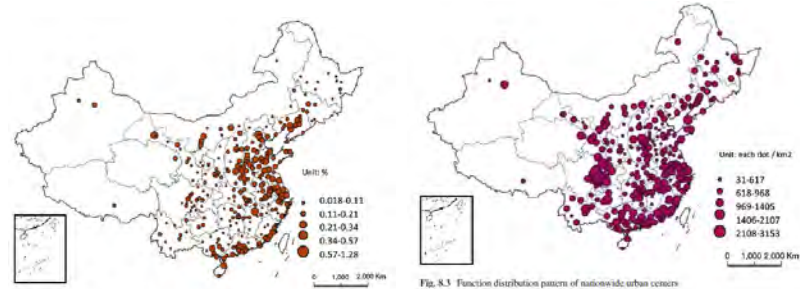


Fig. 8.1 Scale distribution pattern of nationwide urban centers

Fig. 8.3 Function distribution pattern of nationwide urban centers

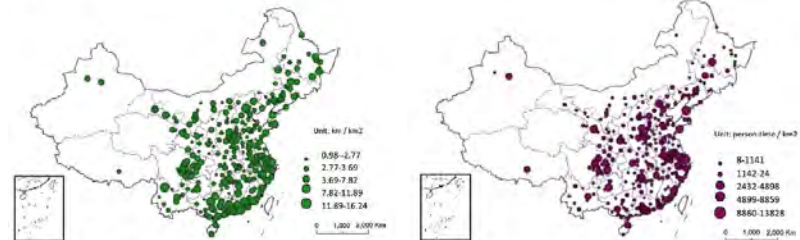


Fig. 8.2 Morphology distribution pattern of nationwide urban centers

Fig. 8.4 Vitality distribution diagram of nationwide urban centers

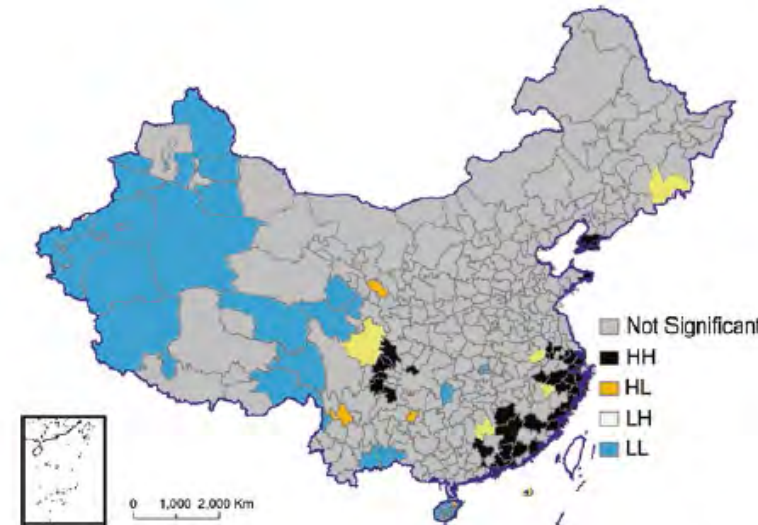


Fig. 8.16 Cold-hot agglomeration pattern of morphology of nationwide urban centers

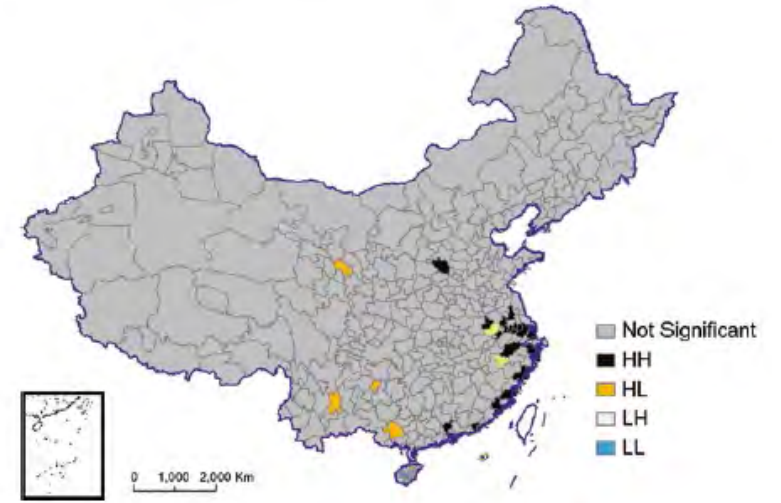


Fig. 8.18 Cold-hot agglomeration pattern of vitality of nationwide urban centers

# 29 Picture Urbanism

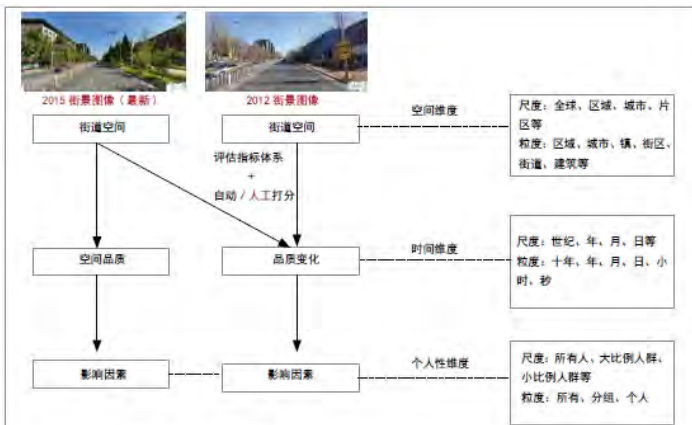


图1 街道空间品质测度、变化识别和影响因素分析的框架  
注：红色箱体为本文研究所对应的具体特点。

大类	子类	评分说明
建筑部分	立面色彩变化	1. 发生色彩更新则评分为1, 无变化则评分为0 2. 立面清理、材质更改等则评分为1, 无变化则评分为0 3. 建筑部分美化行为效果好则评分为2, 效果一般则评分为1, 没有效果或者负面效果则评分为0
	立面清理、材质更改及其他	
人行道部分	停车空间整治	1. 划分停车空间或停车空间美化则评分为1, 无变化则评分为0 2. 人行道绿化增加或改善则评分为1, 无变化则评分为0 3. 街道家具增设或优化则评分为1, 无变化则评分为0 4. 人行道部分美化行为效果好则评分为2, 效果一般则评分为1, 没有效果或者负面效果则评分为0
	绿化改善	
车行道部分	车行道绿化	1. 发生车行道精细化划分则评分为1, 无变化则评分为0 2. 车行道绿化改善则评分为1, 无变化则评分为0 3. 车行道部分美化行为效果好则评分为2, 效果一般则评分为1, 没有效果或者负面效果则评分为0
	道路部分改善是否有效	
底商部分	店面招牌变化	1. 发生店面招牌变化或改善则评分为1, 无变化则评分为0 2. 立面通透性增强、装饰美化则评分为1, 无变化则评分为0 3. 底商部分美化行为效果好则评分为2, 效果一般则评分为1, 没有效果或者负面效果则评分为0
	店面立面通透性、装饰变化	
围墙部分	通透性变化	1. 围墙通透性增强则评分为1, 无变化则评分为0 2. 围墙绿化及其他设施改善则评分为1, 无变化则评分为0 3. 围墙部分美化行为效果好则评分为2, 效果一般则评分为1, 没有效果或者负面效果则评分为0
	周边绿化与设施建设	

图2 街道空间品质变化评价体系及具体评分说明

注：人工识别时应排除因季节变化等干扰因素造成的绿化变化及天气影响，针对有围墙的小区对围墙打分，针对有底商的小区对底商打分，道路两侧居住项目底商围墙部分情况不同的则分别打分。

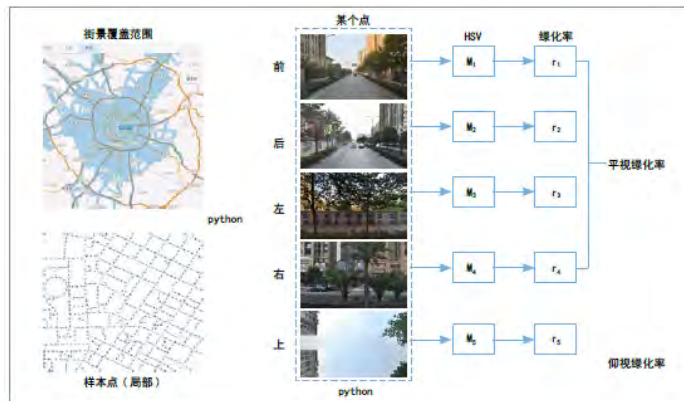


图3 街道绿化率计算方法

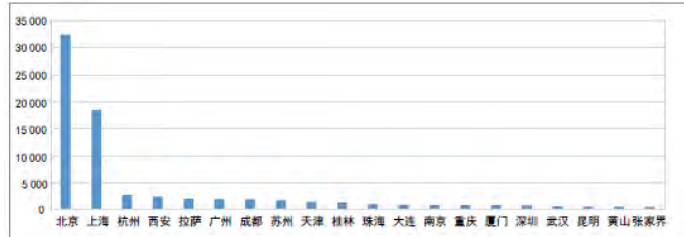


图8 中国不同城市 Flickr 深度学习相片数量

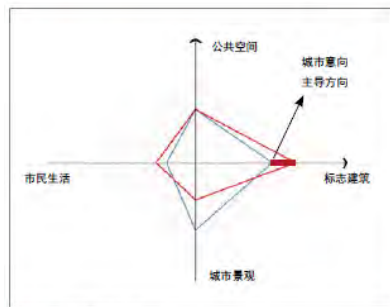


图9 城市意象比较模型



图10 主导城市意象



图4 成都街道平视绿化水平



图5 成都街道仰视绿化水平

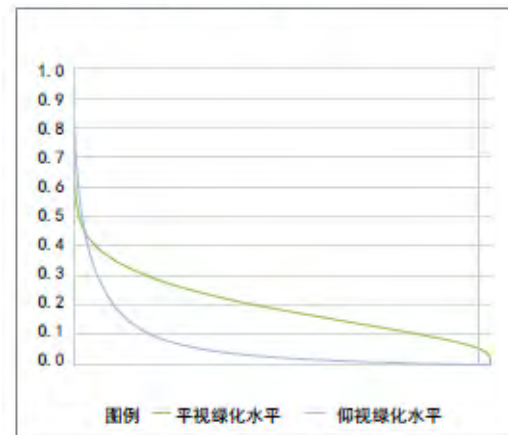


图6 成都街道不同视角绿化水平对比



图7 中国街道平均绿化水平

# 30 Ghost Cities

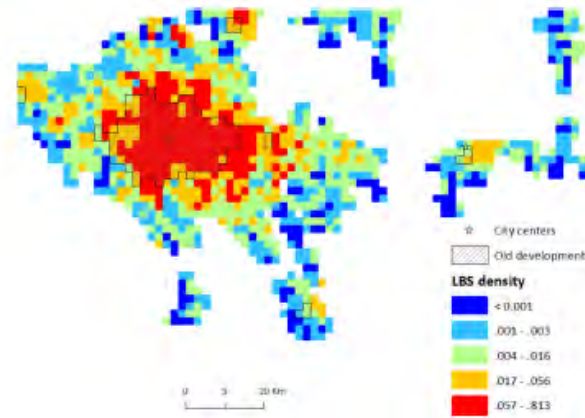
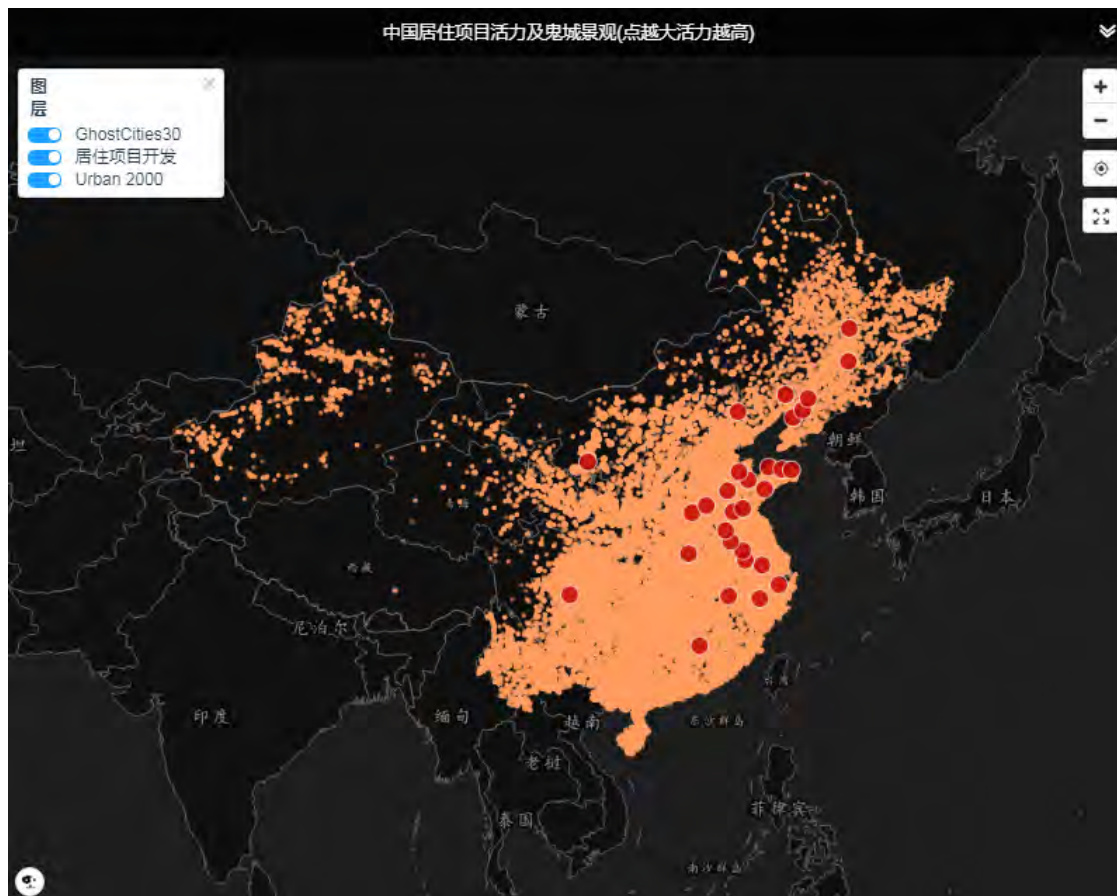


Fig. 3 LBS density of a small area in Jiangsu province. Note that the LBS density has been normalized and does not indicate the real population.

