



# 构建适宜绿色出行的城市

## Create Green Transport Friendly Cities

王志高

Zhigao Wang

China Sustainable Transportation Center | the Energy Foundation



宇恒可持续交通研究中心 | 美国能源基金会



传统的城市：以人的活动为中心  
Traditional cities: human activity oriented



# 传统的城市的尺度 Scale of traditional cities



古城街道



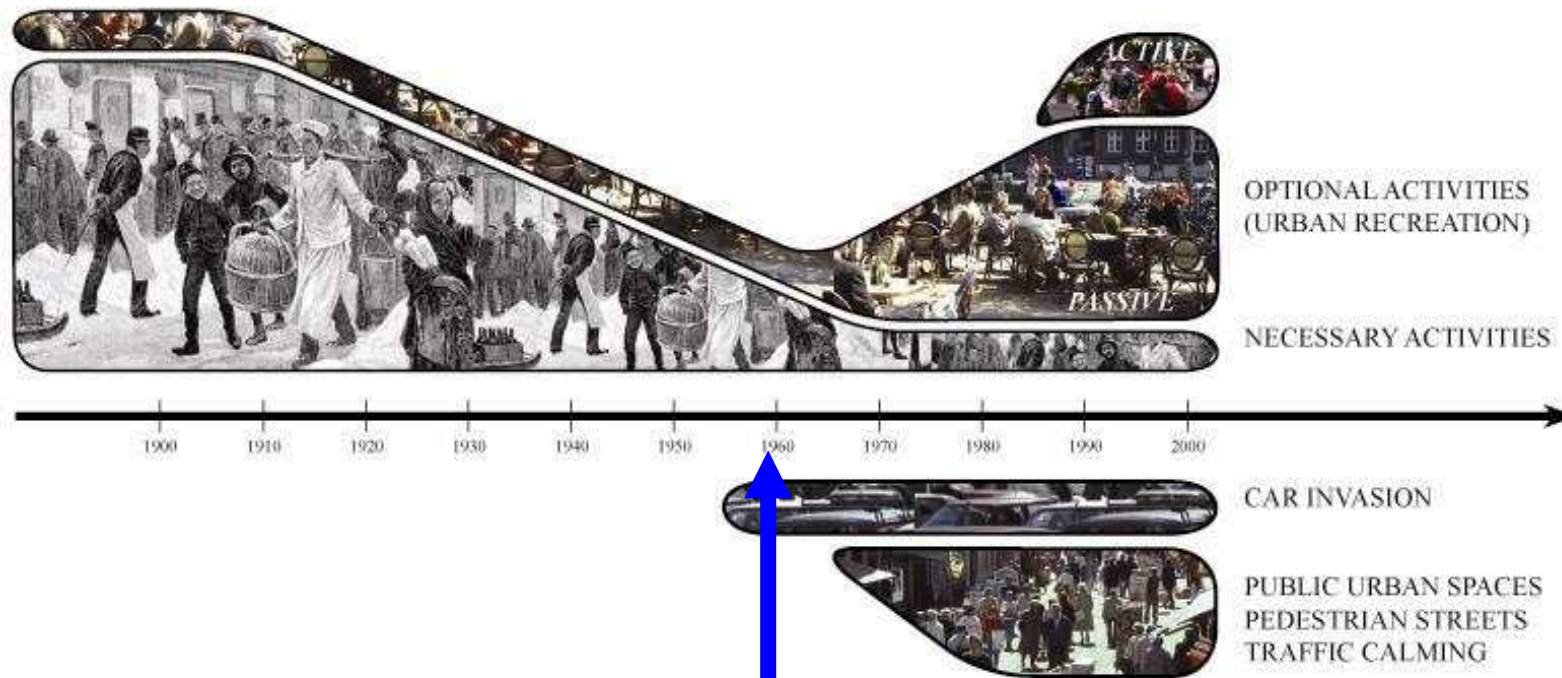


# 传统的城市的尺度

Scale of traditional cities reflected in a Chinese painting

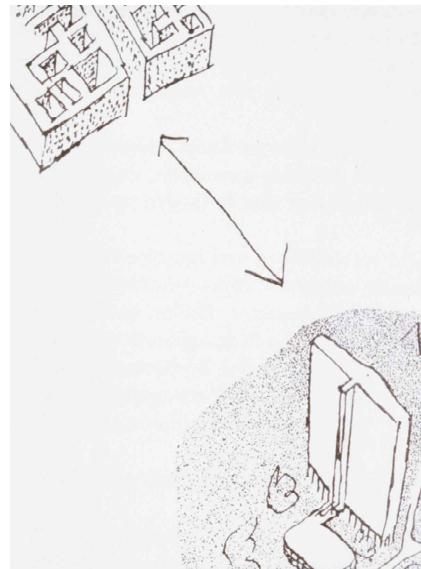






# 1960

**GEHL ARCHITECTS**  
URBAN QUALITY CONSULTANTS





被入侵的城市：以汽车的活动为中心  
拥堵、尾气、噪音、冲突、事故…

Invaded cities: car oriented, creates congestion,  
air pollution, noise, conflicts, and accidents





被入侵的城市：以汽车的活动为中心  
拥堵、尾气、噪音、冲突、事故…  
Invaded cities

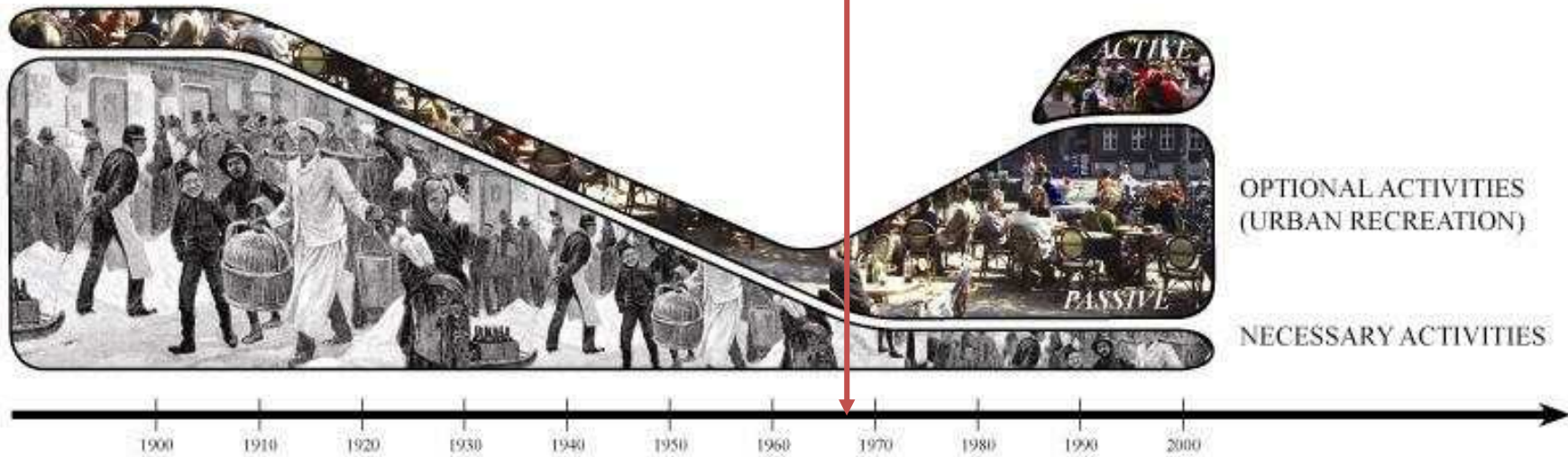
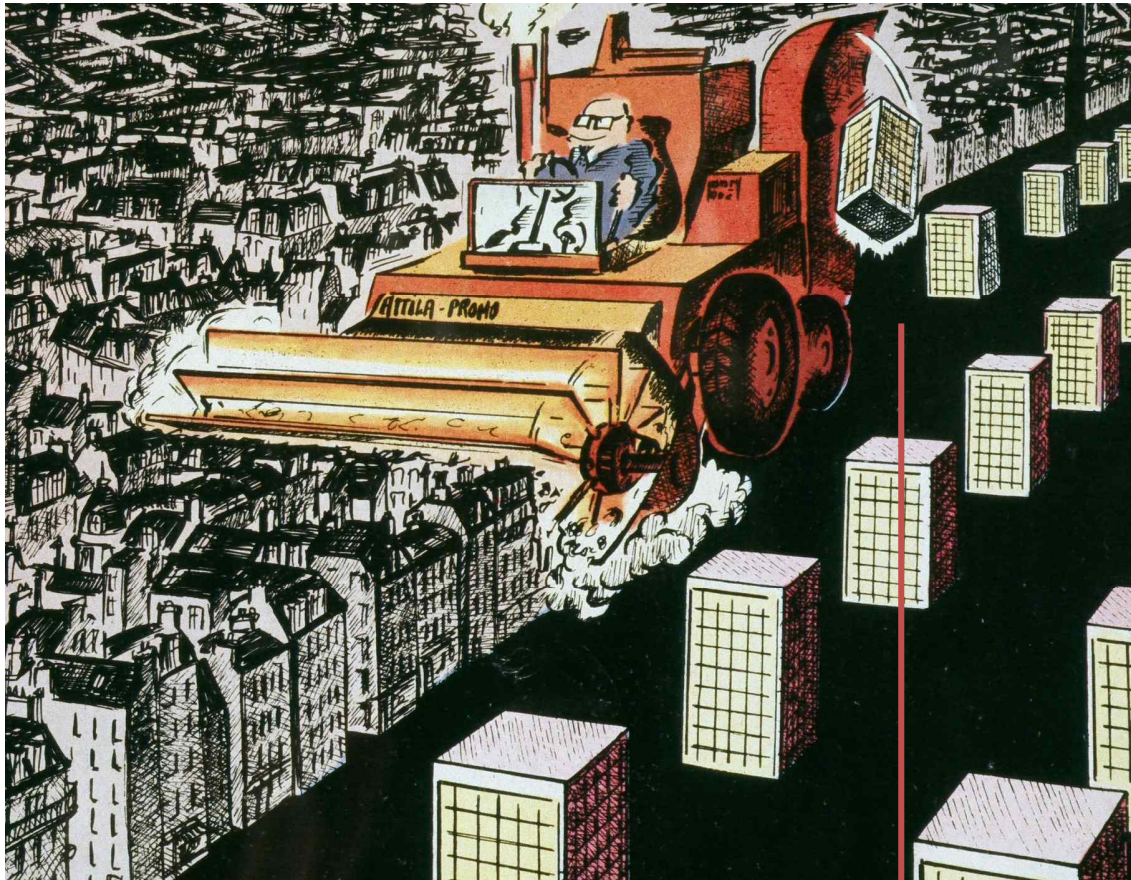




被入侵的城市：以汽车的活动为中心  
拥堵、尾气、噪音、冲突、事故…  
Invaded cities







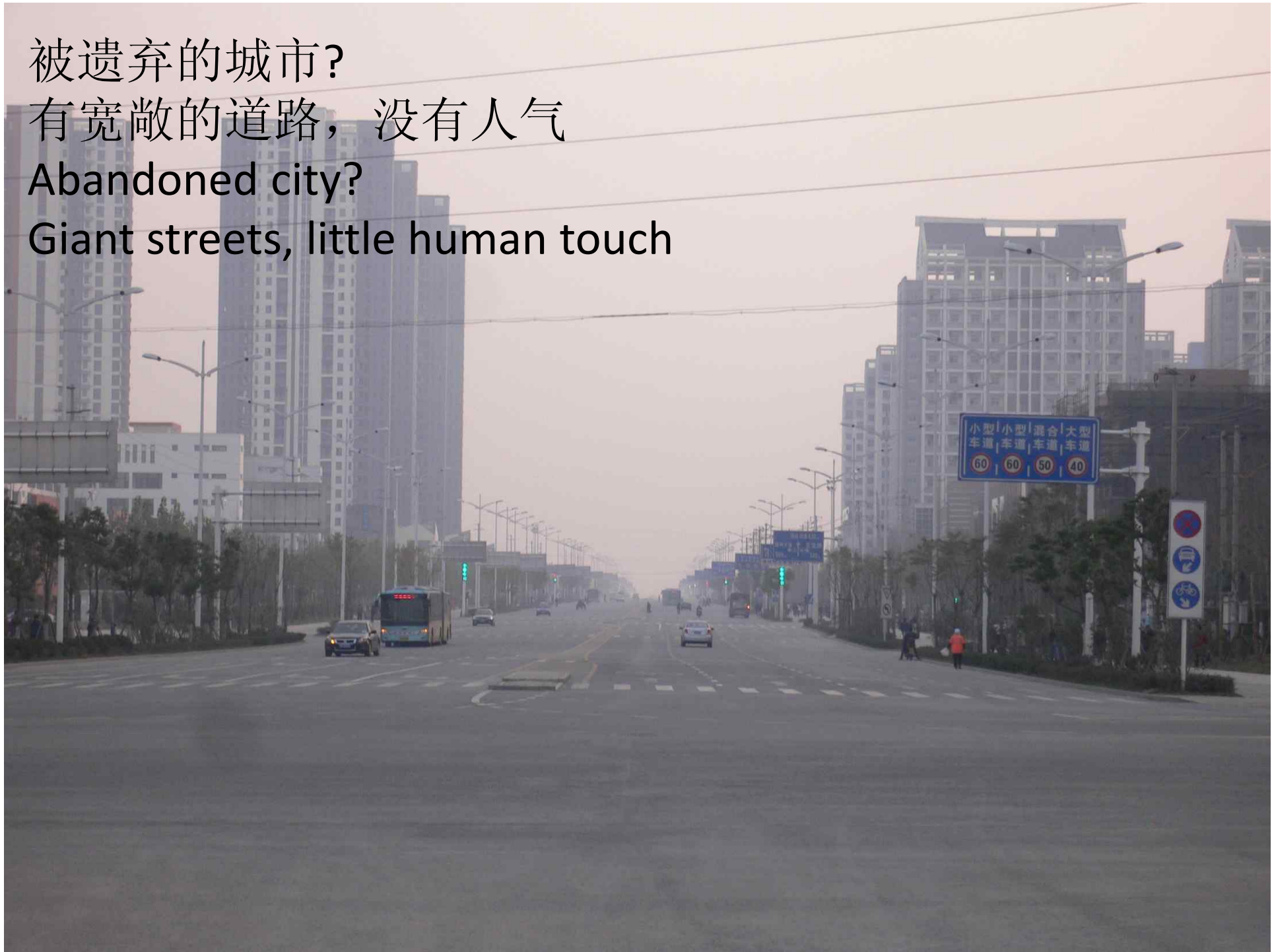


被遗弃的城市： Abandoned cities  
有宽大的停车场，没有人气 Many traffic infrastructure, little human touch





被遗弃的城市？  
有宽敞的道路，没有人气  
Abandoned city?  
Giant streets, little human touch





被遗弃的城市? Abandoned city?

