

可持续的中国城市

— 低碳城市的规划策略研究



中国可持续能源项目
— 迈向中国可持续能源的未来
美国能源基金会



Nov., 2009

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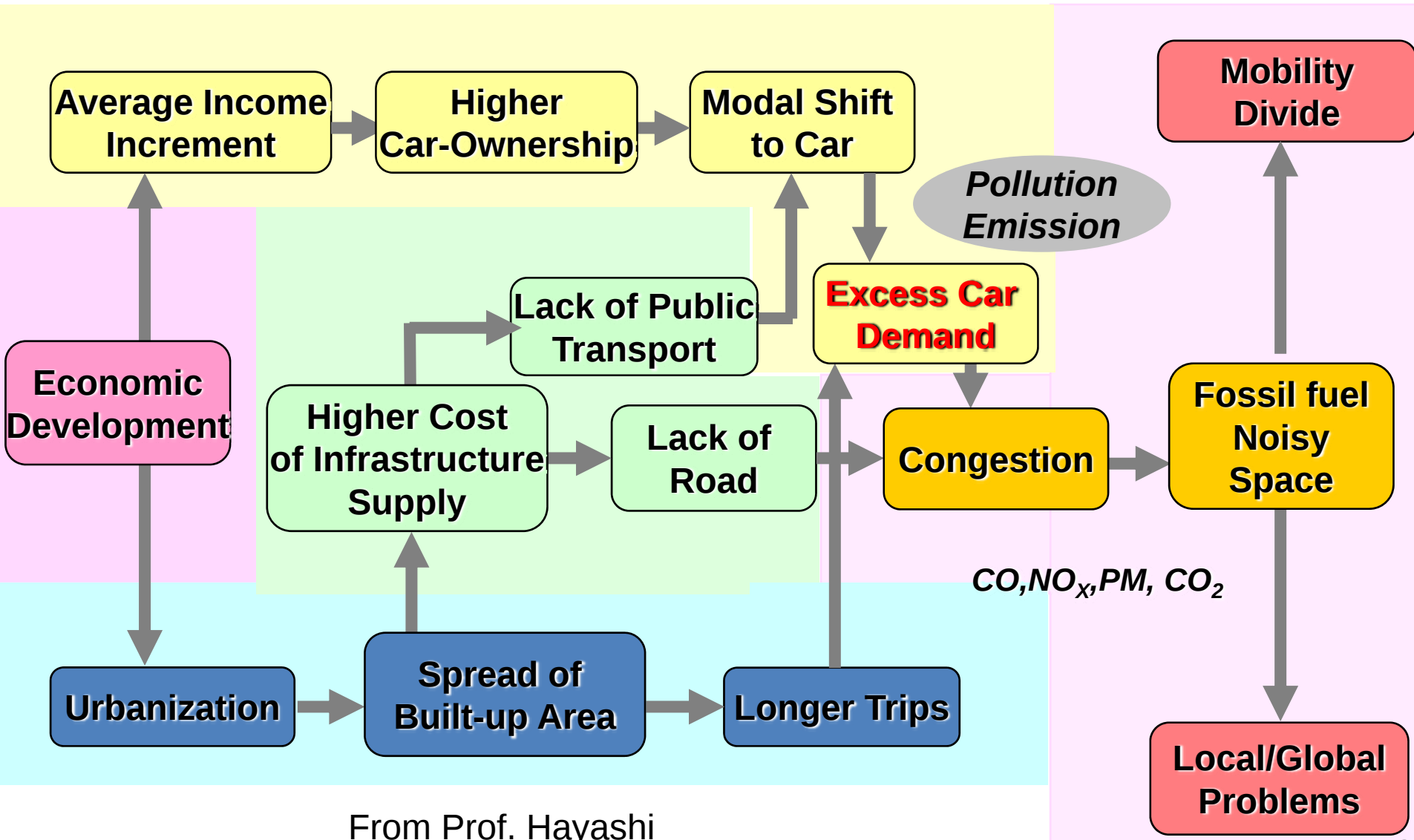
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背景 Background

- 现代社会活动的频度增强，空间的广度扩展
More Diversified Activities, Extended in Space
- 支撑的要素面临严重的制约和不确定性
Uncertainty and Constrain of Fundement
- 未来的城市再也没有机会在资源充分的环境中发展。
- ----石油资源的短缺和温室效应的威胁
Threat from Fossil Energy/Climate Change
- 如何保持现代生活的质量，又能使我们个人和城市本身能够适应未来的不确定性，并保持发展的灵便性是当今城市规划所面临的巨大挑战。
- How to Maintain Life Quality, Facing Challenge



快速变革环境下，低碳城市结构的建立。

On the rapid revolutionary condition, we' re aiming at establishing a LOW-CARBON URBAN STRUCTURE.

