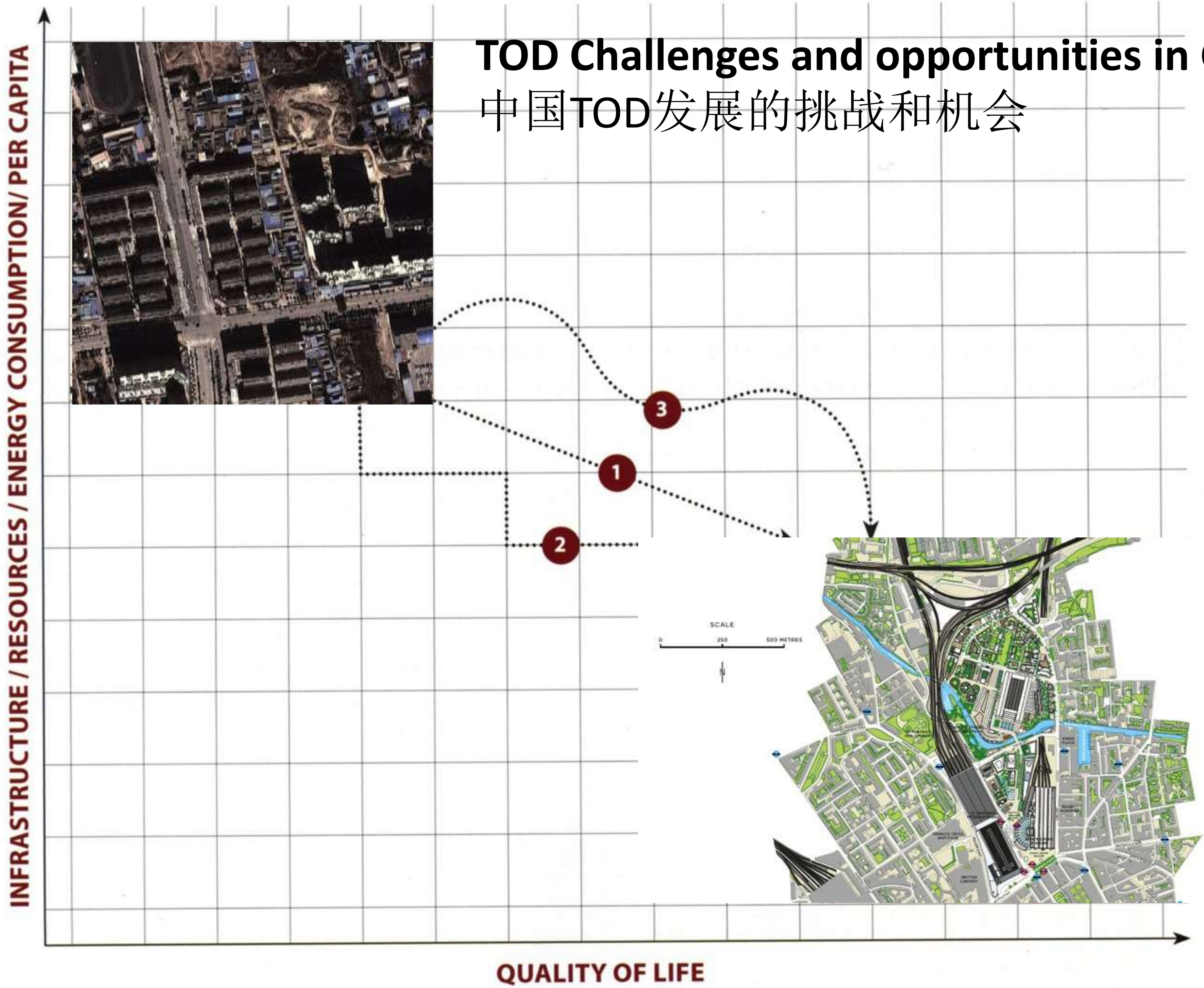
TOD Urban Integration, Community and Value Creation
9 Planning Strategies
通过TOD实现天津城市一体化发展及社区和价值创造
城市规划9项战略

Serge Salat

URBAN MORPHOLOGY & COMPLEX SYSTEMS INSTITUTE

The World Bank seminar on TOD, Tianjin, June 2014

TOD Challenges and opportunities in China
中国TOD发展的挑战和机会



TOD urban forms are dense, accessible, mixed use and adaptive
TOD城市形态：较高密度、可达、土地混合使用和灵活性强

Articulated density相互关联的密度

- Residential density matches with job density
- Human density matches with transit infrastructure capacity
- High gross built density
- High density of amenities

Accessibility and proximity可达性和接近度

- Each part of the city is easily accessible
- Easy access to public transit infrastructures
- Seamlessly interconnected transit infrastructures
- Daily amenities accessible by foot (shops, health, education, culture, sport)
- Intense street network (high number of intersections per km^2)

Mixed use and adaptive土地混合利用和灵活性

- Jobs, housing and retail are mixed on the city, district, community and building scale
- Land use is highly flexible

