



Big/Small Data and Jobs-housing Balance

A Tale of Four Chinese Cities

大小数据、职住平衡： 中国四城故事

Jiangping Zhou, PhD

Associate Professor in Urban Planning and Design
& Transport Policy and Planning

周江评 博士

城市规划与设计、交通政策与规划副教授

zhoujp@hku.hk

Outlines

Part 1 What is jobs-housing balance?

Part 2 How to measure it? (with big/small data)

Part 3 Why we need it?

Part 4 How to promote (assuming that we could) it? (Based on four cities' lessons and/or findings)

Part 5 Conclusions and discussion

概览

什么是职住平衡？

怎么衡量之？（用大小数据）

我们为何需要它？

如何（假定我们可以）促进之？

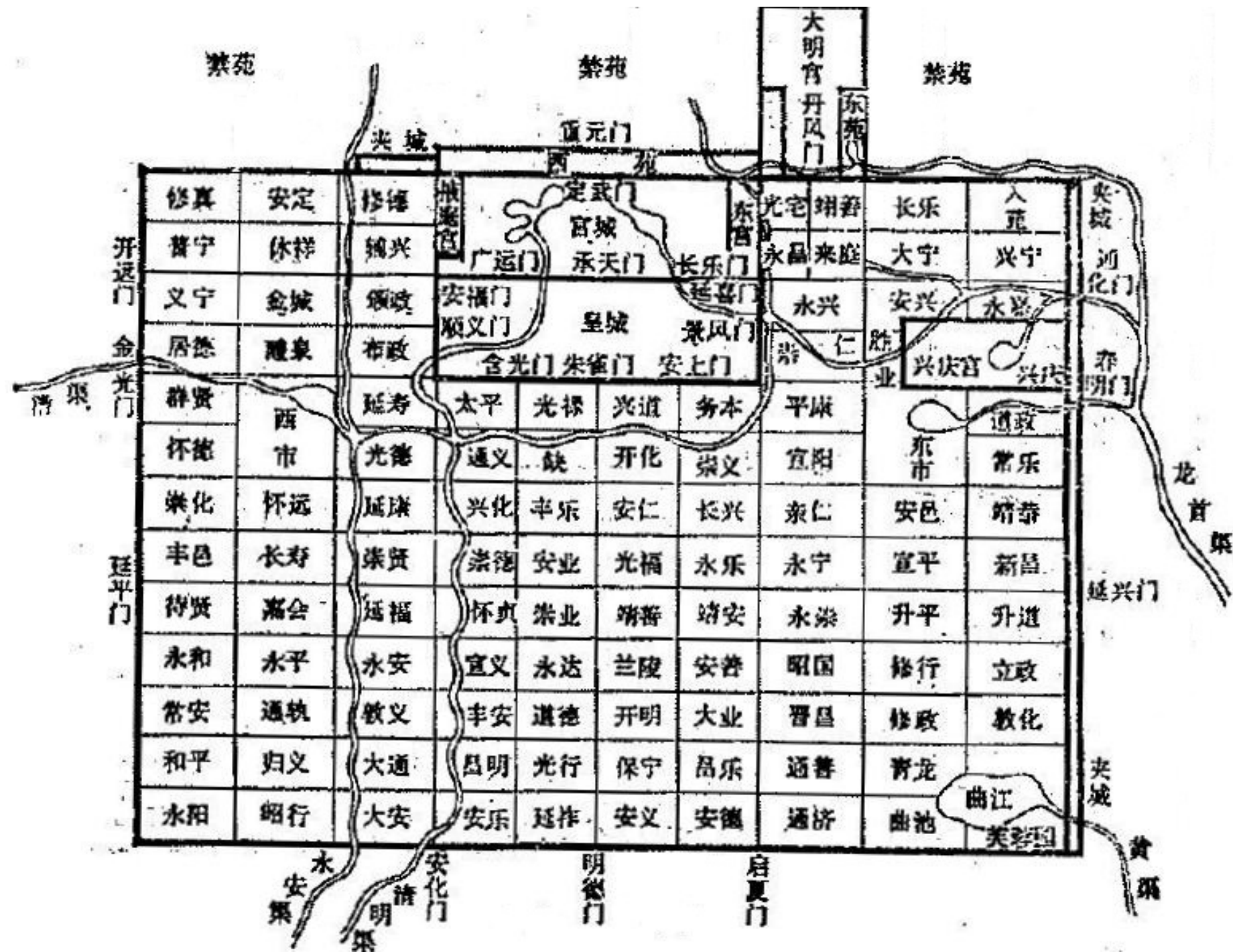
结论和讨论

PART What is jobs-housing balance?

01 职住平衡是什么？

It was once the norm of our cities (e.g., Chang'an and Kaifeng)

它曾经是我们城市的常态（例如长安和开封）

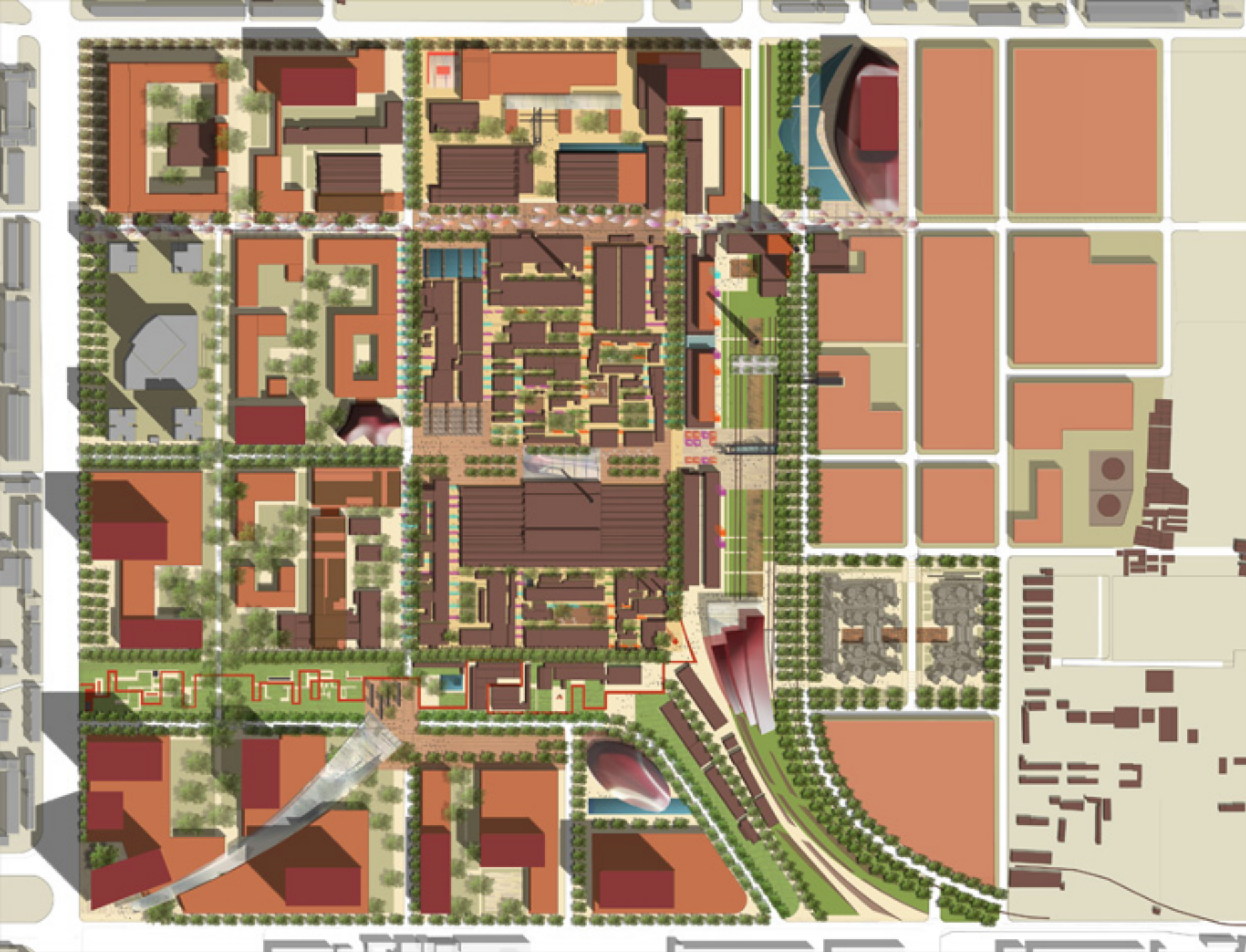




PART 01 What is jobs-housing balance?

01 职住平衡是什么？

- It seems something “controllable”
它似乎是可以被控制的
- We control it via mechanisms such as land use, zoning and Danwei
职住平衡能为土地利用、区划和单位等机制所控制



798

The complex was to occupy 500,000 square metres, 370,000 of which were allocated to living quarters (The remaining is industrial and related)

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曾经的单位大院
500, 000平米占地，
370, 000平米居住（其余
为工业及配套）

PART What is jobs-housing balance?

01 职住平衡是什么？

- Spatial/numerical relationship of jobs and housing units w/i a given geographical area
给定地理单元的工作岗位和居住单元的空间、数量关系 (Peng, 1997*)
- Ratio of jobs/housing
工作岗位和居住单元的比例 (Cervero, 1989; Margolis, 1973)
- Quantitative and qualitative match
工作岗位和居住单元定量定性的匹配 (Ma and Banister, 2006)

PART What is jobs-housing balance?