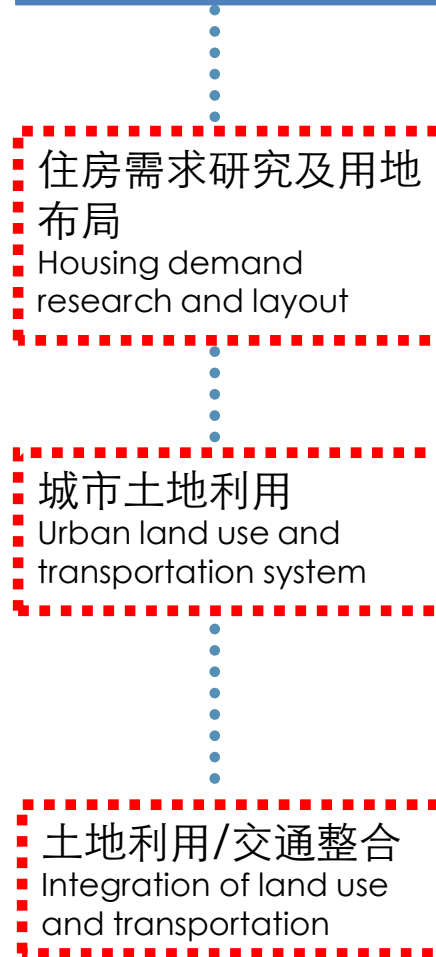
Part 2

Regional Planning



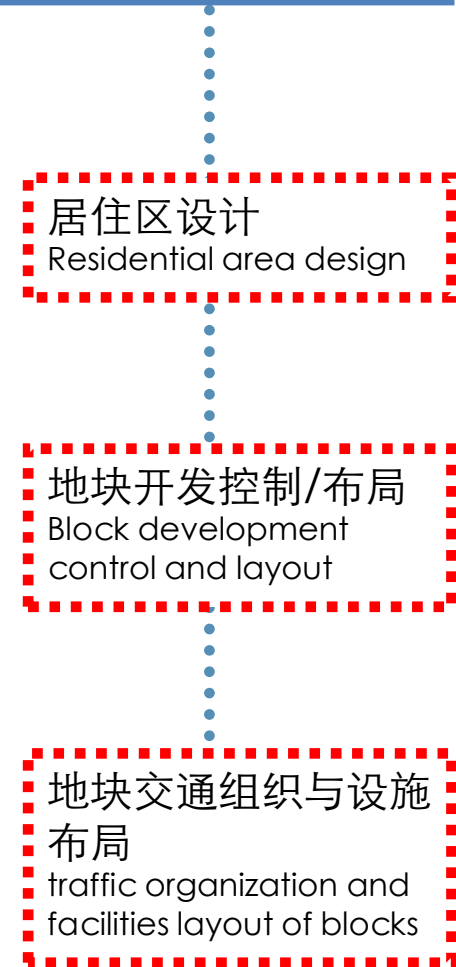
Part 3

Master Planning



Part 4

Detailed Planning



Part2 区域规划下的低碳城市形态结构

Low-Carbon Urban Form and Structure Led by Regional Plan

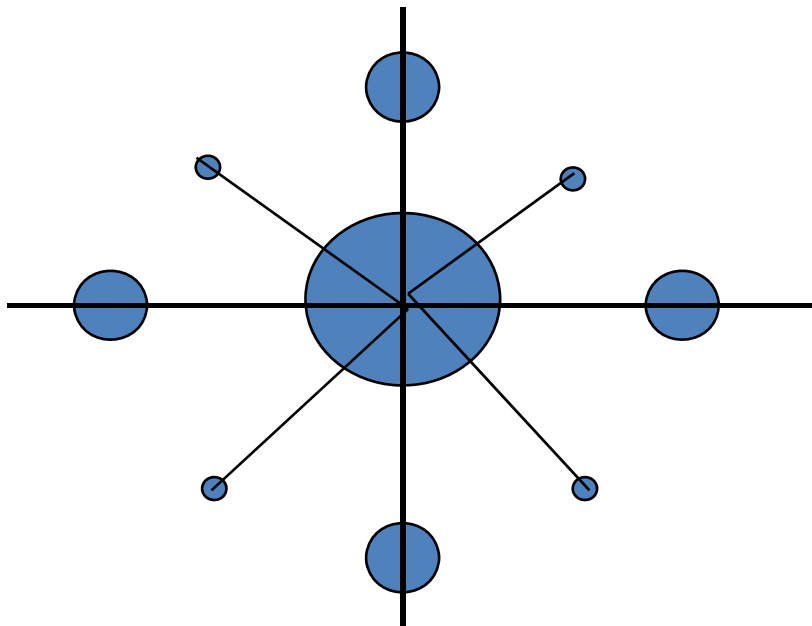
大城市的大都市区化趋势与问题Metropolization

趋势Trend

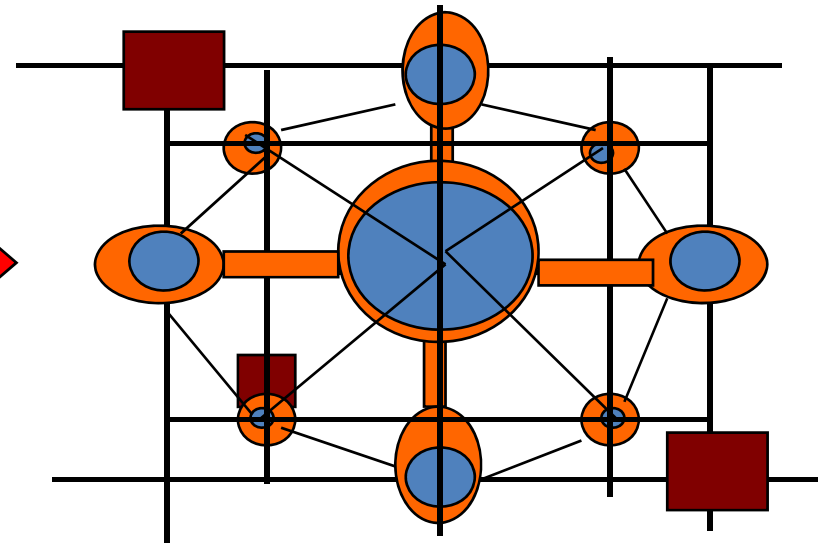
- 城市化进程加快，人口加速向大城市转移
- Accelerating urbanization
- 城市的生活、就业活动范围扩大，城镇间联系加密
- The connection of town tie up
- 中心区蔓延，内部功能转变，人口外迁
- Urban sprawl
- 新城和工业园区建设，人口与产业集中
- New town and Industry park construction

问题Problem

- 城镇体系难以完全覆盖到新开发地区
- New Development outside Planning Area
- 缺乏考虑交通网络的时空距离以及出行活动
- The lack of consideration of time-space and travel
- 过度基于小汽车出行的空间布局可能导致高能耗
- The car-oriented development will lead to high use of energy



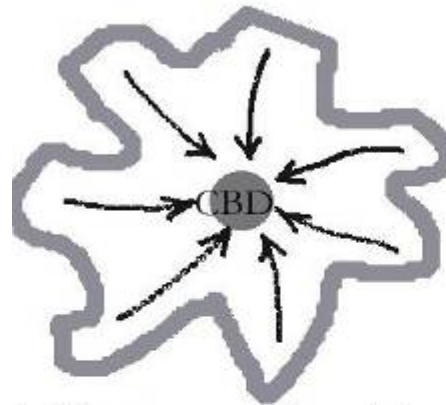
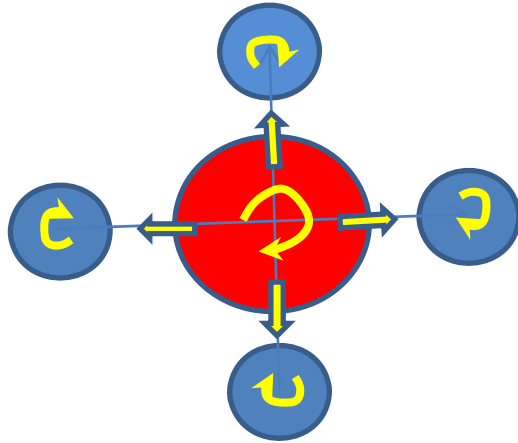
Existing Pattern



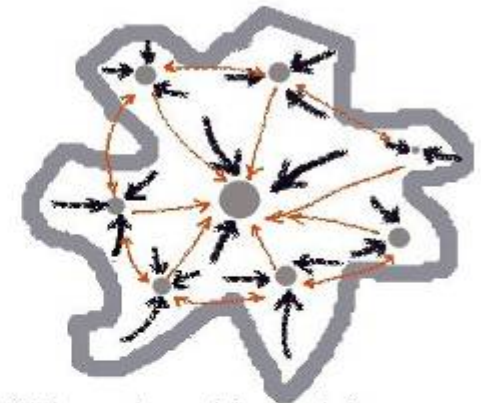
Development Without Control

区域空间模式和交通出行Regional spatial organization

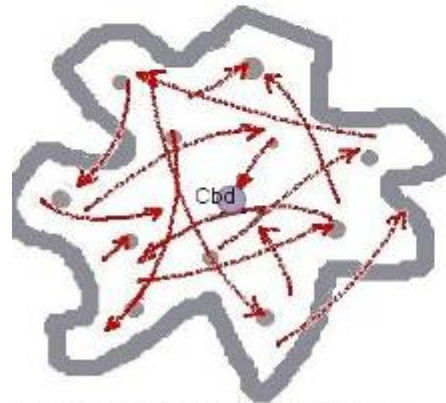
Schematic Representation of Trips Patterns Within a Metropolitan Area



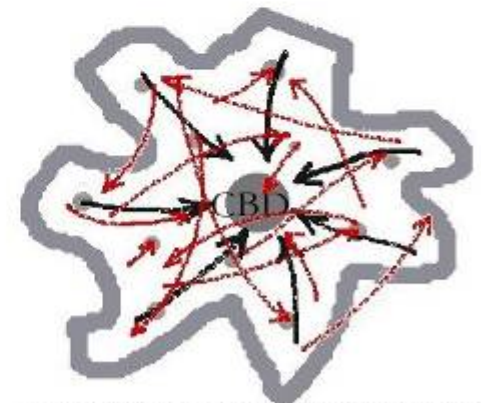
(a) The monocentric model



(b) The polycentric model:
The urban village version



(c) The polycentric model:
The random movement version

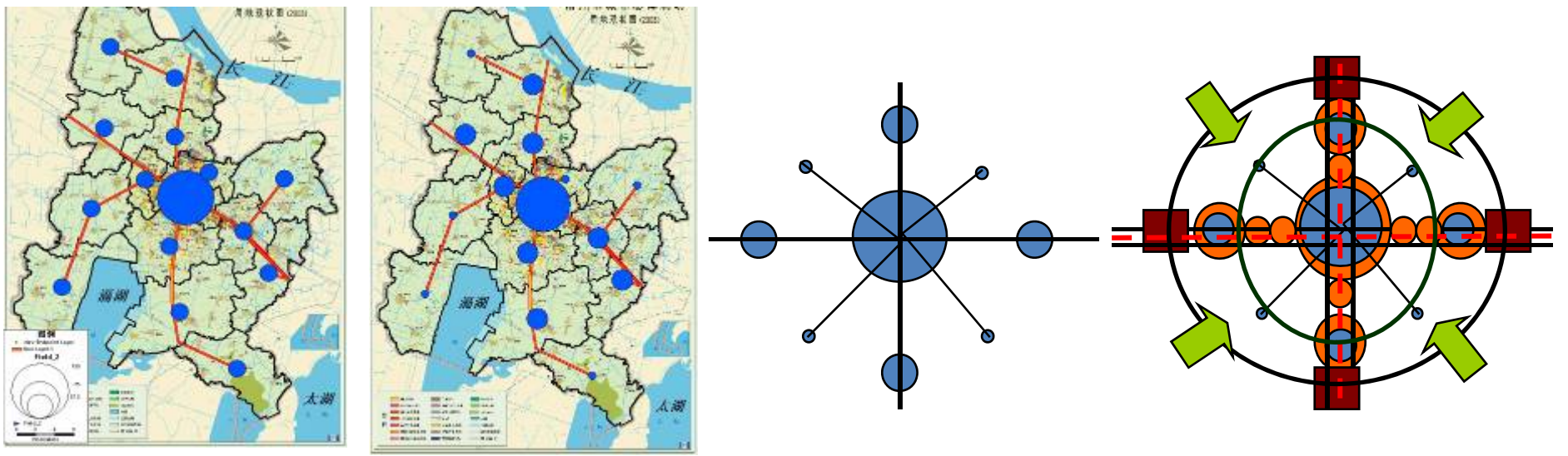


(d) The mono-polycentric model:
Simultaneous radial
and random movements

— weak links
— strong links

- 不同的城镇空间组织形式会导致多种类型的出行
 - spatial organization leads to travel pattern
- 多中心化的城镇空间组织形式，
会改变出行模式
Polycentric modes will
change the travel pattern