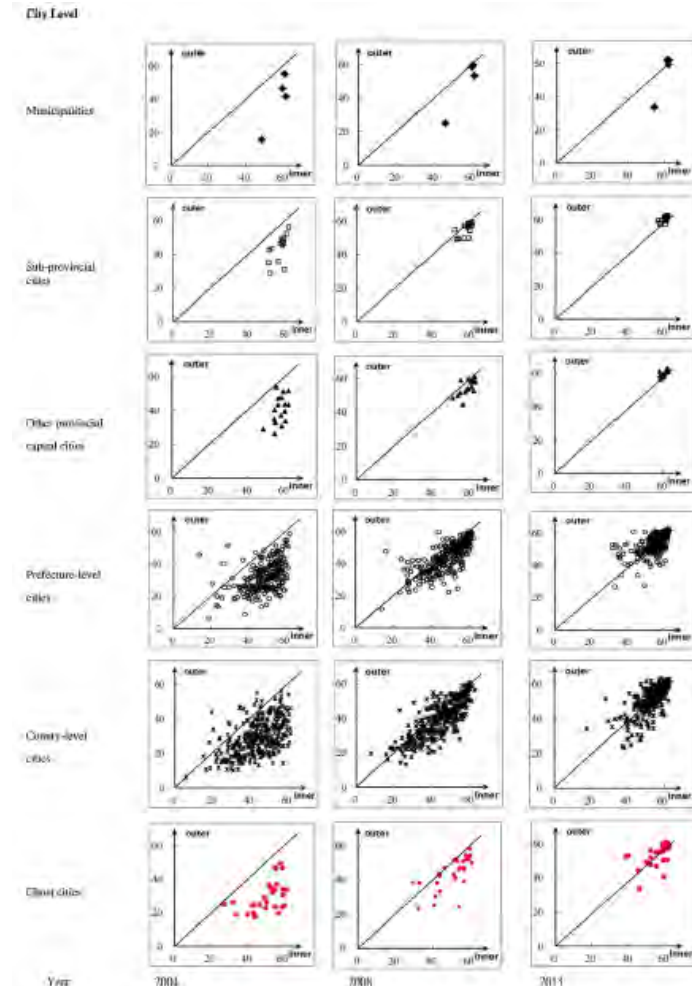
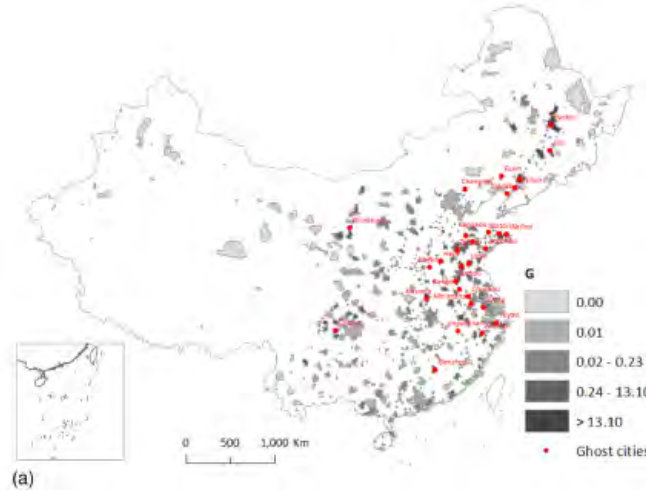


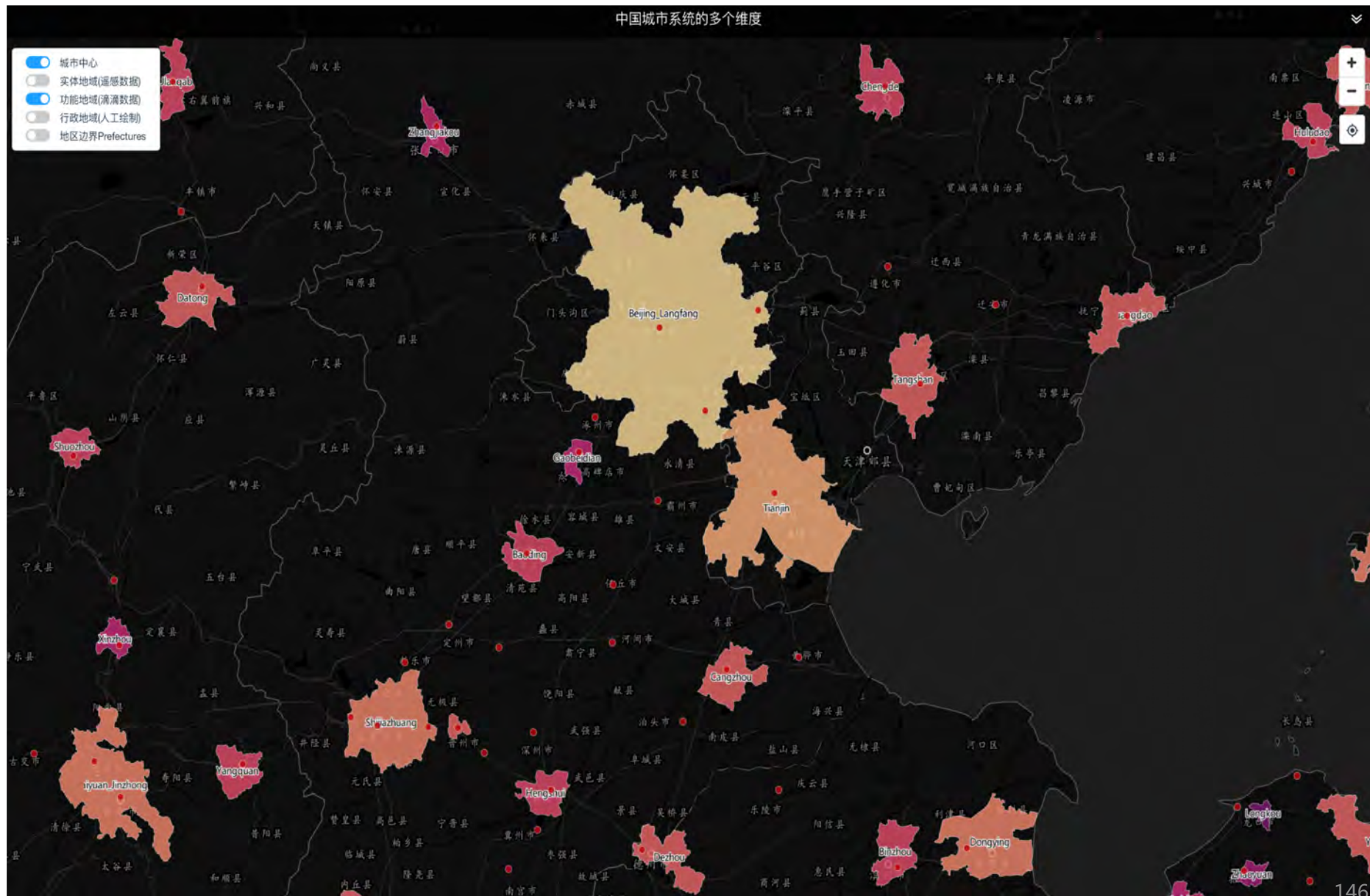
Fig. 6 The relative urban construction in old and new urban areas of Chinese cities in various years.

We argue that ghost cities are associated with very low urban vitality. In the light of big/open data, we are able to profile ghost cities of China based on 535,523 recent project-level residential developments from 2002 to 2013. We use the national-wide and million magnitude road junctions, points of interest and location based service records of 2014/2015 for measuring the morphological, functional and social vitality of each residential project. We then aggregate the project level evaluation results into the city level and thirty ghost cities are then identified by comparing the residential projects' vitality in the old (developed before or in 2000) and new (developed after 2000) urban areas in each city. Our profiling results illustrate the big picture of China's past residential developments, and then of ghost cities. We find the average vitality of residential projects in new urban areas is only 8.8% of that in old urban areas, denoting the potential existence of ghost cities in newly developed areas in Chinese cities.



## 31 Redefining Chinese city system

- Redefining Chinese city system using new data
- Understanding uneven urban expansion with natural cities using open data
- Function Urban Areas of China using Bus Connections and Population Density



# 31 Redefining Chinese City System: using emerging new data

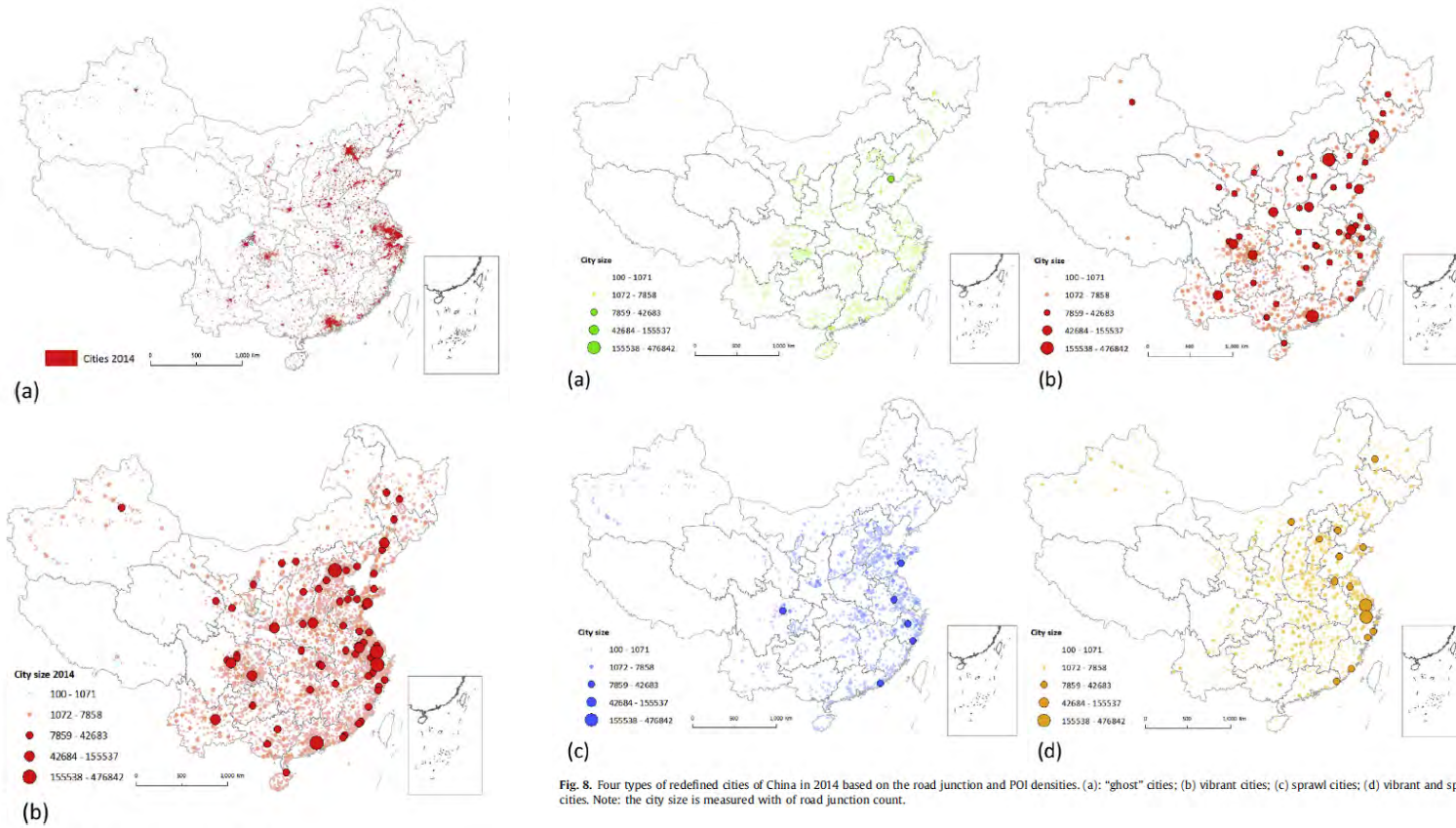


Fig. 8. Four types of redefined cities of China in 2014 based on the road junction and POI densities. (a): "ghost" cities; (b) vibrant cities; (c) sprawl cities; (d) vibrant and sprawl cities. Note: the city size is measured with of road junction count.

Fig. 7. Redefined Chinese city system in 2014 (a) urban areas; (b) city hierarchy in terms of road junctions.

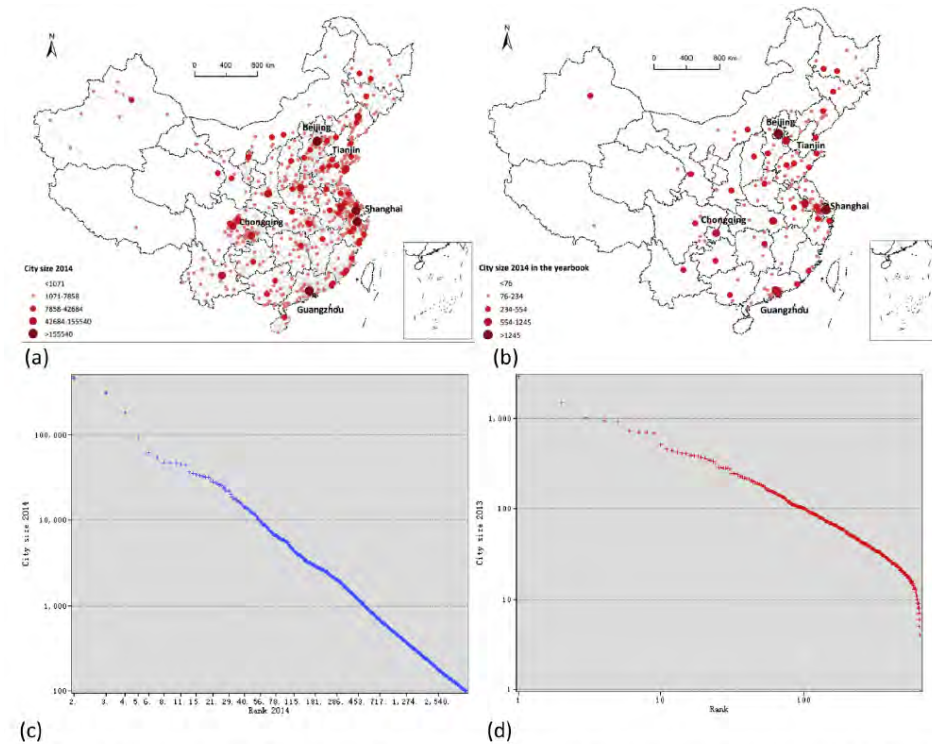


Fig. 11. Redefined Chinese city system versus official one in 2014 (a) City hierarchy of the redefined cities in 2014 (city size in terms of road junction count); (b) City hierarchy of official cities (city size in terms of urban areas in km<sup>2</sup>); (c) Rank-size distribution of the redefined cities in 2014; (d) Rank-size distribution of official cities.