01 职住平衡是什么？

- Amenities and preference matter

受配套和偏好影响 (Giuliano, 1991)

- A dynamic process

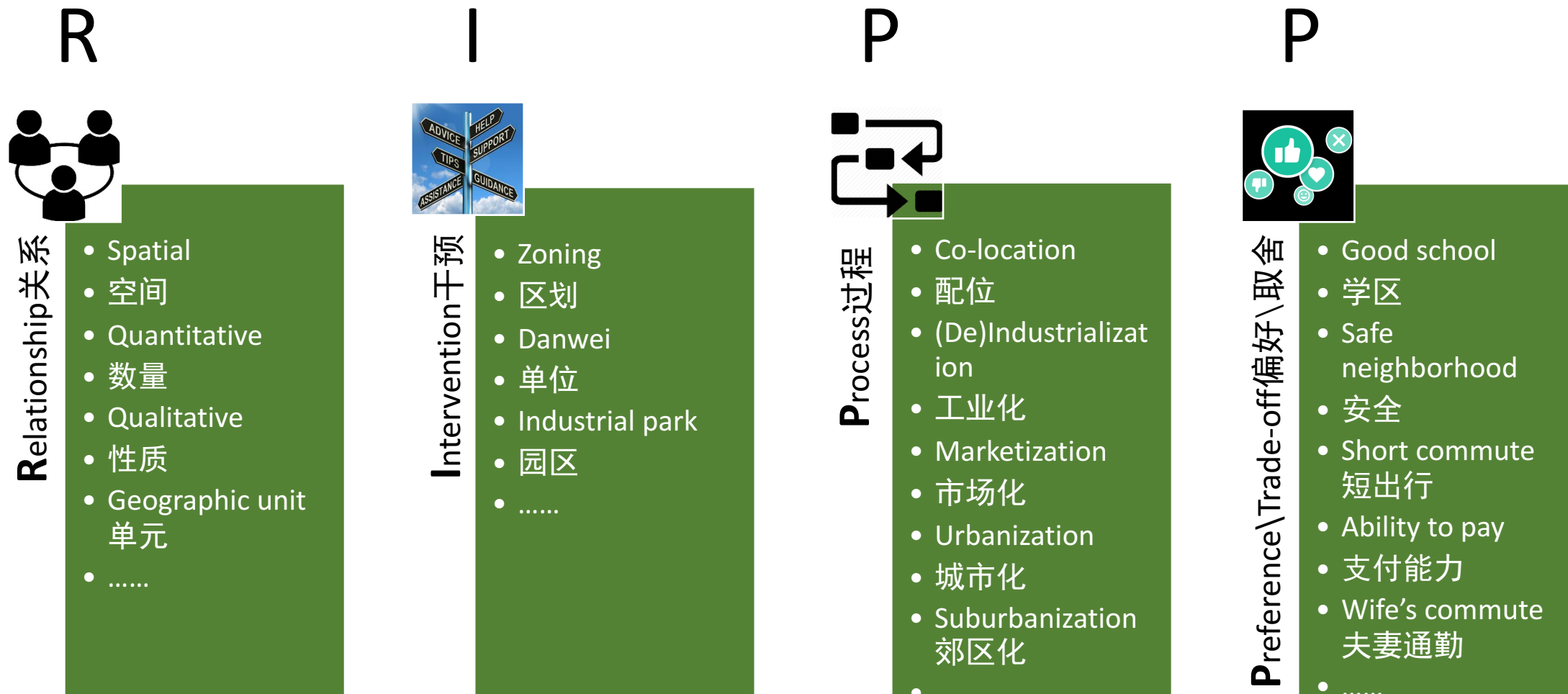
动态的过程 (Dubin, 1991)

- Inappropriate interventions lead to imbalance (Co-location exists)

不合适的干预会导致失衡（职住会相互配位） (Cervero and Landis, 1995)

PART 01 What is jobs-housing balance?

职住平衡是什么?



02 怎么衡量之？

- Local level: Jobs-housing ratio; match between jobs and housing; amenities and commuters' preference

本地（小）尺度上：职住比例；工作和居住单元的匹配

- Regional level: Average commuting distance

区域（大）尺度：通勤距离

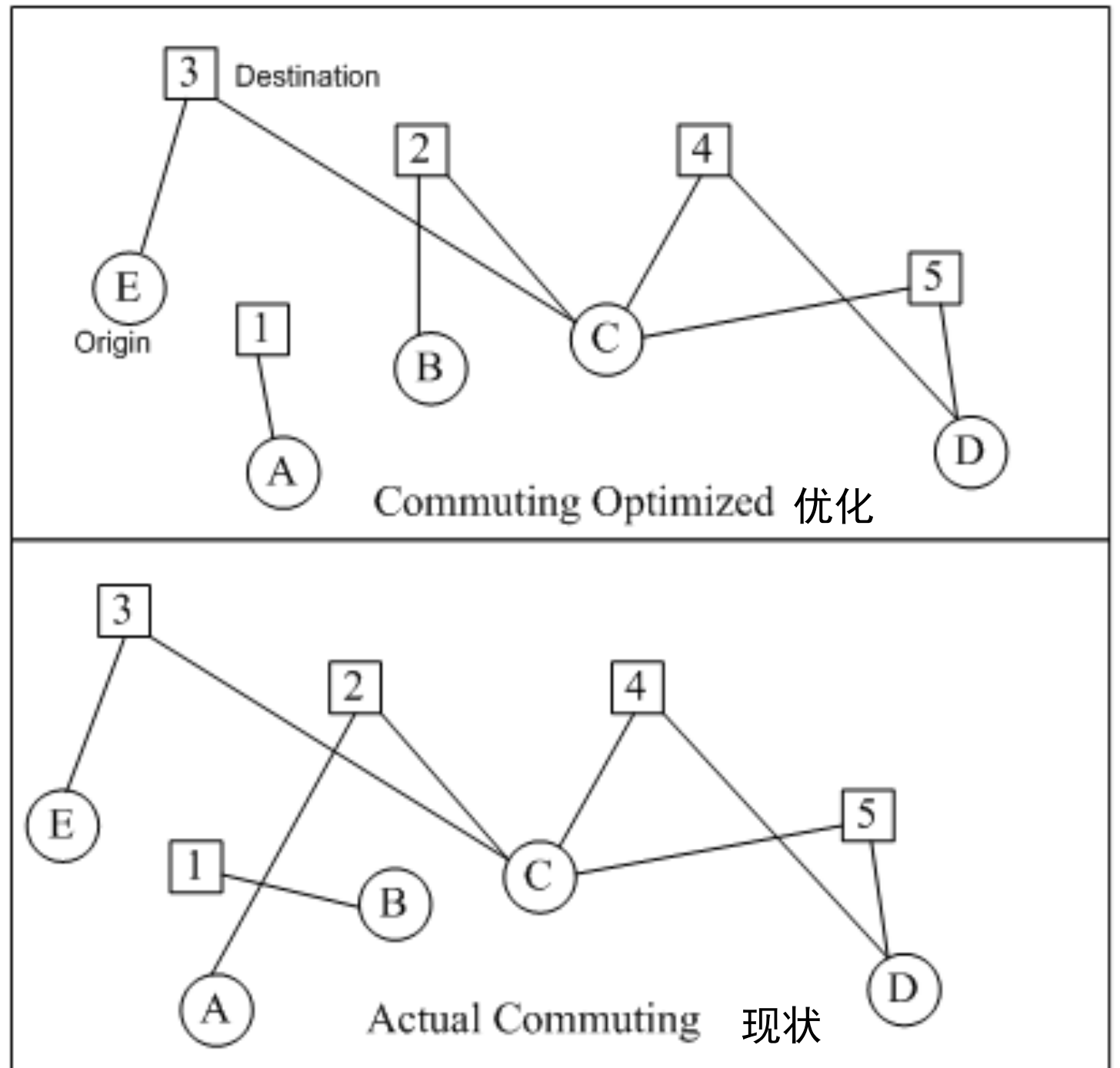
- But, if unbalanced, what should be the baseline?

但，如果不平衡，相对于什么样的基准线？

Optimizing commuting
and jobs/housing
balance:

An excess-commuting
framework

通勤优化和职住平衡：
过剩通勤框架



PART 03 Why we need it?

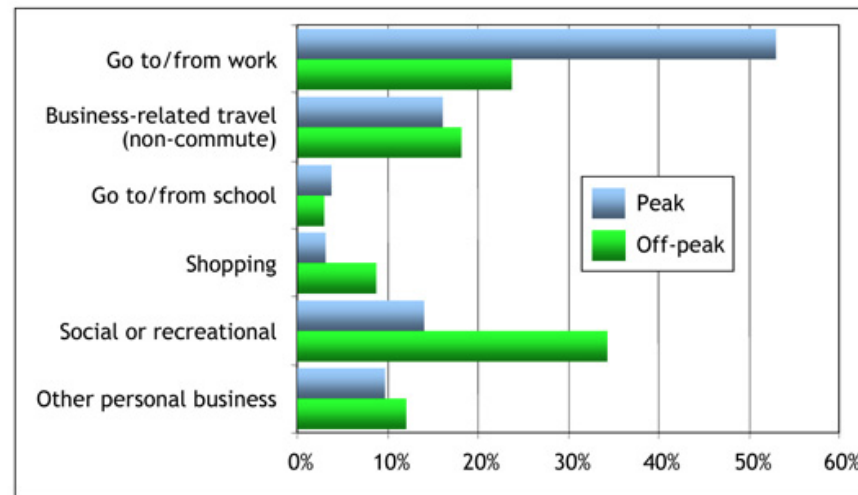
03 我们为什么需要之?