大都市区发展模式与出行Development pattern and travel



发展模式 Development pattern		新城 New town	外围城镇 outside Corridor	外围城镇 in Corridor	合计 total
现状 Now	人口population	70万	20万	10万	100万
	城镇间出行比例Travel	15%	15%	15%	15万
	小汽车比例car	10%	10%	10%	1.5万
	出行距离distant	10Km	10Km	10Km	15万Km/Day
无轨道引导的 蔓延模式 Without public transport	人口population	140万	40万	20万	200万
	城镇间出行比例Travel	30%	30%	30%	60万
	小汽车比例car	30%	30%	30%	18万
	出行距离distant	15Km	15Km	15Km	270Km/Day
基于轨道引导的 走廊模式 With public transport	人口population	140万	30万	30万	200万
	城镇间出行比例Travel	30%	30%	30%	60万
	小汽车比例car	15%	30%	15%	10.35万
	出行距离distant	15Km	15Km	15Km	155Km/Day

都市区蔓延与能源消耗Sprawl and Energy

- 现有的城镇体系规划与公路规划缺少在新的发展条件下对交通的认识，容易导致基于小汽车的出行

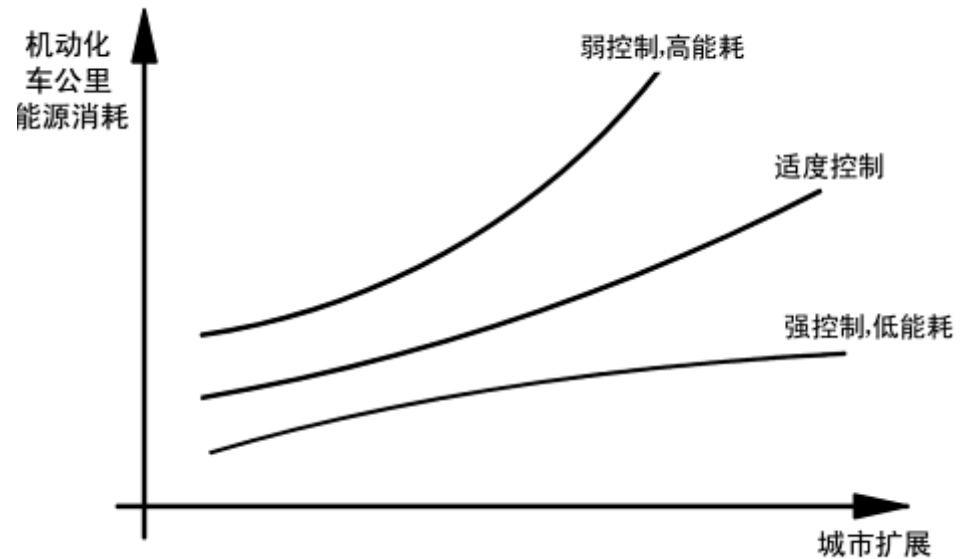
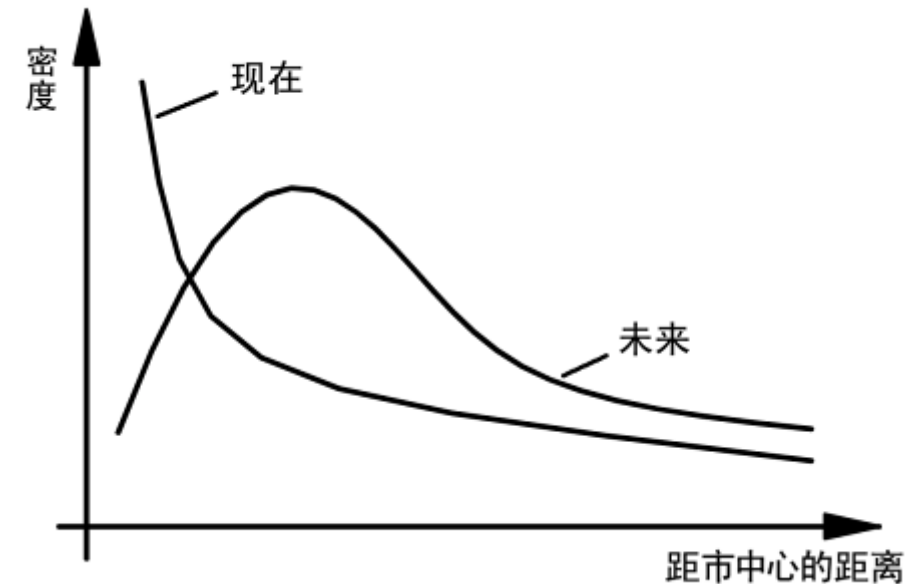
Existing urban system will encourage the use of car

- 缺少控制的蔓延方式，会导致高能耗的发展模式
- The sprawl without control can lead to high energy consume

要控制大都市区内由于小汽车出行导致的能源消耗，需要：

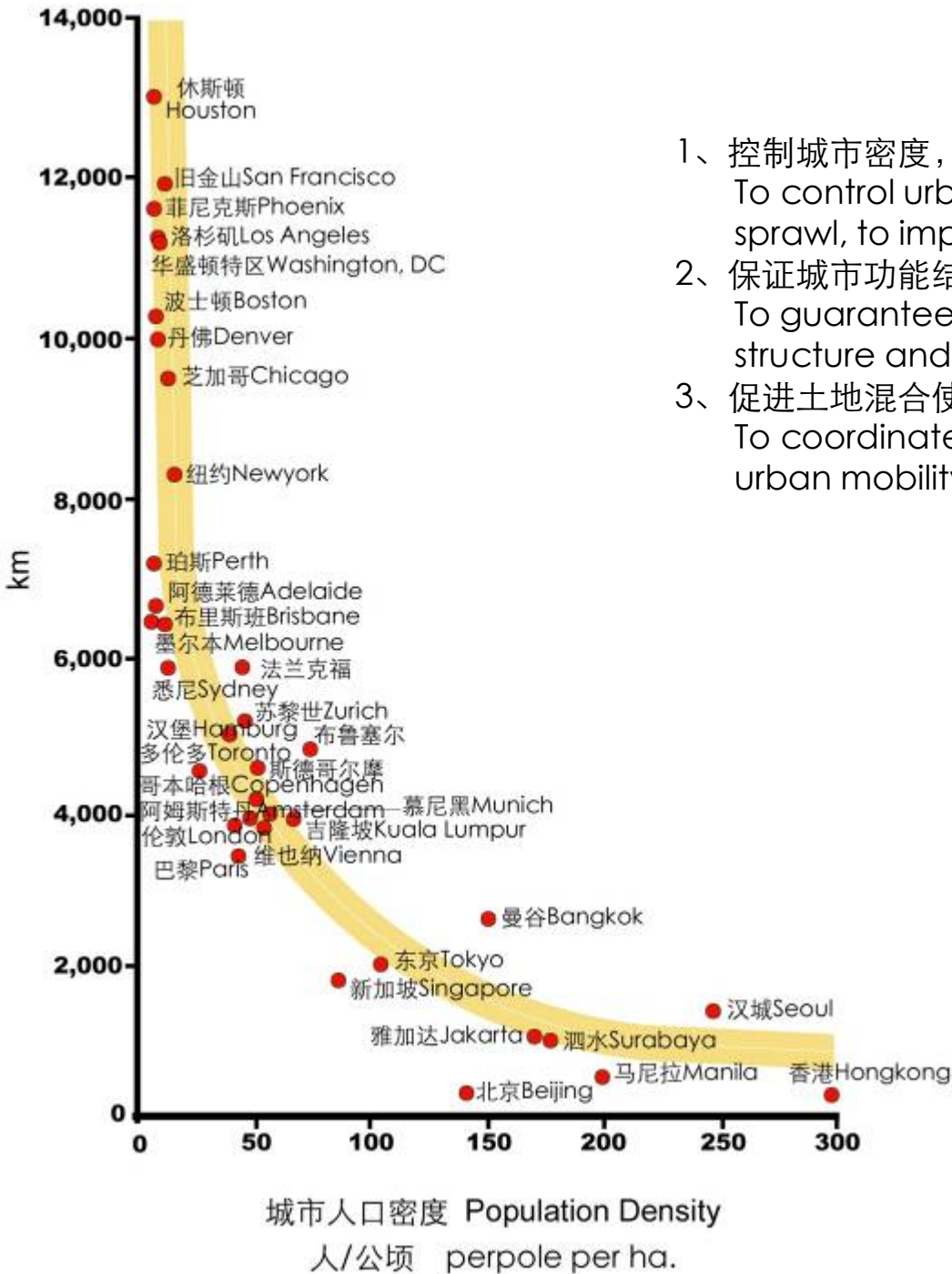
In order to control the use of car,

- 鼓励都市区内有大运量公交的地域的开发活动
To Encourage the development in the area with Large capacity of public transport
- 围绕轨道交通、BRT等发展走廊来组织城镇布局
• To Contribute the form of development Corridor with the Supply of rail and BRT
- 控制可能形成基于小汽车的开发方式和基础设施建设
• To control the car-oriented development and Infrastructure