TOD

9

Urban Planning Strategies TOD

城市规划9项战略

1.High FAR around transit stations 公交站点附近高FAR

2.High Density of Intersections交叉口高密度

3.Connected and Complex Street Patterns连通性好、更复杂的街道形态

4. Streets and Public Spaces as Places for People 街道和公共空间是为人们提供的场所

5.Low and Medium Rise Small blocks低、高层小型建筑群

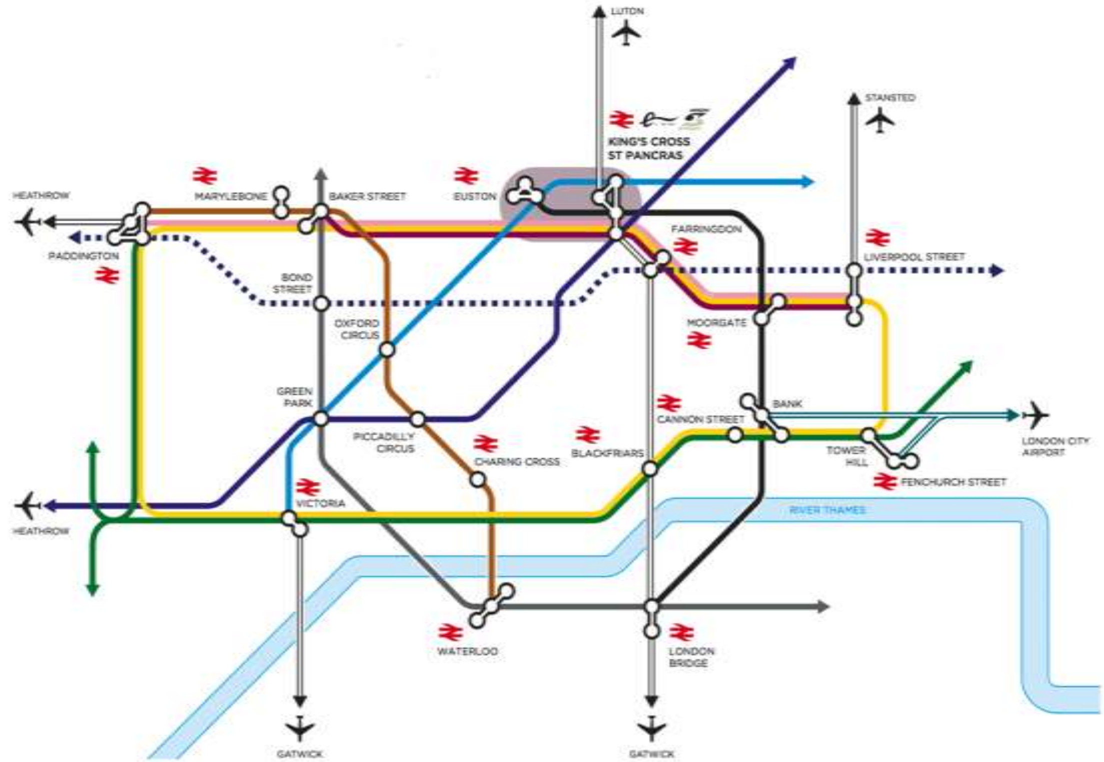
6. Fine Platting细密性街区布局

7.Mixed Use混合利用

8. Long Tail of Small and Medium Size Amenities小型、中型便利设施的密集（无标度？）分布

9.Integrated Synergized Energy Planning综合协调的能源规划

1.High FAR around transit stations



King’s Cross Central

Reshape and create value

A prime location in central London

A point of universal connectivity

2 major train stations
(International high speed Eurostar and domestic)
Passengers can reach the centre of Paris in 2hrs 15, Brussels in 1hr 51 and Lille in 1hr 20.
These destinations will be joined by Amsterdam, Cologne and Frankfurt via Deutsche Bahn’s high speed ICE
6 subway lines hub
A dozen or more bus lines

26 ha

45, 000 people will live, work or study In King's Cross

Urban Built density 2.84

FAR at block scale average 4.6

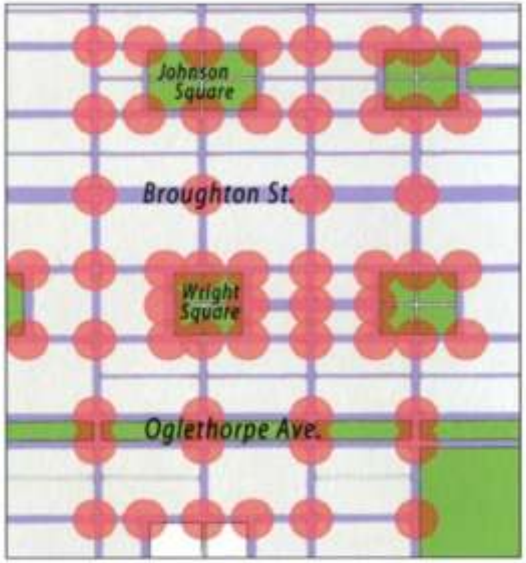
A high density mixed use infill redevelopment

Conversion of industrial heritage on railway property 26 ha development, 740 000 m2
45, 000 will live, work or study (human density (residents +Jobs) 173,000 people/km^2 will be similar to Hudson Yards in NY).

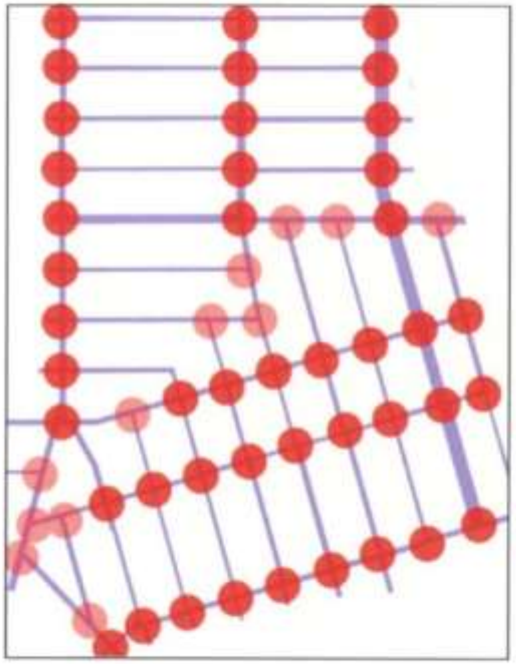
Heritage buildings are being retained and refurbished as shops and restaurants – their color and character proudly displaying the unique nature of the development

Efficient land use in King's Cross
Higher FAR than in China: 4.6 at block scale
Much higher human density: 173.000 people/km2
Much higher value creation
Much higher street density and connectivity
Still 40 % of land is public space and greens space + inside blocks green space

2. High Density of Intersections



Savannah's Historic Street Grid. *The historic district of Savannah, Georgia, has a street network made for walking. Small, one-acre blocks are laid out in a rectilinear grid, which ensures a high density of intersections, many of which are four-way. Pedestrians arrive at a corner every 125 or 350 feet. Small lots with narrow frontages dictate a human-scale building pattern. Greens bisected by public walkways are interspersed among the blocks of Savannah.*



Sample Intersection Density Map. *A diagram of the street network shows the frequency or density of intersections. A higher number of intersections indicates better connectivity. Four-way intersections, which offer more route choices, are shown in darker red; three-way intersections are shaded more lightly.*

Dense networks of narrow streets encourage biking

King's Cross Central 2 Billion £ investment in 20 new streets and 10 new public spaces