- Commutes often account for at least half of the peak-hour trips

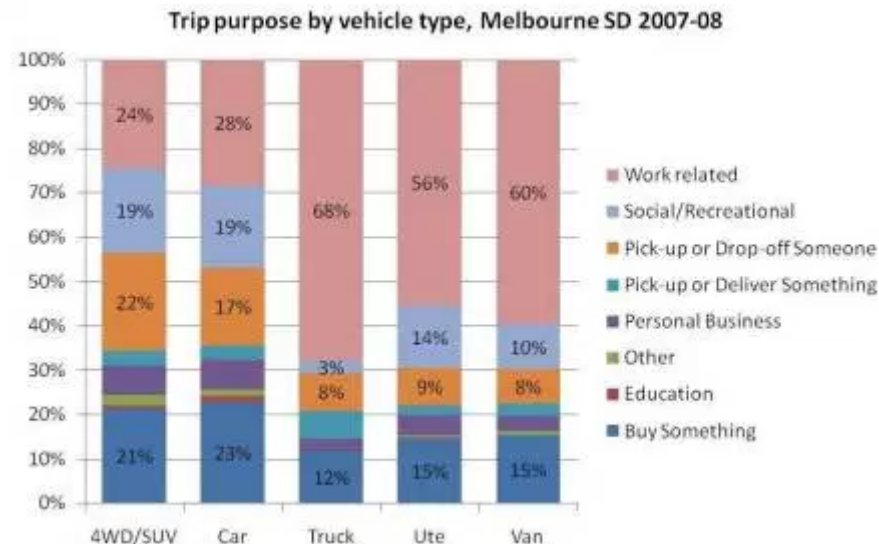
日出行当中的通勤比例

- Consequences of long commutes (jobs-housing imbalance): car dependence, traffic congestion, lost productivities, worsening air quality, etc.

长距离通勤和职住失衡的后果



Trip Purpose by Time of Day Figure 4-1



PART How to promote jobs-housing balance?

04 怎么促进职住平衡

A tale of four cities 四城故事：

- #1 Beijing 北京
- #2 Shanghai 上海
- #3 Xi'an 西安
- #4 Suzhou 苏州



THE UNIVERSITY OF HONG KONG
faculty of architecture



香港大學
建築學院

Sources of primary data

主要数据来源

- Smartcard data 公交卡数据 (Beijing 北京)
- Cellular network data 手机信令数据 (Shanghai 上海)
- Household travel surveys 家庭出行调查 (Xi'an 西安; Suzhou 苏州)



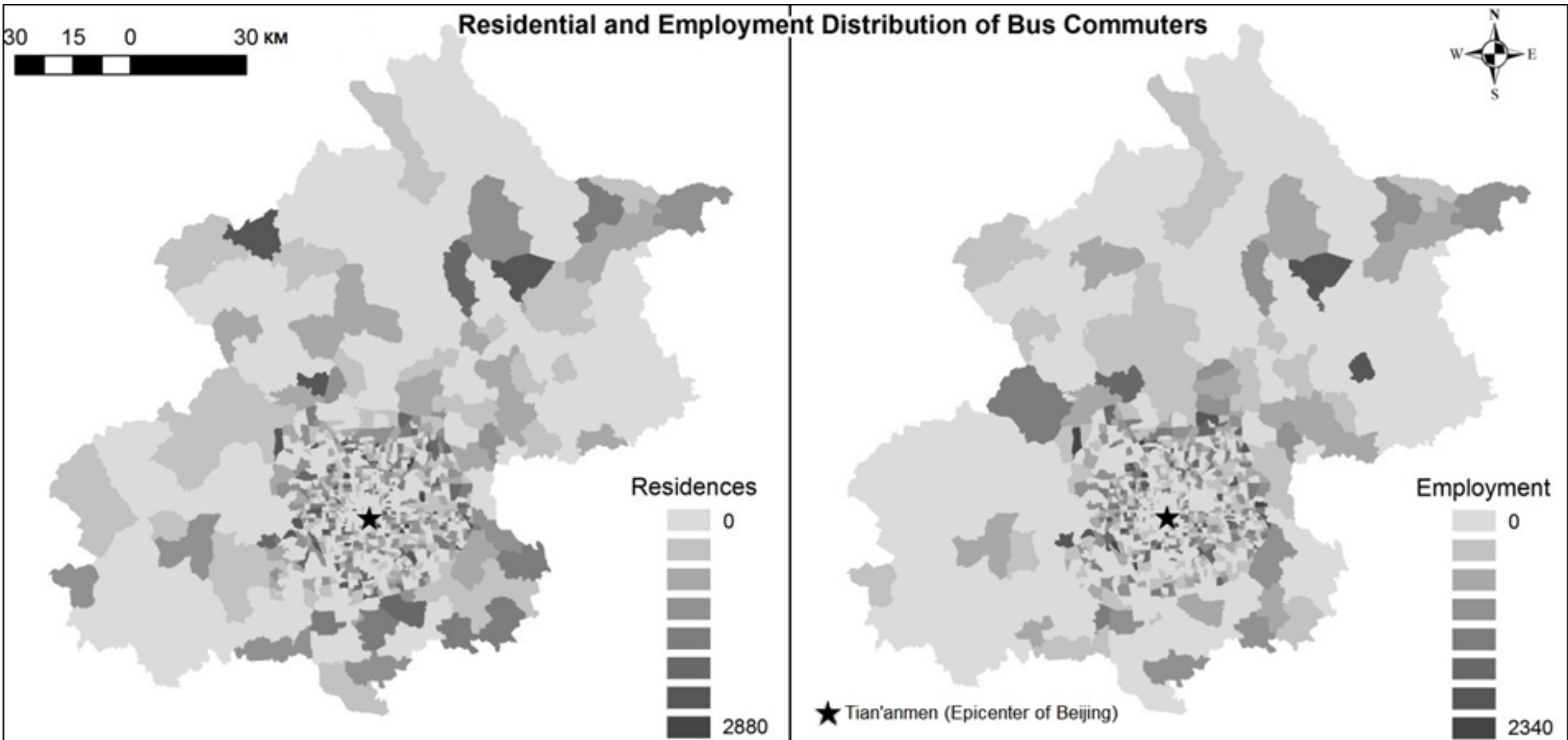
Methodologies 方法

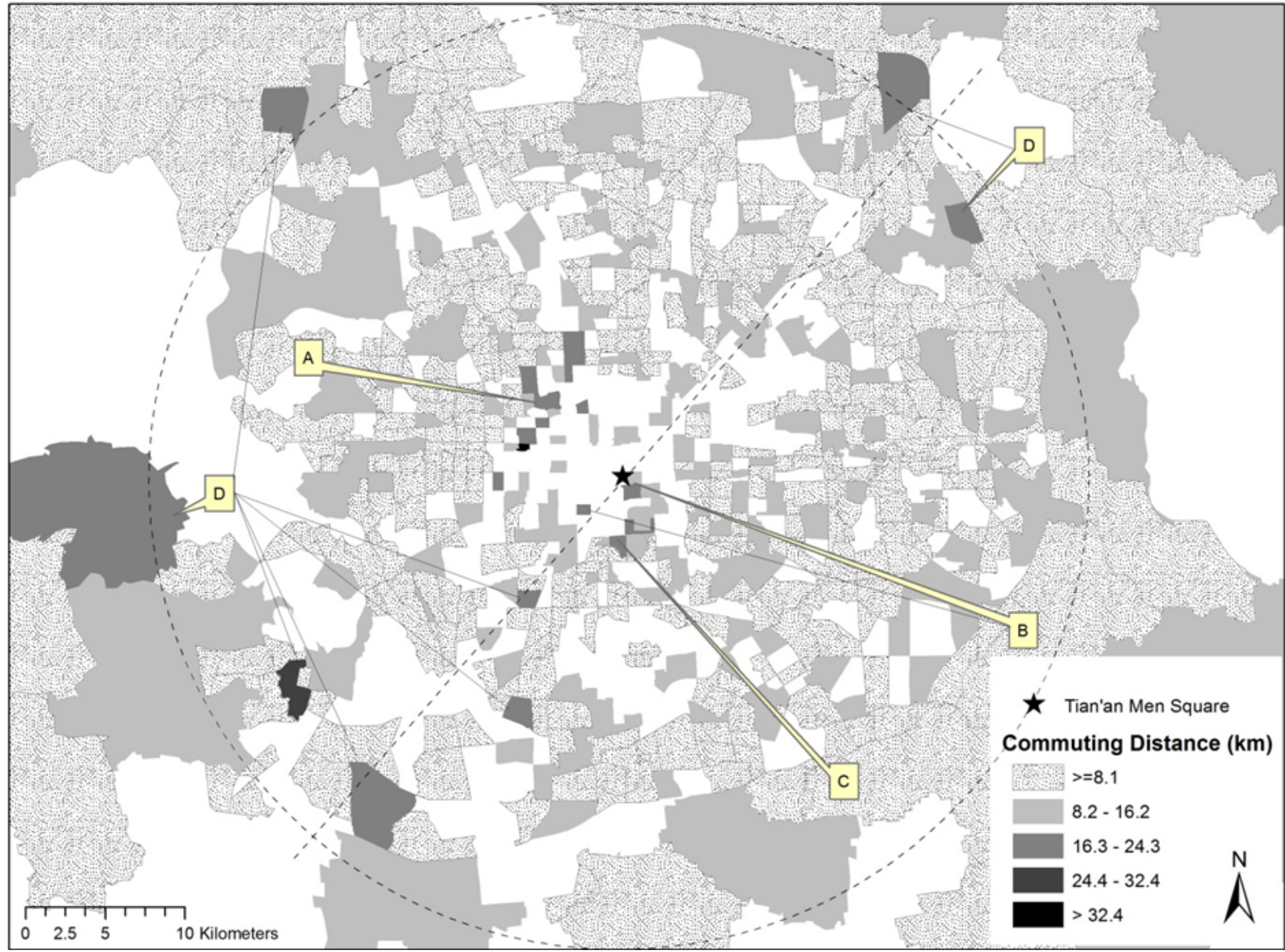
- Geo-visualization 地理可视化
- Transportation linear programming problem 交通线性规划问题
- Prototype studies based on fieldtrips/interviews 原型分析
- Excess-commuting framework 过剩通勤框架
- All-or-nothing traffic assignment 全有全无交通分配

City #1 : Beijing 北京

Corridor-level balance 基于走廊的平衡







Unbalanced prototype 失衡原型抽象

- Cheap

e.g., university campuses, old Danwei compounds left with mostly apartment buildings

- Green

e.g., Parks with luxury hotels, high-end apartments
Specialism

- Specialized

e.g., Specialized research institutes

- Old

e.g., Traditional Hu'tong with old, cheap, small, shared and underserviced rental housing units

- Low

e.g., Low density, developing areas with relatively cheap housing units in the suburb.