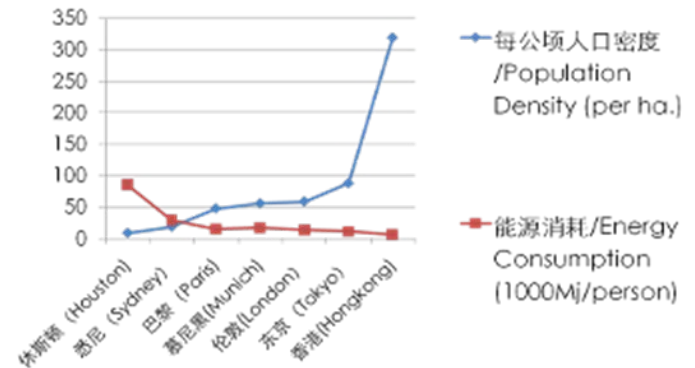


Part3 总体规划下的低碳城市形态结构

Low-Carbon Urban Form and Structure Led by Master Plan

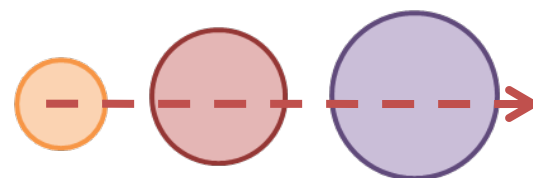
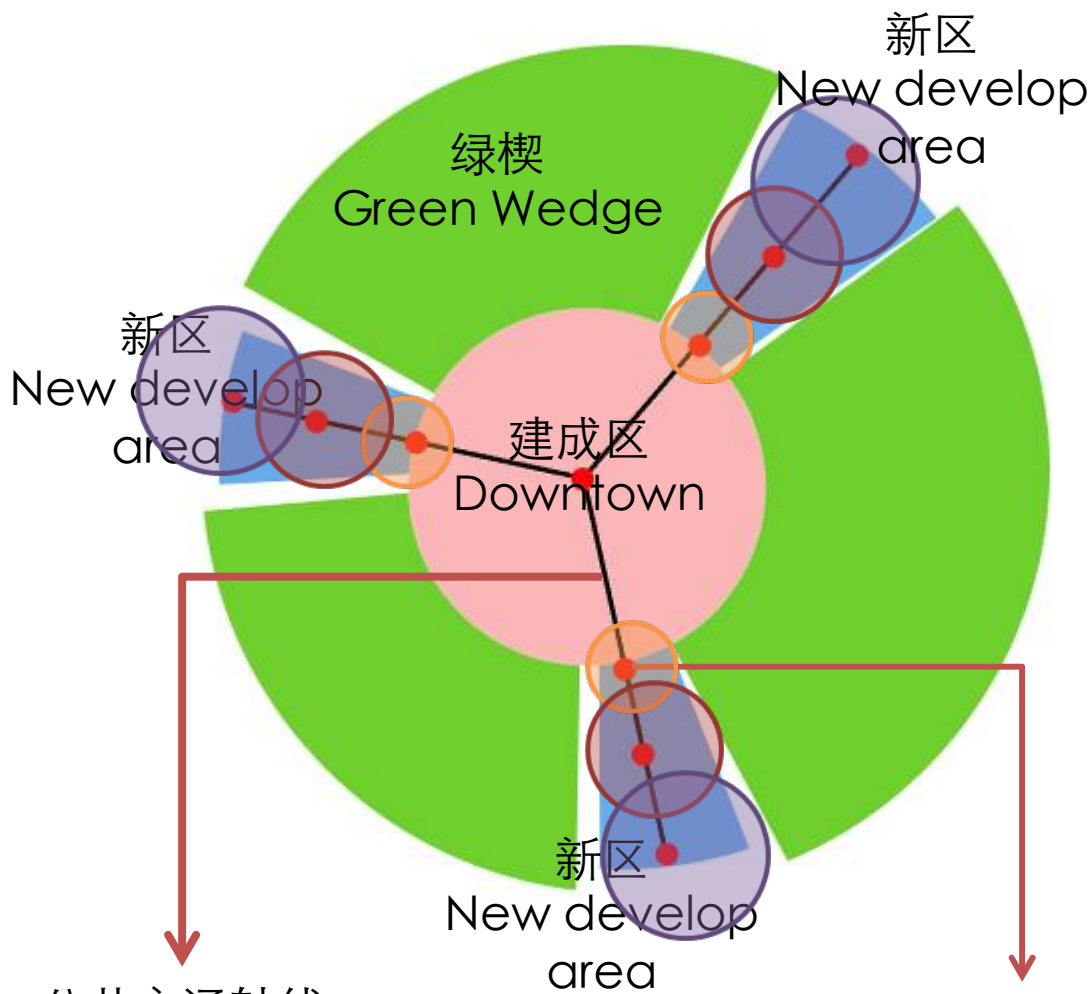


- 1、控制城市密度，防止城市无序蔓延，促进低碳的交通方式
To control urban density, to prevent disorderly sprawl, to improve low-carbon transportation means
- 2、保证城市功能结构与交通体系相结合
To guarantee the integrate between urban land use structure and transportation system
- 3、促进土地混合使用、开发强度与交通方式的协调
To coordinate mixed land use, develop intensity and urban mobility



城市人口预测的不确定性！
The uncertainty of population estimation.

绿楔的城市发展模式 Green wedge style



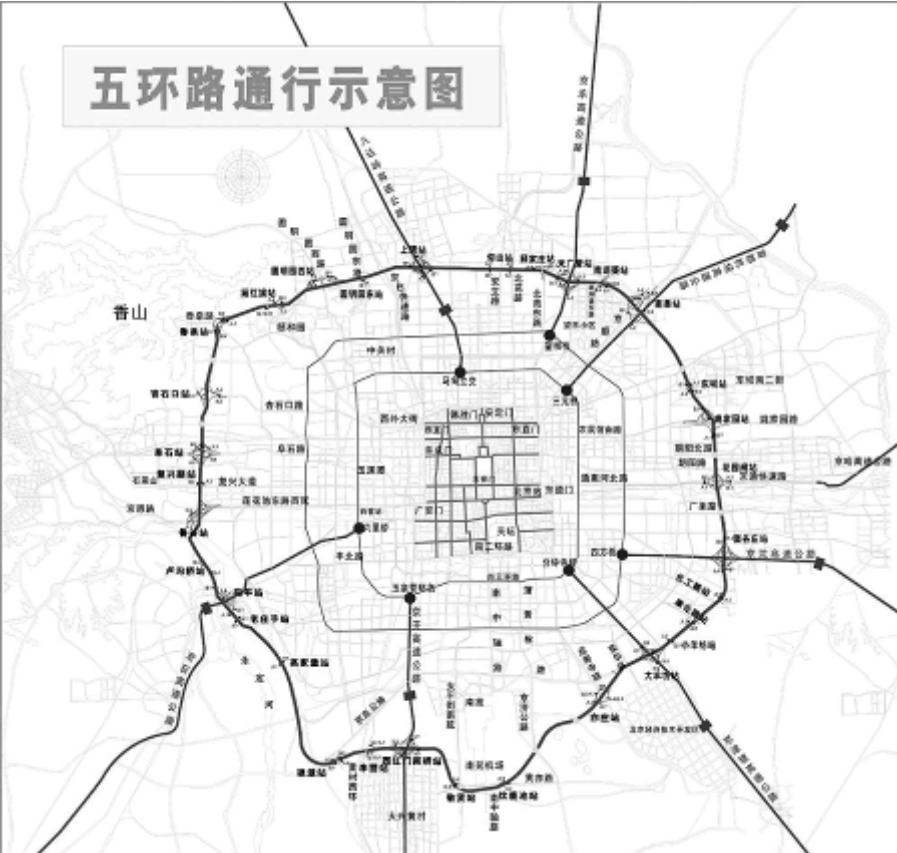
发展时序
Develop Timetable

有利于组织公共交通，紧缩型发展，节约能源。
Easy to organize public transportation and improve compact city, save energy.