Public realm

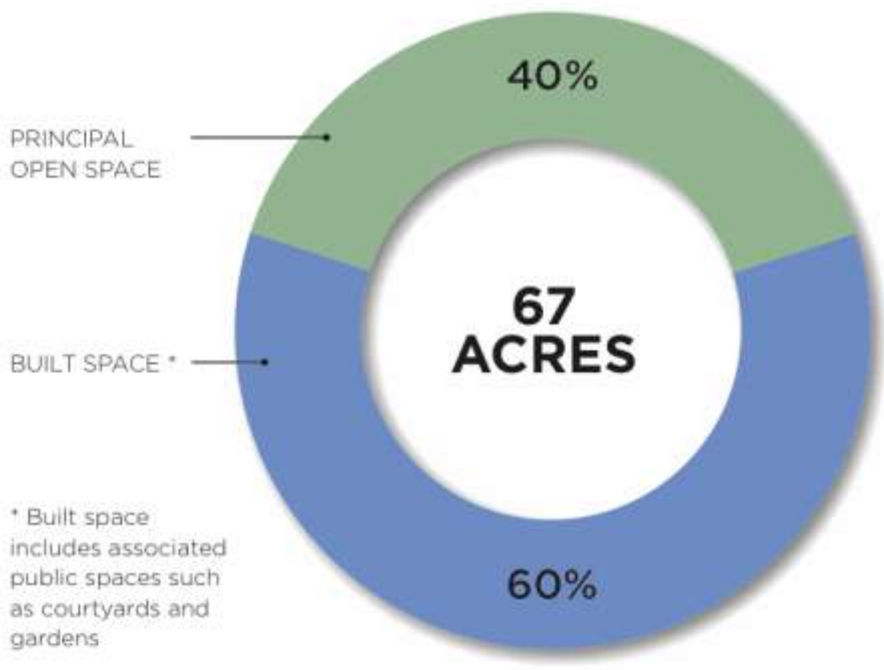
2 Billion £ (21 Billion RMB) already spent in local transport infrastructure and public realm)

A third of the site (10 ha) dedicated to new public streets and open spaces

20 major streets created

10 new public spaces

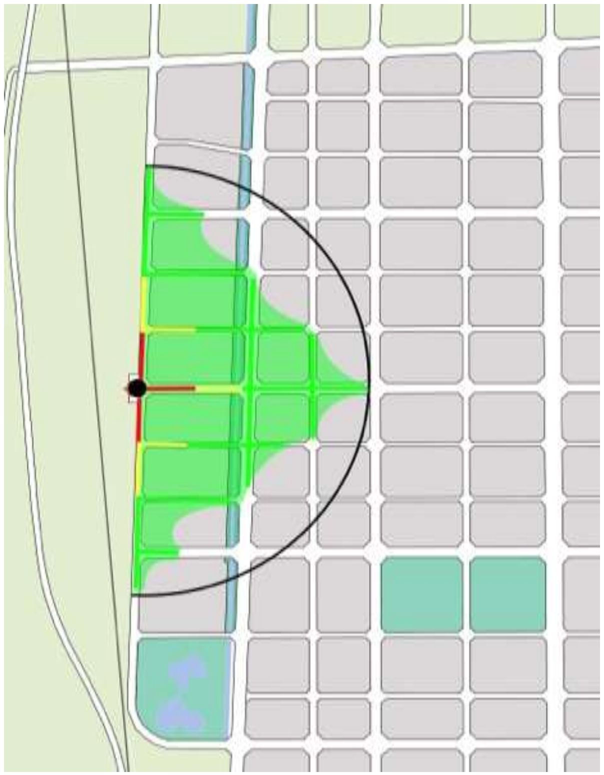
Including 5 major squares totaling 3.2 ha



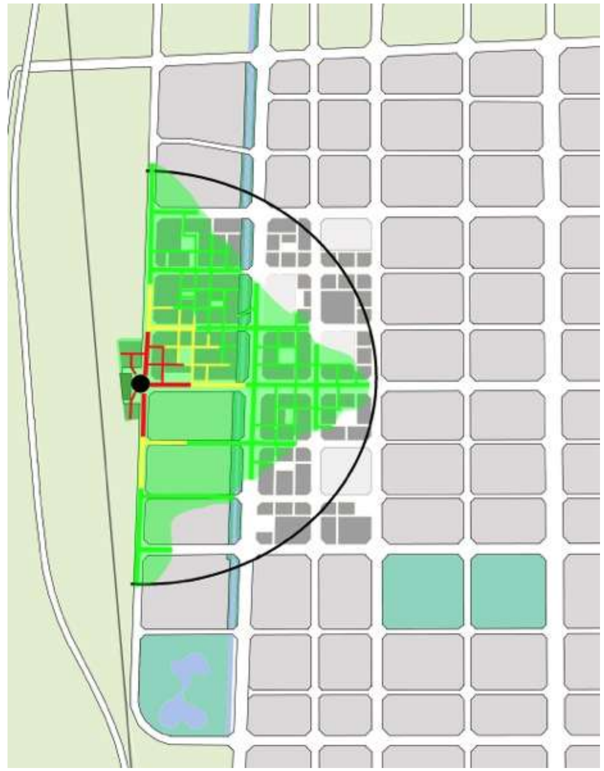
Qingyang case study

Higher density of intersections and smaller blocks increase accessibility

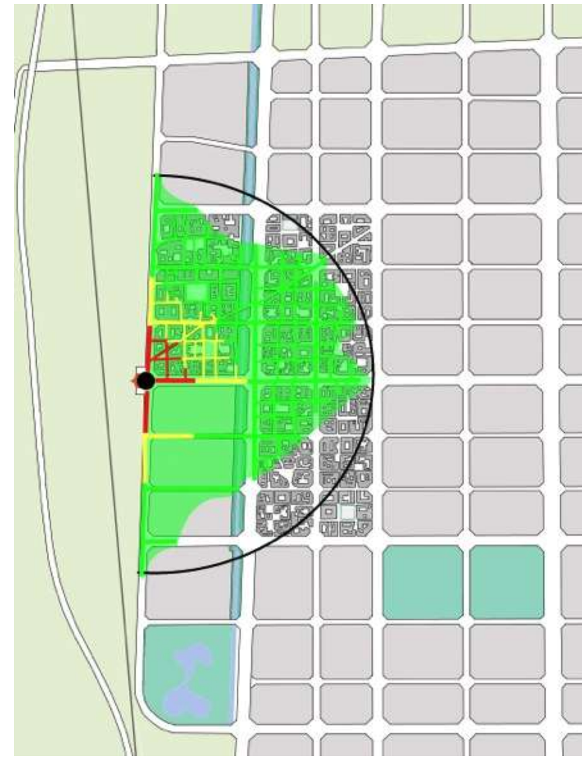
In red accessibility at 250 m, in yellow at 500 m, in green at 1 km (source: Urban Morphology Institute)