有宽敞的道路, 没有人气 Wide street, little human touch





# 被重新收复的城市：人的回归 Reclaimed city: return of human





被重新收复的城市：自行车的回归  
Reclaimed city, return of bikes





被重新收复的城市：人与车和谐共处

Reclaimed city: harmony coexistence of man and vehicles





被重新收复的城市：人与车和谐共处  
Reclaimed city: return of transit





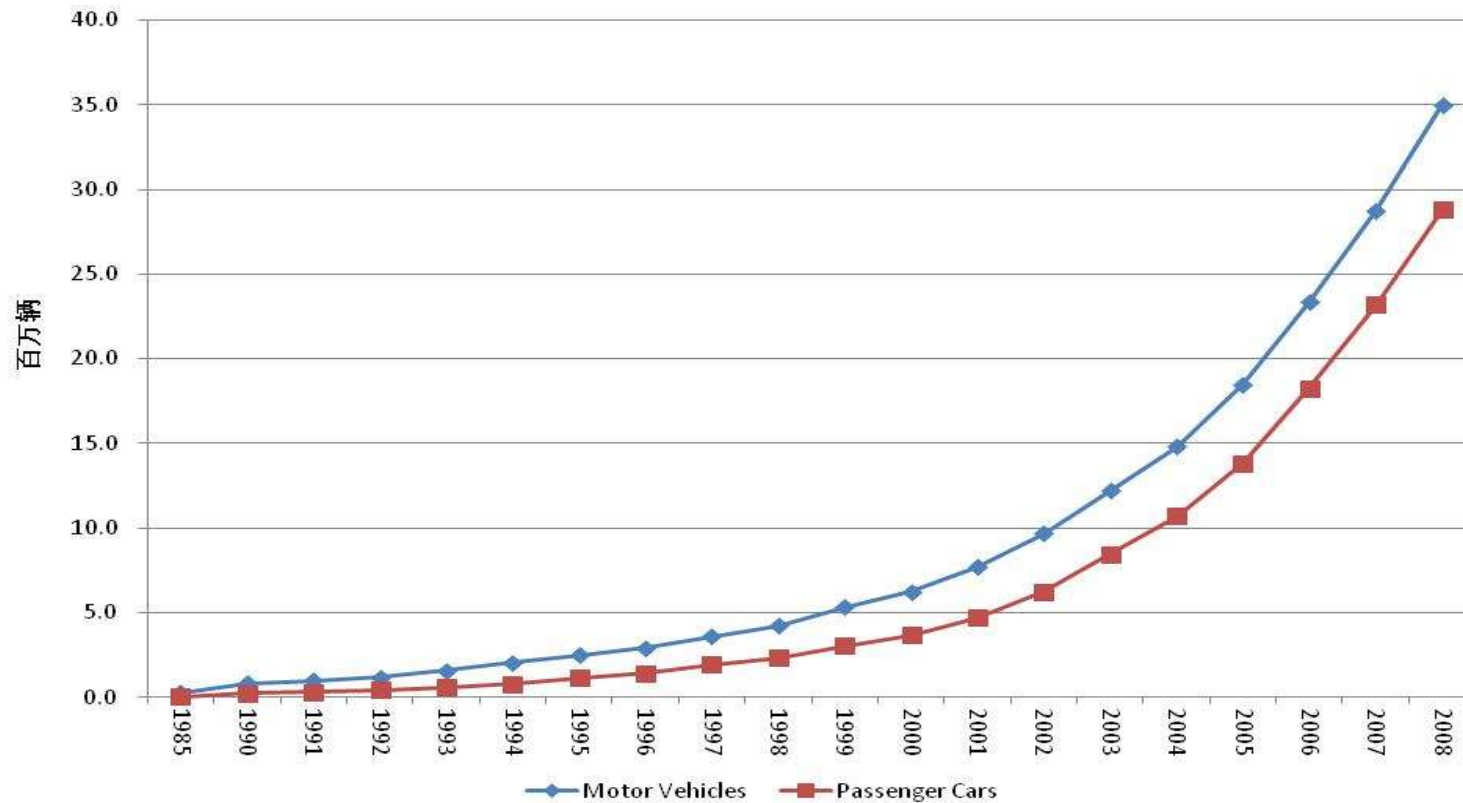
# 被重新收复的城市：人与车和谐共处 Reclaimed city: return of transit





发达国家城市发展历史表明：以汽车为导向的城市发展模式是不可持续的，但是…

The history of developed world shows that car oriented development is non-sustainable, however,



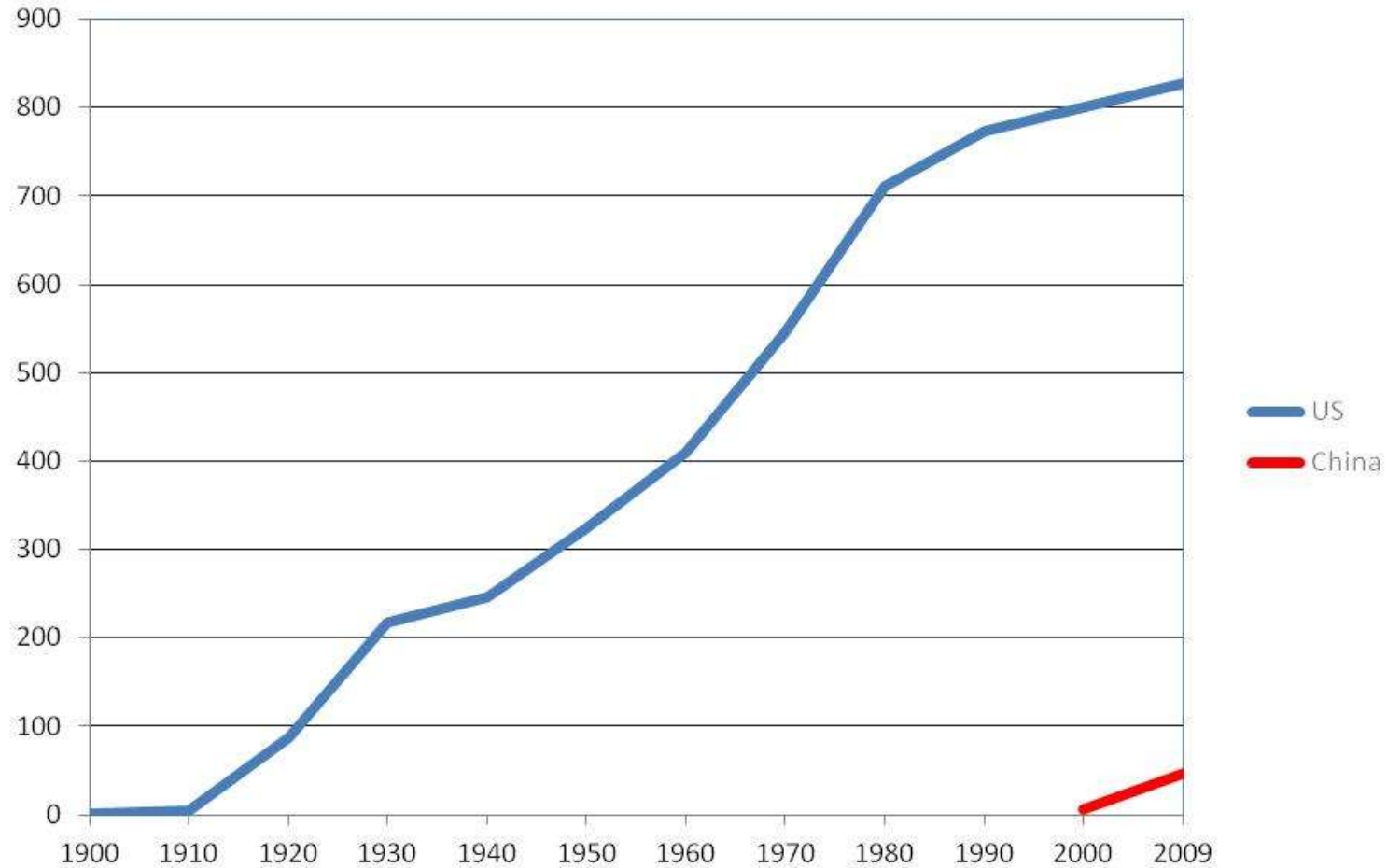
Registered motor vehicles in China

资料来源：中国统计年鉴



# 中国才刚刚开始

## China's problem is just beginning



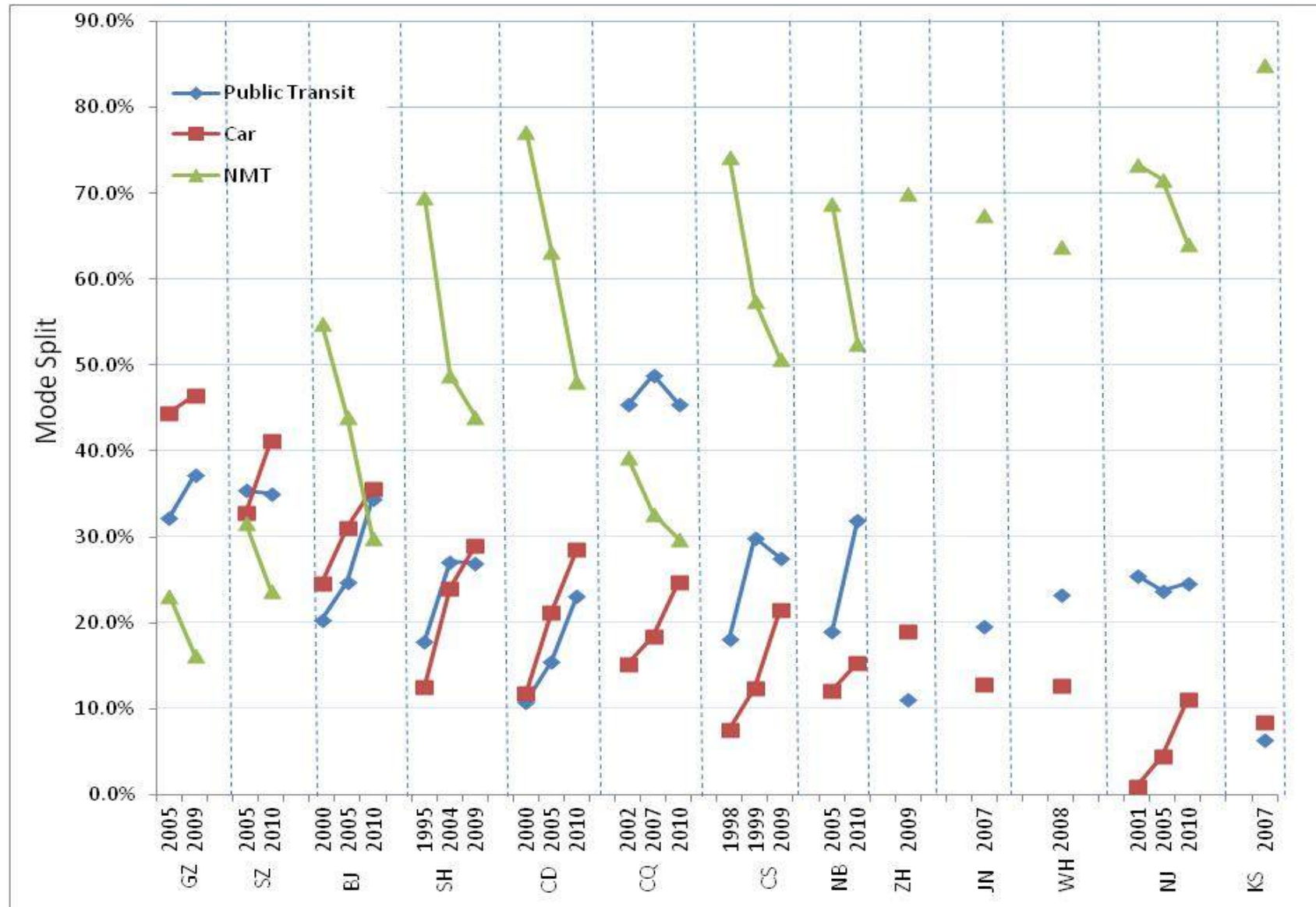
千人小汽车拥有量

Car ownership per 1000 households 资料来源： 摩根大通，2011年10月



# 绿色出行的比例急剧下降

## The plummeting green transport mode share





小汽车正在我们的城市里“攻城掠地”  
Cars are taking away every piece of land



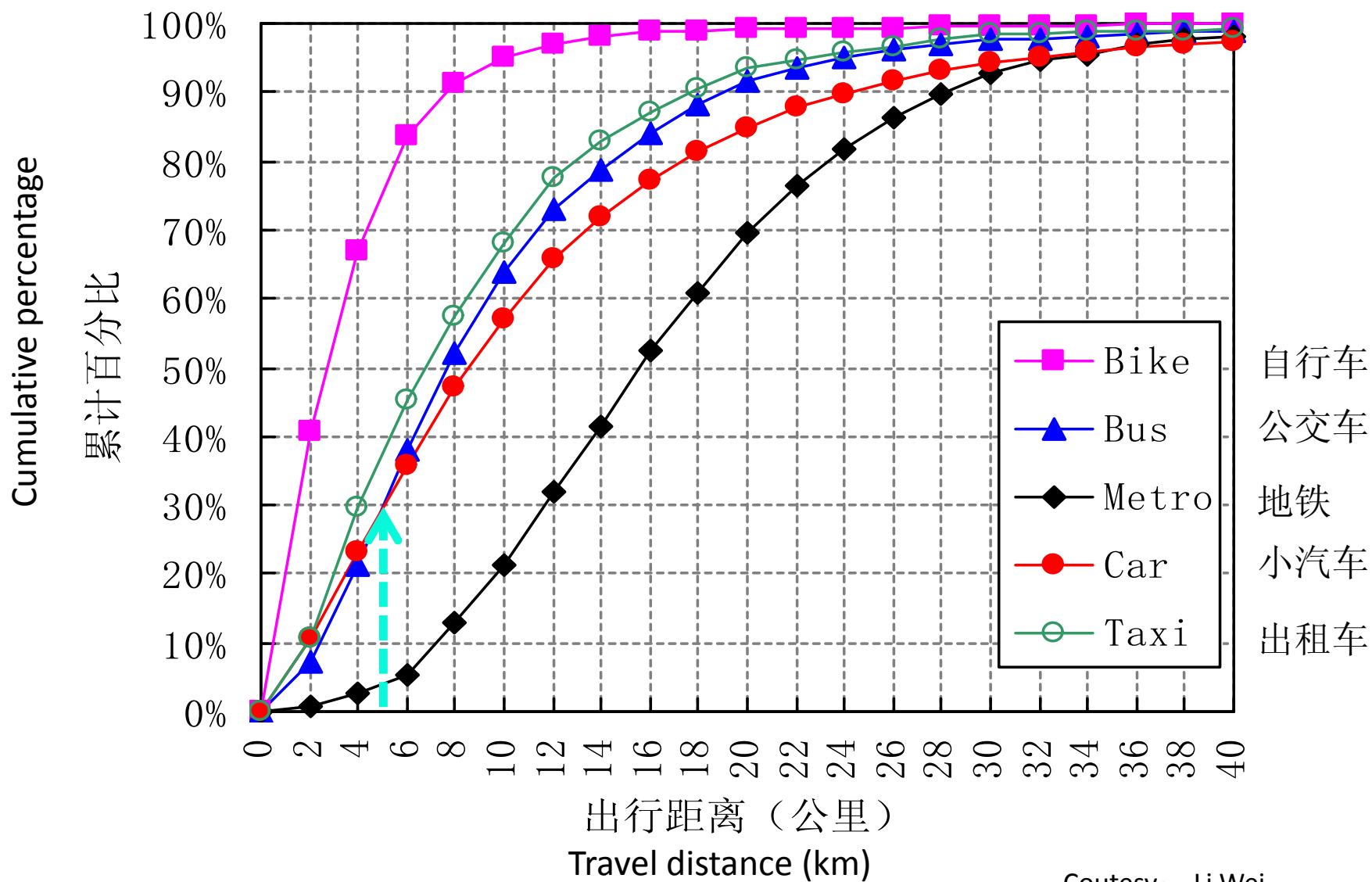


An aerial photograph of a city, likely Beijing, showing a dense urban landscape with a prominent highway interchange. The air is thick with a yellowish haze, indicating significant air pollution. Several tall buildings are visible, including one with a large rectangular cutout. The text '空气污染' and 'Pollution' is overlaid in the center of the image.