公共交通轴线
Public Transportation Axis

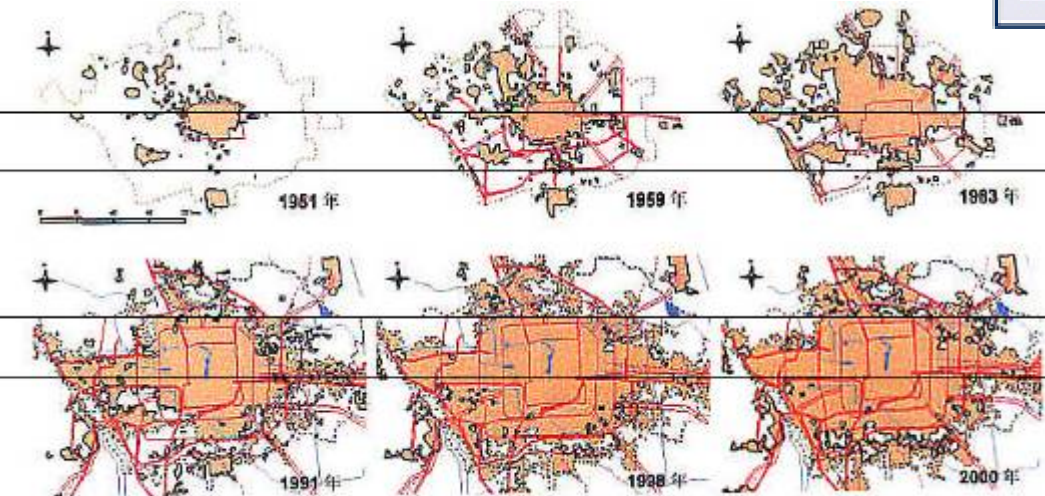
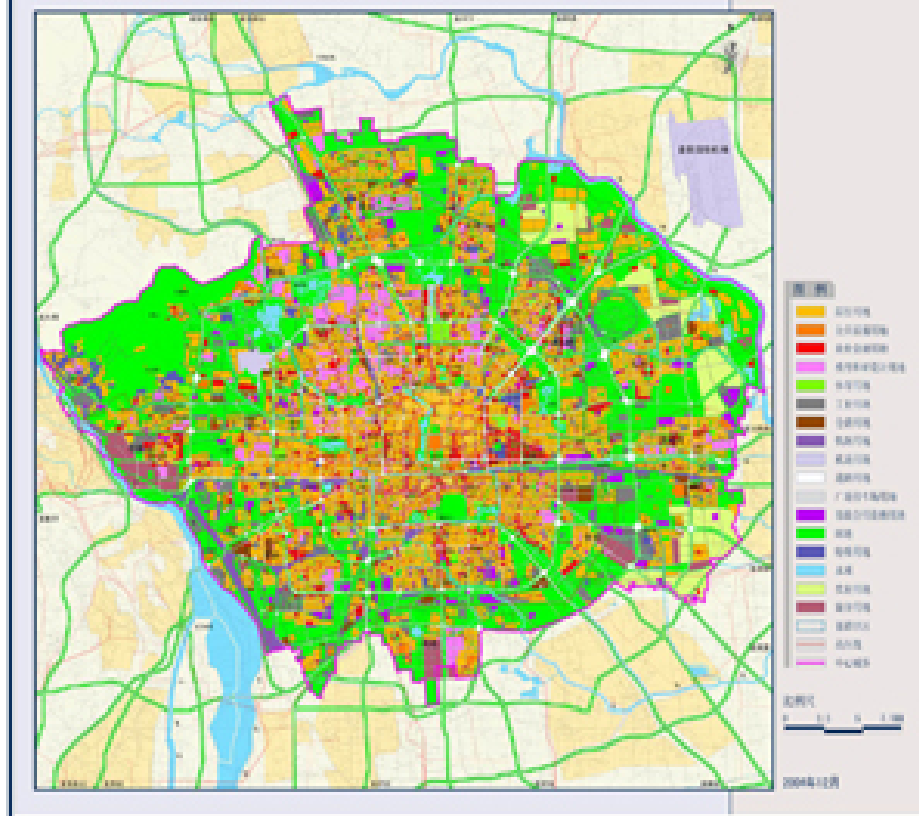
公共交通枢纽
Public Transportation Hubs

五环路通行示意图



北京城市总体规划（2004年-2020年）

图07、中心城用地规划图

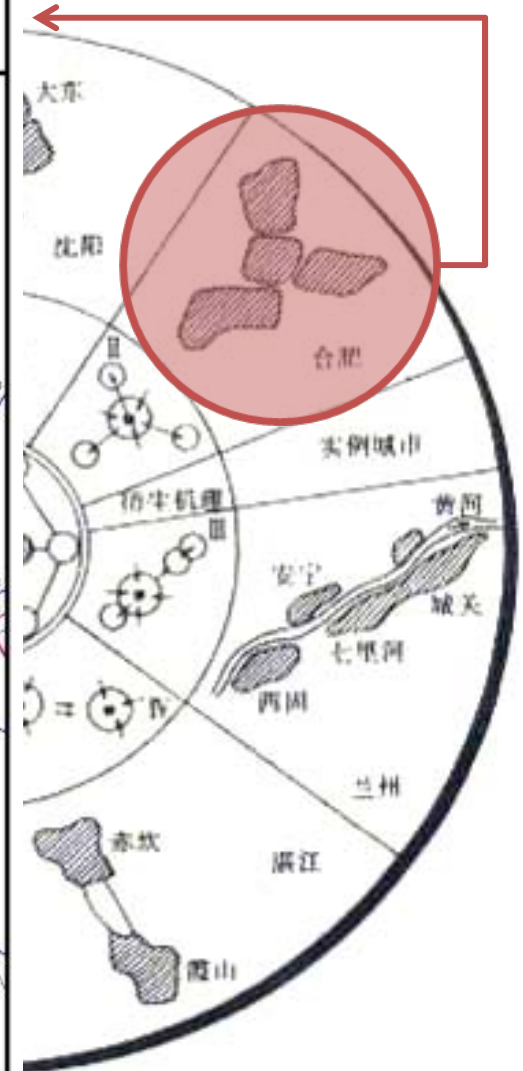
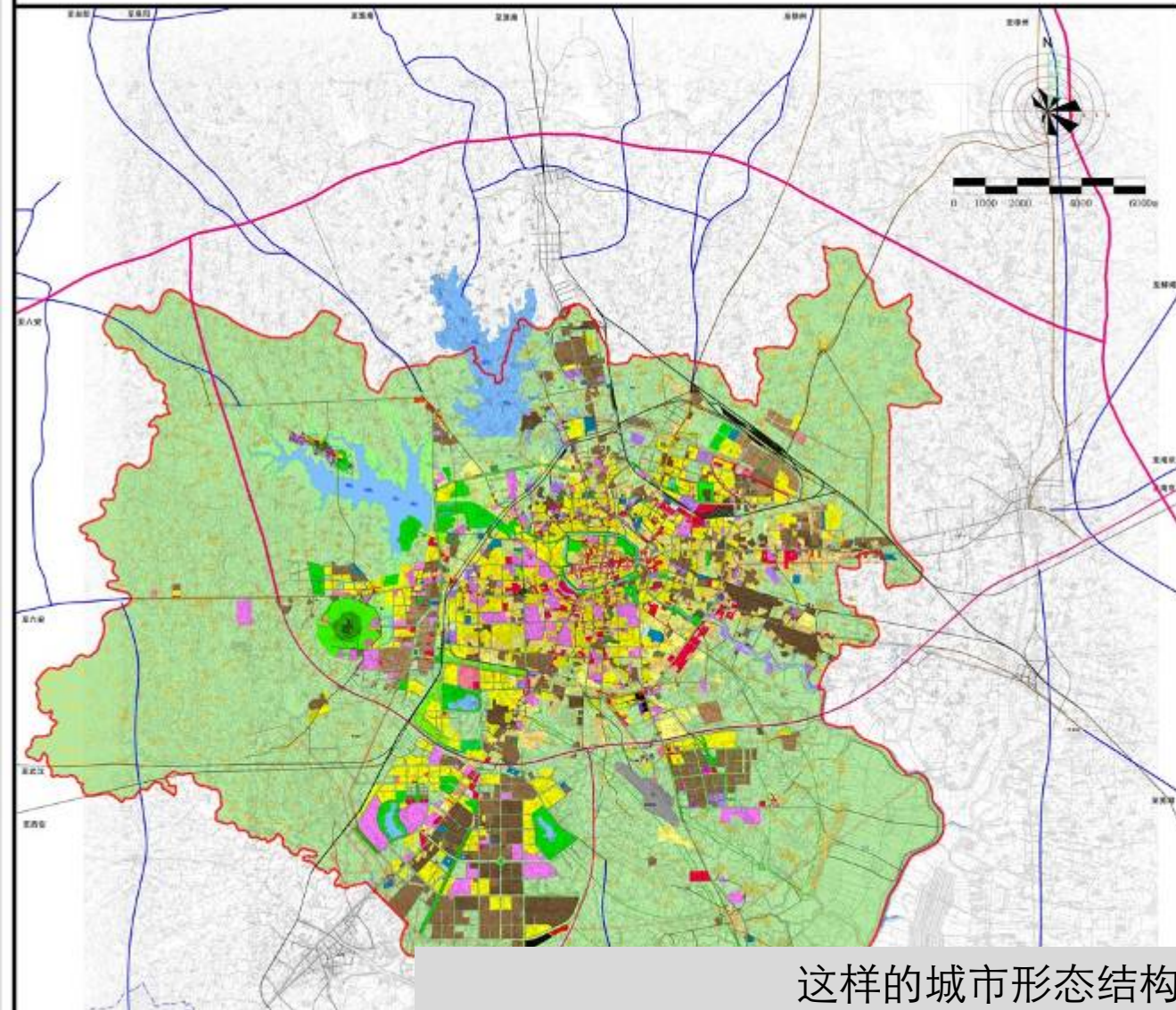


北京城市空间“摊大饼”式地蔓延扩张 (资料来源: 清华大学 GIS 实验室)

城市蔓延与低密度发展
Urban sprawl and low density development

合肥市城市总体规划 (2006-2020)

中心城区建设用地现状图



这样的城市形态结构类型是否支持低碳的目标?
Do these urban form support the low-carbon objective?