With superblocks most of the station neighborhood is accessible only after 1 km or more walk

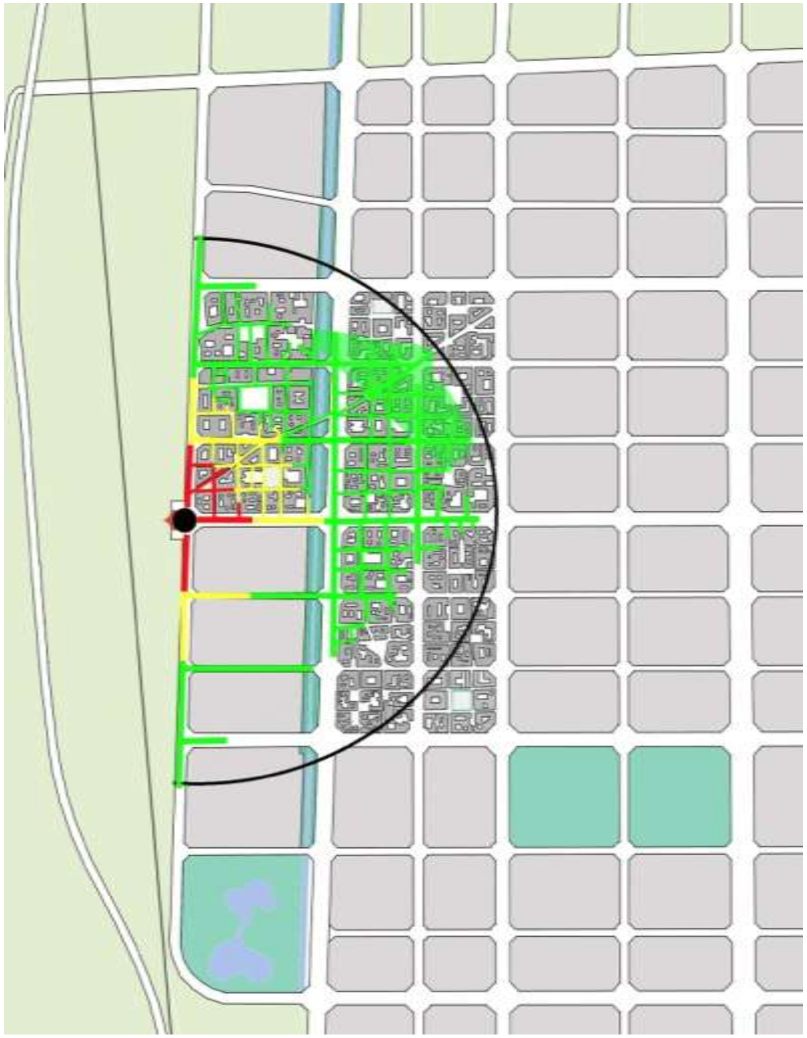


Smaller blocks and more intersections increase significantly accessibility within 250 m and 500 m range



More complex street patterns increase accessibility range

3. Connected and Complex Street Patterns



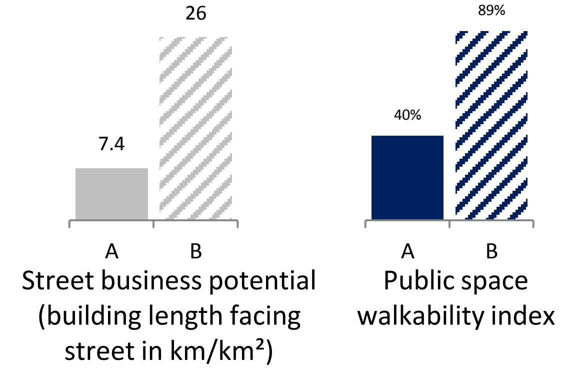
WB Team Qingyang TOD planning workshop and further urban design by Urban Morphology Institute and Françoise Labbe, architect.

Addition of public space and more complex street patterns increase accessibility. The diagonal street increases accessibility.

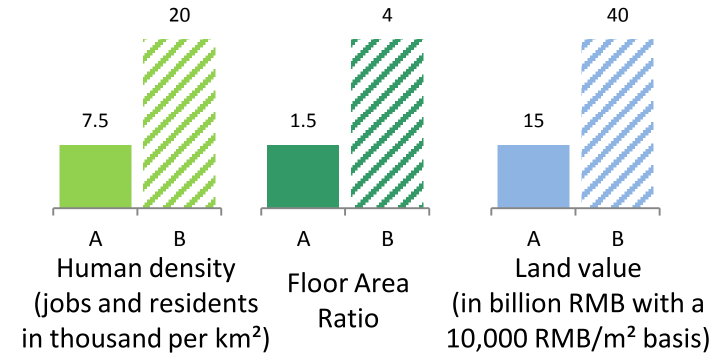
Dense street networks and small blocks cost less per capita.They increase economic returns on investment and social benefits

Fine grain urban development have higher return on investment rates by generating more, longer term and sustainable value with lower investment costs per capita.