空气污染  
Pollution



# 我们对汽车的依赖是否理性？ Rational choice?



Courtesy: Li Wei



从碳排放角度出发，我们的选择意味着什么？  
What does the choice mean from carbon point of view

更低碳的选择(low carbon emission choices):

污染物\方式 Emission\mode	步行/自行车 Bike	轨道交通 Railway	普通公交 Bus	出租车 Taxi	私家车 Car
CO <sub>2</sub> (ton)	0	7.5	19.8	116.9	140.2
NO <sub>x</sub> (kg)	0	17.5	168.4	662	746
油耗 Fuel(ton)	0	2.6	6.9	41	49.2

数据来源：美国能源基金。各交通方式按每100万人  
每公里出行距离的能耗与尾气排放数据进行统计。  
Source: the Energy Foundation. Emissions/km/million  
population



# 空间使用效率更高的选择 more land use efficient choices





# 空间使用效率更高的选择 More land use efficient choice

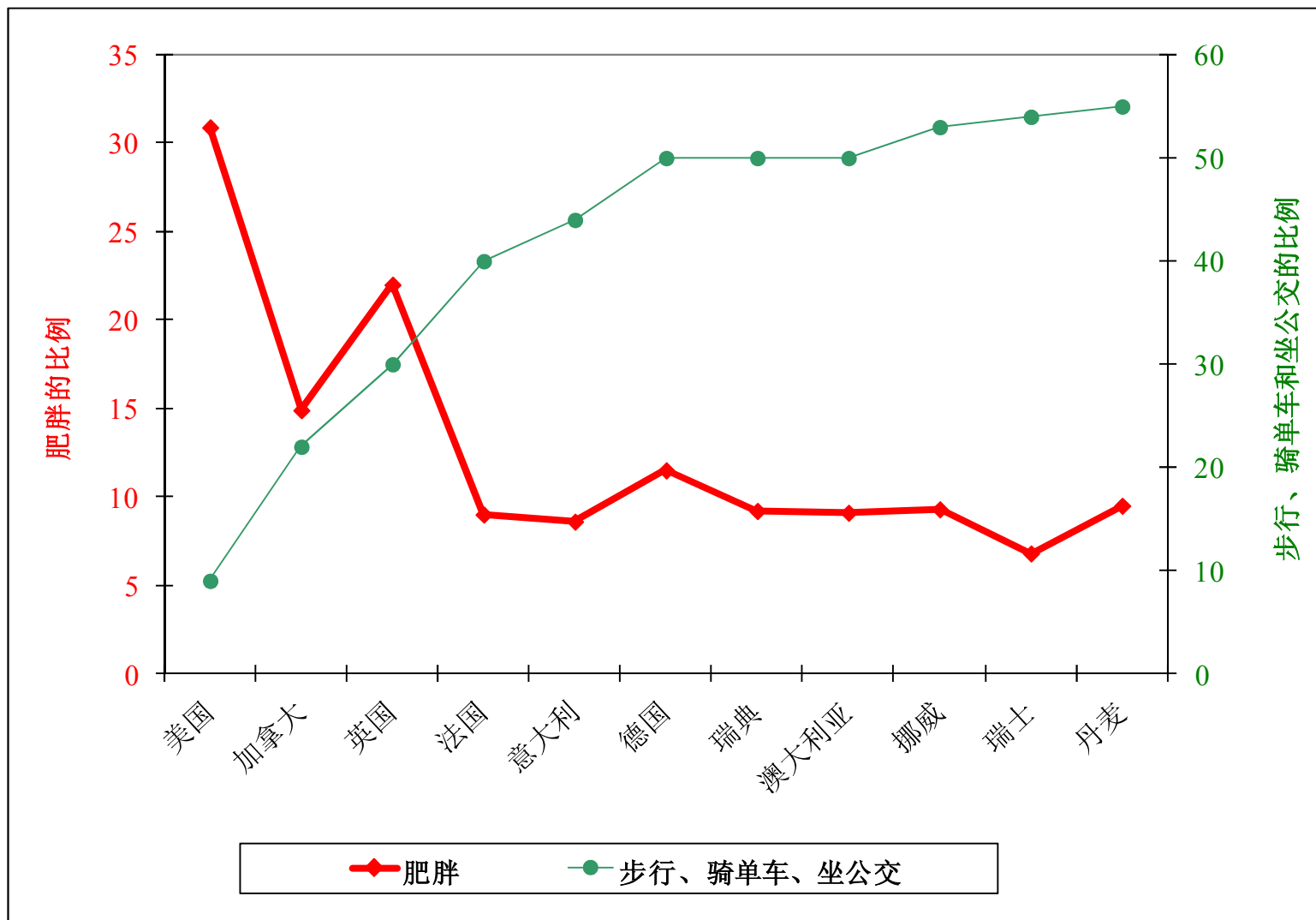
474  
汽车  
/ 车道  
/ 小时

1425  
单车  
/ 小时

290  
行人  
/ 小时



# 更健康的选择 Healthier choices



Source: Pucher and Dijkstra, "Promoting Safe Walking and Cycling to Improve Public Health, *Am Journal of Public Health*, Sep 2003.

如何减少对小汽车的依赖？

**How to relieve our addiction to cars?**

通过更好的规划、设计和管理  
构建绿色出行友好的城市！

**Create green transport friendly cities through  
better planning, design and management!**













# 规划 Planning

原则一：提供良好的公共交通系统（数量、品质、结构）  
Principle 1: provide high quality public transit system





**FLEET COMPOSITION 2013**  
**RIT - INTEGRATED TRANSPORT NETWORK**

LINE TYPES	VEHICLE	CAPACITY	OPERATING FLEET		NUMBER OF LINES
			Subtotal	Total	
LIGEIRÃO EXPRESS	BIARTICULATED 	250	27	27	02
EXPRESS	BIARTICULATED 	230/250	133	166	06
	ARTICULATED 	170	33		
DIRECT LINE	ARTICULATED 	150	65	392	18
	PADRON 	110	327		
INTERDISTRICT LINE	ARTICULATED 	140	101	113	07
	PADRON 	100	2		
	HYBRID	79	10		
FEEDER LINE	ARTICULATED 	140	150	799	221
	COMMON 	85	620		
	SPECIAL MICROBUS 	70	29		



优先保障地面公共交通的路权和用地  
Prioritize public transit ROW





Karl Fjellstrom, ITDP



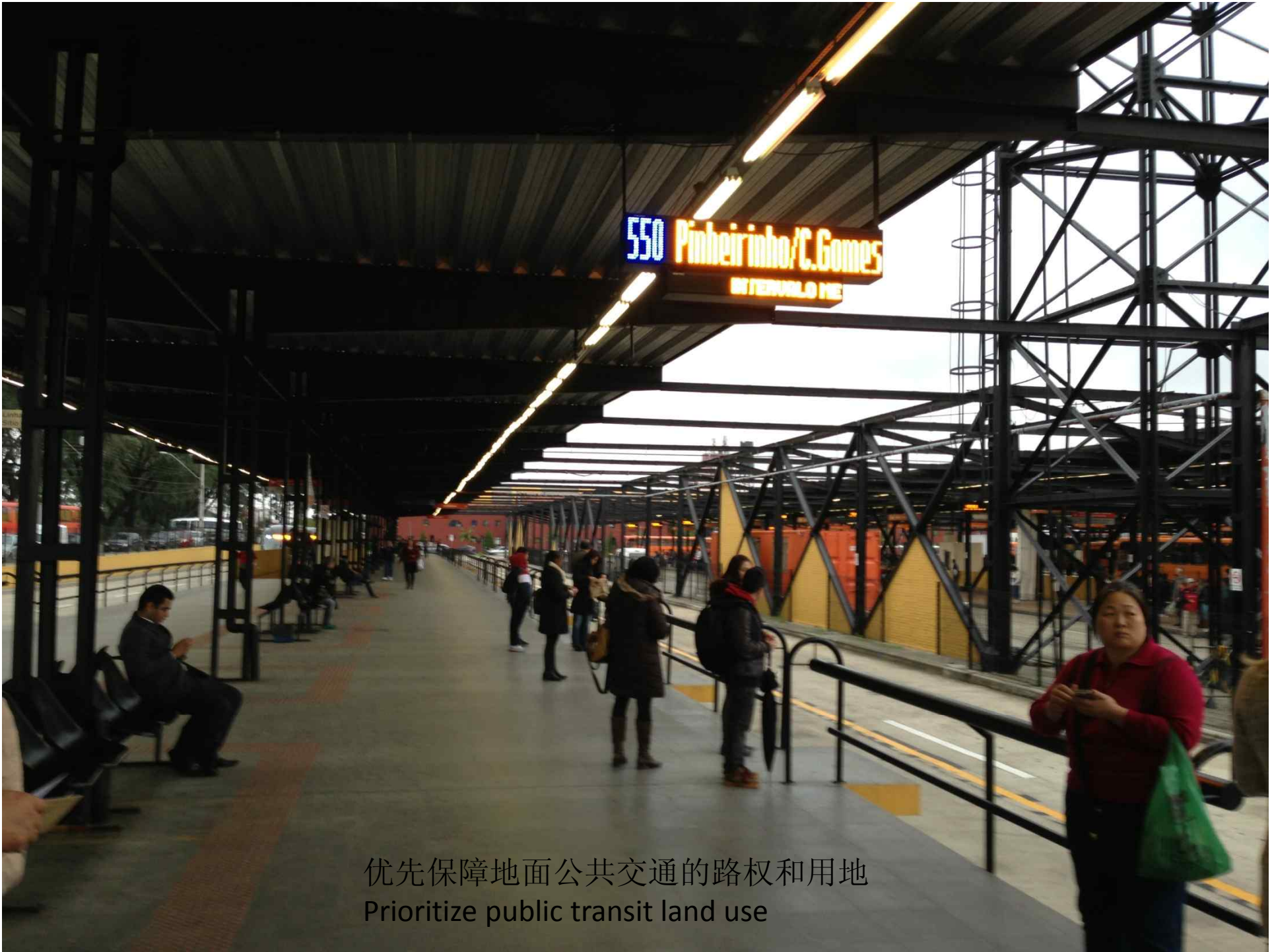


优先保障地面公共交通的路权和用地  
Prioritize public transit ROW





优先保障地面公共交通的路权和用地  
Prioritize public transit ROW



优先保障地面公共交通的路权和用地  
Prioritize public transit land use





优先保障地面公共交通的路权和用地  
Prioritize public transit land use

# 规划Planning

原则二：围绕重要公交站点安排高强度混合土地开发

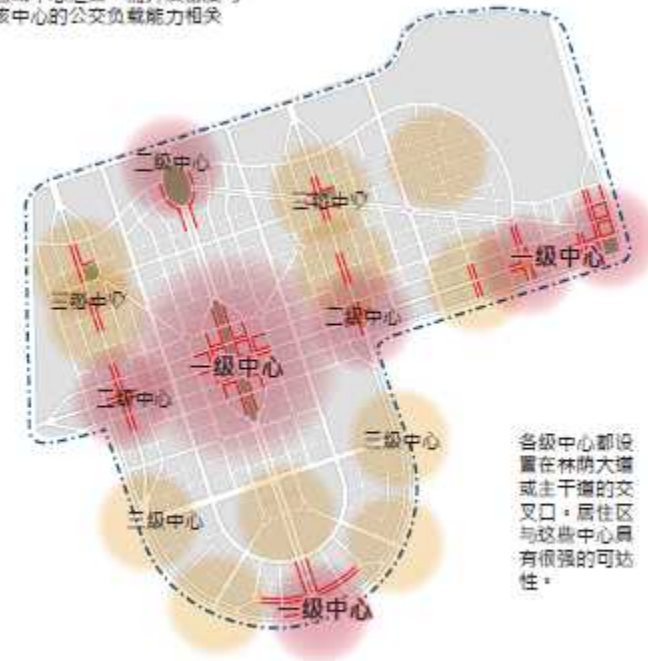
Principle 3: increase density and mix uses around transit nodes