上海市城市总体规划：
一个城市中心、四个
城市副中心
Shanghai Master
Plan: One City
Center, Four Sub
Centers

轨道交通一号线
Metro No.1

五角场城市副中心
Wujiaochang
Subcenter

真如城市副中心
Zhenru Subcenter

上海城市中心
Shanghai City Center

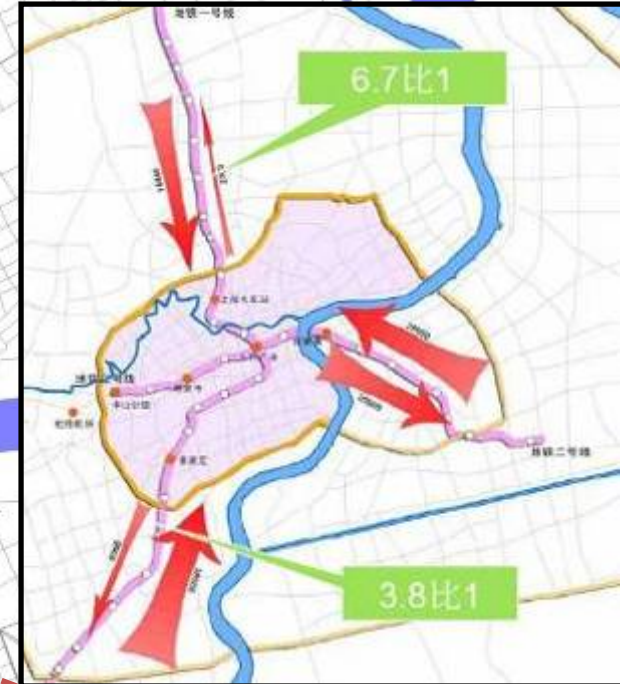
轨道交通二号线
Metro No.2

徐家汇城市副中心
Xujiahui Subcenter

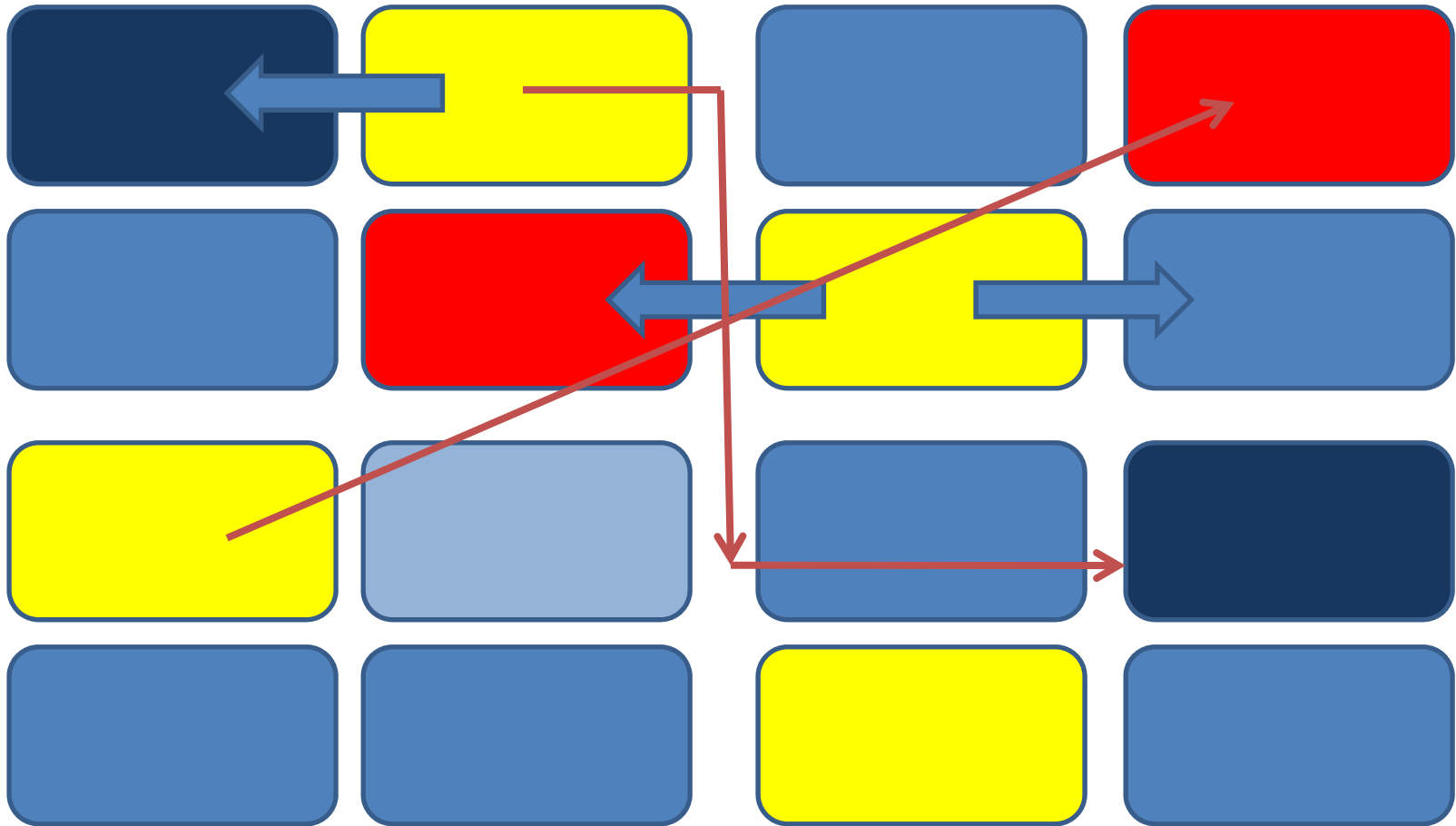
唯一成功的副中心
The only sub center success

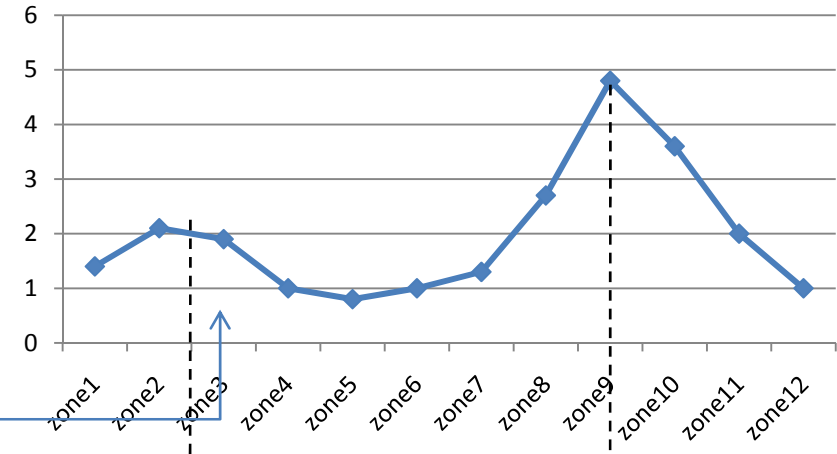
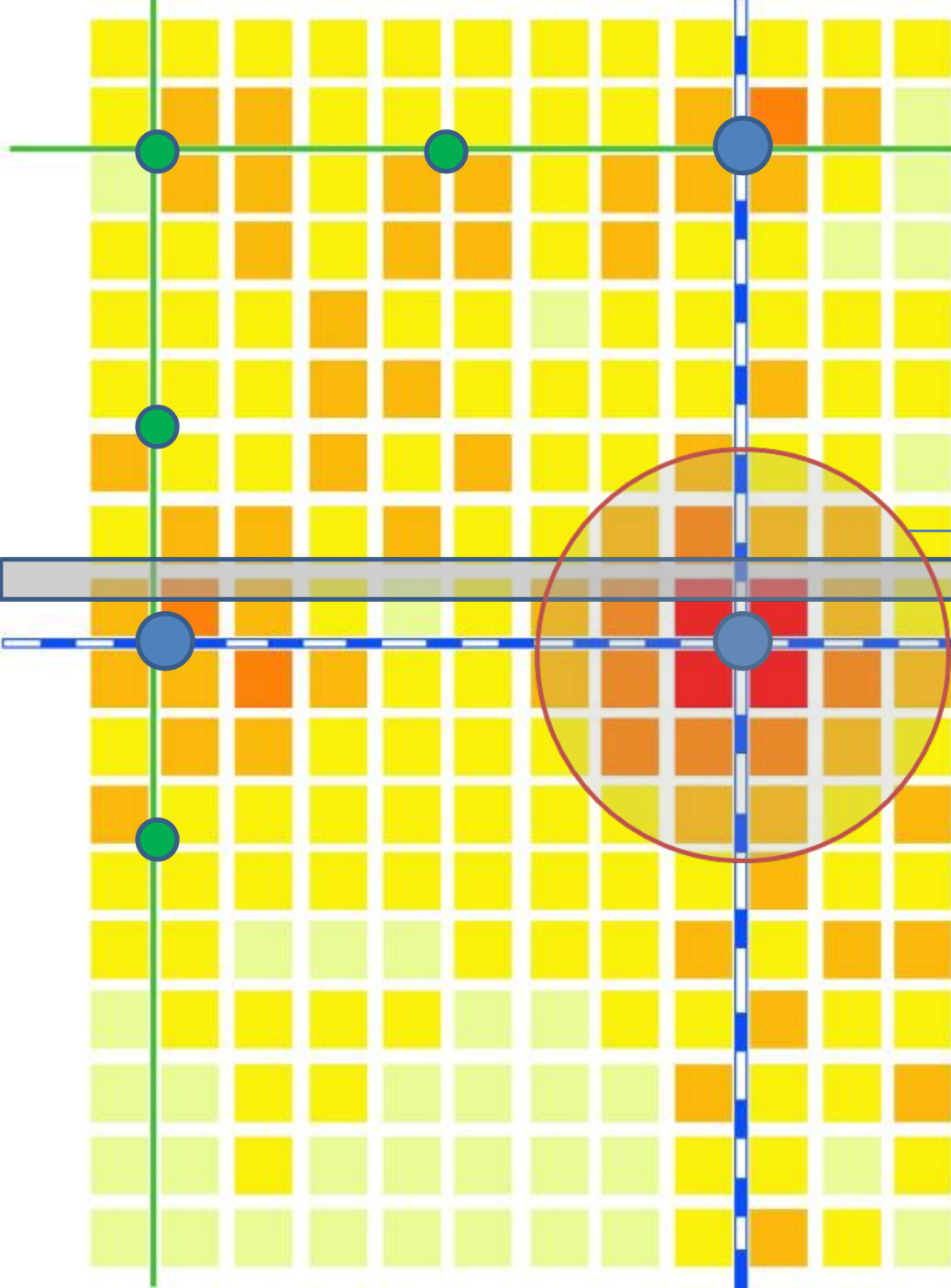
花木城市副中心
Huamu Subcenter