1. Decrease in infrastructure costs per capita (-33% for the street network, -23% for the water network and -53% for the waste water network) benefits to municipal finances
2. Increase in overall street length (multiplied by 4.7) allows better diffusion and higher fluidity of traffic, and contributes to the diminution of both congestion and pollution
3. The increase in street business potential (multiplied by 3.5) and land value (multiplied by 2.7) steers economic success
4. The increase in accessibility and walkability (multiplied by 2.2) increases urban sustainability and social inclusiveness

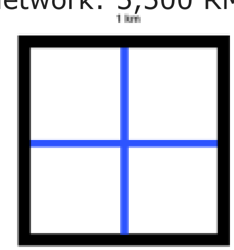


Business and sustainability

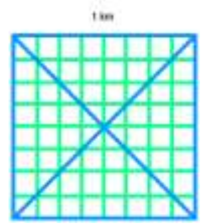


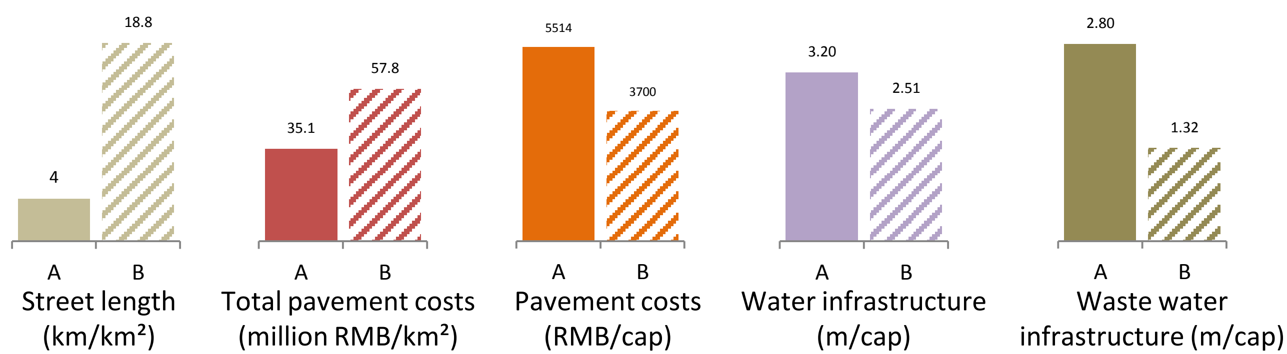
Land intensity and land value

Model A
Chinese superblock
500 m between intersections
Road network: 5,500 RMB/cap



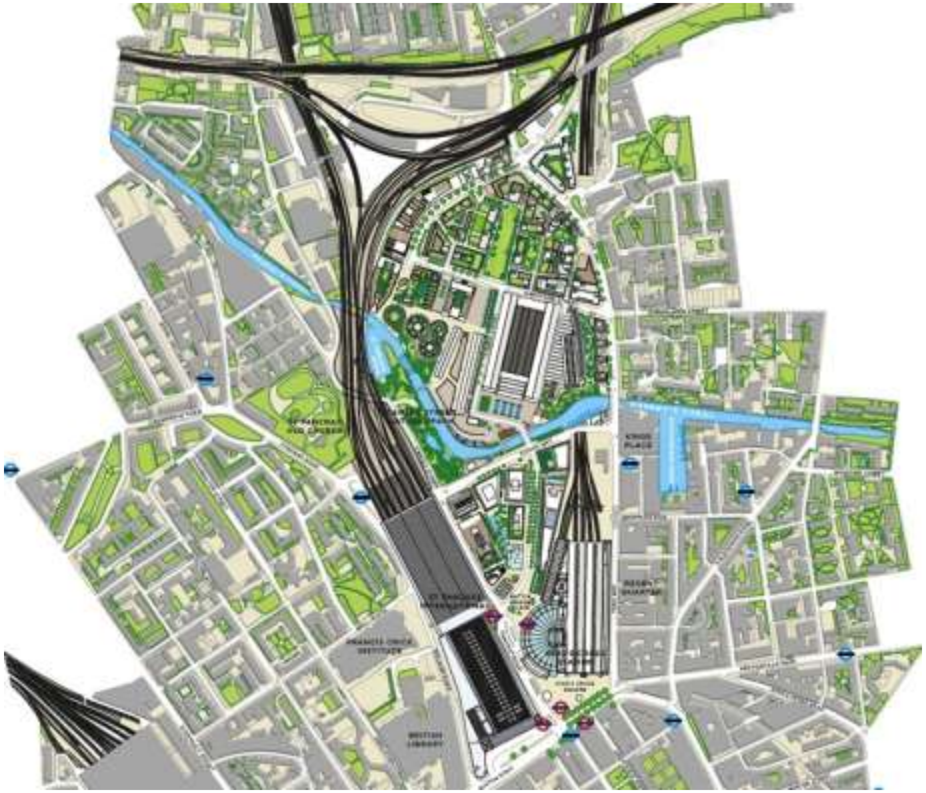
Model B
Fine grain small block
130 m between intersections
Road network: 3,700 RMB/cap