# 31 Redefining Chinese City System: Understanding uneven urban expansion with natural cities using open data

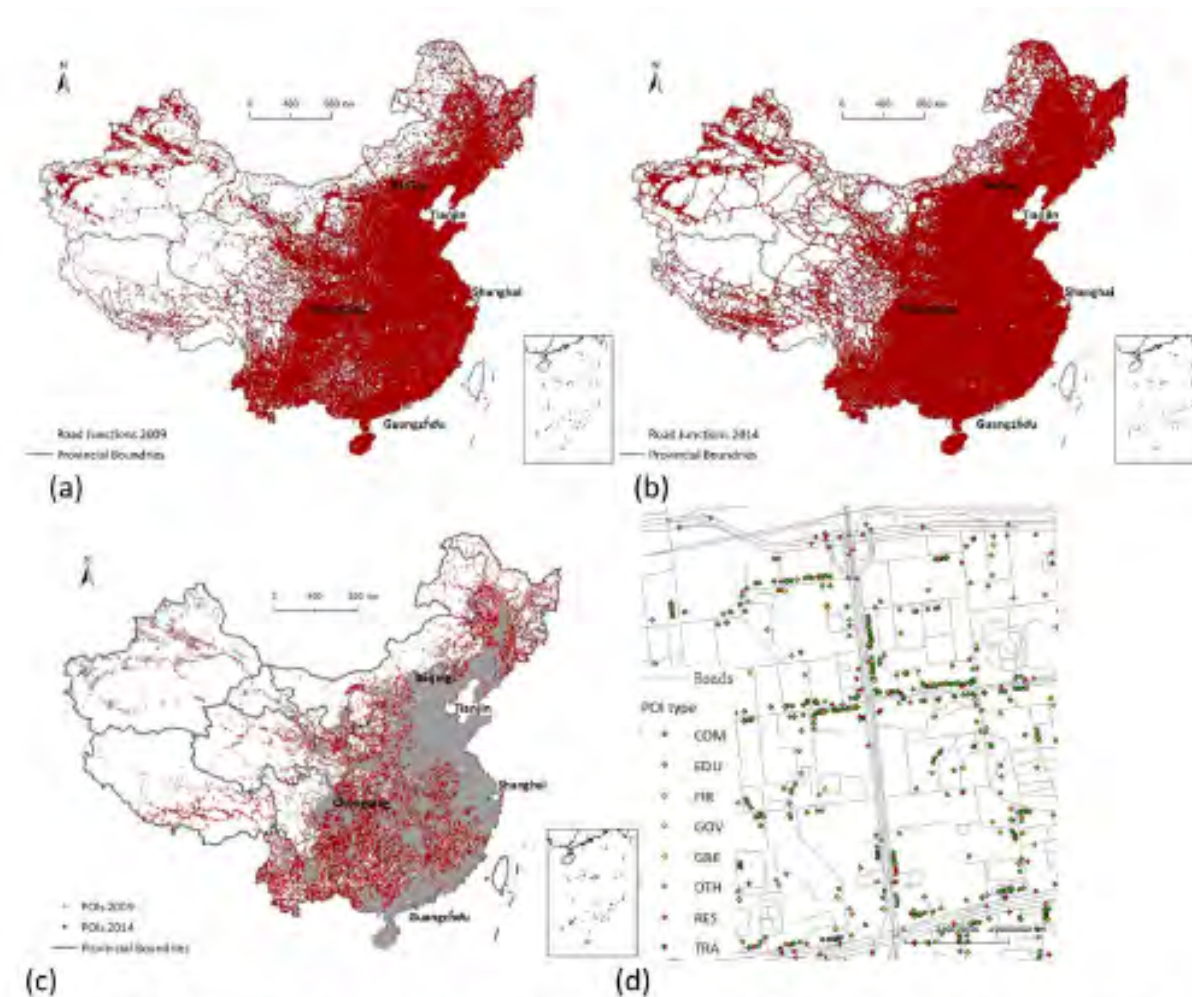


Fig. 5. Road junctions and POIs of China in 2009 and 2014 (a) road junctions in 2009, (b) road junctions in 2014, (c) POIs in China, (d) POIs in a part of Beijing. Note: COM denotes commercial sites, EDU denotes education facilities, FIR denotes firms, GOV denotes government sites, GRE denotes green spaces, OTH denotes other types, RES denotes residence communities, and TRA denotes transport facilities. Miss data in Taiwan.

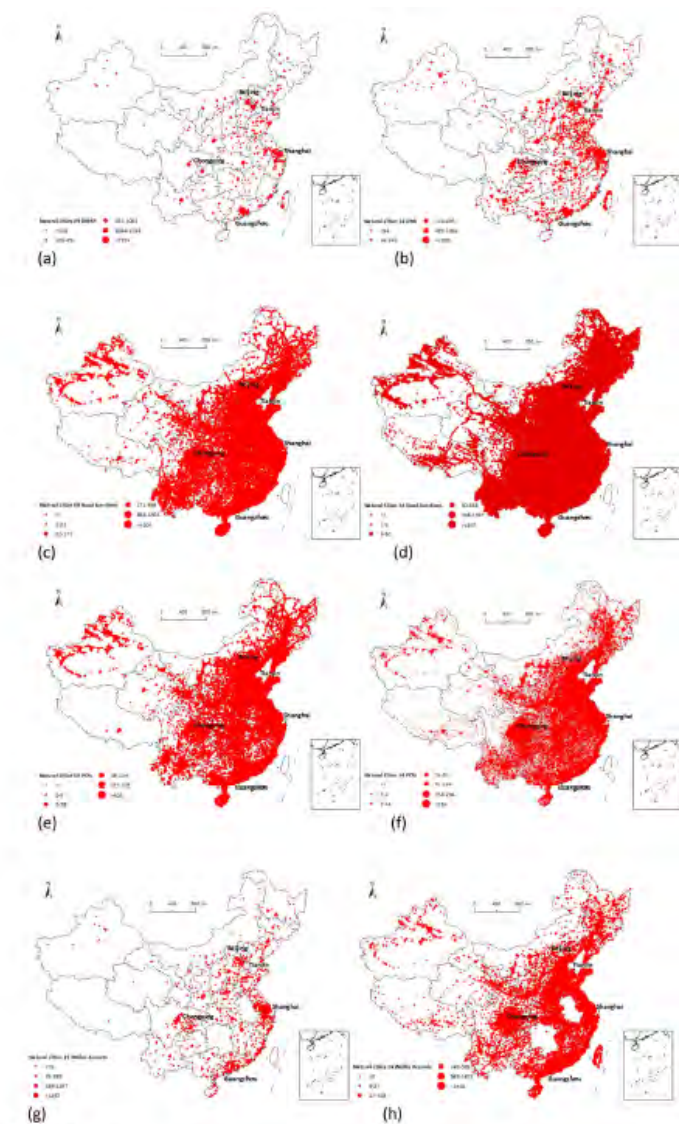
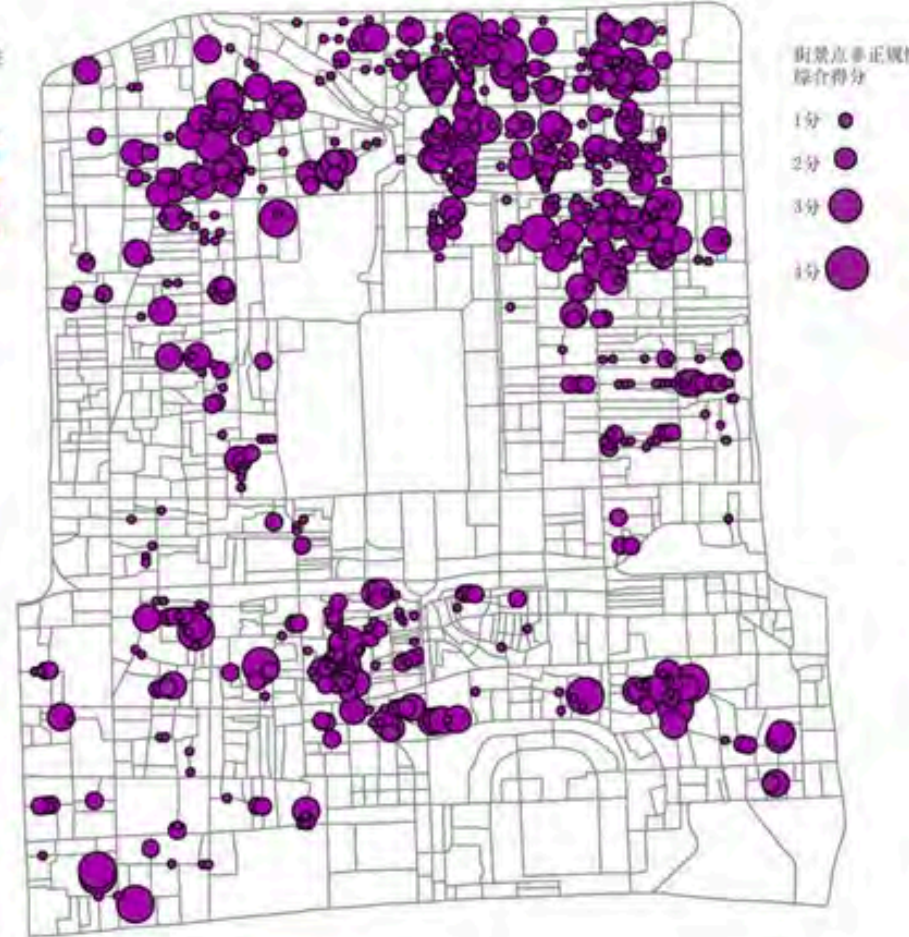
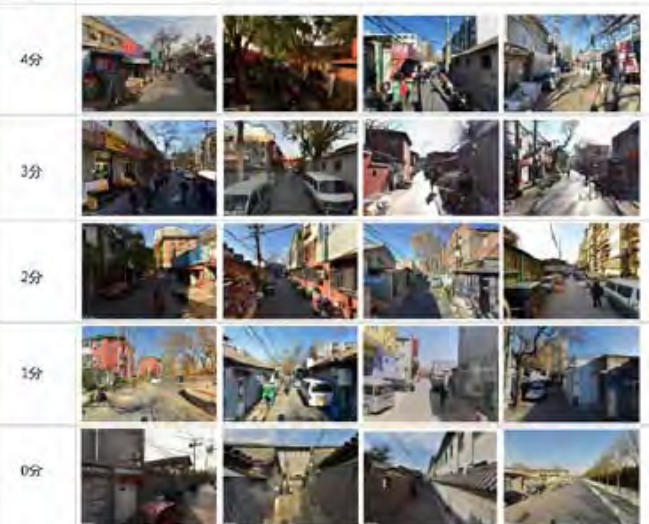


Fig. 6. Four Types of Natural cities. Note: The NCs are derived from DMSP in 2009(a) and DNB in 2014(b), from road junctions in 2009(c) and 2014(d), from POIs in 2009(e) and 2014(f), and from Wabao records in 2011(g) and 2014(h).