郊区
Suburb



土地混合使用 Mixed Land Use





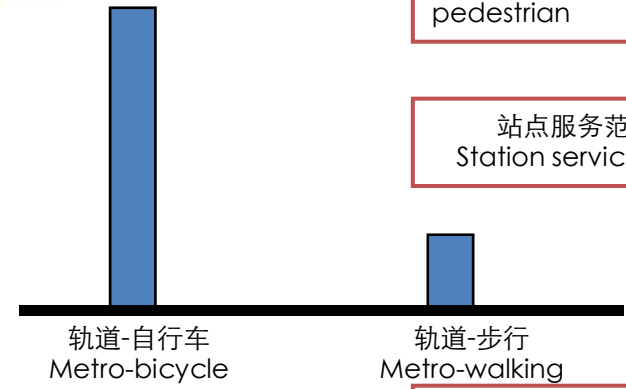
轨道站点
Metro Station

轨道交通线Metro

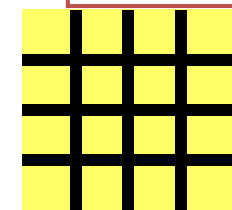
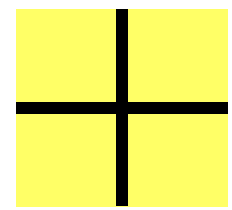
轨道站点
Metro Station

适宜自行车与步行的服务范围
Service area fit for bicycles and pedestrian

站点服务范围比较
Station service area



线网密度
Network density



BICYCLE



中国城市可持续、低碳节能的最佳选择与必要条件。(无污染、低能耗、出行短)
The necessary condition and the best choice for Chinese cities to achieve the low-carbon sustainable development objective. (no pollution, low energy consumption, short trips)



Part4 详细规划下的低碳城市居住区

Low-Carbon residential area Led by Detailed Plan

详细规划内容 The contents of the detailed planning



A

封闭地块过大
Block too large

减少乘坐公共交通的可能
Reduce the possible use of public transport

B

停车场地多
Large number of parking

增加机动车使用
Increased use of car

C

配套设施的内容不合理
The ineffective facilities planning

增加交通出行
increase traffic

增加交通能耗
increase traffic energy consumption

D

地块用地性质单一
A single land use

增加交通出行
Increase the transportation

增加交通能耗
Traffic energy consumption increased

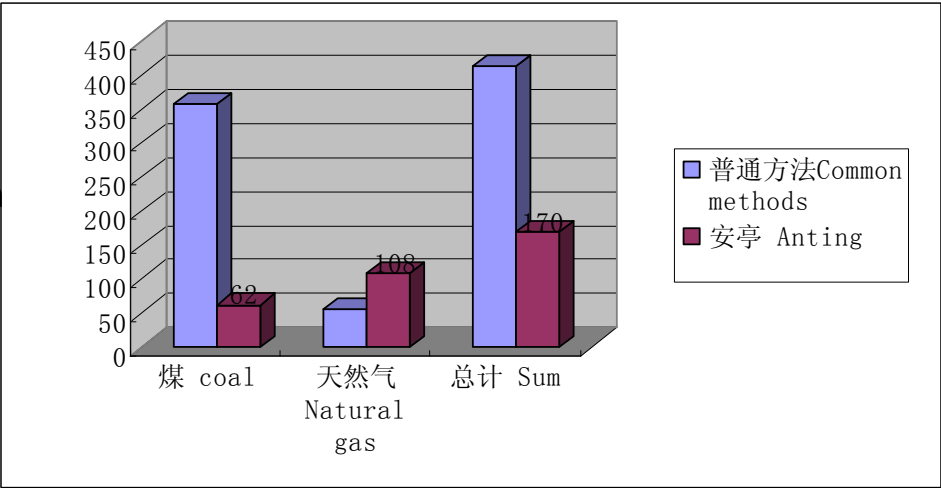




安亭新镇 Anting New Town



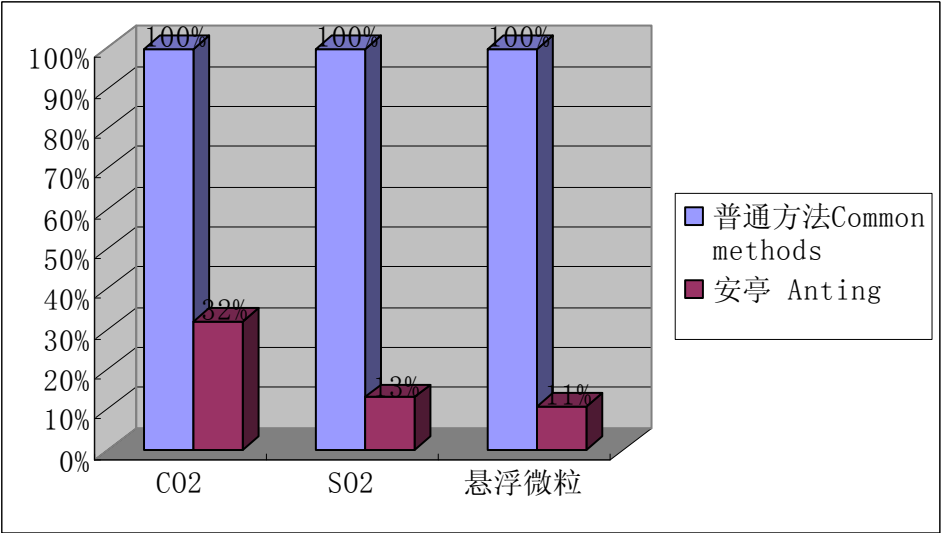
初始能源消耗
The initial
energy
consumption



安亭新镇和传统建筑的负荷比较

	冷负荷 (W/m²)	热负荷 (W/m²)
安亭新镇 Anting New Town	40	25
传统高能耗建筑 Traditional construction: high-energy consumption	150	80

排放平衡
Emissions
balance

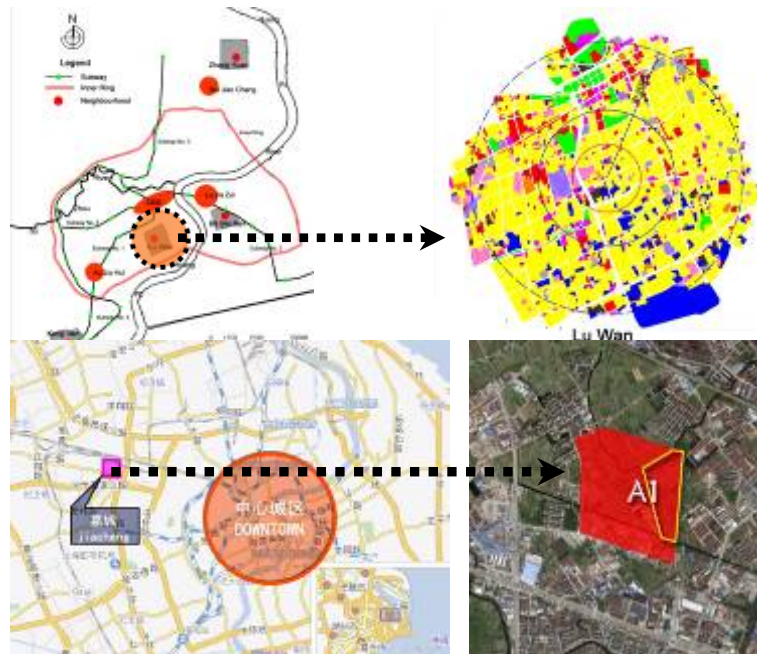


BUT

距离市中心远 Far from the city center
没有相应的公共交通的配合 No convenient public transport
住户多使用小汽车出行 Residents used car trips