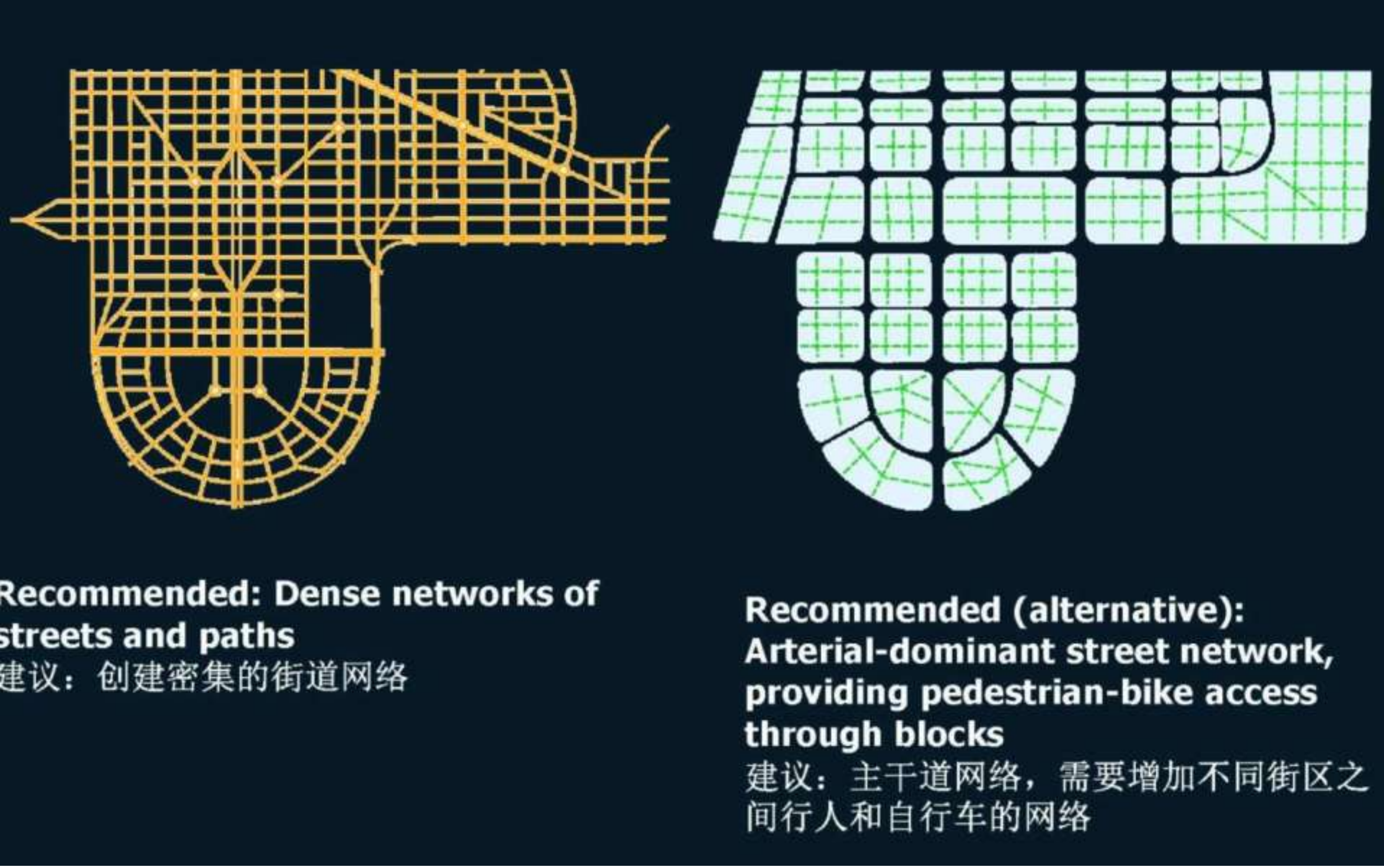


Infrastructure costs

Integrated patterns versus quantum leap in scales

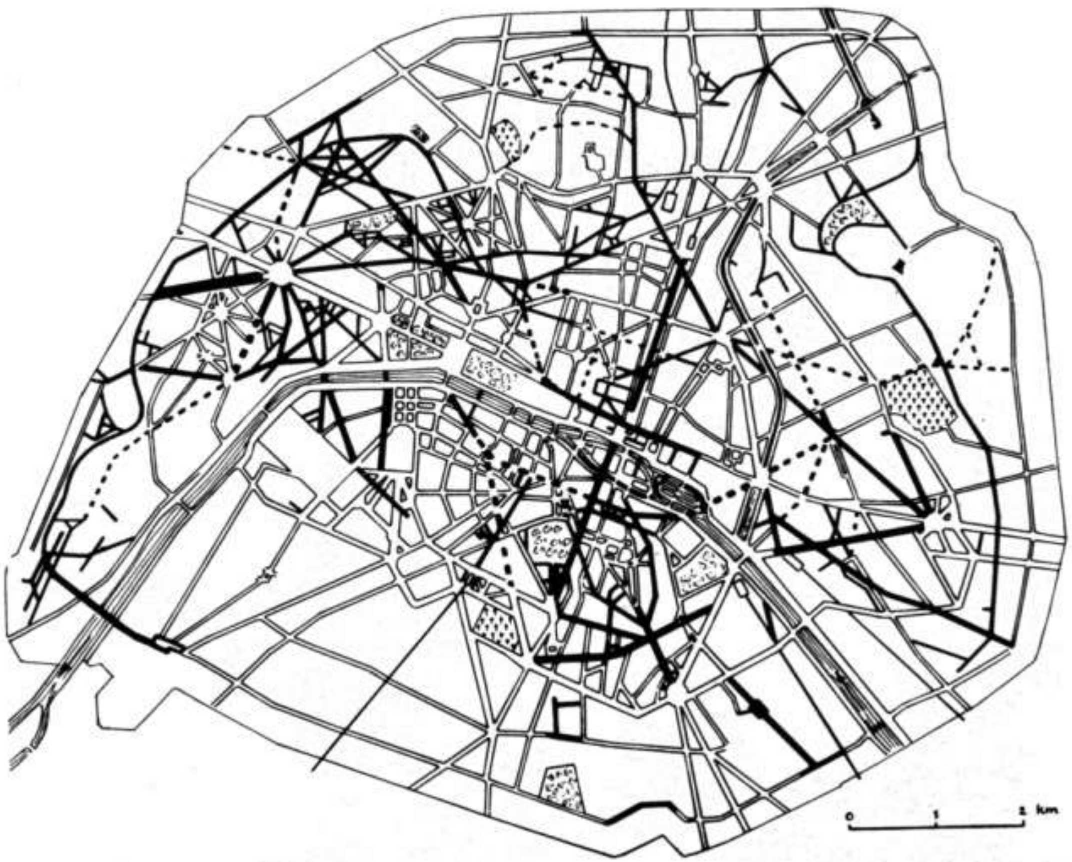


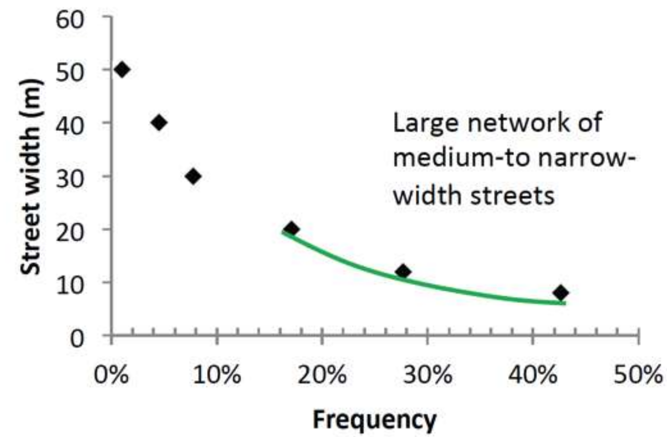
At the same scale, London King's Cross Central and WB team Qingyang TOD workshop (with additional public realm definition by Urban Morphology Institute and Françoise Labbe, architect)
Public realm in the projected Qingyang neighborhood station has been scaled to London scale with squares and gardens the right size but the oversized arterials act as barriers and block the full seamless integration of the public realm into a fully walkable neighborhood (there is a quantum leap between the scale of current Chinese planning and the scale of international TOD planning).