- Noisy

e.g., Residential areas with mixed-year housing units adjacent to freeway interchanges or arterials, railways within the fifth ring road

廉: 大学校园宿舍、老单位公房

绿: 公园边上高档宾馆

专: 专业研究院

旧: 破旧失修胡同

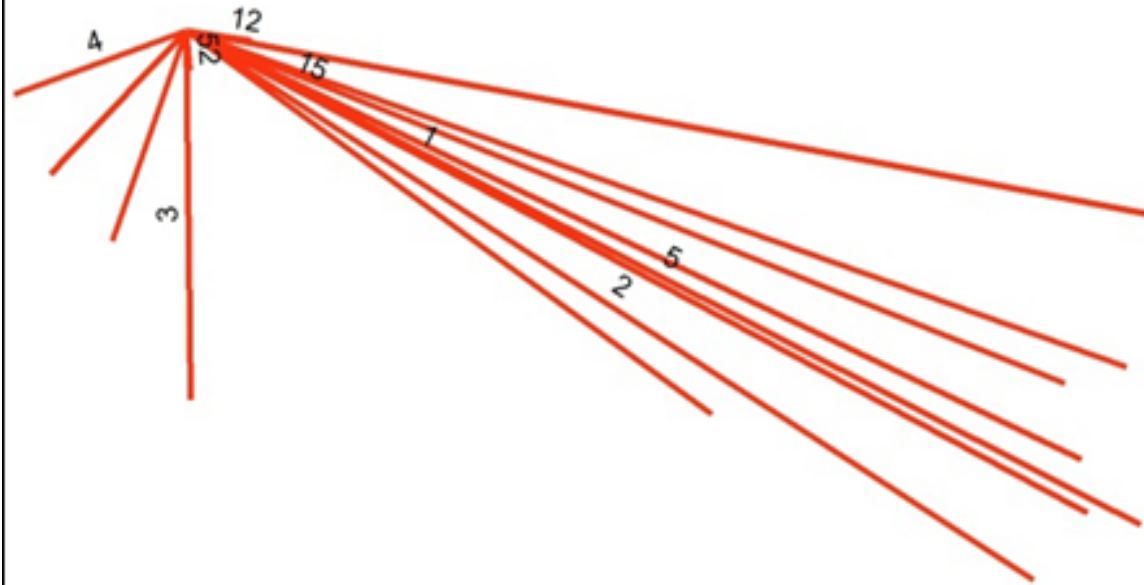
疏: 郊区新开发地段

吵: 高速公路交叉口附近

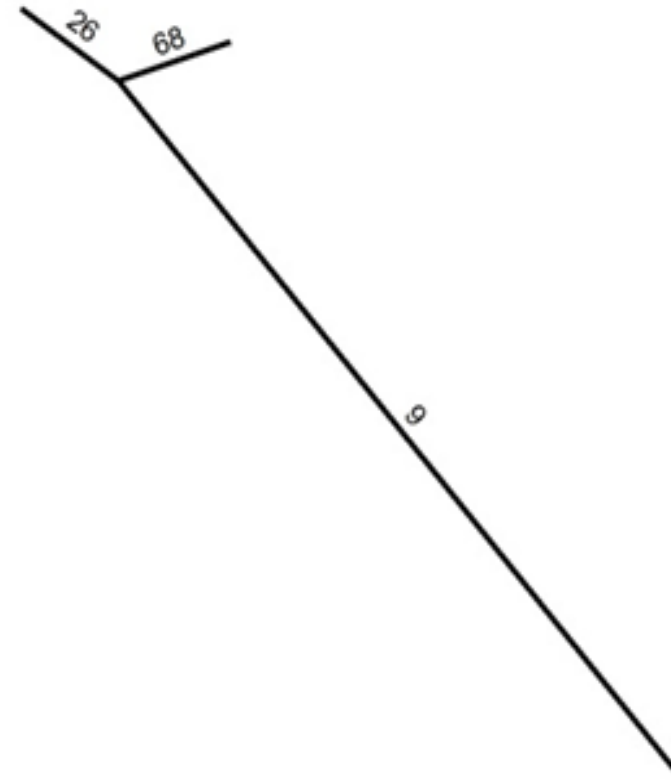
Prototype 原型	Characteristics 特征	Landmarks and Directions 地标和导引	Spatial index 空间索引
1	University campuses, hotels and old Danwei compounds left with mostly apartment buildings	Mizhu and Jiaotong Universities and areas in between; Beijing Technology and Business University and Capital Normal University (east campus) and areas adjacent to them; Bejing University of Aeronautics and Astronautics and Beijing University of Science and Technology and adjacent areas	A (North part)
2	Parks with luxury hotels, high-end apartments, specialized research institutes, hospitals and some mixed-use residential areas	Areas north to Yu Yuan Tan Park; Area adjacent to Tian Tan Park in the east	A (South part, the darkest area)
3	Traditional Hu'tong with old, cheap, small, shared and underserviced rental housing units	Areas in between Qian Men Da Jie and Zhu Shi Kou Da Jie	B
4	Residential areas with mixed-year housing units adjacent to freeway interchanges or arterials, railways within the fifth ring road	Areas near Yong Ding Men and Nan Sha Wo Bridges	C
5	Low density, developing areas with relatively cheap housing units in the suburb	Areas adjacent to the sixth ring road and Jingshi Freeway interchange; Areas adjacent to Yan Cun Railway Station	D

Balance around nodes and along corridors 围绕着节点和沿着走廊的平衡

Before Optimization



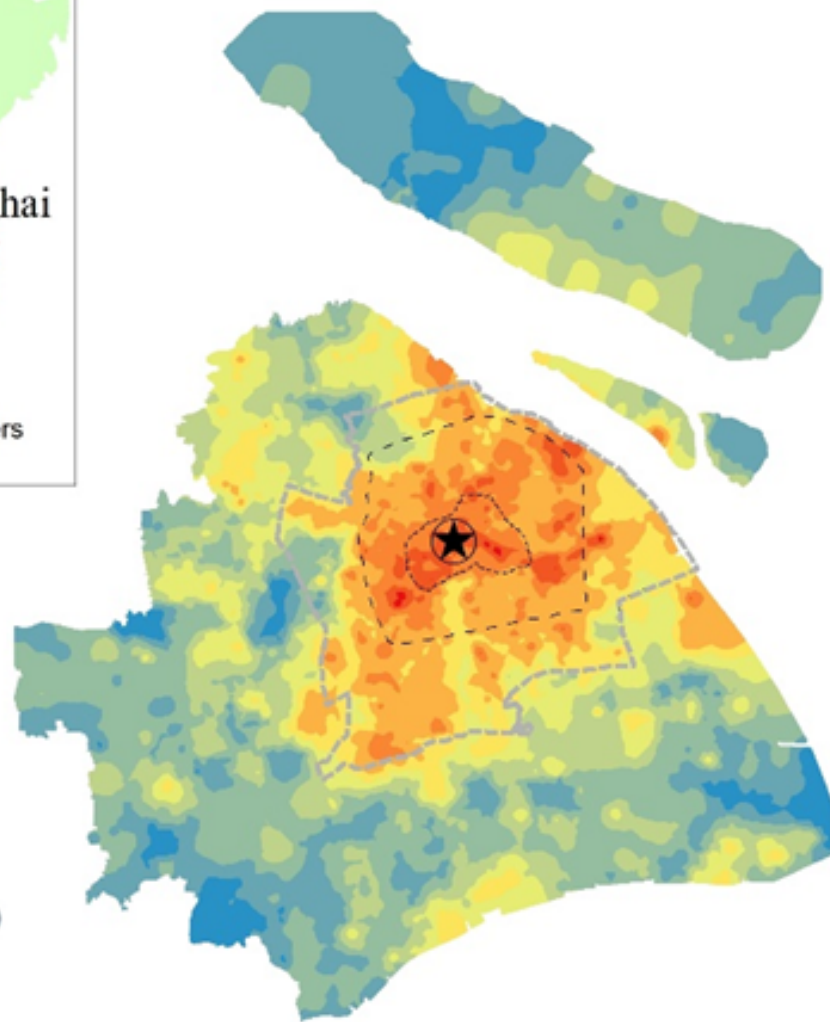
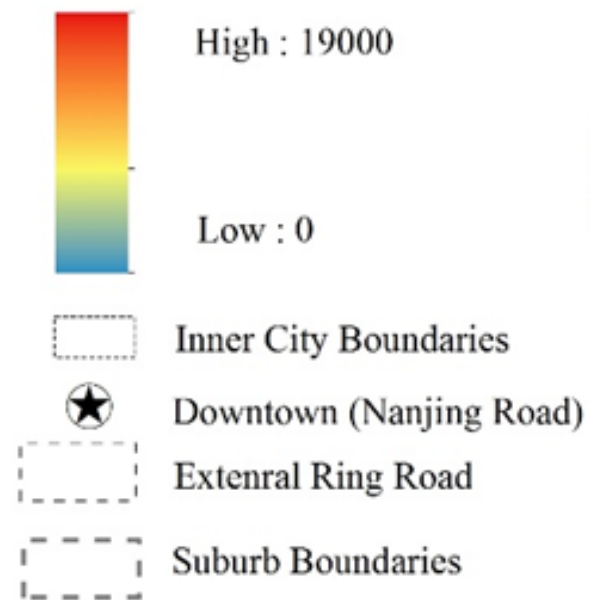
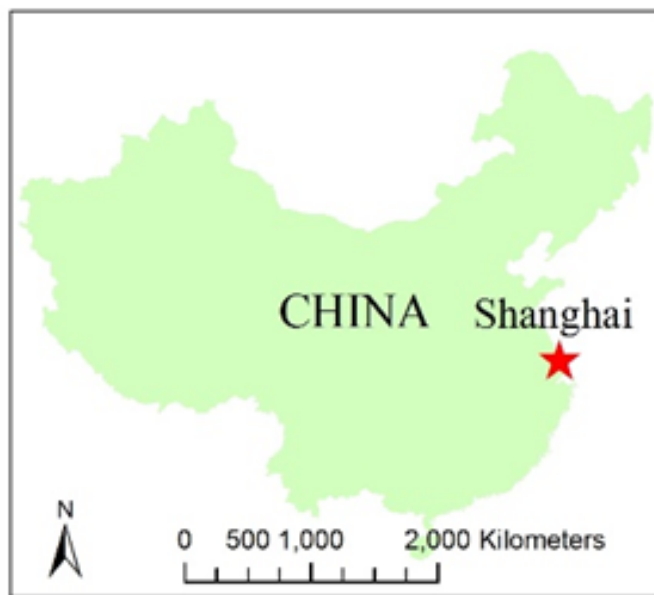
After Optimization