# 公交导向的土地开发模式 (TOD) Transit Oriented Development (TOD)



高密度的混合开发活动在各级区域中心汇集，而开发密度与该中心的公交负载能力相关

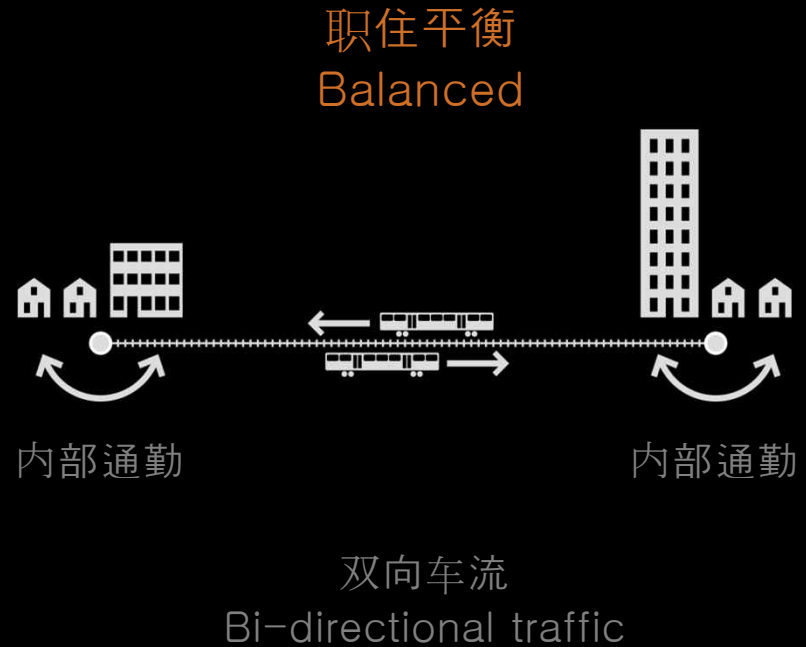


# 在公交站点周边聚集目的地 Clustering development around transit station



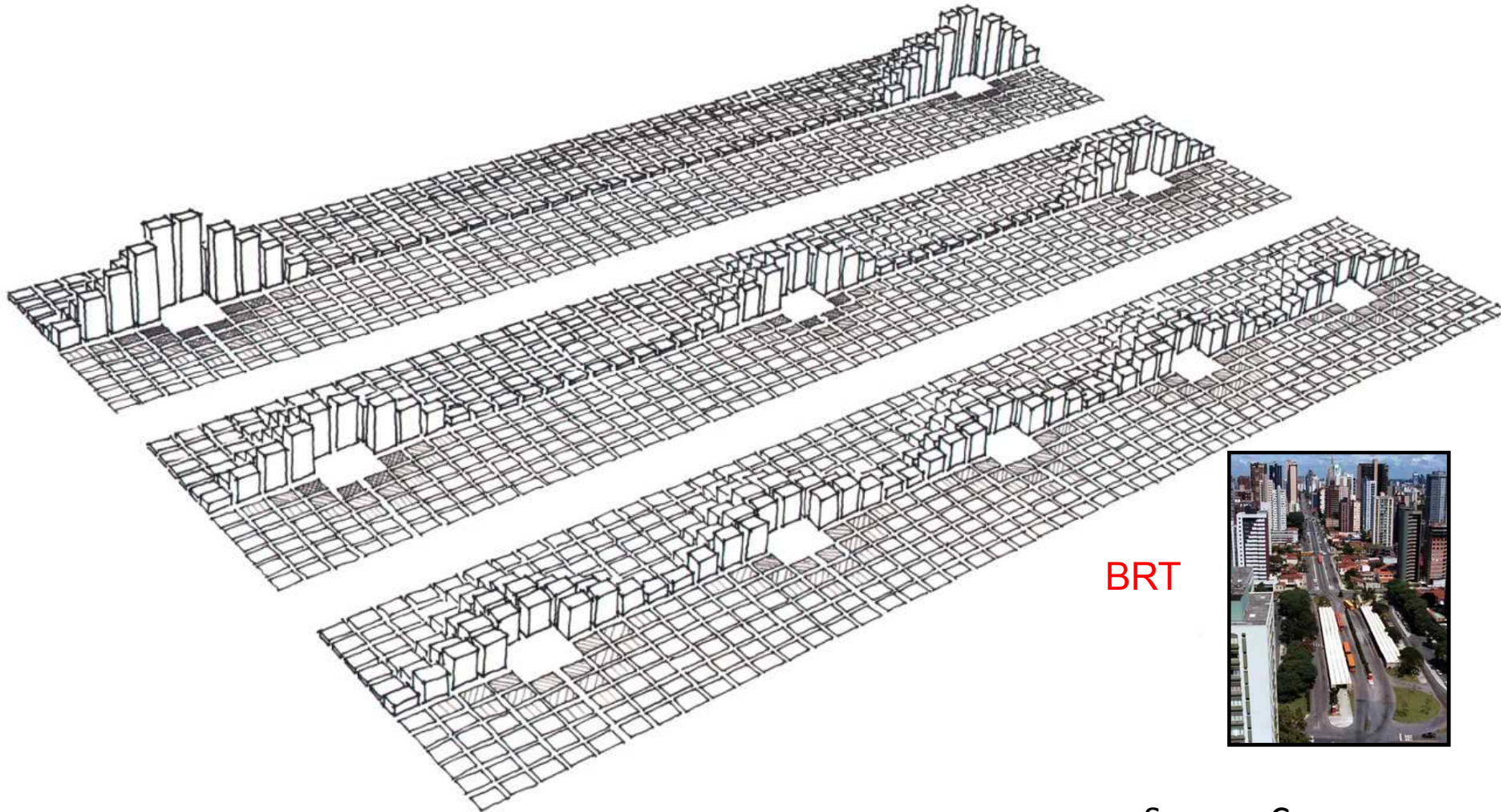


# 职住平衡 Jobs-housing balance



# 公共交通与城市形态 *Transit and City form*

轨道交通Rail transit



BRT

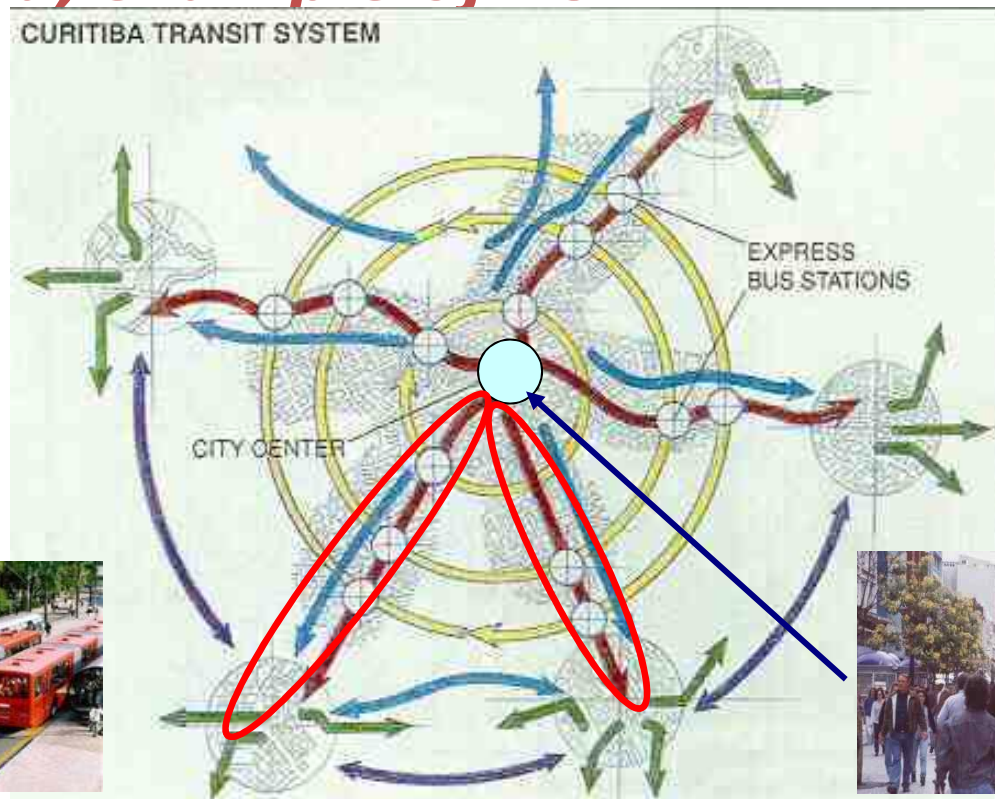


Source: Cervero



# 库里蒂巴：公交导向开发范例

## Curitiba, example of TOD



高强度混合开发走廊 High density, mixed use corridor





# FORMAÇÕES TURÍSTICAS



PROTEÇÃO  
TURÍSTICA

## BRASÍLIA em perspectiva

# TOURIST INFORMATIC

Índice	
1	Área de Proteção Ambiental
2	Arquitetura
3	Arquitetura
4	Arquitetura
5	Arquitetura
6	Arquitetura
7	Arquitetura
8	Arquitetura
9	Arquitetura
10	Arquitetura
11	Arquitetura
12	Arquitetura
13	Arquitetura
14	Arquitetura
15	Arquitetura
16	Arquitetura
17	Arquitetura
18	Arquitetura
19	Arquitetura
20	Arquitetura
21	Arquitetura
22	Arquitetura
23	Arquitetura
24	Arquitetura
25	Arquitetura
26	Arquitetura
27	Arquitetura
28	Arquitetura
29	Arquitetura
30	Arquitetura
31	Arquitetura
32	Arquitetura
33	Arquitetura
34	Arquitetura
35	Arquitetura
36	Arquitetura
37	Arquitetura
38	Arquitetura
39	Arquitetura
40	Arquitetura
41	Arquitetura
42	Arquitetura
43	Arquitetura
44	Arquitetura
45	Arquitetura
46	Arquitetura
47	Arquitetura
48	Arquitetura
49	Arquitetura
50	Arquitetura
51	Arquitetura
52	Arquitetura
53	Arquitetura
54	Arquitetura
55	Arquitetura
56	Arquitetura
57	Arquitetura
58	Arquitetura
59	Arquitetura
60	Arquitetura
61	Arquitetura
62	Arquitetura
63	Arquitetura
64	Arquitetura
65	Arquitetura
66	Arquitetura
67	Arquitetura
68	Arquitetura
69	Arquitetura
70	Arquitetura
71	Arquitetura
72	Arquitetura
73	Arquitetura
74	Arquitetura
75	Arquitetura
76	Arquitetura
77	Arquitetura
78	Arquitetura
79	Arquitetura
80	Arquitetura
81	Arquitetura
82	Arquitetura
83	Arquitetura
84	Arquitetura
85	Arquitetura
86	Arquitetura
87	Arquitetura
88	Arquitetura
89	Arquitetura
90	Arquitetura
91	Arquitetura
92	Arquitetura
93	Arquitetura
94	Arquitetura
95	Arquitetura
96	Arquitetura
97	Arquitetura
98	Arquitetura
99	Arquitetura
100	Arquitetura

Índice	
1	Área de Proteção Ambiental
2	Arquitetura
3	Arquitetura
4	Arquitetura
5	Arquitetura
6	Arquitetura
7	Arquitetura
8	Arquitetura
9	Arquitetura
10	Arquitetura
11	Arquitetura
12	Arquitetura
13	Arquitetura
14	Arquitetura
15	Arquitetura
16	Arquitetura
17	Arquitetura
18	Arquitetura
19	Arquitetura
20	Arquitetura
21	Arquitetura
22	Arquitetura
23	Arquitetura
24	Arquitetura
25	Arquitetura
26	Arquitetura
27	Arquitetura
28	Arquitetura
29	Arquitetura
30	Arquitetura
31	Arquitetura
32	Arquitetura
33	Arquitetura
34	Arquitetura
35	Arquitetura
36	Arquitetura
37	Arquitetura
38	Arquitetura
39	Arquitetura
40	Arquitetura
41	Arquitetura
42	Arquitetura
43	Arquitetura
44	Arquitetura
45	Arquitetura
46	Arquitetura
47	Arquitetura
48	Arquitetura
49	Arquitetura
50	Arquitetura
51	Arquitetura
52	Arquitetura
53	Arquitetura
54	Arquitetura
55	Arquitetura
56	Arquitetura
57	Arquitetura
58	Arquitetura
59	Arquitetura
60	Arquitetura
61	Arquitetura
62	Arquitetura
63	Arquitetura
64	Arquitetura
65	Arquitetura
66	Arquitetura
67	Arquitetura
68	Arquitetura
69	Arquitetura
70	Arquitetura
71	Arquitetura
72	Arquitetura
73	Arquitetura
74	Arquitetura
75	Arquitetura
76	Arquitetura
77	Arquitetura
78	Arquitetura
79	Arquitetura
80	Arquitetura
81	Arquitetura
82	Arquitetura
83	Arquitetura
84	Arquitetura
85	Arquitetura
86	Arquitetura
87	Arquitetura
88	Arquitetura
89	Arquitetura
90	Arquitetura
91	Arquitetura
92	Arquitetura
93	Arquitetura
94	Arquitetura
95	Arquitetura
96	Arquitetura
97	Arquitetura
98	Arquitetura
99	Arquitetura
100	Arquitetura

Prezado hóspede:  
Em breve nova versão do mapa  
de informações e de massa









a, Federal District, Brazil  
proximate

© 2017 Google





	<b>Curitiba</b>	<b>Brasilia</b>
<b>Bus Trips/ capita/year*</b>	<b>334</b>	<b>95</b>
<b>VKT/capita/ year**</b>	<b>7,900</b>	<b>16,700</b>

\* Confederação Nacional do Transporte, 2002.

\*\* E. Santos, 2011, *Pioneer in BRT and Urban Planning*, Lambert Academic Press.



**库里蒂巴  
Curitiba**



**巴西利亚 Brasilia**



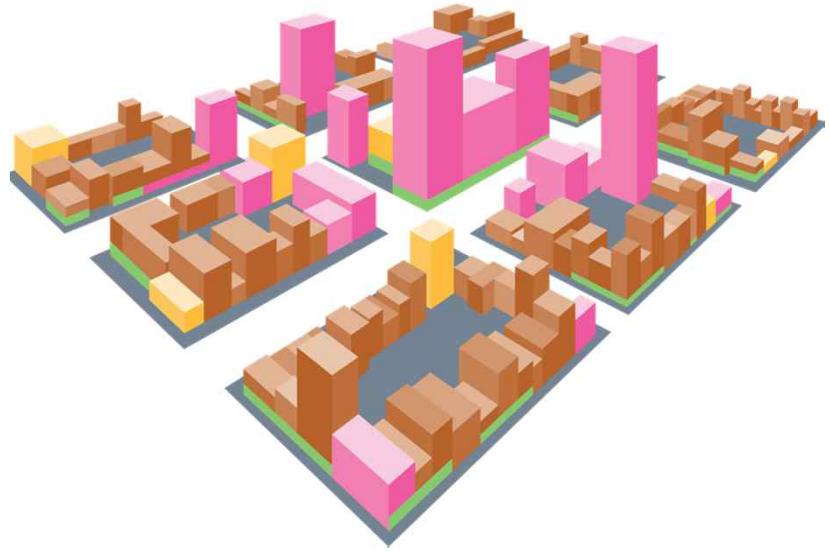
Source: Cervero

# 规划 Planning

原则三：建设多功能混合的邻里社区

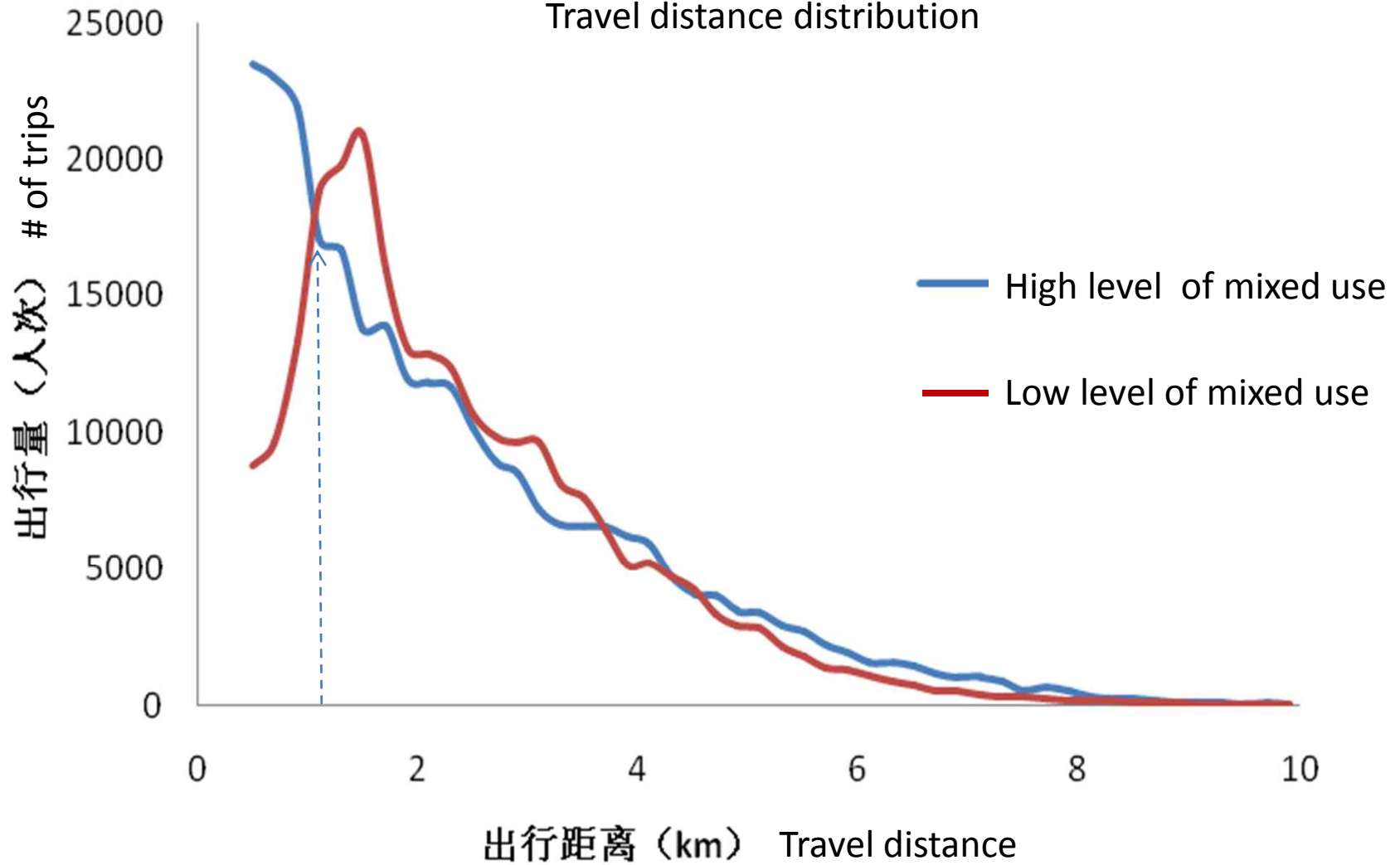
Principle 4: create mixed use neighborhood