# 32 Urban Informality



典型街道示意



## 33 Monitoring Urbanizing China with New Data



### 33 Monitoring Urbanizing China with New Data

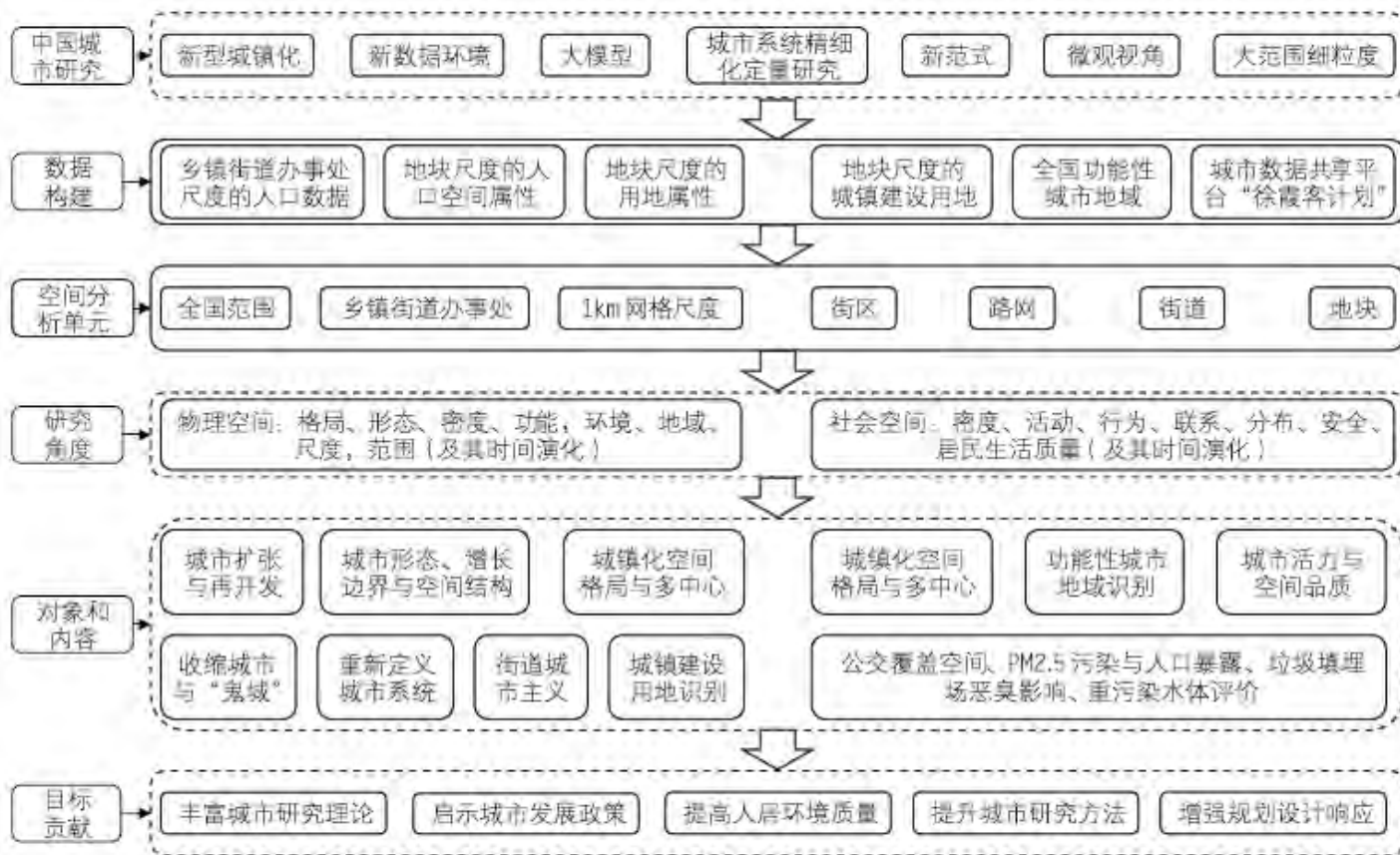


图2 “大模型”研究范式总体框架及其实证研究

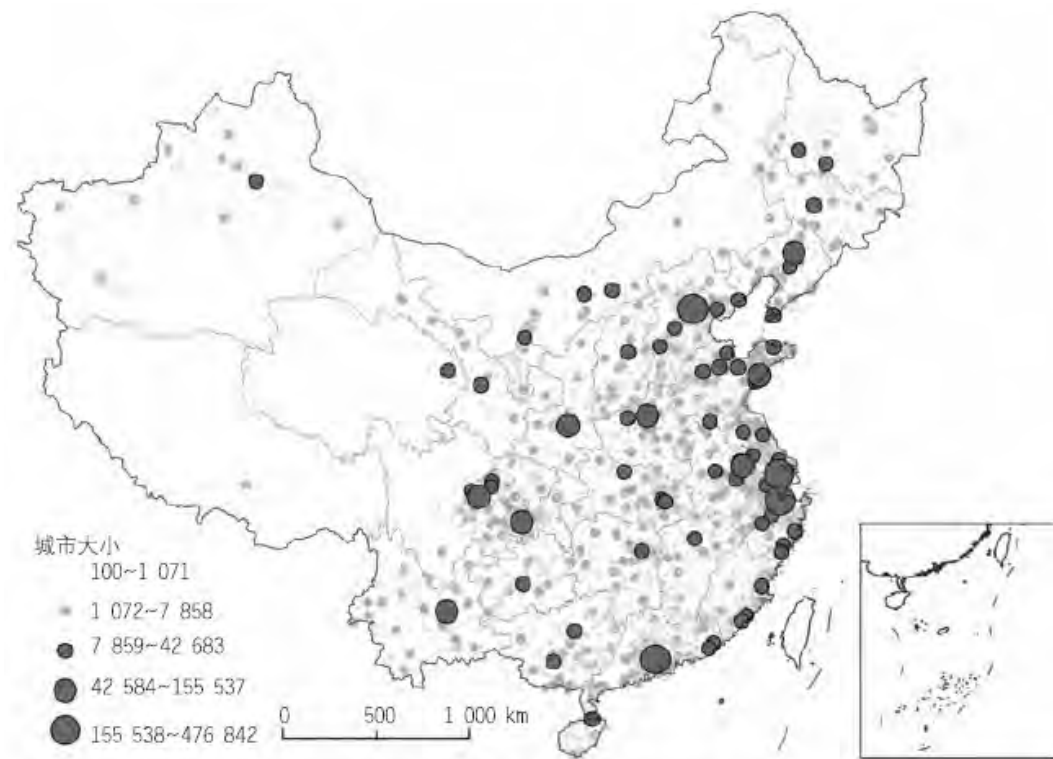


图15 重新定义的中国城市系统  
注: 城市大小为道路交叉口数量。  
资料来源: 龙瀛和吴康 (2016)。

# 34 Healthy Cities

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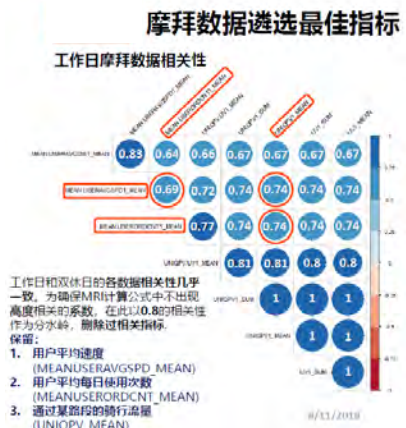
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注：摩拜骑行数据分工作日和双休日

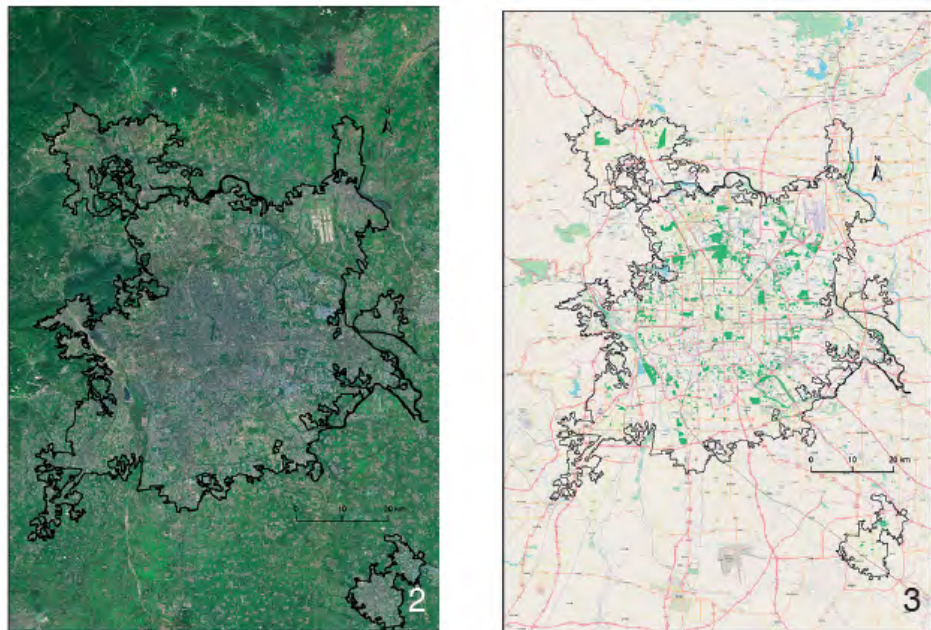
## 街道设施参考指标

指标	解释	计算方法	来源或参考文献
WALKSCORE	步行指数 (0-100) 该指数体现了街道诱发步行的概率,是步行友好性研究中最通用的指标。 数值越高代表该街道越有可能诱发步行活动	$Walk\ Score = \sum_{i=1}^n (W_i \times f(S_i)) \times \frac{100}{15}$	Long & Zhao, 2018
FUNCTION_DEN	功能密度	$FUNCTION\_DEN = \frac{number\ of\ POIs}{area\ (km^2)}$	Liu & Long, 2015
FUNCTION_MIX	功能混合度, 一个区域内功能设施的多样性	$FUNCTION\_MIX = -\sum_{i=1}^n (p_i \times \ln p_i)$ $p_i$ : 每个街道沿途 i 类型的设施占总体设施的比例	Liu & Long, 2015
JUNCTION_DEN	交叉路口密度, 一个区域内交叉路口数量, 单位: #/km <sup>2</sup>	$JUNCTION\_DEN = \frac{number\ of\ junctions}{0.5km\ search\ radius}$	中心城道路网络来源: 某导航公司
DIST_TO_CC	离城市中心距离, 单位: m	用ArcGIS的Spatial Join工具算出街道中心与街道所在城市的城中心距离	城市中心点来源: 人工识别
STREET_LEN	街道路段长度, 单位: m	ArcGIS 默认长度	
POP_DEN	街道所在居委会人口密度, 单位: 人/km <sup>2</sup>		2010年全国人口普查

## 城市大环境参考指标

指标	解释	计算方法	来源或参考文献
STREET_COUNT	城中心街道数量	ArcGIS Summarize 工具	
SUM_LEN	城中心街道总长度, 单位: m	ArcGIS Summarize 工具	
GDP_PC	每个城市的市辖区人均(per capita)年生产总值, 单位: 元/人		中国(2015)城市统计年鉴
EAST	中国东部城市; 0: 否, 1: 是		北京市宏观经济与社会发展基础数据库
MIDDLE	中国中部城市; 0: 否, 1: 是		同上
WEST	中国西部城市; 0: 否, 1: 是		同上
CITY_LEVEL_N	城市级别, 1: 直辖市, 2: 副省级, 3: 省会, 4: 地级市		参考文献: Long, 2017
AREA_CC	中心城区面积, 单位: km <sup>2</sup>	ArcGIS 默认多边形面积	中心城边界来源: 中国土地利用分布图
ANNUAL_TEMP	全国各城市年平均温度, 摄氏		中国(2015)统计年鉴

# 35 Urban Green Infrastructure



3 通过电子地图提取北京中心城内城市绿地  
Extraction of urban green space in downtown Beijing by electronic map

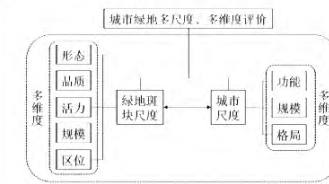
表 1 绿地空间品质测度的典型方法及代表性研究内容

Tab. 1 Typical methods and representative research contents of green space quality measurement

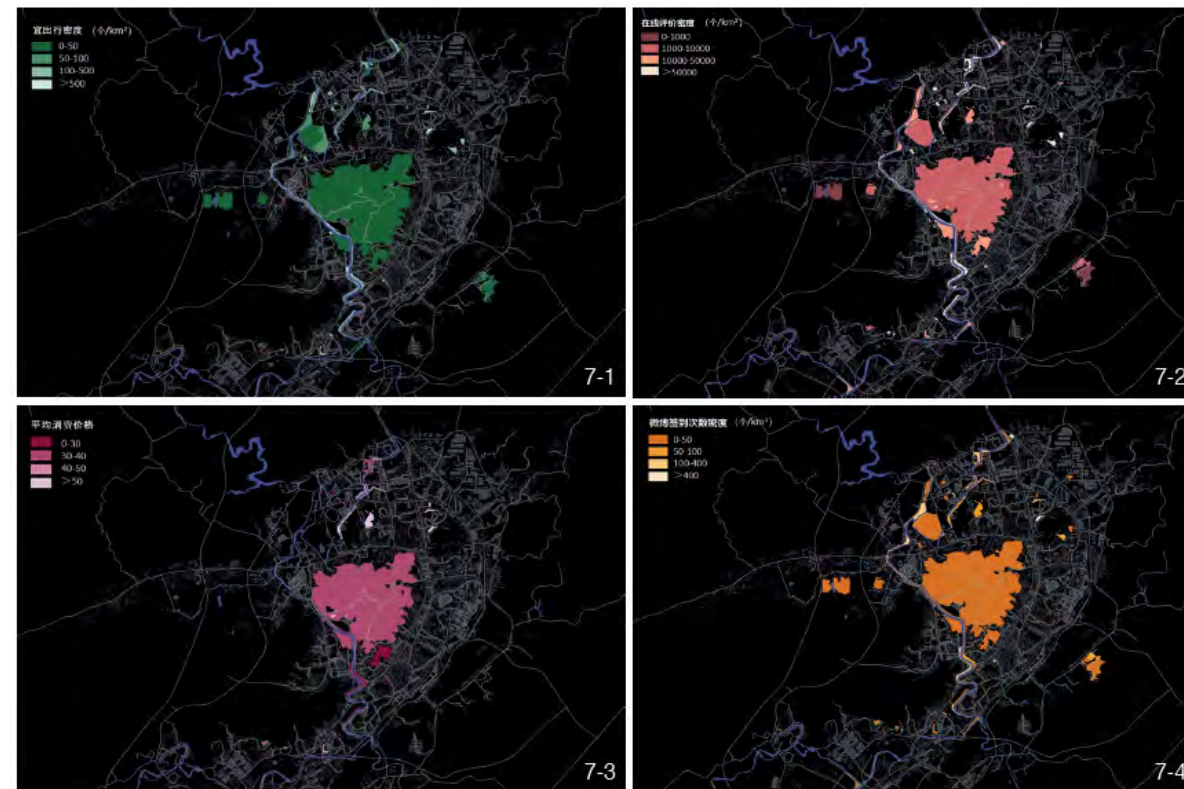
评价指标	指标内涵
人性化尺度	物理环境的尺度、比例，包括铺装的形式、植被、小品等将影响使用者心理感受的尺度
整洁度	是否整洁，若有垃圾、气味，将会影响整洁度，进而干扰使用者的心理
可意象化	空间的可认知、可识别、有特色的品质
可参与性与趣味性	提供基本的设施进而促使人们使用、参与和体验的空间
安全感	各项设施是否运转状况良好，路灯是否明亮，有无断头路
通透性	使用者可以看到公共空间中所发生活动的程度，界面的材质、植物的种类以及是否有围墙、篱笆等将影响通透性
多样性	物种多样性、景观多样性



4-1 POI 数据 POI data  
4-2 位置微博数据 Location Microblog data  
4-3 大众点评数据 Dianping data