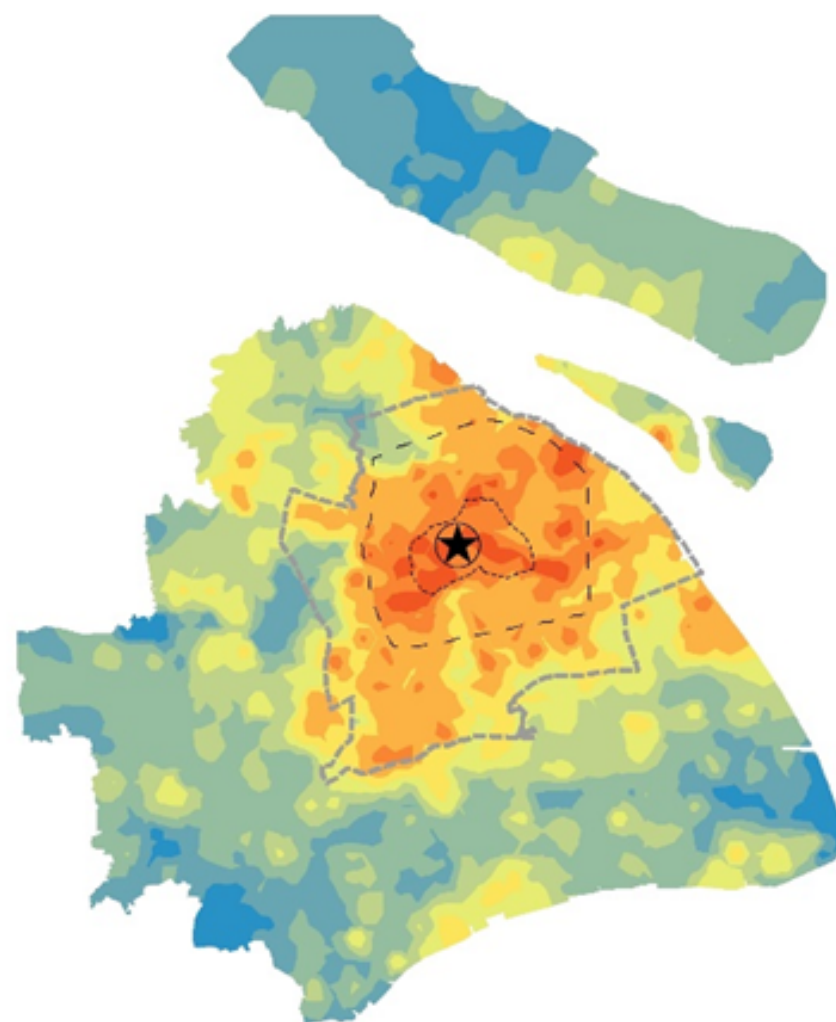
City #2 : Shanghai 上海

Qualitative match between jobs/housing 定性上的职住平（失）衡

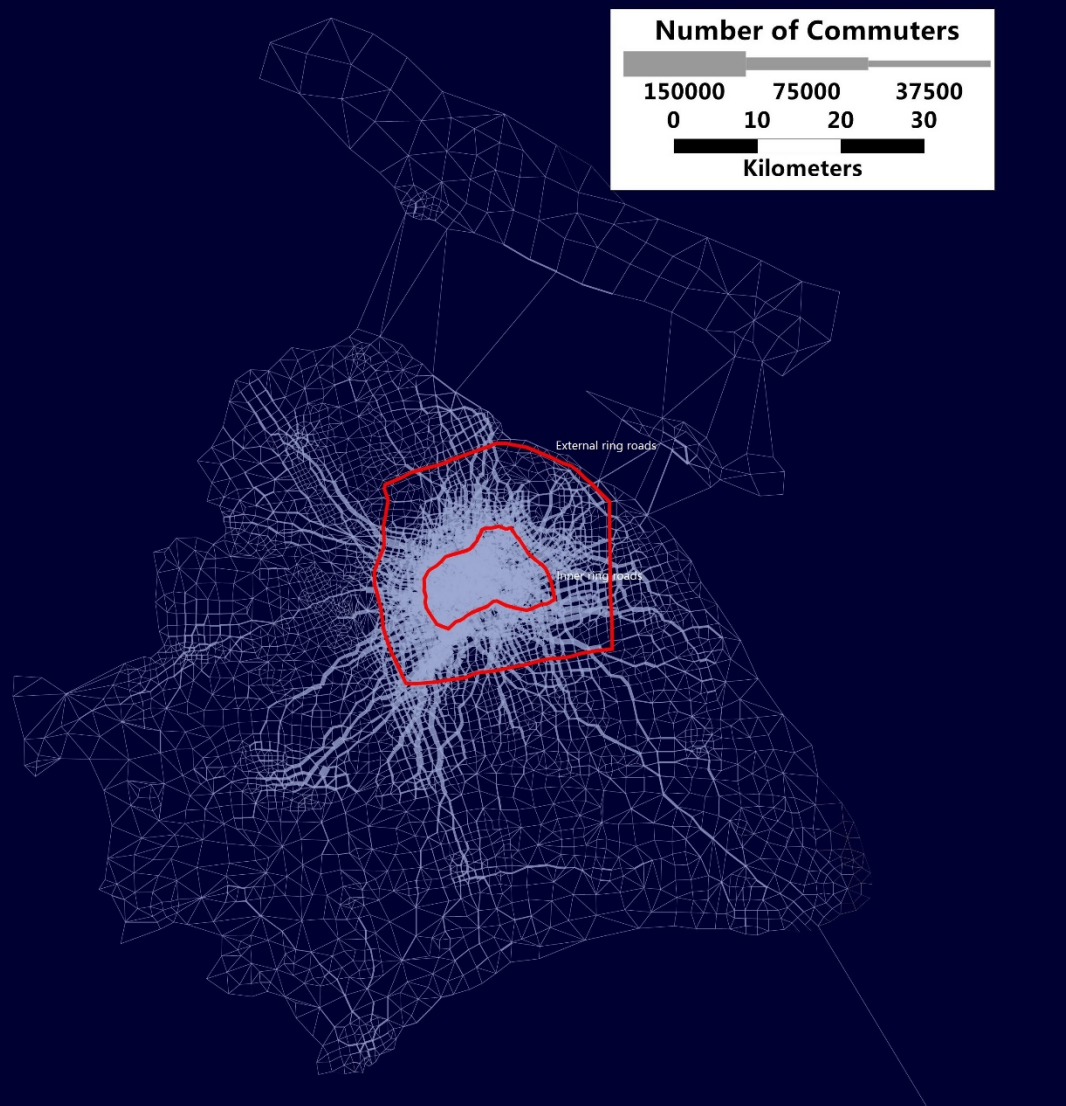




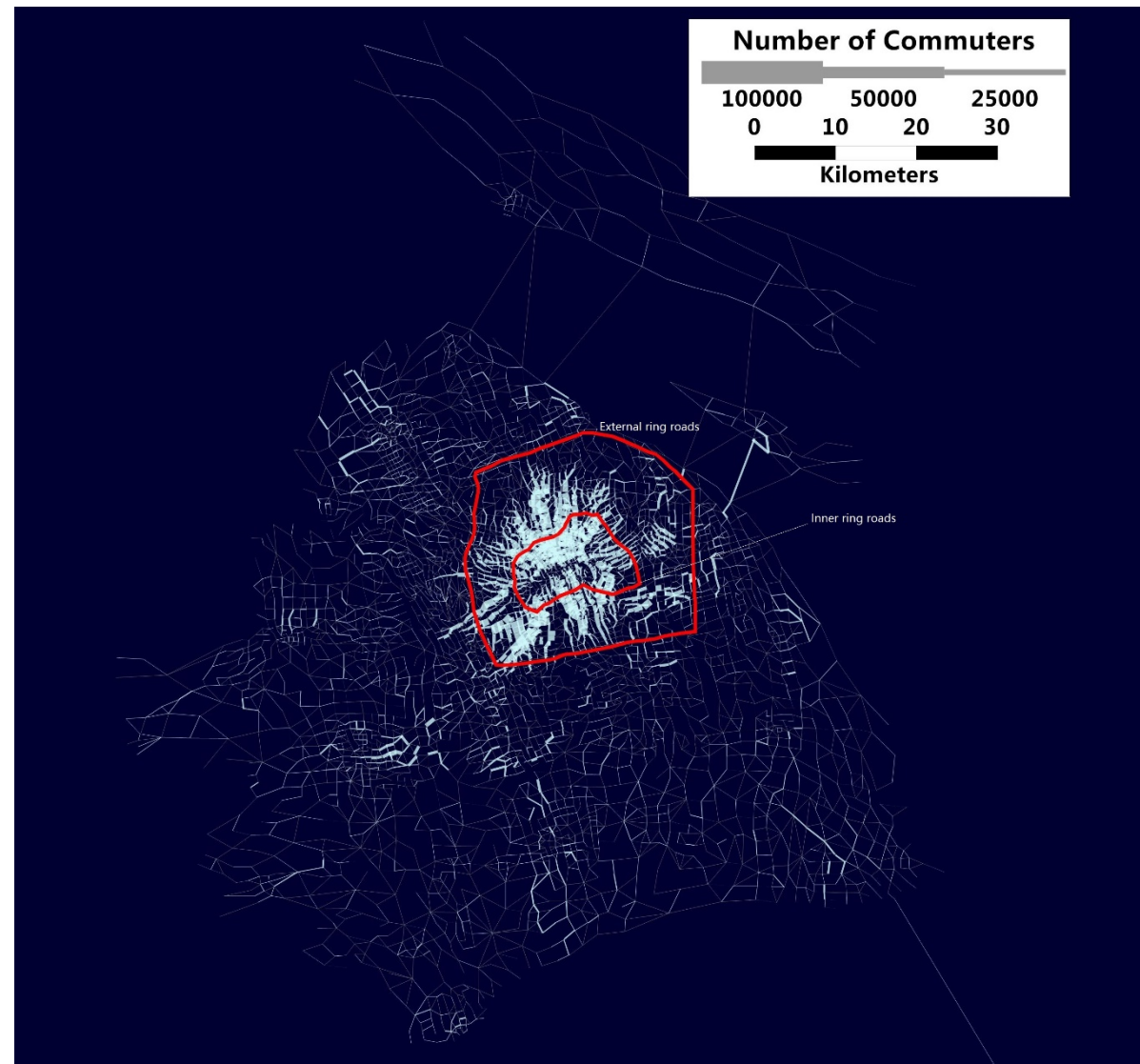
Residential Density



Job Density



Actual commuting flows
实际通勤流



Optimal commuting flows
优化后的通勤流

Optimal vs. Reality 优化和现实