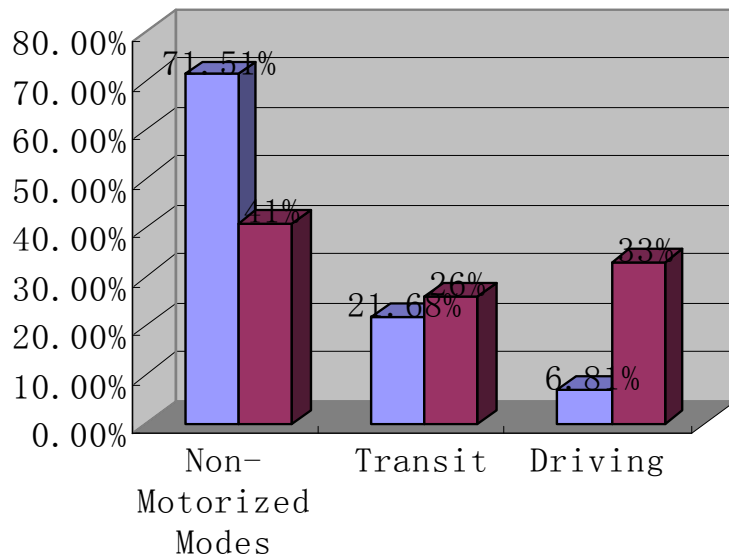
2 实证研究 Demonstration Study

上海居住区出行比较 The Neighborhoods Trip Compare



卢湾在CBD附近,建于上世纪30、40年代
Lu Wan near the CBD
Lu Wan is an Old-styled Neighborhood which built in the 1930s and 1940s

江桥嘉城居住区位于城市边缘区, 建于2000年后
Jiacheng residential area built after 2000 in urban fringe areas
Area 0.88km²
building 1000,000m²



■ 卢湾 Luwan
■ 嘉城 Jiacheng

非机动化出行: 步行, 自行车, 电动自行车
Non-Motorized Modes: Walk, Bicycle, E-Bike

公交出行: 公交车, 地铁
Transit: Bus, Metro

私人机动出行: 摩托车, 出租车, 小汽车
Driving: Motorcycle, Taxi, Car

3 实证研究 Demonstration Study---about construction energy-consumption

建筑热导系数的比较

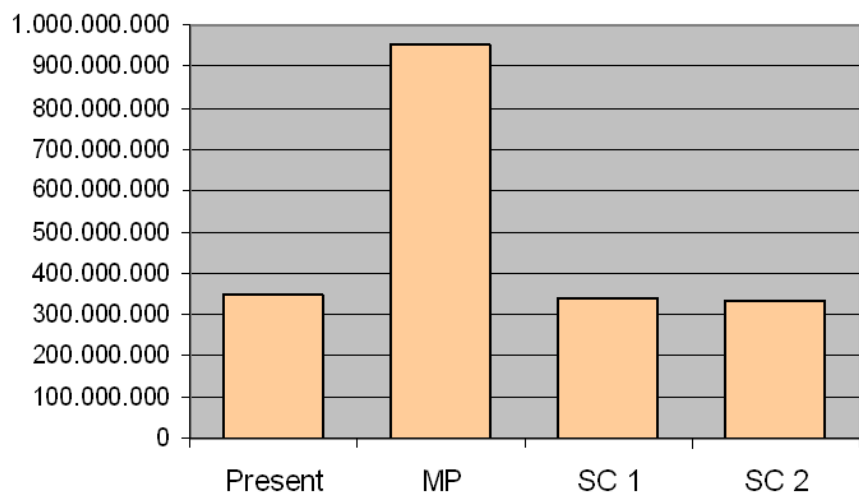
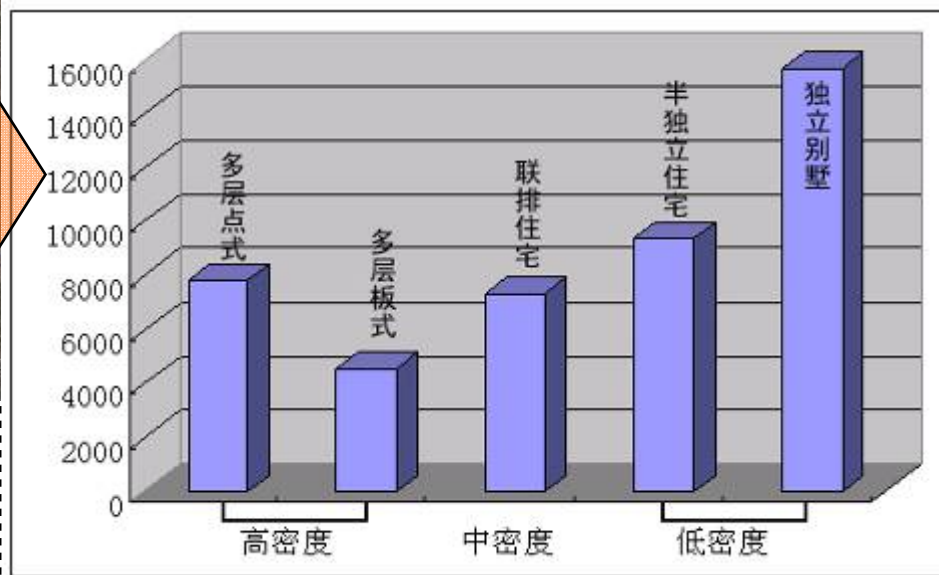
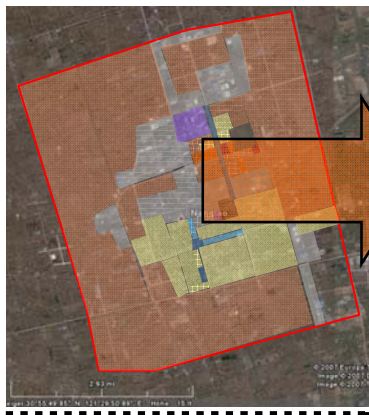
Heat Conduction Coefficient ($\text{W/m}^2 \text{K}$)

Design Standard设计标准		Roof楼板	Wall墙	Window窗
Shanghai上海	2001 Standard 2001年标准	1,0	1,5	4,7
Germany德国	EnEV	0,3	0,45	1,7

上海南桥镇某地块建筑能耗研究



Calculation of energy demand in Nanqiao



Present:当前建筑能耗The current building energy consumption

MP:按总体规划实施将会产生的能耗Energy Consumption if MP be implemented

SC1:运用节能技术建设的能耗if built it use of energy-saving technology

SC2:建筑改造后的能耗 if architectural transformation

TONGJI UNIVERSITY
CAUP

策略与建议

Strategies and suggestion

1. 城镇体系的规划要以大容量的公共交通引导，才能有效降低交通能耗。
Regional planning should be oriented by mass rapid transit (MRT), thus to reduce the energy consumption of transportation.

2. 鼓励用地的有效 混合，考虑居住与就业的平衡，避免巨型或单一化的功能分区
Encourage rational mixed land use, keep the balance of house and job, prevent giant or single functional area.

3. 未来中国可持续低碳城市的结构一定是建立在骨干公交联络的自行车友好的城市框架下的，放弃自行车就是放弃未来
The low-carbon sustainable city in the future must be based on the bicycle friendly environment which will be connected by rapid public transit system. The city abandon bike will loose her future.

POD>BOD>TOD>GOD>COD

4. 信息和现代通信是保证城市有效运转和城市灵便性重要的技术资源.

5. 城市结构形态的构建从中心地理论转向网络嵌套的理论，大型公共设施的建设要与公共交通枢纽相结合

Change the method to form the city from the central place theory to the inter nested theory, match the important public development with the public transport hubs.

6. 开发强度取决于公共交通的可达性，是确定控制性详细规划的依据

The develop intensity depends on the accessibility of the public transport, it is the basis of the regulatory plan.



THE CHINA SUSTAINABLE ENERGY PROGRAM
Toward a Sustainable Energy Future for the People's Republic of China

中国可持续能源项目
—迈向中国可持续能源的未来
美国能源基金会



同济大学建筑与城市规划学院城市规划系

The End

谢谢!

Thank you

Nov.,2009