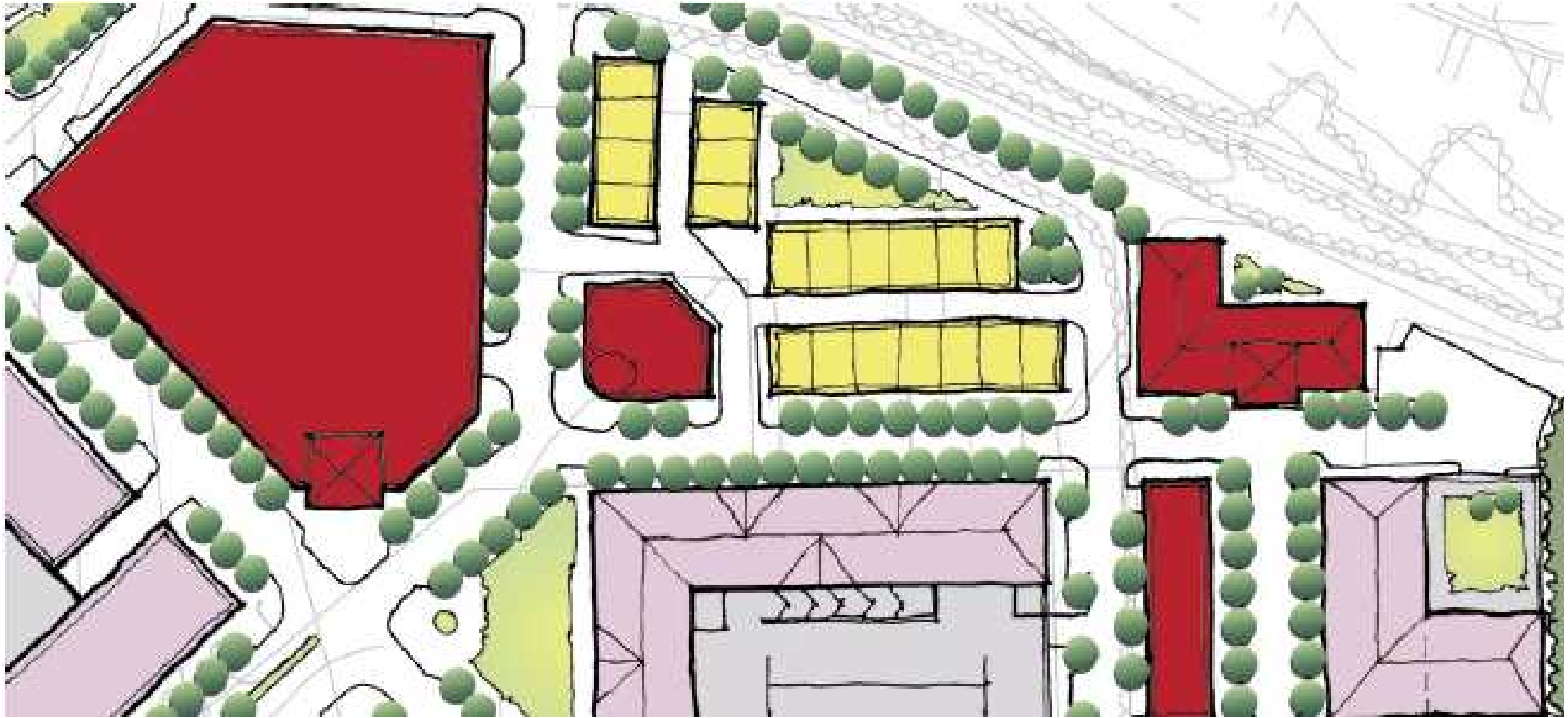


# 步行距离分布曲线

Travel distance distribution







80m? YES!

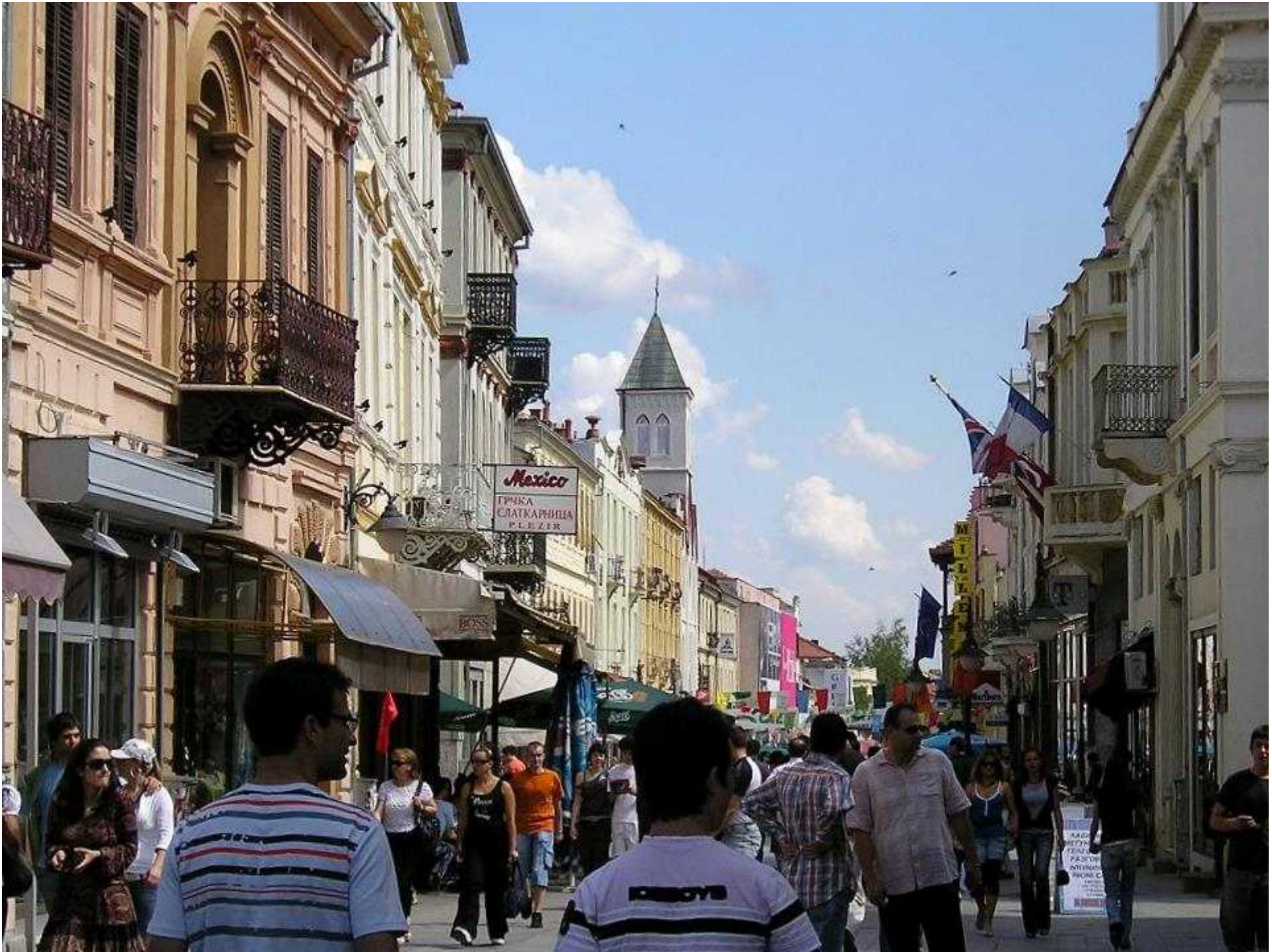


500m? NO!

LOCATION BLOCKS  
MODEL VIEW: NORTHEAST  
住宅区鸟瞰













# 规划Planning

原则四：构建密集的道路格网，使步行、非机动车、公共交通更好通行

Principle 4: Create dense street network to facilitate walking, biking and public transit

# 构建人性化尺度的道路网络 Create human scale street network



巨型街区 Super block



超大道路 Giant road



失衡的路权分配 Car prioritized street section



恶劣的慢行环境 Unfriendly NMT environment



# China's Development Challenge

中国城市开发的挑战

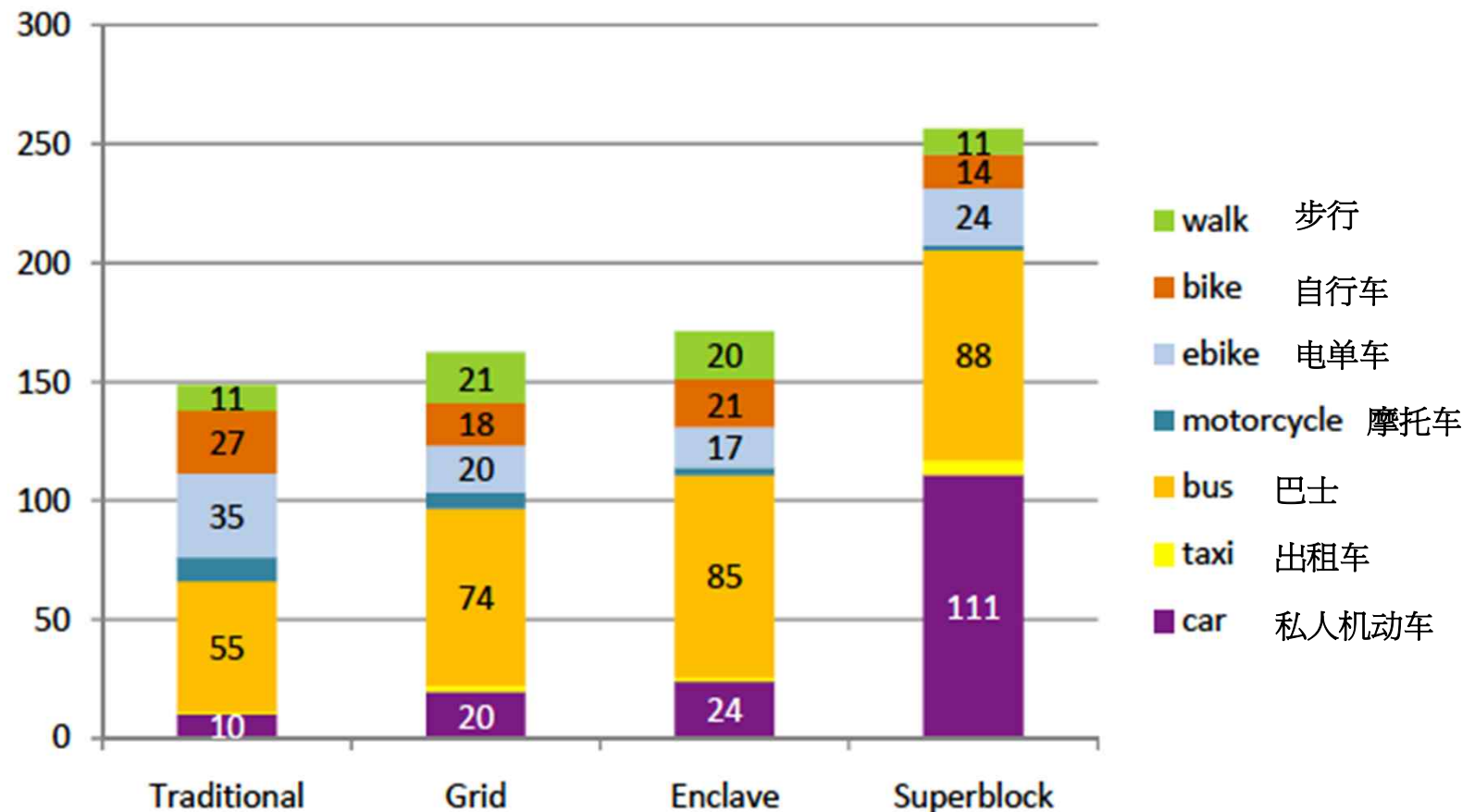


# 不同社区类型的出勤距离

## Distance traveled under different block types

家庭周出行距离

Weekly travel distance per household



Source: Jiang, Does energy follow urban form?