- If optimized, average commuting distance should be 3.2km (8.2km in reality).

优化时平均通勤仅3.2KM，但实为8.2KM.

- In theory, over 95% of all the local workers can find a job within 6 km of his/her residence or vice versa.

理论上，95%的职工能在6公里范围内找到至少一份工作

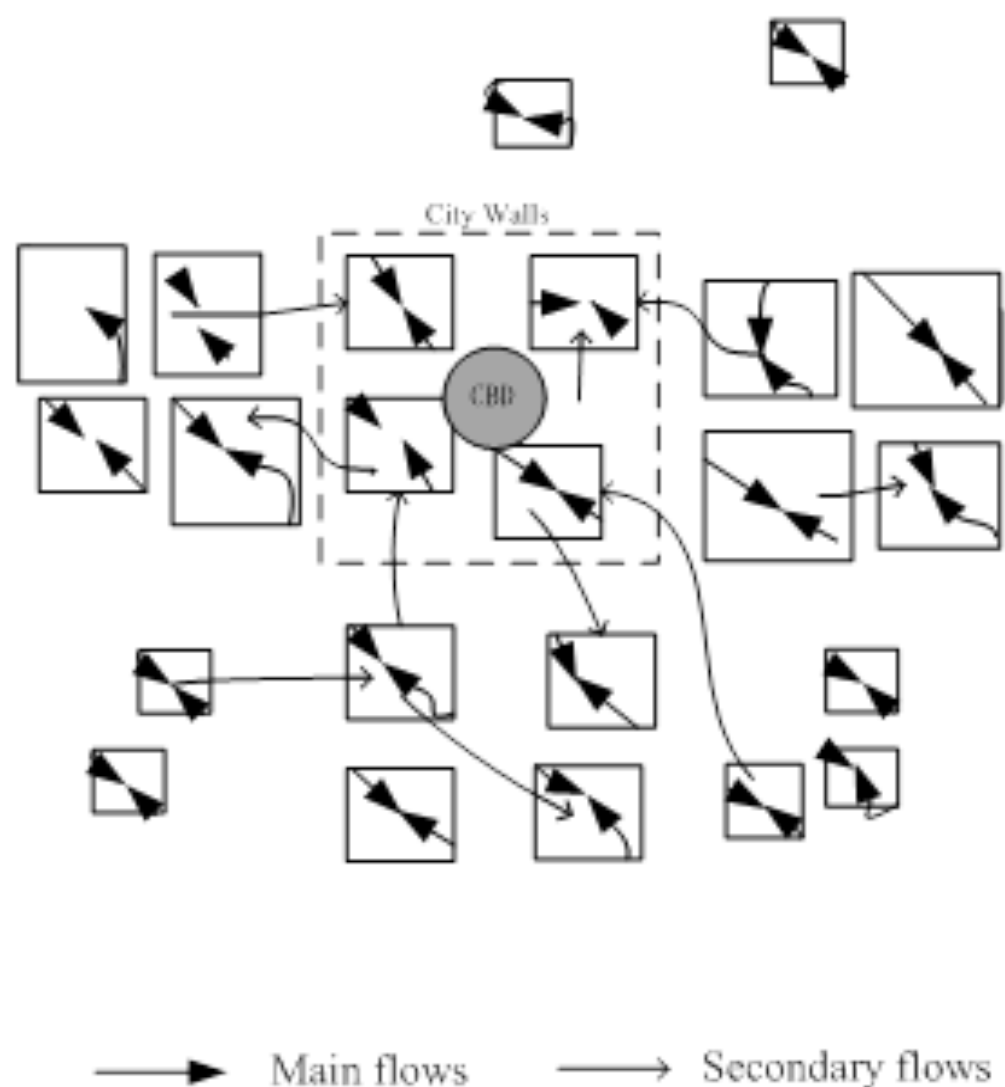
- In reality, a much lower percentage (71%) of workers can enjoy such a benefit.