The alternative strategy is an improvement compared to existing superblocks but it creates a quantum leap in street scales

Well integrated street patterns follow an inverse power law in the frequency of street widths and do not exhibit quantum leaps. Haussmann reinforced the scaling structure of Paris by integrating the existing city into a larger scale free structure.





Scale-free distribution of street widths in Paris

4. Streets and Public Spaces as Places for People

Improve walkability

Qualitative evaluation index

Safety and Secutiry
Eg. Cars are driving and parking on sidewalks.

Sidewalk Condition
Eg. User-friendly design makes sidewalks more walkable, especially for the old and the disabled.

Intersection Design
Eg. Vast intersection design make crossing the street a problem for pedestrians.

Comfort
Eg. Trees and grassland make the walking environment comfortable.

Amenities
Eg. On a sidewalk which is lack of benches, people have to sit and squat on the ground.

Source: The World Bank

Create public places for people

Reduce setbacks and encourage edge development for vibrant street life

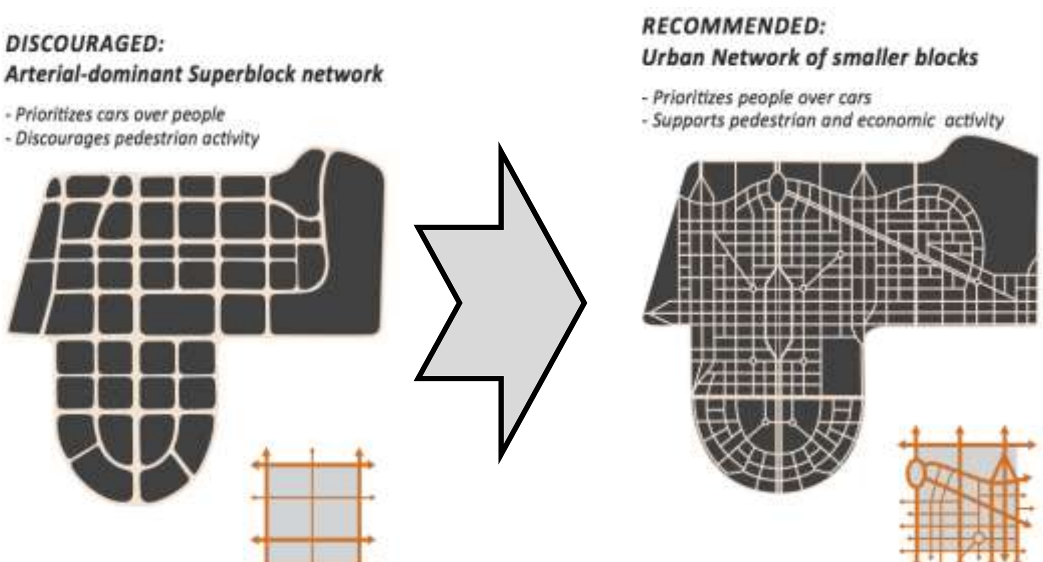
A conforming line ratio promotes development along the street. In the bottom left example , 80% of the buildings (red line) are aligned on the street (black line)

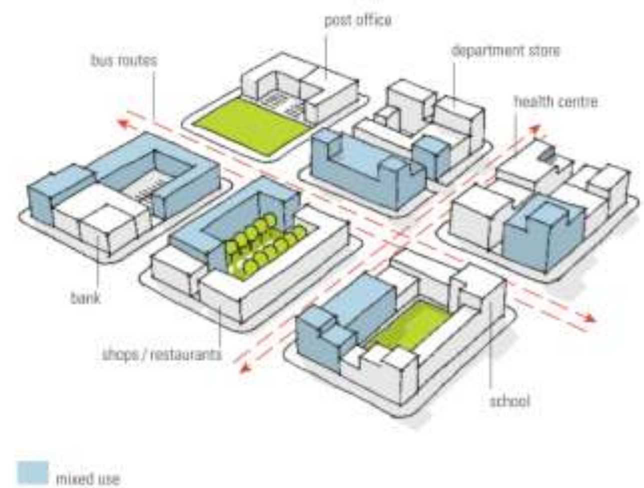
Manhattan highly diversified streetscape

Energy Foundation 2012

5.Low and Medium Rise Perimeter Small Blocks

- Reduce size of blocks to 12,000m2 or less
- Optimize land use by reducing setbacks
- Free local densification potential.
- Facilitate redevelopment and urban regeneration
- Promote mixed use and edge development





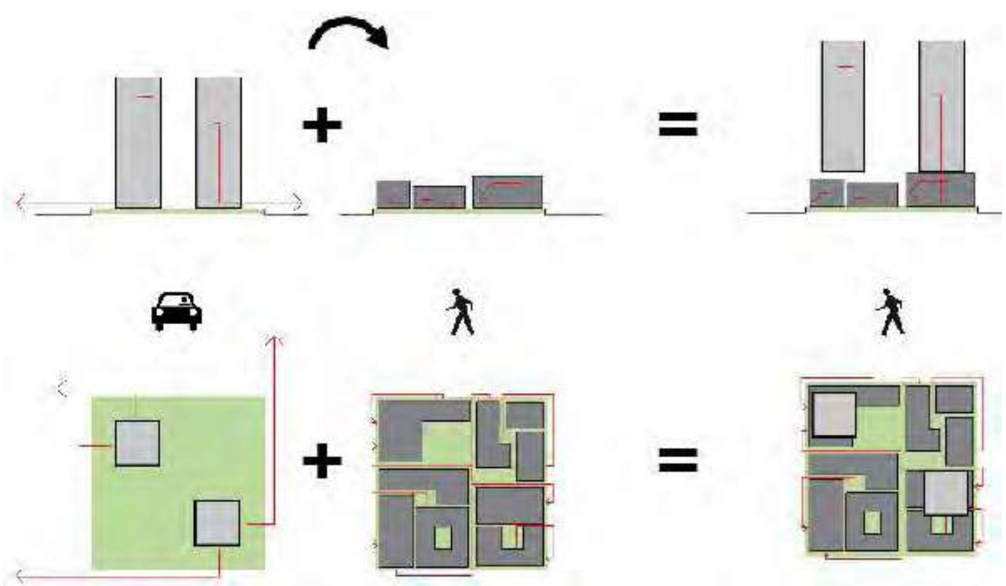
Mixed use and edge development

Source: Energy Foundation and Calthorpe Associates

London King's Cross Central

Infill densification strategies inside superblocks create fine grain scale and increase urban resilience

High low rise concept has been introduced by D. Frenchman from MIT to provide new strategies for infill urban development within existing Chinese superblocks. It rests upon superimposition on existing superblocks of a fine grain urban infill based on courtyards.