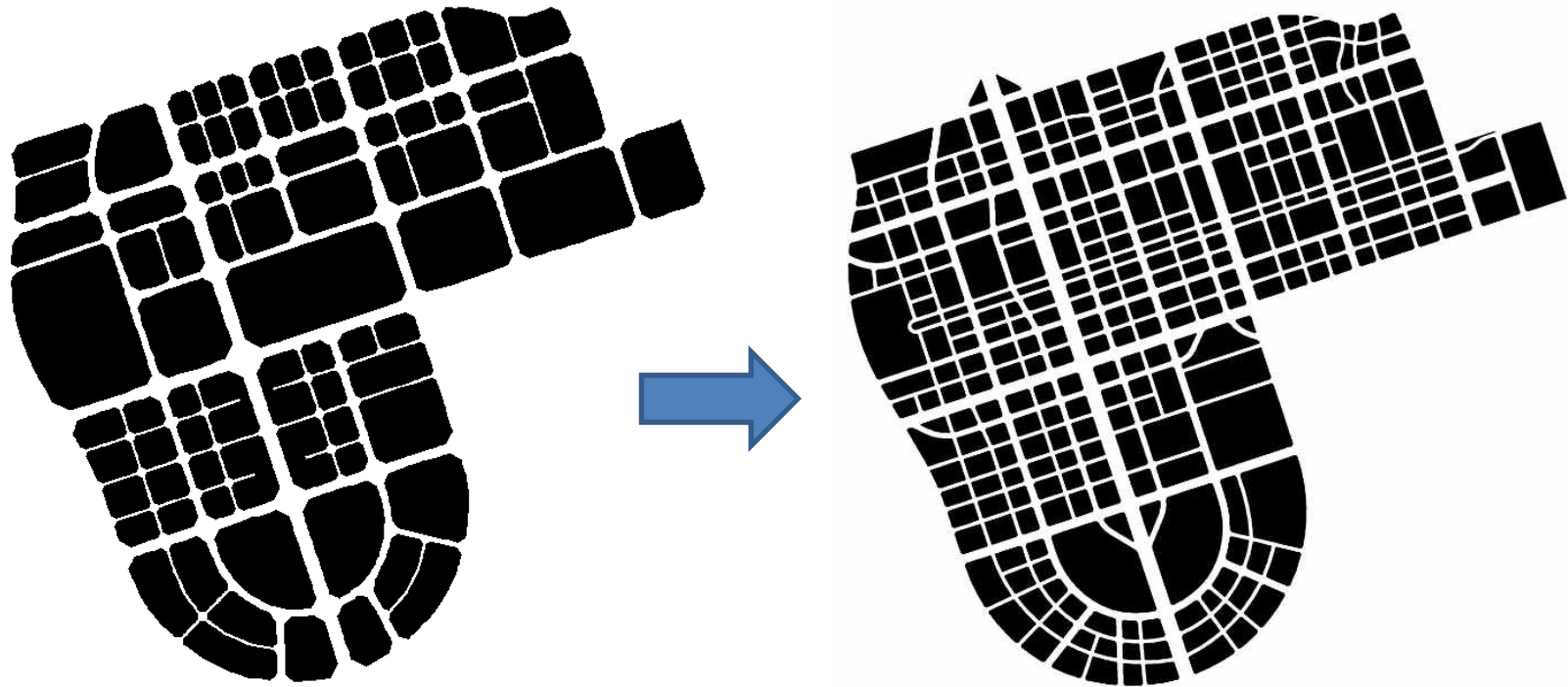
# 不同城市中心区道路网密度对比

## Road density for typical urban areas

国际城市 <b>international</b>		路网密度 (km/km <sup>2</sup> )	国内城市 <b>domestic</b>	路网密度 (km/km <sup>2</sup> )
美国 U.S.	纽约New York	13.1	北京Beijing	6.3
	芝加哥Chicago	18.6	上海Shanghai	6.7
	旧金山San Francisco	36.2	广州 Guangzhou	7.3
日本 Japan	东京 Tokyo	18.4	武汉Wuhan	9.8
	横滨	19.2	深圳Shenzhen	5.7
	大阪	18.1	大连Dalian	6.0
	名古屋	18.1	南京Nanjing	11.9
巴塞罗那 Bacerlona		11.2	杭州Hangzhou	5.2
维也纳Viena		6.28	成都Chengdu	5.9
米兰Milan		7.14	昆明 <b>Kunming</b>	<b>4.7</b>
规范 (Chinese national standard): 5.4-7.1				

来源：昆明城市交通研究所

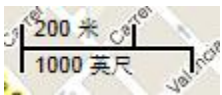
构建人性化的街道网络—增加密度，减小尺度  
Create human scale streets: denser but smaller in scale