实际上，71%的职工通勤距离等于或者小于6公里

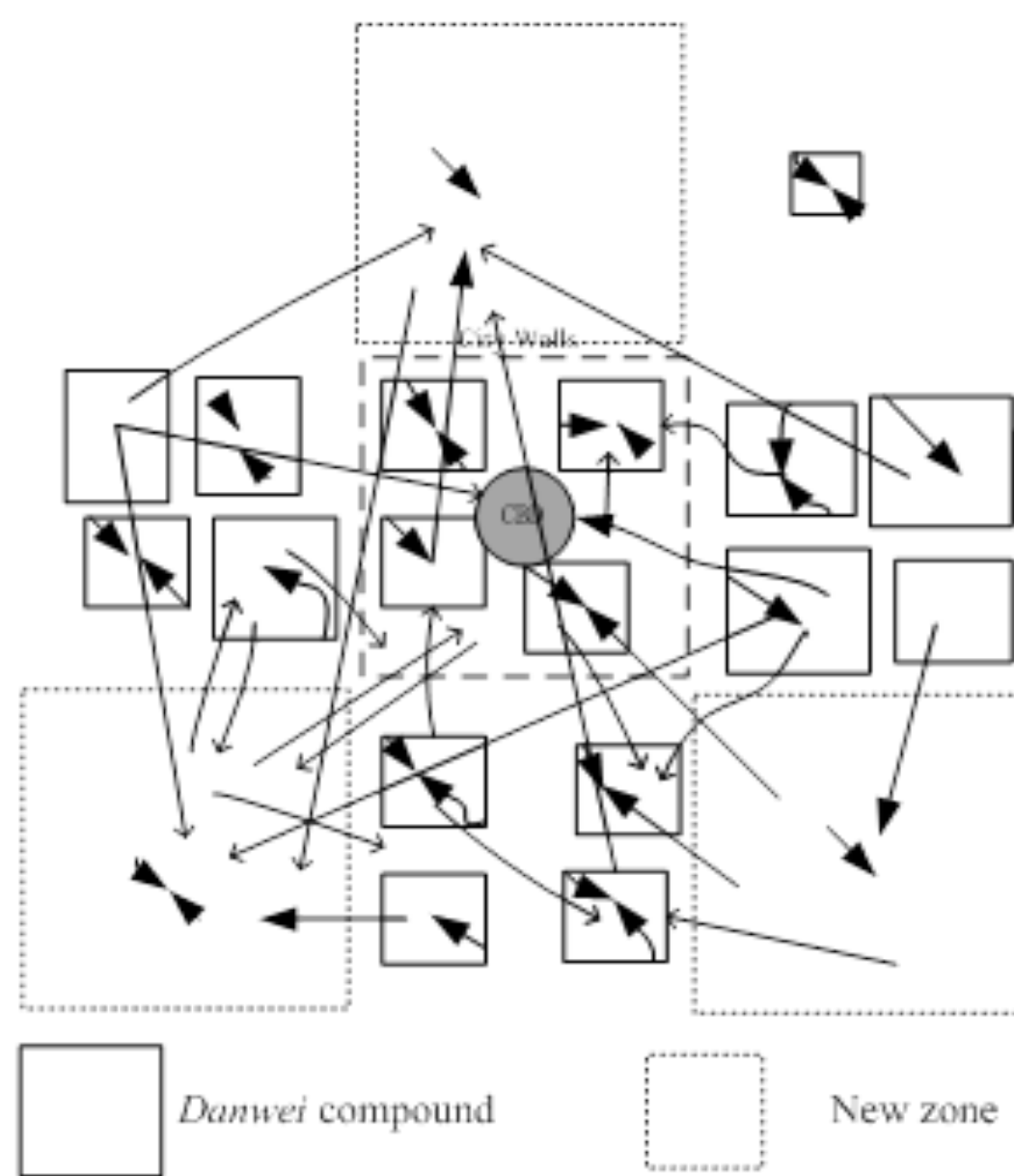
City #3 : Xi'an 西安

Co-locating jobs/housing 职住的多相位同步

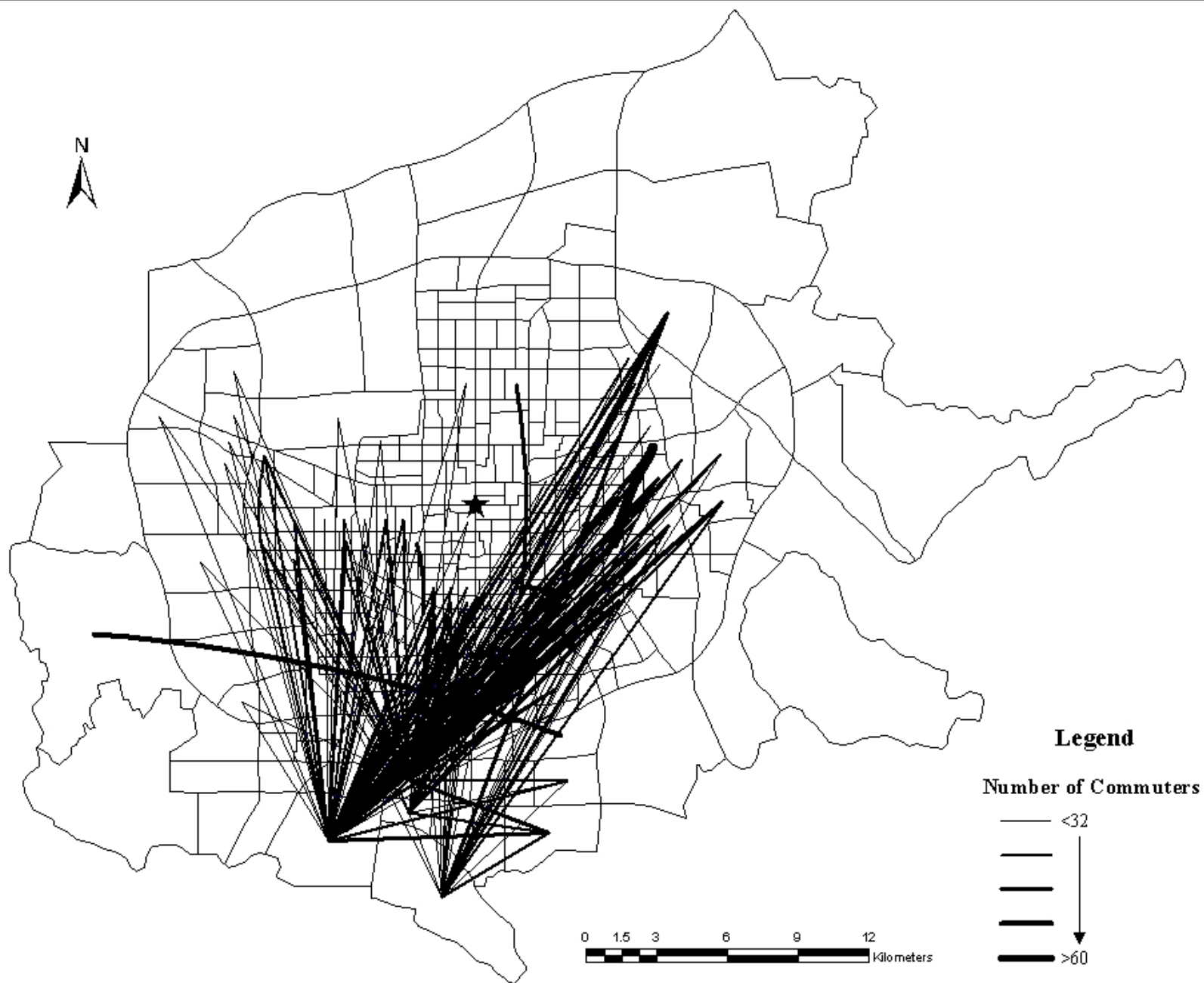




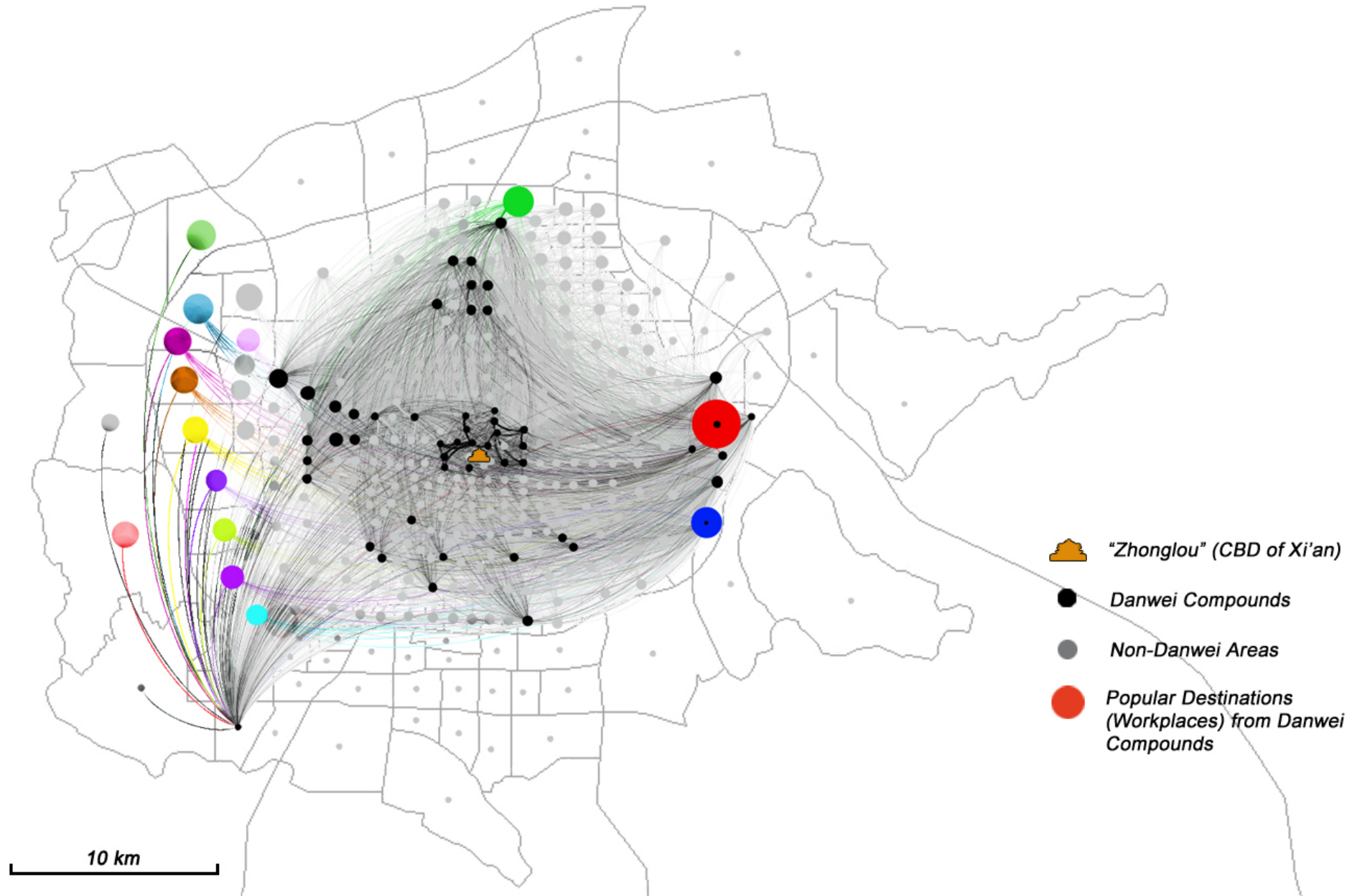
(a) Before the 1990s



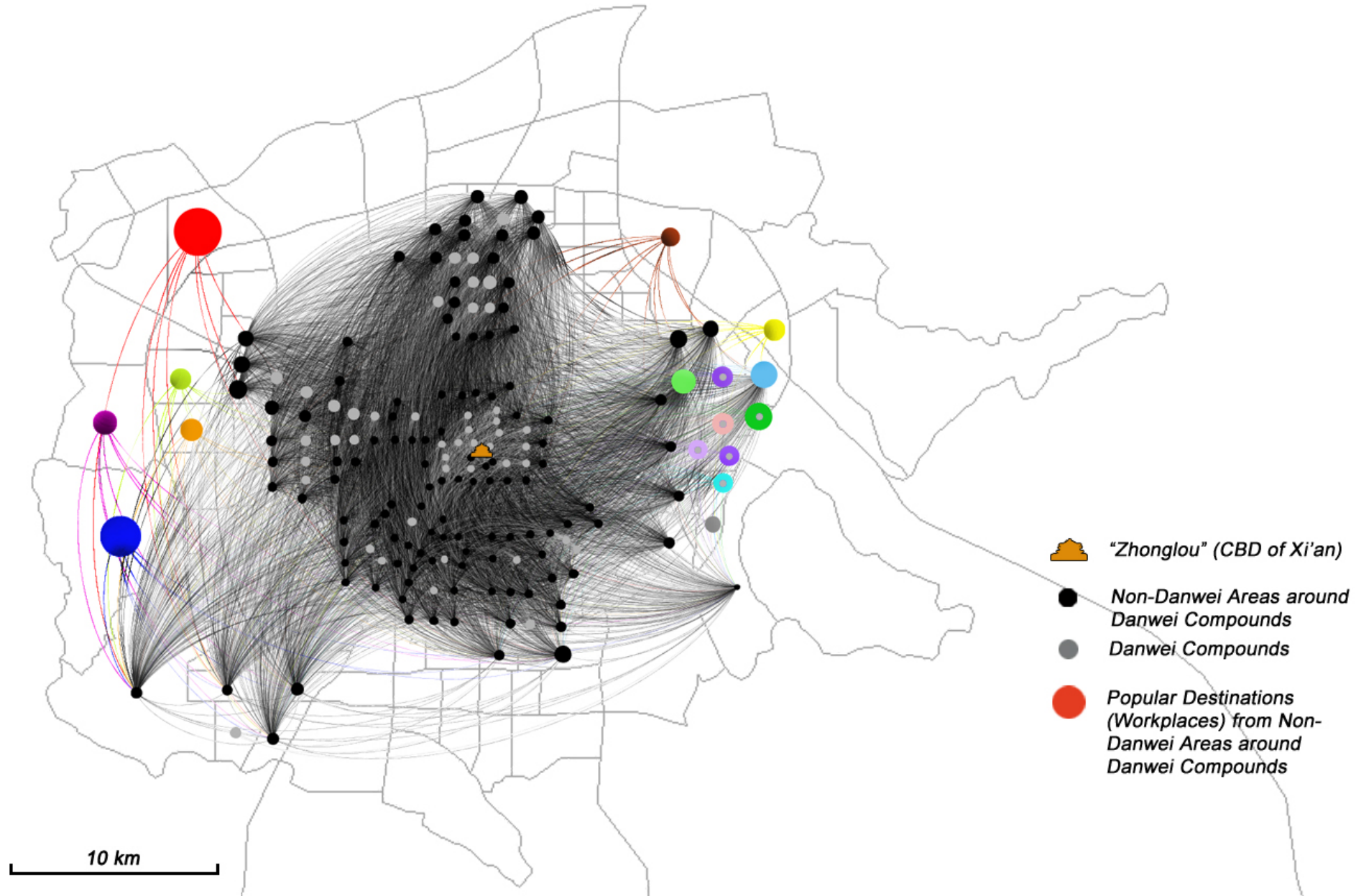
(b) After the 1990s



Journeys to Work from Danwei Compounds in Xi'an, China



Journeys to Work from Non-Danwei Areas around Danwei Compounds in Xi'an, China



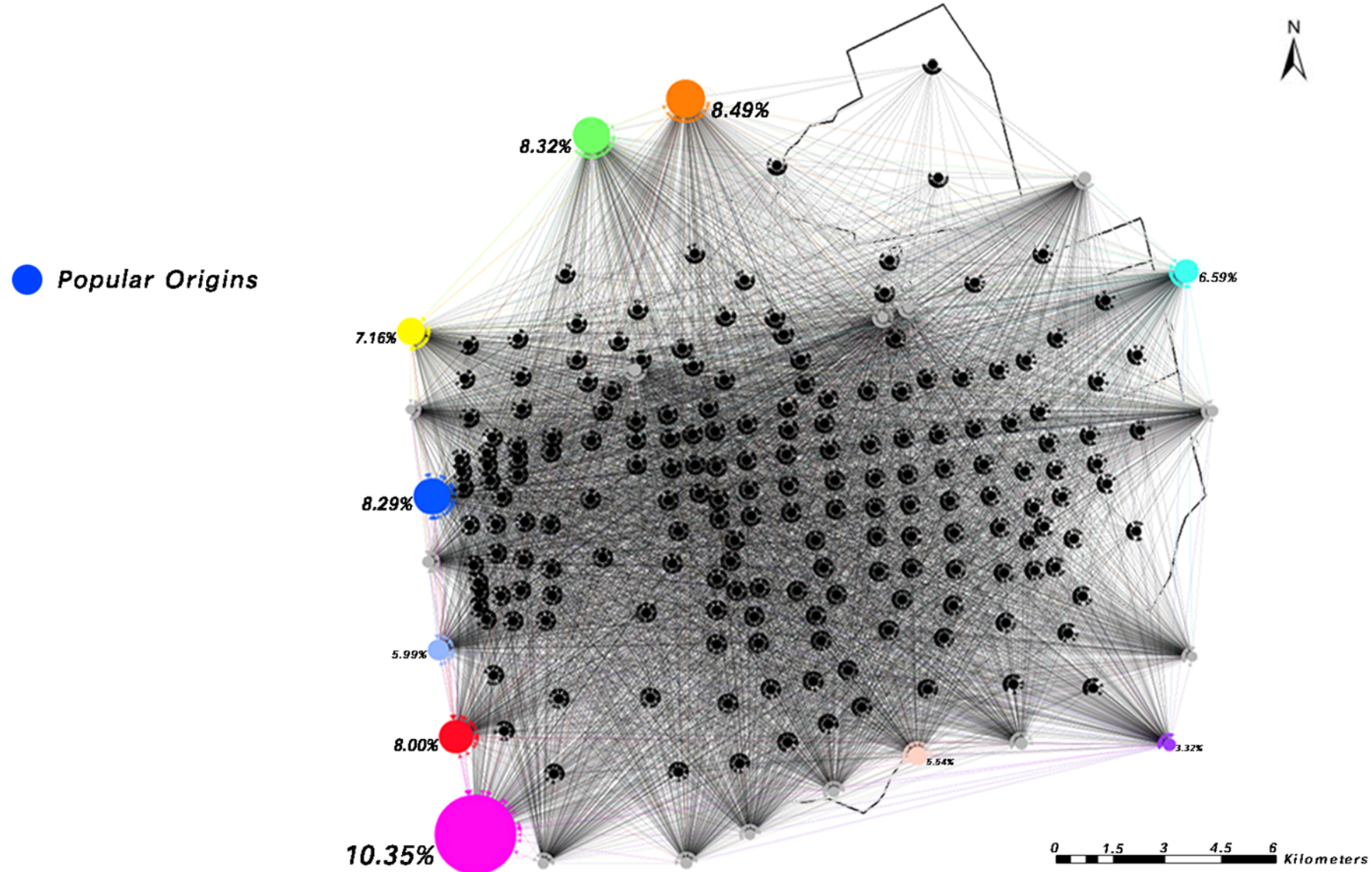
City #4 : Suzhou 苏州

Affordable housing near low-paying jobs

低收入工作和经济上可承受租房



Journeys to work visualization: Home outside SIP and Workplace inside SIP



Monthly rent (RMB) 月租金	Number or Percentage of buildings 楼盘比例			
	Inside SIP 园区内		Outside SIP 园区外	
500-1,000	20	4%	116	8%
1,000-2,000	23	5%	528	37%
2,000-3,000	189	41%	532	37%
3,000-5,000	199	43%	257	18%
5,000-8,000	36	8%	6	0%
>8,000	17	4%	6	0%
All	464	100%	1,445	100%

Mode 交通方式	1996	2000		2006		2010	
	Suzhou (%)	SIP (%)	Suzhou (%)	SIP Core (%)	Suzhou (%)	SIP (%)	Suzhou (%)
Bike 自行车	63.7	33.0	41.8	11.9	17.9	6.6	9.0
Bus 公交	6.4	6.0	6.4	20.5	10.4	12.8	16.0
Bus-pool 厂巴	0.0	4.0	2.8	9.0	4.0	7.8	3.0
Drive-alone 自驾	0.0	2.0	1.0	23.8	7.1	25.5	20.0
E-bike 电动车	10.0	22.0	19.0	17.0	20.7	40.9	28.0
Motorcycle 摩托车	-	-	-	-	9.0	2.7	2.0
Taxi 出租车	-	-	-	9.0	4.0	0.1	0.1
Walk 步行	18.8	32.0	27.7	8.0	26.5	3.3	21.0
Other 其它	1.1	1.0	1.3	0.8	0.4	0.4	0.9
All	100	100	100	100	100	100	100

City #4 : Suzhou 苏州

Balanced land use 平衡不同使用性质土地比例



Land use 土地利用性质	Suzhou (%) 苏州	SIP (%) 苏州工业园区
Residential 居住	23.34	24.69
Public facilities 公共设施	8.77	4.43
Industrial 工业	36.40	42.56
Warehouses 仓储	1.31	1.00