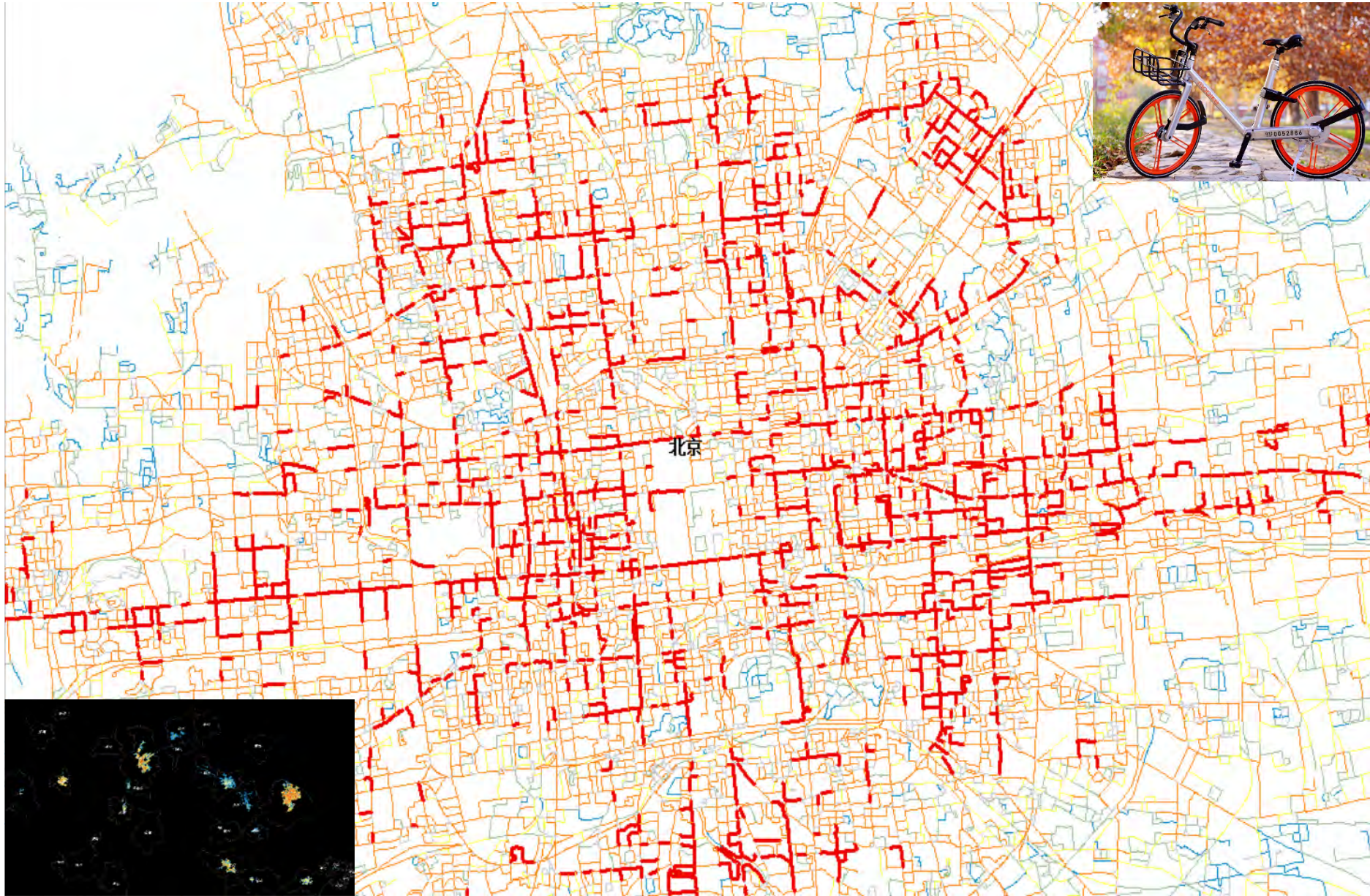
5 研究方法 Research methods



7 遵义市公园绿地活力评价结果 Evaluation result of vitality of parks in Zunyi  
7-1 宜出行密度 Suitable travel density  
7-2 在线评价密度 Online evaluation density  
7-3 平均消费价格 Average consumer price  
7-4 微博签到次数密度 Weibo check-in number density



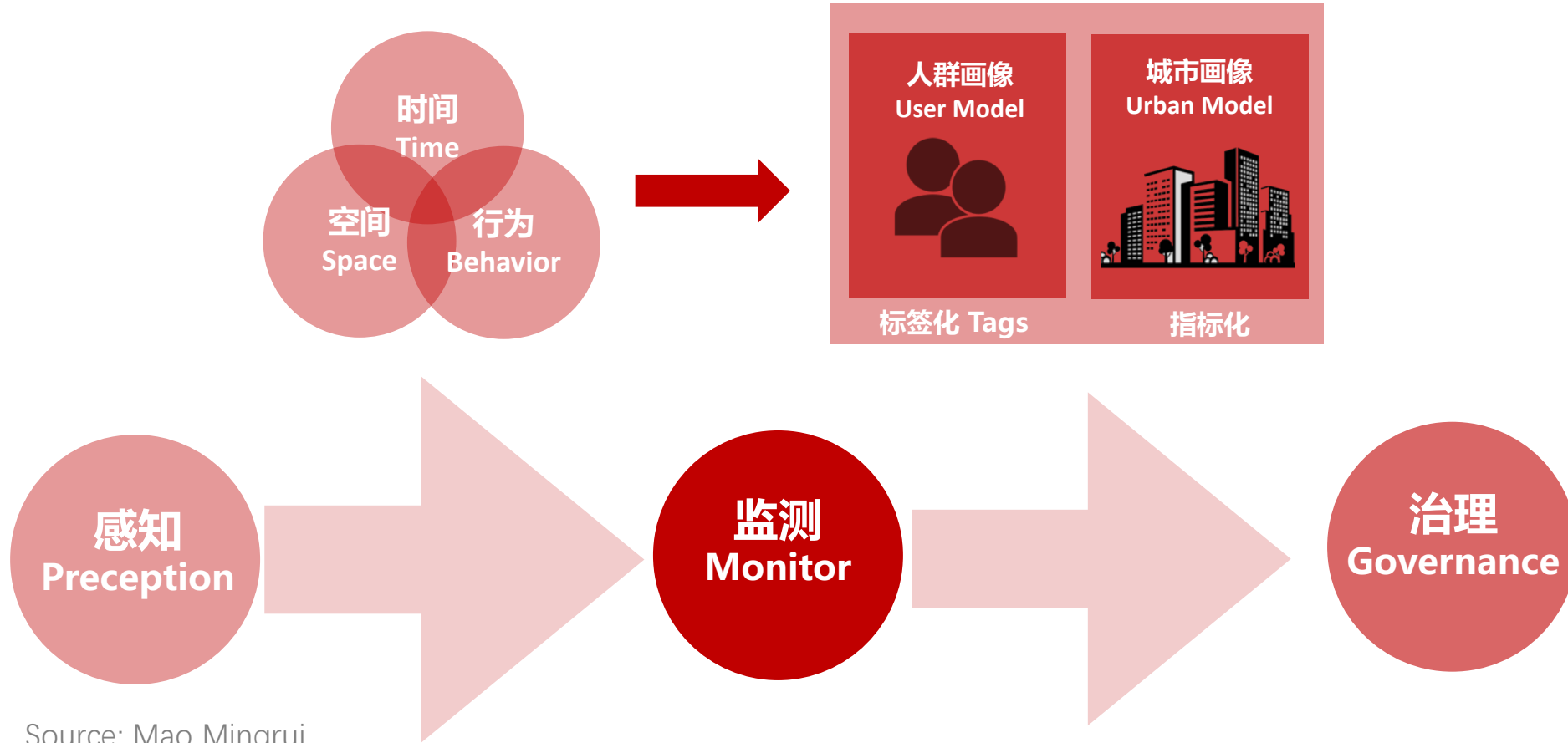
## 36 Others: Mobike Riding Index



## 36 Others: Gudong APP traces recording physical activities of users



### 36 Others: Monitoring Chinese city system with new data (not limited to monitor)



Source: Mao Mingrui

社交媒体 Social Media  
 智能终端 Intelligent Terminals  
 刷卡记录 Transportation Records  
 各类传感器 Sensors  
 .....

人群流动 People Flow  
 城市活力 Vitality  
 公众情绪 Public Sentiment  
 舆情监测 Sentiment Monitor  
 .....

预警应急 Alert Emergency  
 城市规划 Urban Planning  
 设施选址 Site Selection  
 优化提质 Quality Promotion  
 .....

## 36 Others: Monitoring Chinese city system with new data



Source: Mao Mingrui

- A project financially supported by MOHURD (中华人民共和国住房和城乡建设部)
- 基于大数据的城市建设重要指标统计研究

# 36 Others: Monitoring Chinese city system with new data: An online platform

## 大栅栏人本观测——北京坊

省份	省份比例
19 安徽省	0.62%
1 北京市	58.64%
2 香港特别行政区	10.49%
3 天津市	4.94%
4 江苏省	4.94%
5 广东省	4.32%
6 上海市	2.47%

发起单位：  
北京城市象限科技有限公司  
北京工业大学  
北京市城市规划设计研究院

技术支持、数据来源：  
亿阳信通股份有限公司  
北京腾云天下科技有限公司  
浙江巨磁

Source: Mao Mingrui

## 36 Others: Mid-term Evaluation on the New Urbanization Plan 2014-2020 with World Bank Group

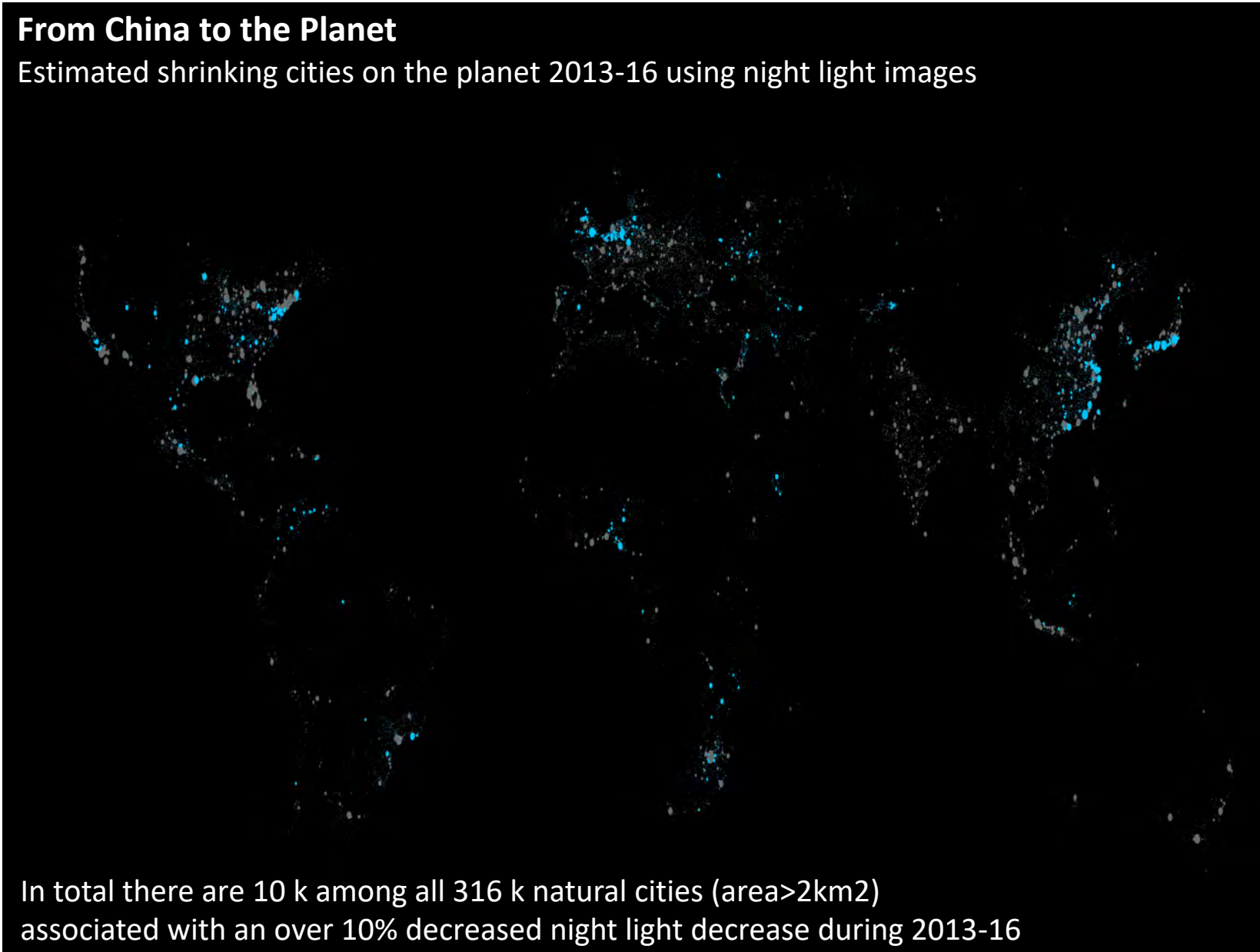
Spatial Scale	Goals/measures addressed by the NUP	Development	Morphology	Function	Activity
Individual city	5 目标：城市发展模式科学合理	Variation of per capita consumption of land 2013-2016 using yearbooks		Polycentric urban structure evolution 2009-2015 using points of interest	
	15.1 改造提升中心城区功能			Urban function evolution 2009-2015(or 2016) using points of interest	
	15.2 严格规范新城新区建设	Urban expansion 2010-2015	Block size evaluation in comparing with "old" areas	Urban function density evaluation in comparing with "old" areas	Digital activity evaluation in comparing with "old" areas
	16.1 基本实现100万人口以上城市中心城区公共交通站点500米全覆盖			Evaluation using bus stops and urban GIS 2016	
	专栏1：人均城市建设用地2020年≤100平方米	Evaluation using the 2016 yearbook			
	专栏1：城市建成区绿地率2020年达到38.9%	Evaluation using the 2016 yearbook and fine grained urban GIS dataset			
Urban agglomeration	9-10 优化东部、培育中西部	City size evolution 2013-2016 using yearbooks for each UA			Passenger flows among cities in each UA 2016 using <u>Didi</u> records
City system	5 目标：城镇化格局更加优化	City size evolution 2013-2016 using yearbooks	Spatial evolution using HSR	Spatial connectivity 2013-2016	
	17.1 城市规划要由扩张性规划逐步转向限定城市边界	Reviewing master plans of Chinese cities			

- Considering the goals and measures set in the NUP, I would like to include three spatial scales in the paper, the individual city level, the urban agglomeration (city region) level, and the city system level. I classify each scale analysis into four dimensions (development/morphology/function/activity), borrowing ideas from urban development practice and the life cycle theory of cities. I then aim to evaluate the related goals/measures set in the NUP using available dataset as indicated in the table for the framework.