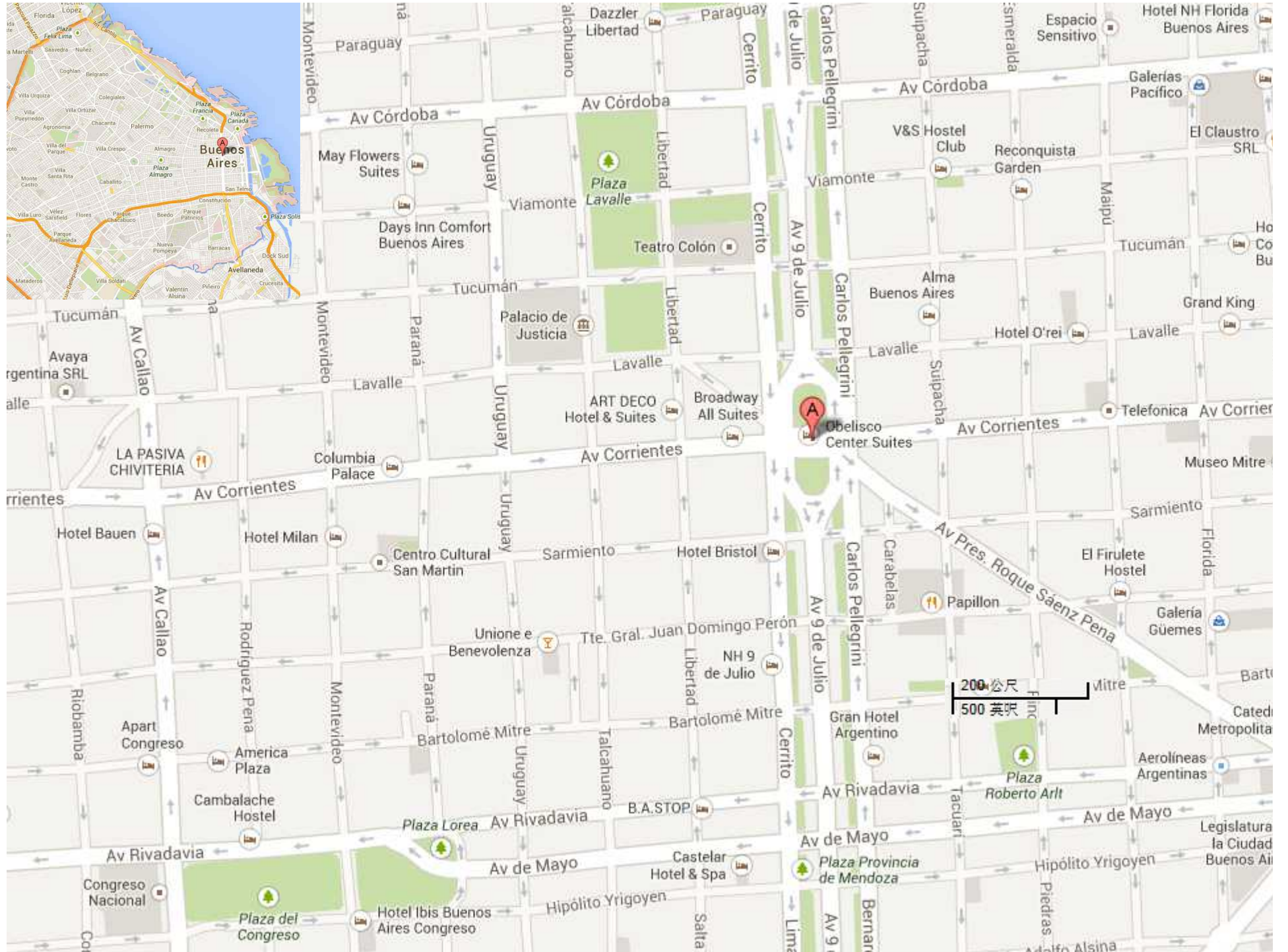


Portland  
Oregon

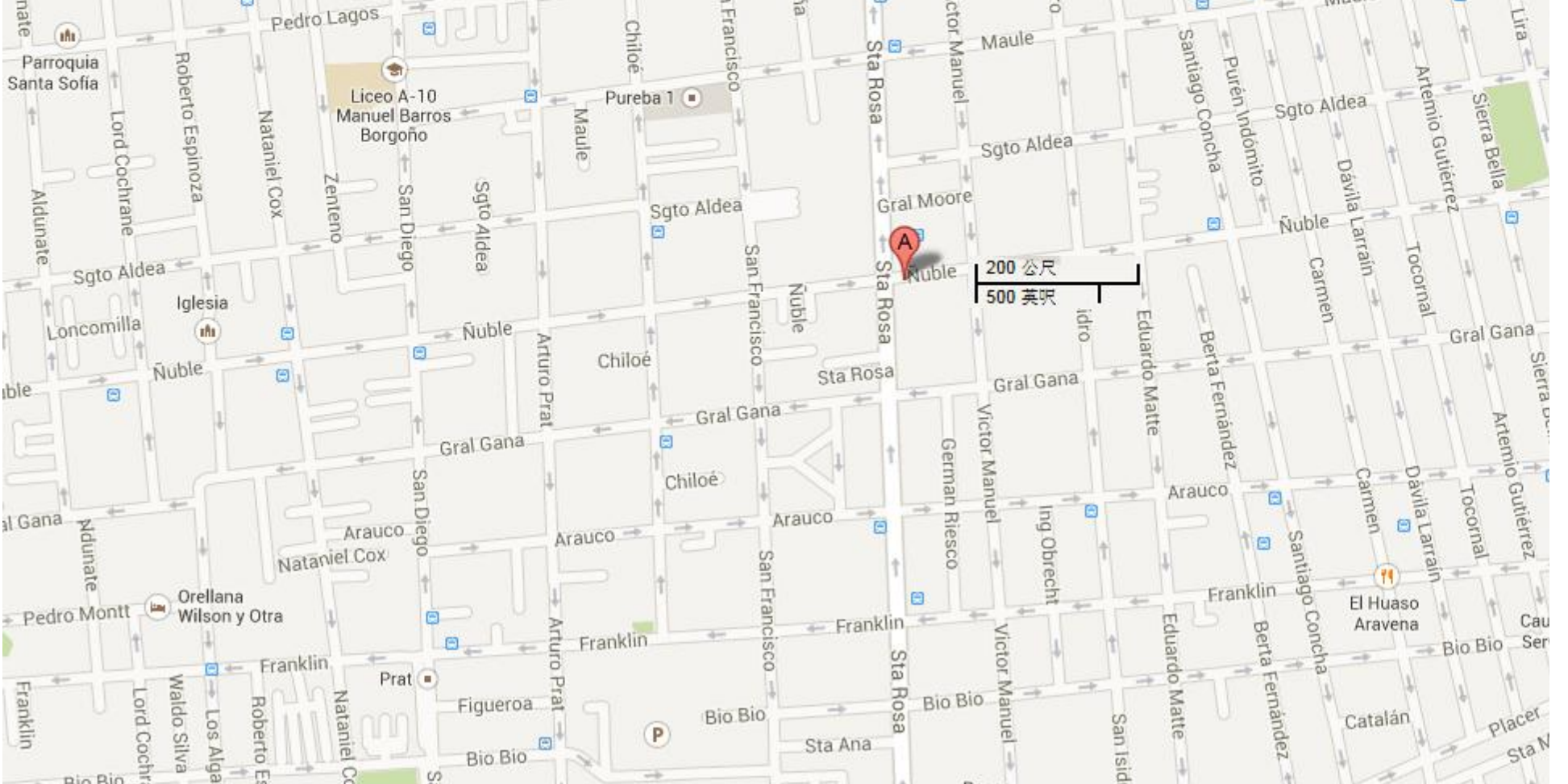


Barcelona, Spain

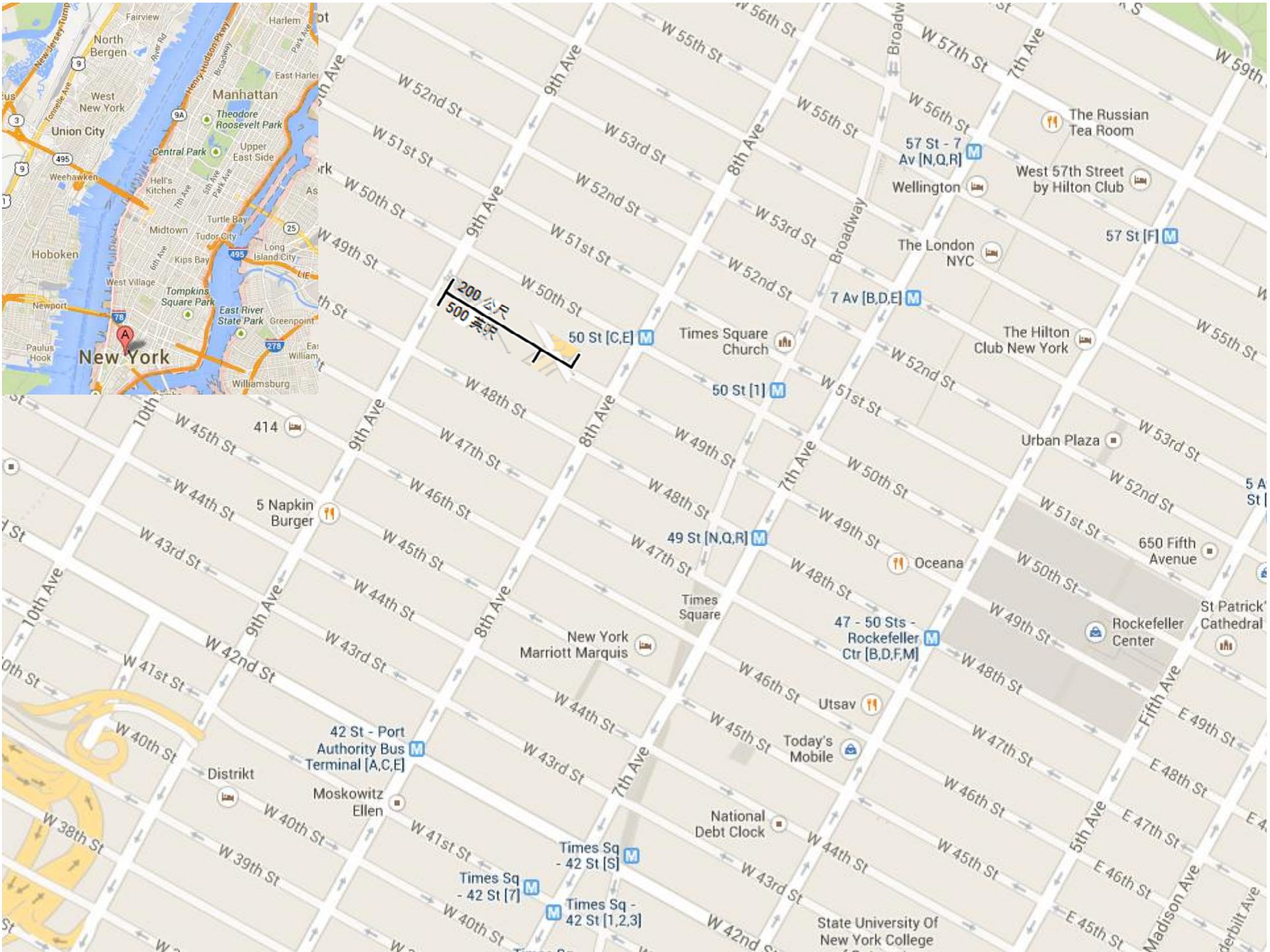




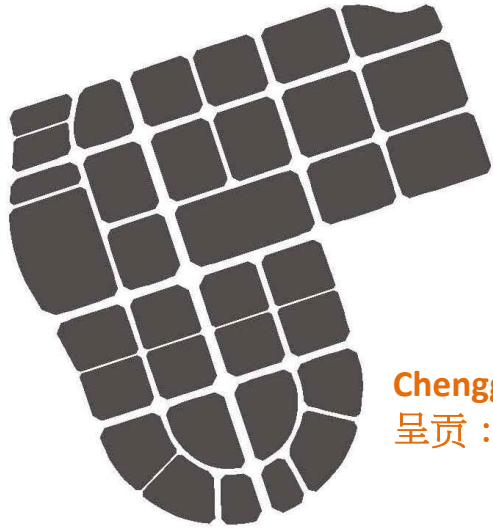








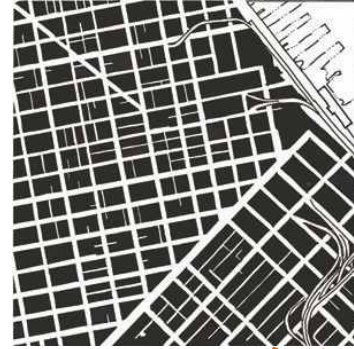




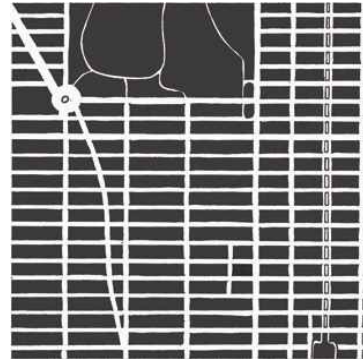
**Chengong: Superblock**  
呈贡：超大街区



**Chengong: Urban Network**  
呈贡：城市格网



**San Francisco 旧金山**



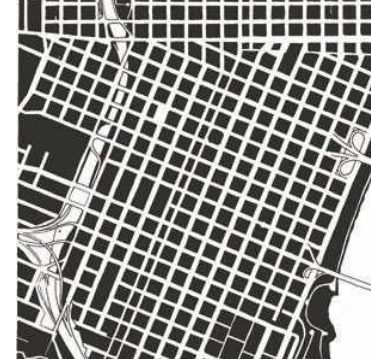
**New York 纽约市**



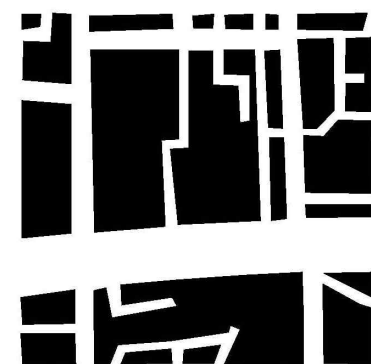
**Shanghai 上海**



**Vancouver 温哥华**



**Portland 波特兰**



**Beijing 北京**



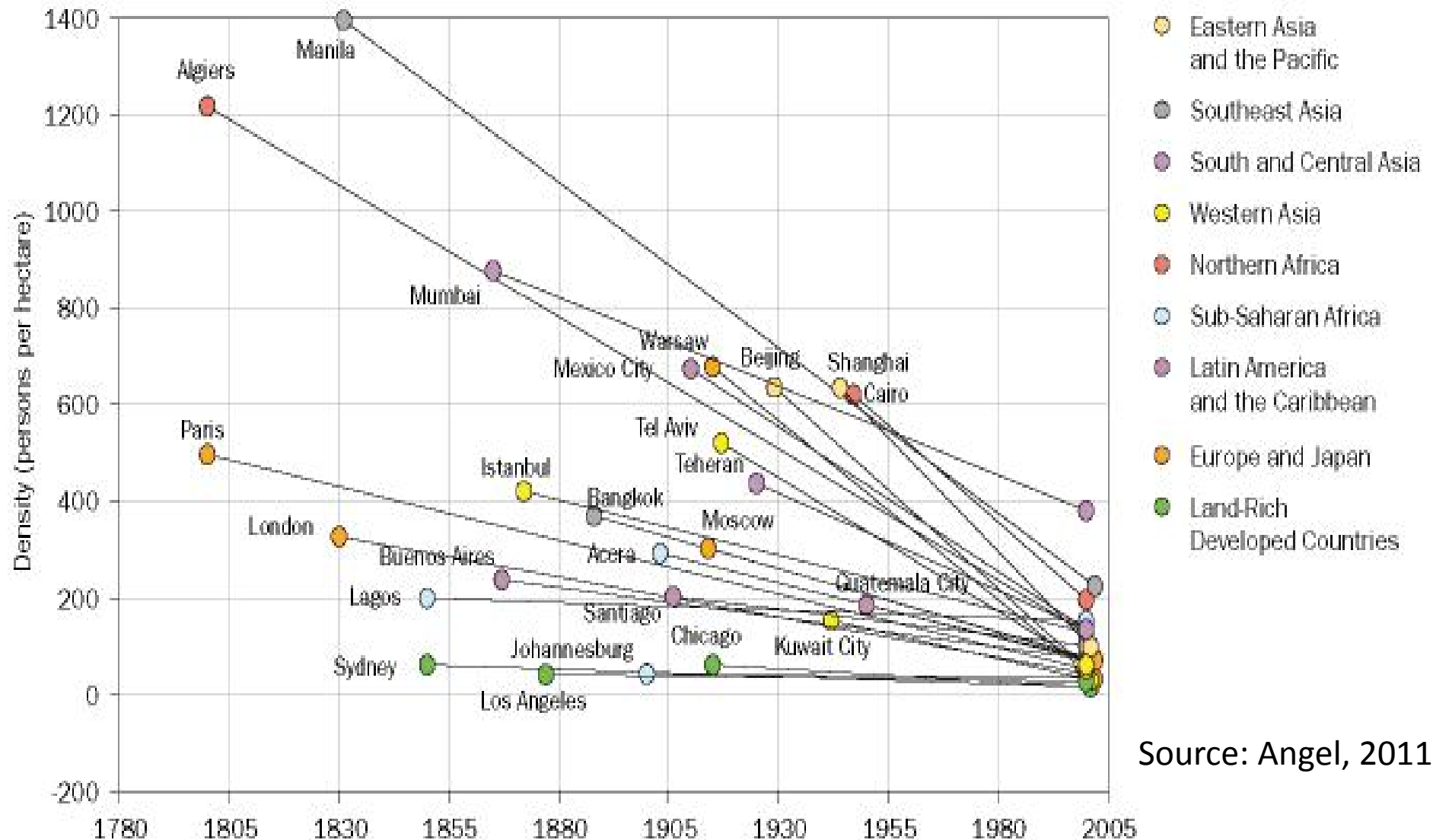
# 规划Planning

原则五：集约发展，避免无序蔓延

Principle 5: Compact development, avoid sprawl

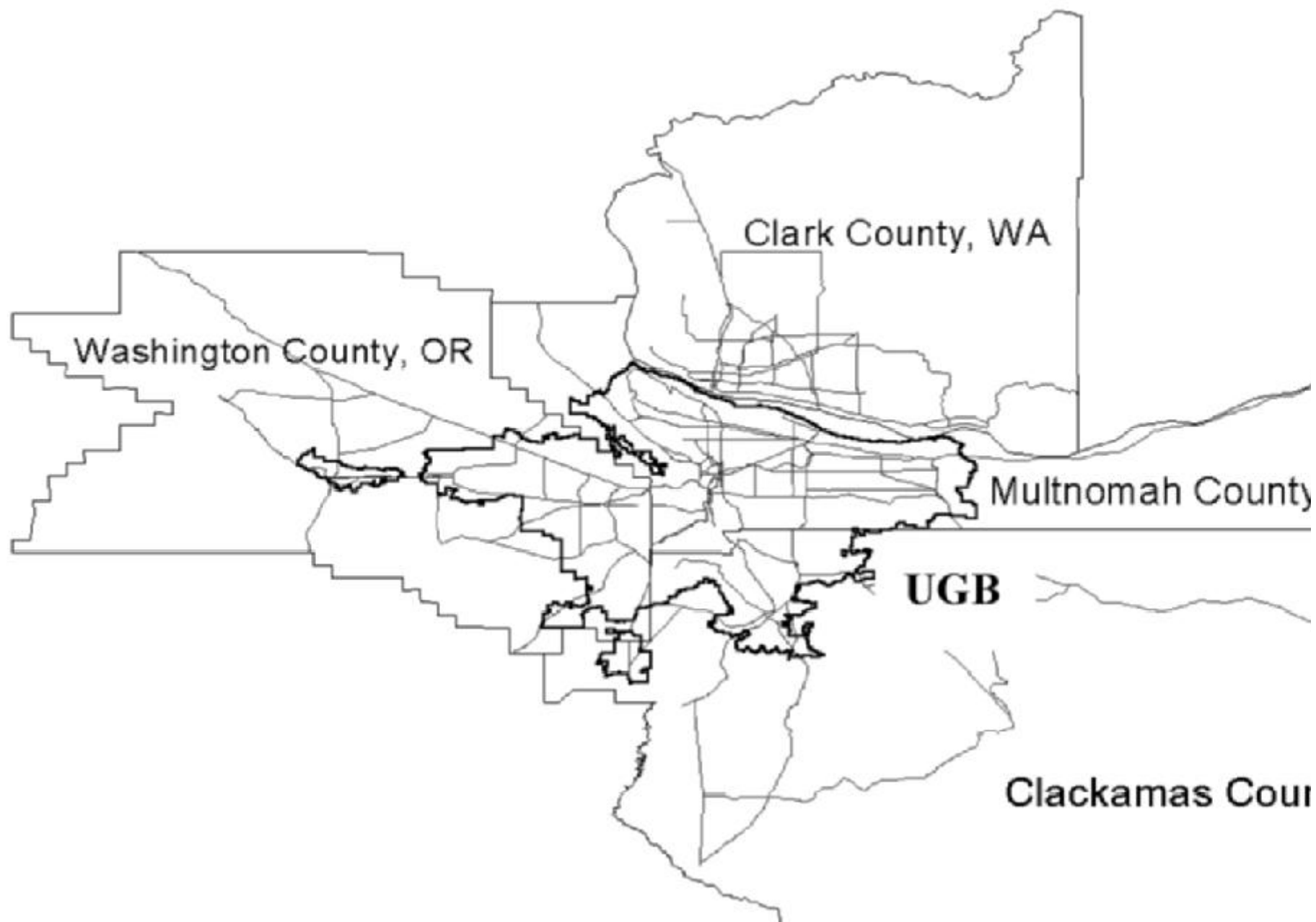
# 建成区密度的发展趋势

## Trends in Built-Up Area Densities in 25 Global Cities

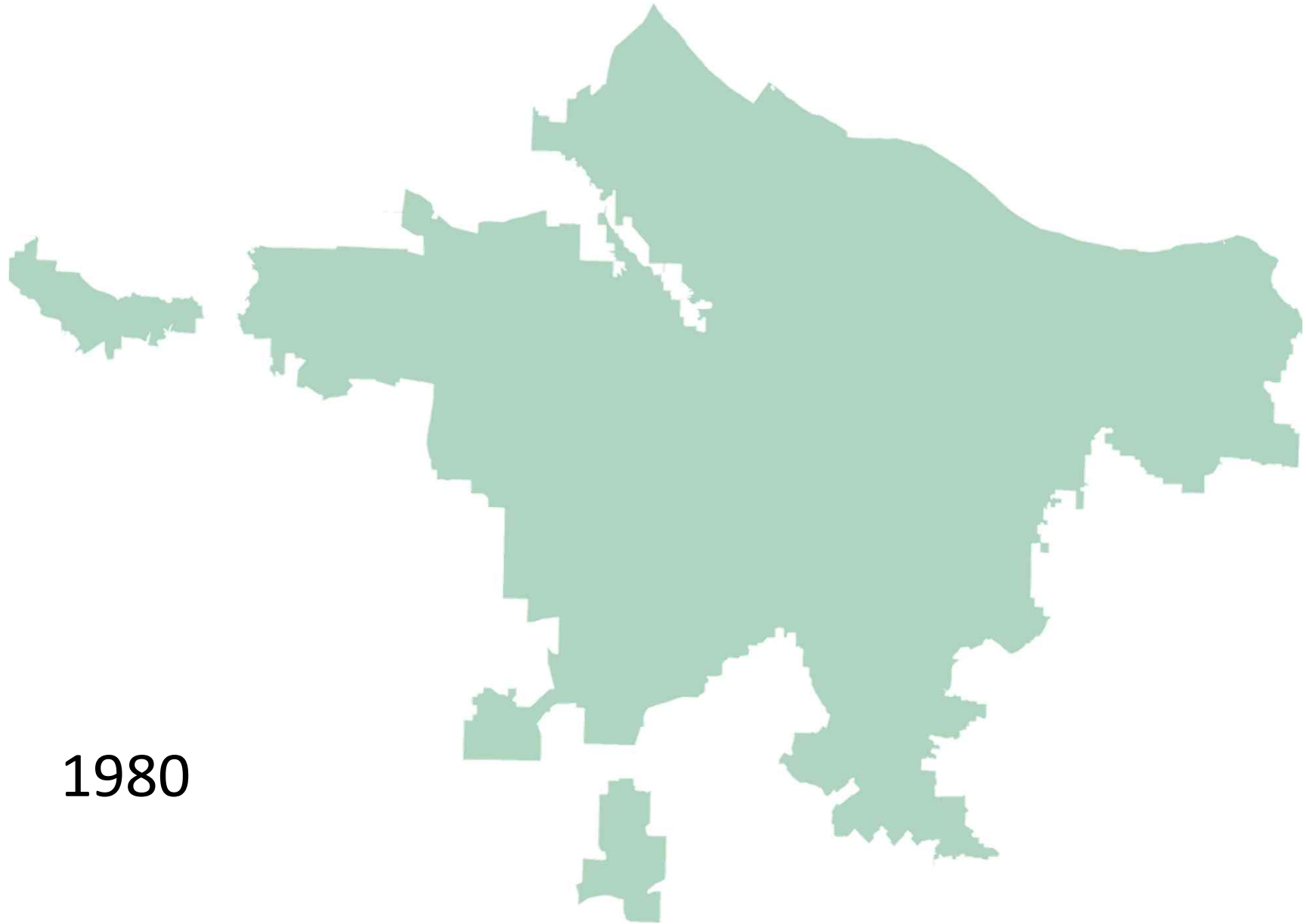