Interurban transportation 城际交通	2.23	2.39
Road transportation and squares 道路广场	12.93	18.25
Public utilities 公共基础设施	1.73	1.86
Green spaces 绿地	12.96	4.81
Special purposes 特别目的	0.33	0.00
All of the above 以上全部	100.00	100.00

PART 05 Conclusions and discussion

结论和讨论

- Jobs/housing balance encompasses at least four dimensions (“RIPP”) 职住平衡至少涉及4个方面(RIPP)
- We need it because of lots of negative consequences associated with long commute or jobs/housing imbalance 我们需之因为失衡或长距离通勤诱发的各种不良后果
- Public/Planning interventions can help promote jobs/housing balance and reduce or stabilize commute cost (e.g., HK) 公共/规划干预能够促进之

PART Conclusions and discussion

05 结论和讨论

- Need some baseline to evaluate jobs/housing balance (e.g., optimization per the excess commuting framework)
职住平衡需要基准线 （例如根据过剩通勤框架的优化）
- Different cities suffer from jobs/housing imbalance because of different reasons

不同城市职住失衡原因、现象不一而同

- We need context-sensitive planning responses

我们需要因地制宜的规划响应

PART Conclusions and discussion

05 结论和讨论

Some generic planning responses could be
可供考虑的一般性规划响应包括：

- If zonal-level jobs/housing balance is infeasible, then pursue corridor-level balance
在片区如果无法平衡，需要（公交）走廊内平衡
- Diversify land use, housing supply, and employment whenever possible (at both zonal or corridor levels)
需要尽可能的让片区、走廊的土地使用、住房供给、就业岗位多样化
- Co-locate jobs and housing (probably as well as appropriate amenities)
让就业和住房多相位同步

PART Conclusions and discussion

05 结论和讨论

- Provide affordable housing near low-paying jobs
低收入工作配经济适用房（富裕阶层即使可以，也不一定愿意住单位边上）
- Learning from successful/established exemplars/cities (e.g., SIP vs. Suzhou)
向成功的范例/城市学习