## 36 Others

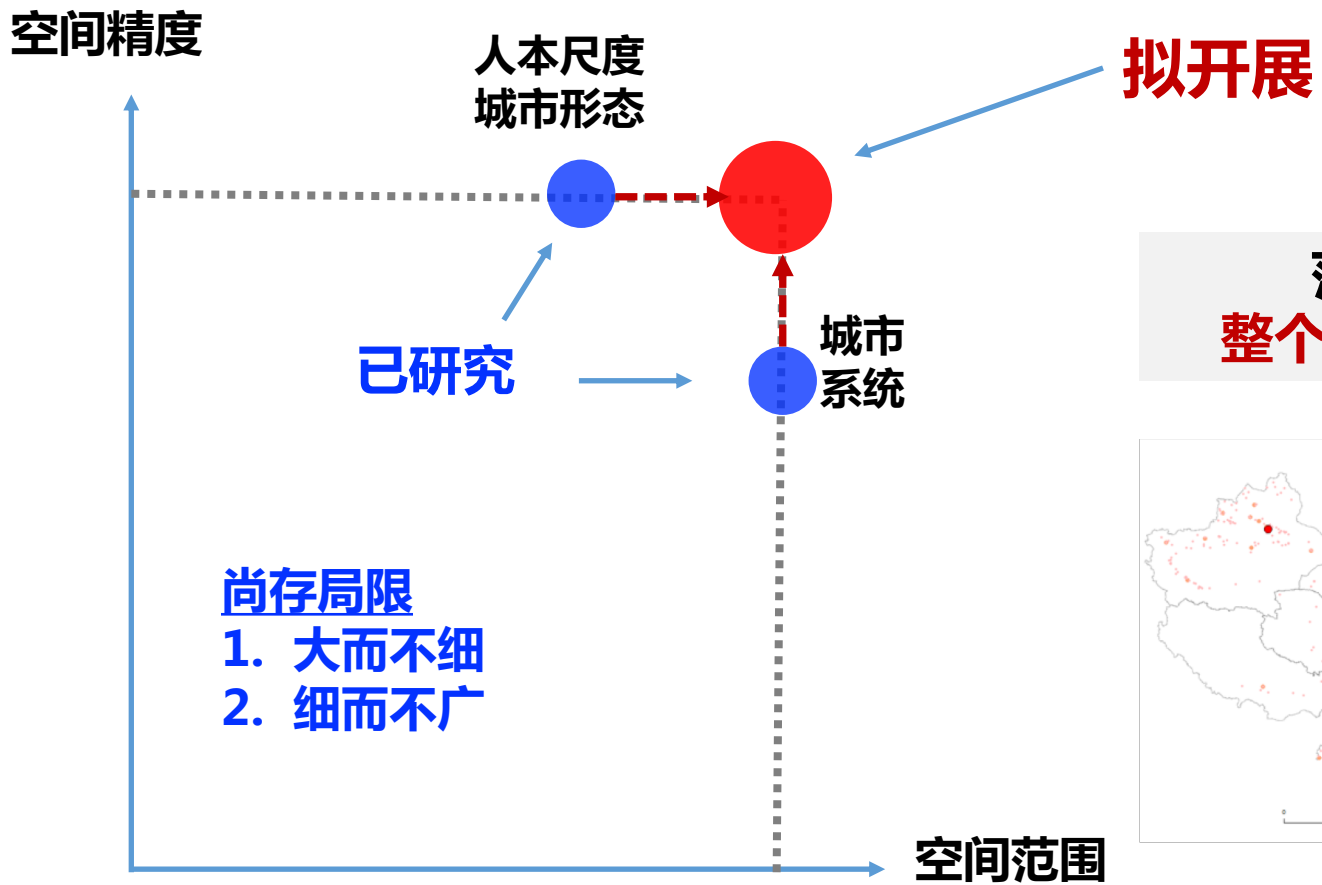
### From China to the Planet

Estimated shrinking cities on the planet 2013-16 using night light images

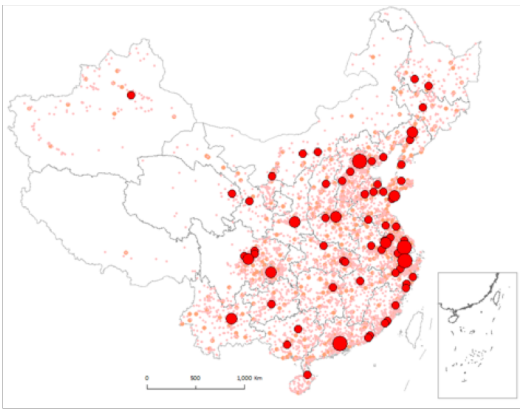


In total there are 10 k among all 316 k natural cities (area>2km<sup>2</sup>) associated with an over 10% decreased night light decrease during 2013-16

# 36 Others



**范围**  
整个城市系统



**精度**  
人本尺度城市形态







# 6 Courses

---

# Applied Urban Modeling

## 城市模型及其规划设计响应

Applied Urban Models and Their Applications in Urban Planning & Design

龙瀛



北京城市实验室  
Beijing City Lab

合作者包括社立群、冯星舟、陈瑞华、刘伦、曹珂斌、朱其明、  
张燕、高松江、王佳浩、吴康、杨志峰、张俊华和赵伟等

### 城市模型及其规划设计响应

这套课件为龙瀛及其合作者近年来在城市模型领域研究的部分合集，包括传统的城市模型、基于大数据的城市模型、大模型这一城市与区域研究新范式，以及最近的面向规划设计应用的初步探索。

这些PPT在不同的学术会议和论坛上做过发表，时间和精力有限，并没有专门针对此课件进行调整。课件内容难免有不完善之处，欢迎将意见和建议致信到 longying1980@gmail.com

#### 1 城市模型与规划支持系统

- 1.1 规划支持系统在城市规划中的应用探索
- 1.2 多尺度的北京城市空间发展模型
- 1.3 规划师主体模型：一项低碳城市形态规划支持的工具
- 1.4 囊括方法、软件和模型的规划支持系统框架体系
- 1.5 面向空间规划的微观模拟

#### 2 大模型与定量城市研究






- 2.1 大模型及中国应用案例
- 2.2 基于OpenStreetMap和兴趣点数据的地块特征自动识别
- 2.3 地块尺度中国所有城市的空间扩张模拟
- 2.4 中国PM2.5的人口暴露评估
- 2.5 利用北京公共交通刷卡数据的若干定量城市研究
- 2.6 当前定量城市研究的四项变革

#### 3 规划设计响应







- 3.1 数据增强设计：新数据环境下的规划设计回应与改变
- 3.2 街道城市主义
- 3.3 城市规划实施评价：针对中国城市的分析框架
- 3.4 基于人类活动和移动数据的城市增长边界实施评价
- 3.5 中国收缩城市及其研究框架
- 3.6 历史上的北京规划

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|  1.1 Planning support systems in urban pl<br>Adobe Acrobat Document [7.2 MB] |  1.2 Beijing Urban Spatial Development Mo<br>Adobe Acrobat Document [5.1 MB] |  1.3 Planner Agents A toolkit for support<br>Adobe Acrobat Document [1.7 MB] |
| <a href="#">Download</a>  | <a href="#">Download</a>  | <a href="#">Download</a>  |
|  1.4 An applied planning support toolkit<br>Adobe Acrobat Document [4.2 MB]  |  1.5 Urban micro-simulation for spatial p<br>Adobe Acrobat Document [3.5 MB] |   |
| <a href="#">Download</a>  | <a href="#">Download</a>  |   |

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| <a href="#">Download</a>  | <a href="#">Download</a>  | <a href="#">Download</a>  |
|  2.4 Estimating population exposure to PM<br>Adobe Acrobat Document [2.4 MB] |  2.5 Bus landscapes Analyzing commuting p<br>Adobe Acrobat Document [2.7 MB] |  2.6 Four changes on quantitative urban s<br>Adobe Acrobat Document [5.4 MB] |
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| <a href="#">Download</a>  | <a href="#">Download</a>  | <a href="#">Download</a>  |
|  3.4 Evaluating the effectiveness of urba<br>Adobe Acrobat Document [3.5 MB] |  3.5 Shrinking cities in China and the re<br>Adobe Acrobat Document [4.4 MB] |  3.6 Historical city plans in Beijing.pdf<br>Adobe Acrobat Document [9.9 MB] |
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# Data Science and Social Studies

## 课程设计

### 课程目标：

课程采用在线自学、课堂讨论、重点讲解、团队实训的方式进行。面向首都高校社会科学和管理学研究生、教师的。课程横跨社会科学和信息技术两个领域，涵盖政治学、社会学、管理学、统计学、数据科学等多个学科的理论知识和实用技术。旨在提高大家的数据应用意识、建立数据思维、了解前沿方法，掌握有关数据采集、处理、分析和解释的基本原理和方法，提升大数据方法自学能力和应用能力。

### 课程骨干：

邀请清华大学龙瀛、孟天广、闫飞，中国社科院陈华珊，中国人民大学竇志成、刘涛、巫锡炜等多位老师为指导老师。中国人民大学李丁负责组织学员讨论、引导自学、联系资源。课程得到了北京大学卢云峰教授，中国人民大学冯仕政教授的赞助和支持。

### 课程时间：

分头自学时间：自己安排。

集中研讨时间：每周四下午三点到六点，地点：中国调查与数据中心0110会议室。

实战训练时间：小组安排。

### 招新目标：

招募20位具有一定基础的三年制硕士、四年制博士学生、教师。要求参与者有强烈的数据爱好，较好的自学能力，充分的时间保证，高度的团结合作精神。

### 招新方式：

由各校青年教师推荐或自荐。报名者需提供自己掌握的方法和软件情况、相关课程的成绩、做过的量化研究、未来的研究计划。优先录入基础较好、兴趣较强烈、未来科研时间长的学员。

## 2017年入门学员课程安排

次序	日期	R1班	R2班	P班
第1讲	3月2日	R入门1 (Y)	R入门1 (L)	Python入门1 (C)
第2讲	3月9日	R入门2 (Y)	R入门2 (L)	Python入门2 (C)
第3讲	3月16日	R数据处理 (Y)	R数据处理 (L)	爬虫原理 (C)
第4讲	3月23日	R数据呈现 (Y)	R数据呈现 (L)	Python爬虫 (C)
第5讲	3月30日	R数据实例 (y)	R数据实例 (L)	Python数分 (C)
第6讲	4月6日	爬虫原理 (Y)	爬虫原理 (L)	R入门1 (zzx)
第7讲	4月13日	Python入门 (J)	Python入门 (ZCW)	R入门2 (ZI)
第8讲	4月20日	Python入门2 (J)	Python入门2 (L)	R数据处理 (ZSQ)
第9讲	4月27日	Python爬虫 (J)	Python爬虫 (L)	R数据呈现 (WHN)
第10讲	5月11日	Python数分 (J)	Python数分 (L)	R小数据实例(C)
第11讲	5月18日	社会网入门 (Y)	社会网入门 (L)	社会网入门(C)
第12讲	5月25日	社会网模型 (Y)	社会网模型 (L)	社会网模型(C)
第13讲	6月1日	文本入门 (F)	文本入门 (L)	文本入门(C)
第14讲	6月8日	文本模型 (Y)	文本模型 (L)	文本模型(C)
第15讲	6月15日	空间分析 (Y)	空间分析 (L)	空间分析(C)

## 二、R语言与Python课程

R语言第一讲入门资料  
[课前准备与上课教室](#)  
[第一讲：入门资料与课前练习题](#)  
[第一讲：课堂演示](#)  
[第一讲：课后作业](#)  
R语言第二讲统计分析资料  
[第二讲：课前自学内容（统计分析）](#)  
[第二讲：课堂演示](#)  
[第二讲：课后作业](#)  
R语言第三讲数据管理资料  
[第三讲：课前自学与作业（数据处理）](#)  
[第三讲：课堂演示](#)  
R语言第四讲绘图资料  
[第四讲：课前自学与作业（绘图与可视化）](#)  
[第四讲：课堂演示](#)  
[陈华珊【课件】ggplot2\\_slides](#)  
R语言第五讲综合实例资料  
[第五讲：课前自学与作业（综合实例）](#)  
[第五讲：课堂演示（王茂林主讲，暂时没有）](#)  
R语言第六讲网络爬虫资料  
[第六讲：课前自学与作业（爬虫）](#)  
[第六讲：课堂演示](#)  
Python第1-2讲入门  
[第1-2讲：入门资料与课前准备](#)  
[第1-2讲：课堂演示](#)  
[第1-2讲：课后作业](#)  
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[第3-4讲：课前自学内容（爬虫）](#)  
[第3-4讲：课堂演示](#)  
[第3-4讲：课后作业](#)  
Python第5讲数据分析  
[第5讲：课前自学与作业（数据分析）](#)  
[社会网络分析](#)  
[自学资料](#)  
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[自学资料](#)

## 三、骨干培训课程资料

第一讲：陈华珊：网络爬虫的原理与入门 (PDF附件)  
 第二讲：陈华珊：社会网络分析原理与入门(PDF附件)  
 第三讲：陈华珊：R中文乱码与Stata、SPSS中文数据读入与分析 (PDF附件)  
 第四讲：李佳龙：如何利用Python登录网站和翻页 (示例代码)  
 第五讲：李丁：基于R语言的网络爬虫综合实例 (爬取个人人人好友网络，并绘图)  
 第六讲：李丁：空间分析的概念与入门 (孙秀林；社会科学中的空间分析：概念、技术和应用实例)  
 第七讲：龙瀛：大数据与城市规划概论 (上)  
 第八讲：龙瀛：大数据与城市规划概论 (下)

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 Adobe Acrobat Document [357.6 KB]  
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[第六讲：李丁：空间分析的概念与入门](#)

 [第七、八讲龙瀛的课件](#)  
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 Adobe Acrobat Document [11.0 MB]  
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 [第七、八讲龙瀛的课堂实验数据](#)  
 DT32\_Yichun.zip  
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# Structural Urban Design

2016年7月，撰写学术论文，对授课进行总结“数据增强设计最新研究进展及其教学实践”（如下）  
 2016年6月，终期评图，2016年度课程结束  
 2016年4月9日，公开答疑，介绍GIS的操作和数据分析的方法。提供了基于建筑物的城市形态分析结果。  
 2016年4月8日，提供第五个版本的数据，补充了村/居委会边界等，并补充了几个参考资料。  
 2016年3月27日，基于提供的建筑数据，完成了sketchup模型的生成  
 2016年3月22日，提供第四版本数据，补充了片区的建筑数据（含层数），以及市域的位置微博数据（含微博内容）；江斌教授报告。  
 2016年3月21日，提供第三版本数据（简化了street\_attributes的属性；增加了地块用地现状图landusemap\_now；2009年企业分布firms2009；更新了weibocheckin（纠偏了））；提供空间句法的几个幻灯片材料。  
 2016年3月15日，大数据与城市设计的几点思考，数据讨论  
 2016年3月12日，提供第二版本数据（纠偏了点评，补充了其他几个图层）  
 2016年3月8日，确认邀请江斌教授作报告（具体见下）  
 2016年3月6日，提供第一版本数据  
 2016年3月2日，创建网页，数据增强城市设计概论