Source: Angel, 2011





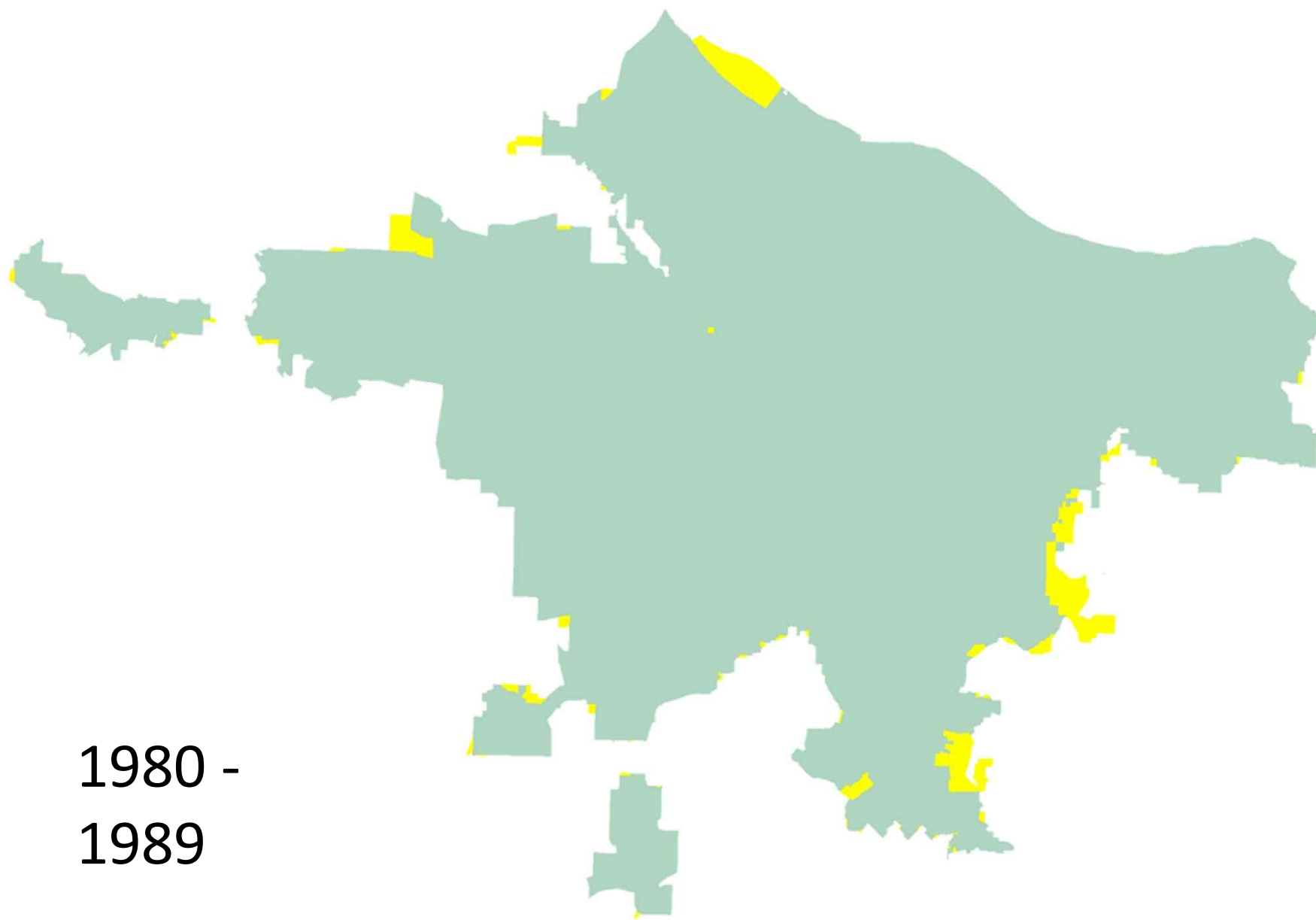
URBAN GROWTH BOUNDARY & URBAN AND RURAL RESERVES



1980

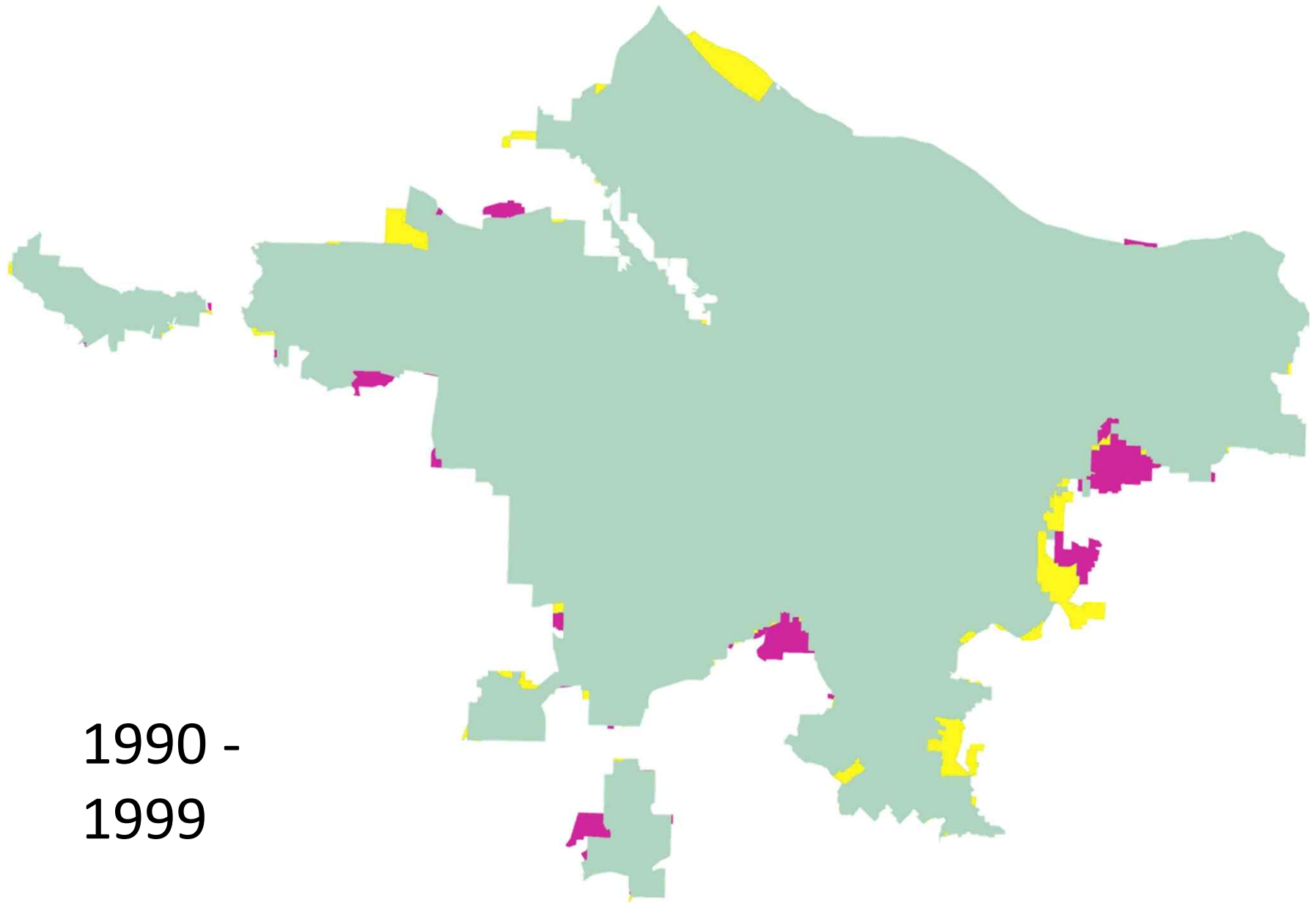


URBAN GROWTH BOUNDARY & URBAN AND RURAL RESERVES



1980 -  
1989

URBAN GROWTH BOUNDARY & URBAN AND RURAL RESERVES





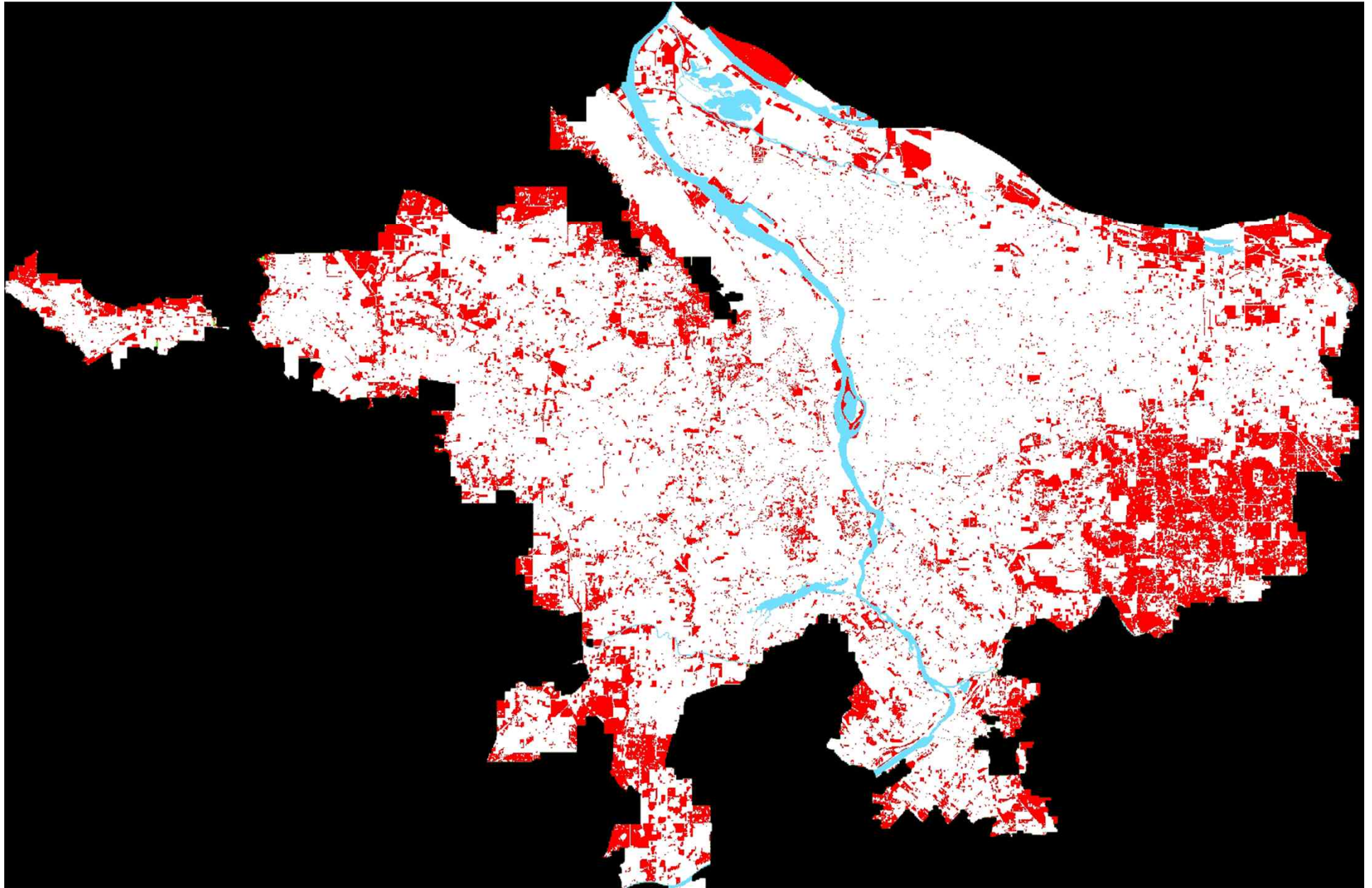


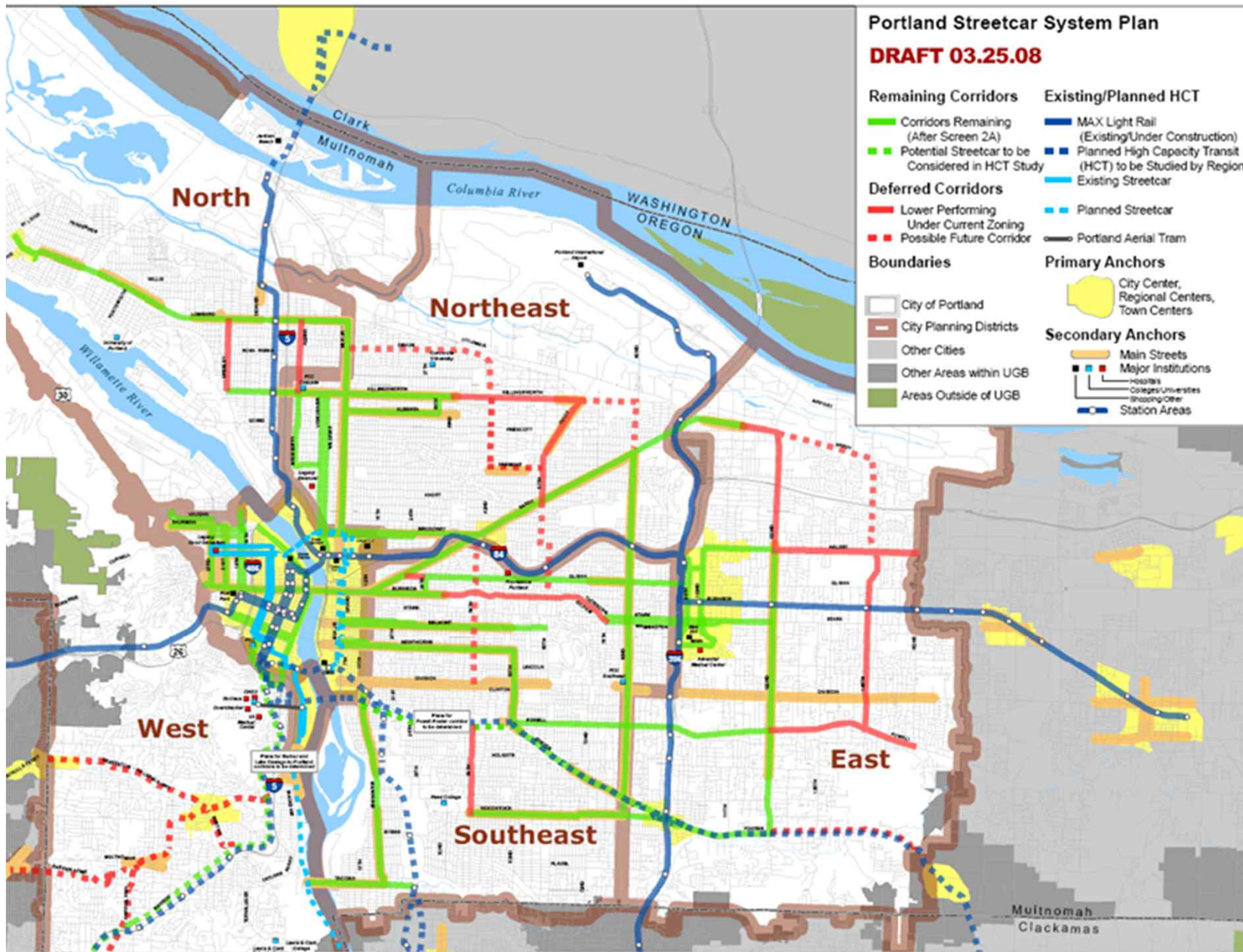






# UGB内的开发机会





城市具有较高的密度是公共交通可持续的基本条件  
Density makes public transit viable



中国的城市的UGB控制机制？  
UGB For Chinese Cities?

# THANKYOU

王志高:宇恒可持续交通研究中心, 项目主管

电话: 010-85261955-105; 18601125783

E-Mail: [zhigaowang@chinastc.org](mailto:zhigaowang@chinastc.org)

网址: <http://www.chinastc.org>



地址 北京市建国门外大街19号国际大厦1903室

电话 86-10-85261955

网址 [www.chinastc.org](http://www.chinastc.org)