尺度/维度	区域/城市/片区/乡镇街道办事处	街区/地块	街区/地块内部	街道	街道内部
开发：遥感解译的土地利用、用地现状图（规划）、土地利用图（国土）	城镇用地面积、建设强度、生态安全格局、适宜开发土地【城市扩张速度、城市扩张规模】	开发年代、是否适宜开发	肌理变化	角度变化	
形态：分等级路网、道路交叉口、建筑物、土地出让/规划许可、街景	基于道路交叉口的城乡判断、建筑面积、路网密度、交叉口密度、开放空间比例【再开发比例、扩张比例】	尺度、紧凑度、基于建筑的城市形态类型、建筑密度、容积率、是否为开放空间、开放空间类型、可达性【再开发与否、扩张与否】	是否有小路、建筑分布规律、是否有内部围墙【历史道路构成】	长度、区位、直线率、建筑贴线率、界面密度、橱窗比、宽高比、可达性、铺装、建筑色彩【历史上是否存在】	建筑分布特征
功能：兴趣点、用地现状图（规划）、土地利用图（国土）、街景	各种功能总量及比例、【城镇建设用地内】各种公共服务覆盖率/服务水平、职位平衡水平、产业结构/优势/潜力	用地性质、（各种）功能密度、功能多样性、主导功能、第二功能、各种公共服务设施可达性、市井生活相关的功能密度	（各种）功能分布特征（单面、双面、三面还是四面）、内部功能相比总功能【内部+临街】占比、界面连续度	（各种）功能密度、功能多样性、主导功能、第二功能、各种公共服务设施可达性、市井生活相关的功能密度、步行指数（walk score）、绿化、等级	（各种）功能分布特征（交叉口附近还是中间）
活动：普查人口、企业、手机、微博、点评、签到、公交卡、位置照片、百度热力图、高分辨率航拍图	总体分布特征、【城镇建设用地内】各等级活动所占面积比例、人口/就业密度体现的多中心性、联系所反映的多中心性、平均通勤时间/距离、各种出行方式比例	（不同时段）活动密度、微博密度、点评密度、签到密度、与之产生联系的地块、人口密度、就业密度、热点时段、通勤时间/距离	活动分布特征（内部还是边缘）、内部联系特征	（不同时段）活动密度、与之产生联系的街道、点评密度、热点时段、【各类型】交通流量、选择度与整合度、限速	活动分布特征（交叉口附近还是中间）
活力：街景、点评、手机、位置照片、微博和房价等	平均心情、整体意象、整体活力、幸福感	平均心情、平均消费价格、好评率、意象、市井活力、平均房价、居住隔离程度		平均消费价格、好评率、设计品质、风貌特色、活力、意象、平均房价	

注：表中 I 特别给出了简单指标变化之外的指标，此表也适用于城市规划与设计方案的评价

G: high-rise point type

D: mid-rise point type

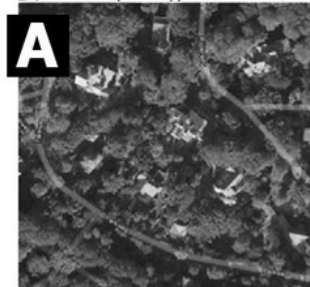
A: low-rise point type



G: high-rise point type



D: mid-rise point type



A: low-rise point type

H: high-rise strip type

E: mid-rise strip type

B: low-rise strip type



H: high-rise strip type



E: mid-rise strip type



B: low-rise strip type

I: high-rise block type

F: mid-rise block type

C: low-rise block type



I: high-rise block type



F: mid-rise block type



C: low-rise block type

## Big Data and Urban Planning 2016

## 清华大学《大数据与城市规划》课程结课汇报(2016)

TSINGHUA UNIVERSITY BIG DATA AND URBAN PLANNING: FINAL PRESENTATION

主题: 城市大数据应用研究——以北京二环内为例

07:50—09:50 上半场汇报 (建筑学院南115; 每组发言15分钟, 问答5分钟)

07:50—08:10 街区要素对城市活力的影响

温祺 清华大学水利水电工程系; 许达, 吴承霖, 张雅敬 清华大学建筑学院

08:10—08:30 历史文化街区街道声音景观探究

周旭影, 刘雪源, 刘为煜, 金程 中国城市规划设计研究院

08:30—08:50 人本尺度城市道路交叉口品质评价

徐特, 徐智伟 清华大学环境学院; 张玉环, 罗圣西 清华大学土木工程系

08:50—09:10 不同空间尺度下情绪研究方法实证对比及其与空间品质关系探究

许宁婧, 王川小雨, 于睿智, 李晶 清华大学建筑学院

09:10—09:30 基于房租数据模型的存量规划研究

沙烨星, 晏聪, 姚宇, 李明玺 清华大学建筑学院

09:30—09:50 基于空间视角的北京二环内影响街道安全性因素与评价

万耀麟 清华大学土木工程系; 冯杰 清华大学电子工程系; 邓铸, 王玲玉 清华地球系统科学研究中心

09:50—10:00 休息及转场

10:00—12:40 下半场汇报 (建筑学院中203; 每组发言15分钟, 问答5分钟)

10:00—10:20 城市物质空间与社会空间国际化匹配程度探讨

周宜笑, 高浩歌, 周宏宇 清华大学建筑学院; 李政圃 清华大学土木工程系

10:20—10:40 空气质量对旅游景点活力的影响调研

詹旭强, 唐博, 唐波谿 清华大学建筑学院; 吴子扬 清华大学环境学院

10:40—11:00 二环内新建轨道站点对周边商业活力影响研究

郭璋, 许阳, 肖钧航 中国城市规划设计研究院; 华高英 中国建筑科学研究院

11:00—11:20 新数据环境下大规模城市旧城街道“街道画像”

谢湘雅, 杨东 清华大学建筑学院

11:20—11:40 北京旧城居住小区的开放性评估与资源共享对策研究

秦岭, 刘钊启, 吕回 清华大学建筑学院; 吴承恩 清华大学土木工程系

11:40—12:00 基于空间数据的北京二环内夜间街道活力与影响因素分析

裴昱, 唐义琴, 吴濯杭 清华大学建筑学院; 李婷婷 清华大学土木工程系

12:00—12:20 北京旧城城市气味景观探究

封蓉, 刘璐, 马頔翔, 程情儀 清华大学建筑学院

12:20—12:40 北京旧城建成环境对步行行为的影响研究

曹哲静, 李文越, 张章, 徐高峰 清华大学建筑学院

授课教师: 龙瀛, 清华大学建筑学院, ylong@tsinghua.edu.cn

点评专家: 李栋、刘岱宗、茅明睿、吴康、张纯(按照姓氏拼音排列)

时间: 2016年12月30日(周五上午) 7:50-12:40

地点: 上半场: 清华大学建筑学院南115; 下半场: 清华大学建筑学院中203



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清华大学建筑学院公共讲座系列

沙龙题目:

Cloud platform, big data and the transformation of planning

云平台, 大数据与规划转型

龙瀛《大数据与城市规划》课外沙龙系列第四讲

沙龙嘉宾:

茅明睿

北京城市象限科技有限公司创始人, CEO

高级工程师, 注册城市规划师

主持人:

龙瀛 博士

内容介绍:

报告从发展转型, 社会转型, 行业变化和规划师的个人理想等多个角度提出了规划如何转型的问题:

从规划业务看, 地在哪里? 活儿在哪里? 钱在哪儿? 从规划院管理转型来看, 类似BCL这类自组织是鼓励还是限制? 管理创新怎么搞? 从规划是个人发展来看, 毕业即失业? 去学大数据?

报告从“下得去社区, 玩得转数据”两个方面, 介绍了北京市城市规划设计研究院云平台创新中心和城市象限团队的若干实践, 尝试为规划转型找到一条可行之路。

沙龙嘉宾介绍:

茅明睿, 武汉测绘科技大学(现武汉大学)城市规划本科; 中国人民大学信息资源管理硕士。2000/7-2016/5任职于北京市城市规划设计研究院规划信息中心, 自2000年任职以来主持和参与了本单位的多项重大规划设计、研究和信息化项目。

社会职务:

- 中国城市科学学会城市大数据专委会副秘书长;
- 北京市城市规划设计研究院云平台创新中心秘书长;
- 北京城市实验室(Beijing City Lab)副主任;
- 阿里研究院数字经济特邀研究员;
- 中关村大数据产业联盟智库专家;
- 中国数据中心联盟大数据发展促进委员会委员

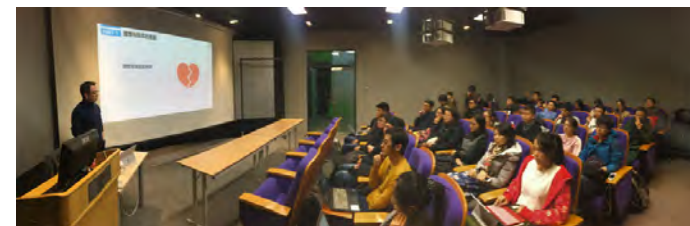
沙龙时间: 2016年12月15日(周四)晚19:00-21:00

沙龙地点: 清华大学建筑学院南118会议室

承办单位: 清华大学建筑学院研究生会

欢迎参加

SATU Public Lecture Series



## Big Data and Urban Planning 2017

## 清华大学《大数据与城市规划》课程期末汇报

TSINGHUA UNIVERSITY BIG DATA AND URBAN PLANNING - FINAL PRESENTATION

主题：城市大数据应用研究——以北京老城为例

时间：2018.01.05(五) 07:45-12:00 | 地点：逸夫馆 多功能厅(中203)

授课教师：龙瀛 | 点评专家：李栋、刘传宗、茅明睿、王江浩、王静远、吴康、张线(按姓氏拼音排列)

## 07:50-09:35 上半场汇报 (每组发言11分钟, 答疑4分钟)

## 07:50-08:05 北京旧城街景美观度的评价研究

吴欣尔、殷茹静 环境学院; 杨文聪 水利水电工程系

## 08:05-08:20 工作学习类第三空间的分布与特征——以北京老城为例

沈一斌、姚洲、曹蕾 建筑学院; 惠硕迪 电子工程系

## 08:20-08:35 单车上的老北京——北京旧城区骑行行为影响因素探究

李煜慧、林源圣、王珊珊、张能 建筑学院

## 08:35-08:50 北京二环内治理“开墙打洞”空间数据的多尺度影响研究

黄澄 建筑学院; 詹斌慧 社会科学学院; 邓双聚 生命科学学院

## 08:50-09:05 出谋划“厕”——北京二环内公共厕所使用现状评估及规划对策研究

李秋蒙、张阳 建筑学院; 张哲蕾 美术学院; 赖智勇 土木工程系

## 09:05-09:20 街边餐饮注定要消亡么? ——以北京市餐饮业为例

李会平、辛磊、郑龙飞 土木工程系; 邢丹琦 地球系统科学系

## 09:20-09:35 基于空间数据的北京旧城街道多样性对街道活力的影响研究

张爽、徐玉 中国城市规划设计研究院; 张富成 土木工程系

## 09:50-11:50 下半场汇报 (每组发言11分钟, 答疑4分钟)

## 09:50-10:05 北京地铁站域活力与情感意象研究及其影响因素探析

徐频庭、马宏涛、陈知雨 建筑学院; 胡昱坤 软件学院

## 10:05-10:20 老年人视角下的北京市二环以内社区步行指数估算

张健、张朝平 地球系统科学系; 胡礼 土木工程系

## 10:20-10:35 北京市二环内影院选址及其它发展要素的研究

程站、韩旭、刘晚琦 中国城市规划设计研究院; 马晓瑾 公共管理学院

## 10:35-10:50 历史街区中的餐饮空间适应性研究——以大栅栏片区为例

尉方 土木工程系; 连颖、王越 建筑学院

## 10:50-11:05 城市绿地空间社会活力的影响因素探析

林子秋 公共管理学院; 赵艳春 医学院; 林子通 建筑学院; 戚光威 土木工程系

## 11:05-11:20 北京市中心城区街道生活指数评估

刘于惠、苏心明、苏洋 水利水电工程系; 古博韬 土木工程系

## 11:20-11:35 胡同里的绅士——北京历史街区点状绅士化分布及影响研究

卢笛、龚子路 建筑学院; 仇青源 地球系统科学系; 李岱璇 社会科学学院

## 11:35-11:50 北京二环内绿色建筑分析

符鹏飞 航天航空学院; 郭翔宇 社会科学学院; 武晓影 建筑学院



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清华大学建筑学院公共讲座系列

报告题目：

## 城市感知与计算方法引论

龙瀛《大数据与城市规划》课外沙龙系列 第三讲

沙龙嘉宾：

王江浩 博士

中科院地理科学与资源研究所, 副研究员

主持人：

龙瀛 博士

沙龙嘉宾介绍：

王江浩博士现为中科院地理科学与资源研究所, 资源与环境信息系统国家重点实验室, 副研究员。同时为中国科学院大学授课教师, 麻省理工学院中国未来城市实验室访问学者, 客座研究员。研究方向主要为地理空间统计学, 资源环境遥感、定量城市研究等。现已主持参加国家自然科学基金、国家重点研发计划、中科院前沿重点等多项科研项目, 并在国际学术期刊上发表 SCI/SSCI 论文 30 余篇, 荣获 2017 年度科技部国家遥感中心遥感青年科技人才创新资助计划。现担任中国资源学会资源制图专委会副秘书长、中国城市科学研究会城市大数据专委会委员, 也是国内首个定量城市研究网络“北京城市实验室(BCL)”的共同发起人之一。

讲演时间：

2017年12月28日(周四) 18:00—19:30

讲座地点：

建筑学院一楼南118会议室

欢迎各位同学参加

清华大学建筑学院公共讲座系列

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报告题目：

## 空间句法在城市研究与设计中的应用

龙瀛《大数据与城市规划》课外沙龙系列 第二讲

沙龙嘉宾：

盛强 博士

北京交通大学建筑与艺术学院  
英国 UCL 空间句法公司北京办公室  
高级咨询顾问兼技术总监

主持人：

龙瀛 博士

沙龙内容：

空间句法已经在规划和建筑学界活跃和发展了 30 余年的时间。作为一种从空间形态出发、以实证为基础的研究方法, 它为当下中国的城市规划和建筑设计提供了一种以数据为基础、以模型为工具的工作方式, 利用数据模型的预测能力实现理性量化的设计。如何更清楚的认识空间句法的意义和局限? 在信息时代和大数据环境下, 空间句法未来的发展方向又在哪里? 本次沙龙邀请到了北京交通大学的盛强博士, 与大家分享空间句法在城市研究与设计中的应用。

沙龙嘉宾介绍：

盛强博士, 毕业于荷兰代尔夫特理工大学, 城市学博士。其研究方向为空间句法城市形态分析, 商业建筑空间盈利能力分析。基于多重网络开放数据的城市空间研究及轨道交通站点周边用地功能和步行行为研究等。近年来致力于将网络大数据资源的空间分析与以实地调研为基础的小数据分析相结合, 验证拓展空间句法理论和模型在当代中国城市的研究及实践。自 2013 年加入英国 UCL 空间句法北京办公室以来, 主持建筑与规划设计咨询项目 5 项, 并负责空间句法在中国的培训课程。

讲演时间: 2017年11月30日(周四) 19:00—21:00

讲座地点: 建筑学院 王泽生厅

欢迎各位同学参加



清华大学建筑学院公共讲座系列

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报告题目：

Data Cradling With Fun  
零代码抓数据

龙瀛《大数据与城市规划》课外沙龙系列 第一讲

沙龙嘉宾：

李栋 博士

北京清华同衡规划设计研究院  
技术创新中心常务副主任

主持人：

龙瀛 博士

沙龙内容：

互联网是当前信息传播的重要途径之一, 其中也蕴含了大量城市规划研究中利用的数据资源。如何快速有效的获取到这些数据、开展针对性的研究与分析, 对每一位非计算机背景同学来说都是一个不小的挑战。本次沙龙针对上述问题, 以零代码为切入点, 组合既有的软件工具, 介绍了数据资源探索与定位、自动化抓取和清洗常规方法, 并结合案例介绍和上机实践, 帮助同学们尽快掌握互网抓取的相关基本知识及技能。

沙龙嘉宾介绍：

2003 年于清华大学环境系获环境工程本科学位, 2008 年于中国科学院生态环境研究中心获生态学博士学位。毕业后在中科院、清枫院等国内一流规划设计单位长期从事城乡规划研究与实践工作, 曾参与或负责多项重大规划咨询项目、国际合作研究课题等任务。个人研究兴趣为城市可持续发展模型与空间数据分析, 主要涉及数据、工具和方法研发与应用; 学术成果多次在国内内外重要会议和同行评议期刊上发表, 并担任 JEMA、CEUS、IJGIS、GeoJournal 等期刊的审稿人。近年来致力于在城市研究和规划中利用多源数据开展精细化研究, 是国内首个定量城市研究网络“北京城市实验室(Beijing City Lab, BCL)”共同发起人。

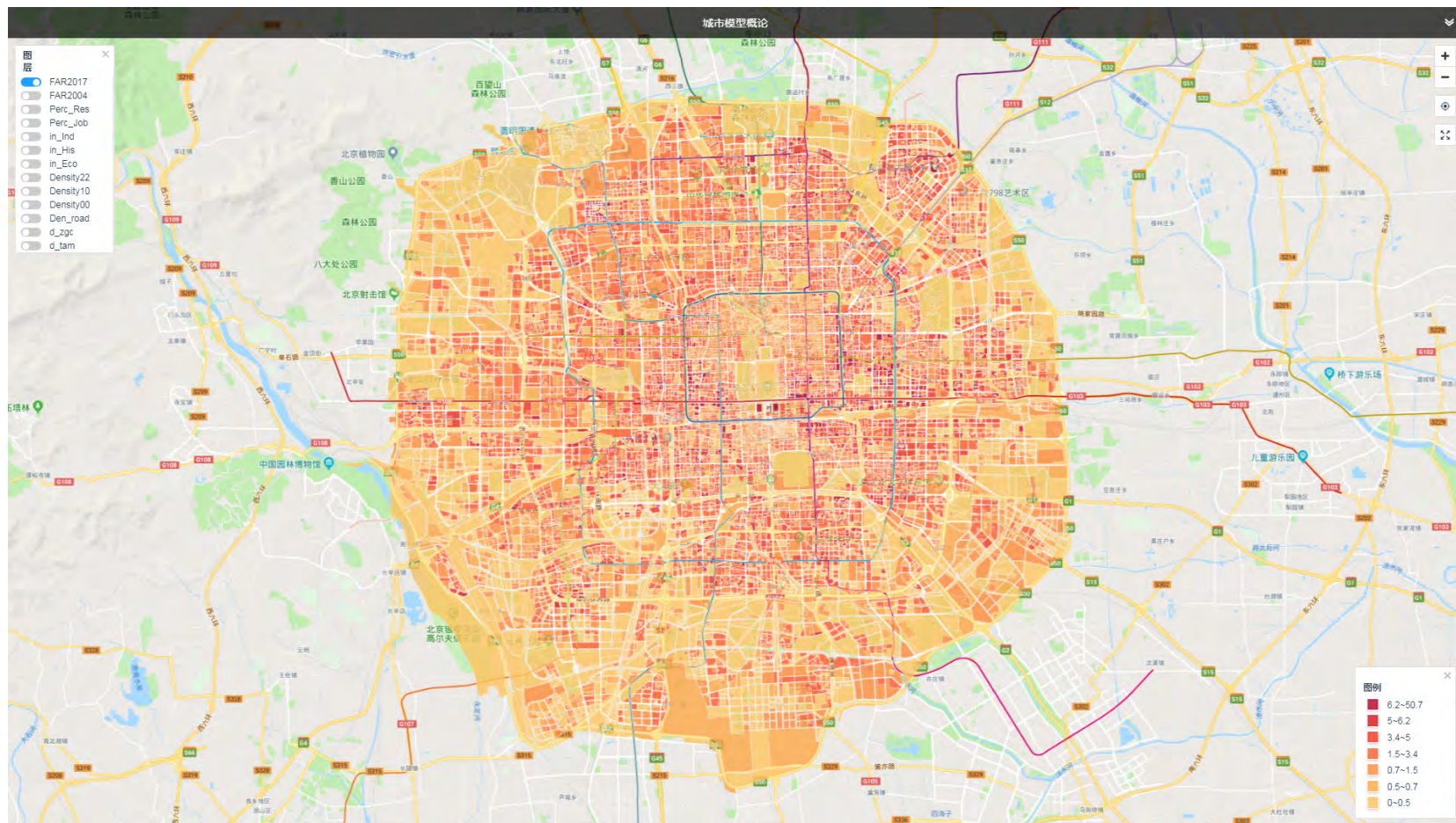
讲演时间: 2017年10月26日(周四) 19:00—21:00

讲座地点: 建筑学院一楼 王泽生厅

欢迎各位同学参加

沙龙实操所需软件：  
(百度网盘)

# 城市模型概论2018



## 城市模型概论

欢迎选课!  
清华大学全校性本科生选修课 (属于 文化素质课)

**课程信息**  
 课程名称: 城市模型概论  
 授课教师: 龙瀛, 清华大学建筑学院  
 授课时间: 1-5周/每周二/第六大节 (19:20-20:55)  
 授课地点: 五教 (具体地点详见选课系统)  
 课程类别: 全校性本科生选修课 (属于 文化素质课)  
 课 时: 16  
 学 分: 1  
 考核方式: 考察中期作业 (30分) + 出勤 (30分) + 大作业 (40分)

**选课指导**  
 本课程适合城乡规划、建筑学、风景园林、人文地理、地理信息系统、城市经济、城市交通、公共管理、环境科学与工程和社会学等专业的清华大学 二年级及以上本科生

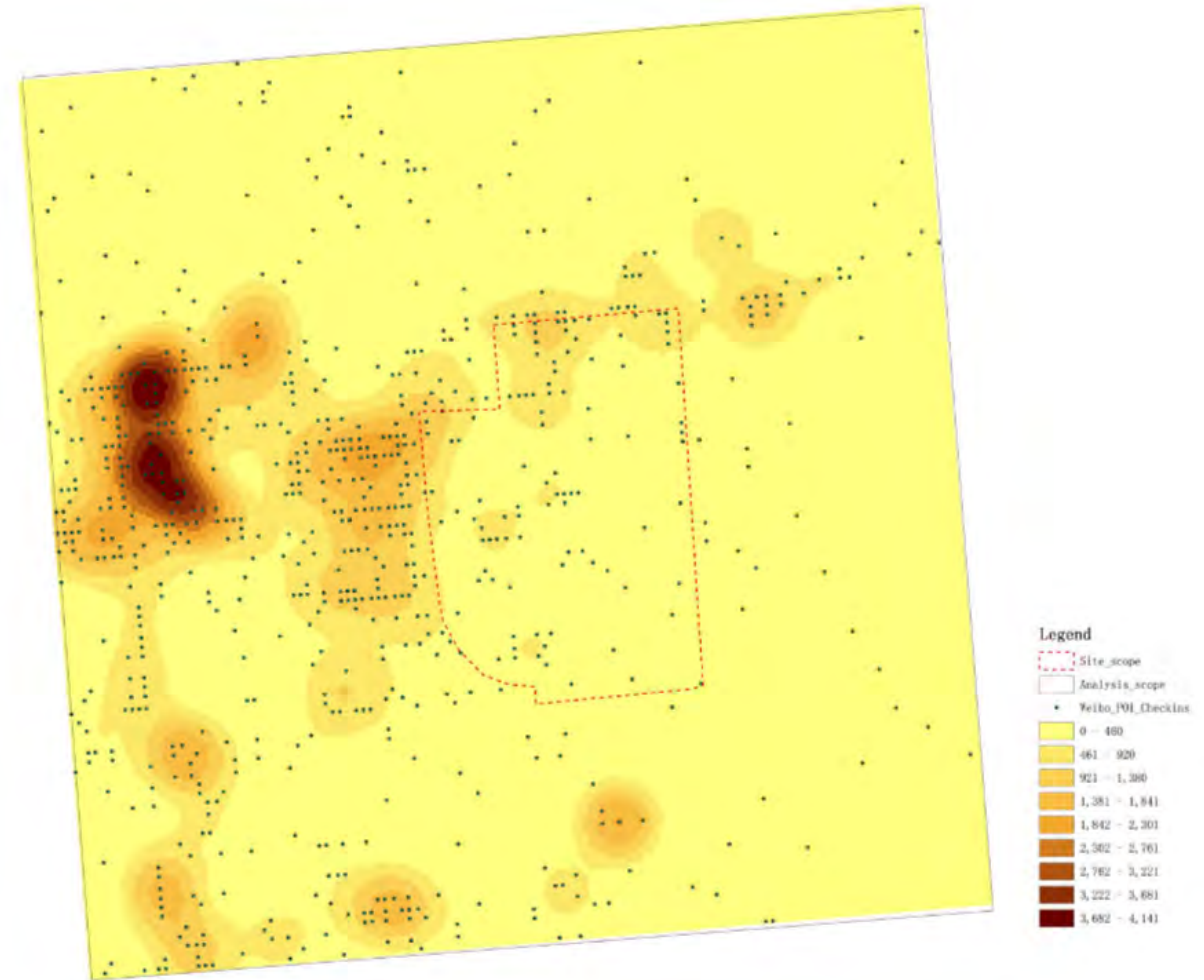
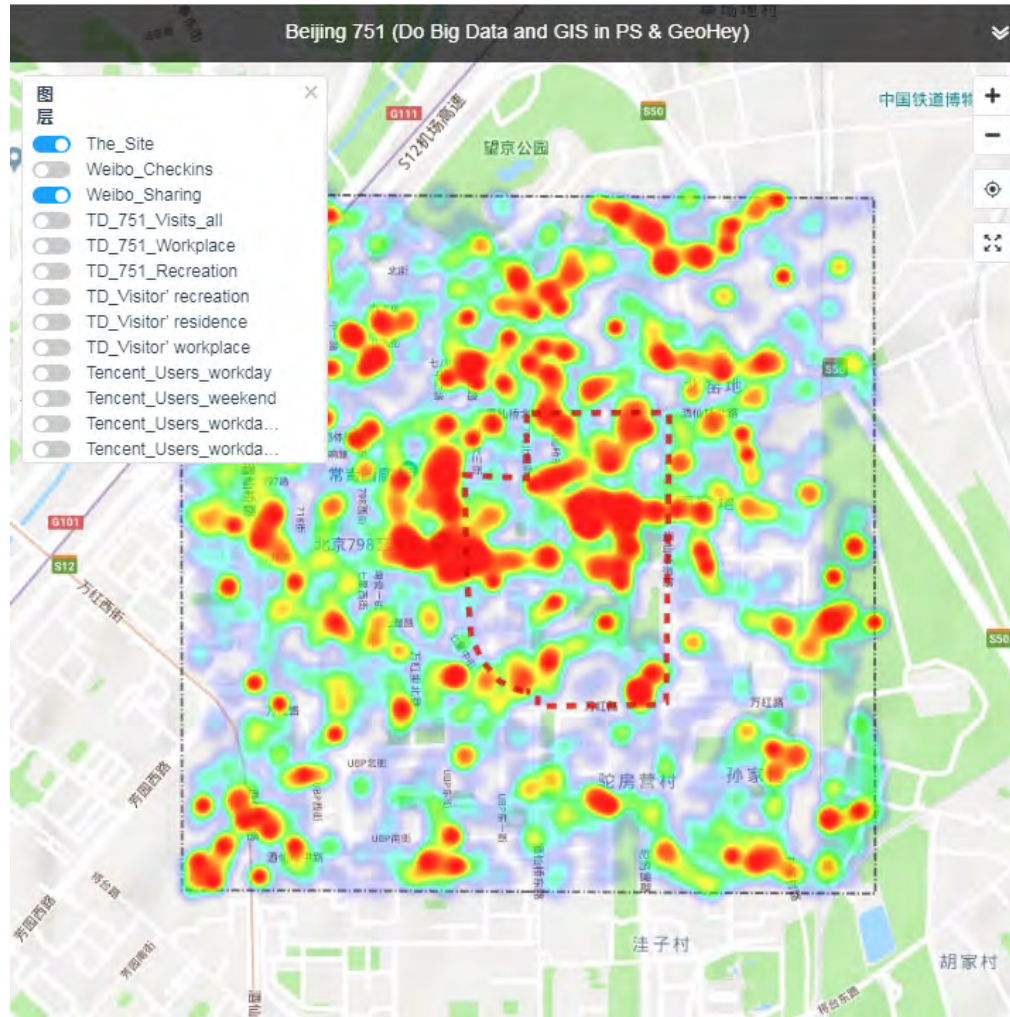
**先修要求**  
 建议先修《建筑数学》、《规划数学》、《高等数学》、《数学分析》、《线性代数》、《概率与数理统计》中的至少一门, 需要对城市系统有初步认识或浓厚兴趣, 最好了解基本的城市空间分析能力和统计分析能力

**教学大纲**  
 1. 城市模型概论之概论 (城市模型的流派、经典城市模型、最新发展趋势再大课堂)  
 2. 建立城市模型所需要的基础数据  
 3. 城市空间分析方法  
 4. 城市模型语言 (Python)  
 5. 空间相互作用模型  
 6. 基于规则建模  
 7. 先量完善自动机模型  
 8. 大数据时代的城市模型展望及课程总结

**欢迎选课**

已有 关于 更多  
 课程 反馈 信息

# EPMA2018 : Do Big Data and GIS in PS & GeoHey





## To summarize: Smart urbanism in Chinese cities

清华大学



### DATA

Big data, commercial, social network, and official open data

### METHOD

Spatial analysis and statistics, statistical and artificial intelligent methods

### MODEL

Both bottom-up and top-down applied urban models

### TECHNIQUE

Sensors, unmanned aircraft, eye tracker, EEGs, and virtual reality techniques

# Smart City Observation

Data driven, online platform, on-site sensors

# Smart Urban Studies

Quantitatively, the whole country, human-scale urban form

# Smart spatial Intervention

Urban planning & design

Urban planning & design

**Thanks for attention!**

**Ying Long, PhD**

School of Architecture, Tsinghua University  
Founder and Executive Director, Beijing City Lab