Generative diagrams for transforming the superblock type by over-layering low-rise courtyard forms (Frenchman et al. 2011)

6. Fine Platting

On 66 km2 Manhattan is made of 300 000 parcels while a typical Chinese city is made of 250 superblocks. Manhattan is 1200-fold finer grain than a Chinese city

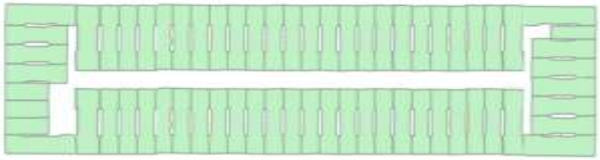
Chinese superblock
400x400m
Block size: 160,000 m²

Block size
should be divided by 11

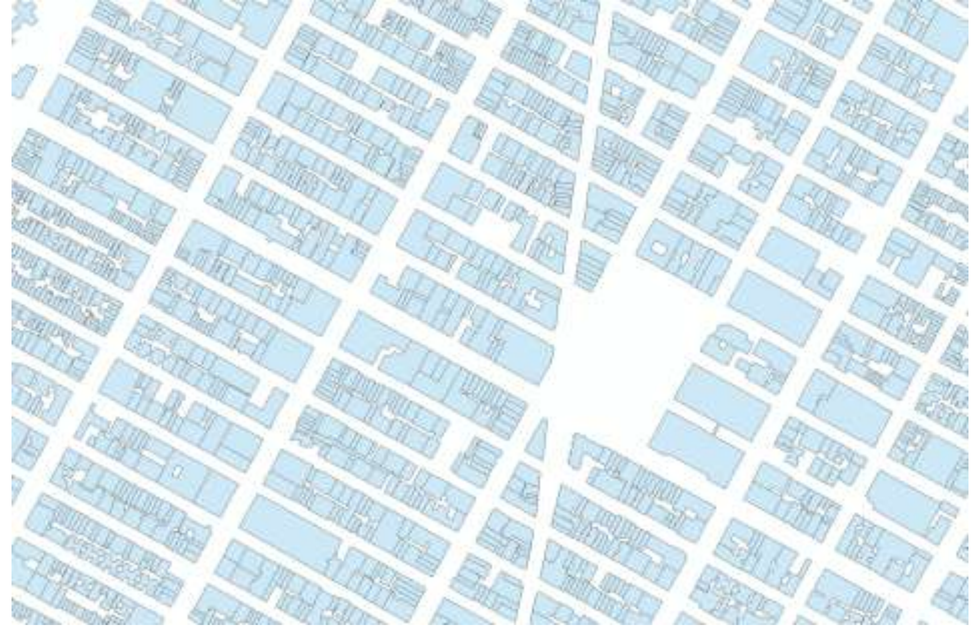
Subdivided superblocks
(Calthorpe design)
120x120m
Block size: 14,400 m²

Plot size
divides by 70 the block size in Manhattan or Paris

Manhattan original plot subdivision
Block size: 14,800m²
Average plot size: 205 m²

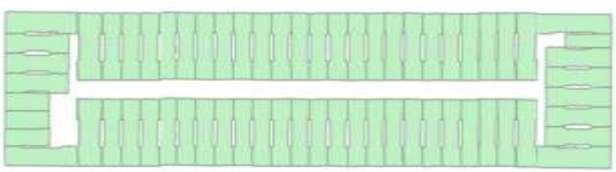


Fine grain platting allows consolidation over time and makes the city resilient, diverse and adaptive to market



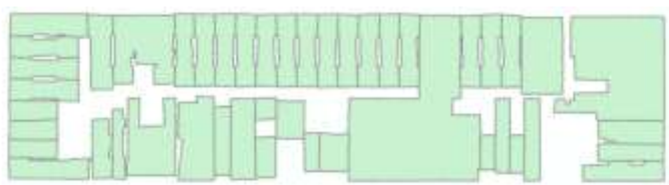
Manhattan Madison Square area

Manhattan
Original plot subdivision
Average plot size: 205 m²



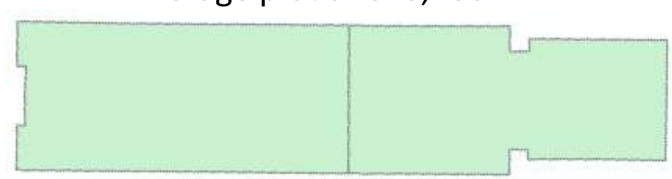
Residential

Manhattan
Intermediary plot consolidation
Average plot size: 255 m²

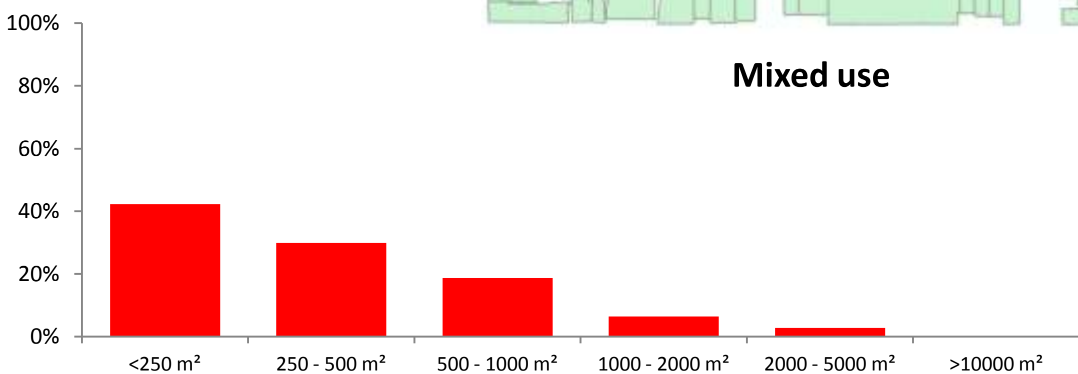


Mixed use

Manhattan
Extreme plot consolidation
Average plot size: 6,100 m²



Large businesses



7.Mixed Use

London King’s Cross Central

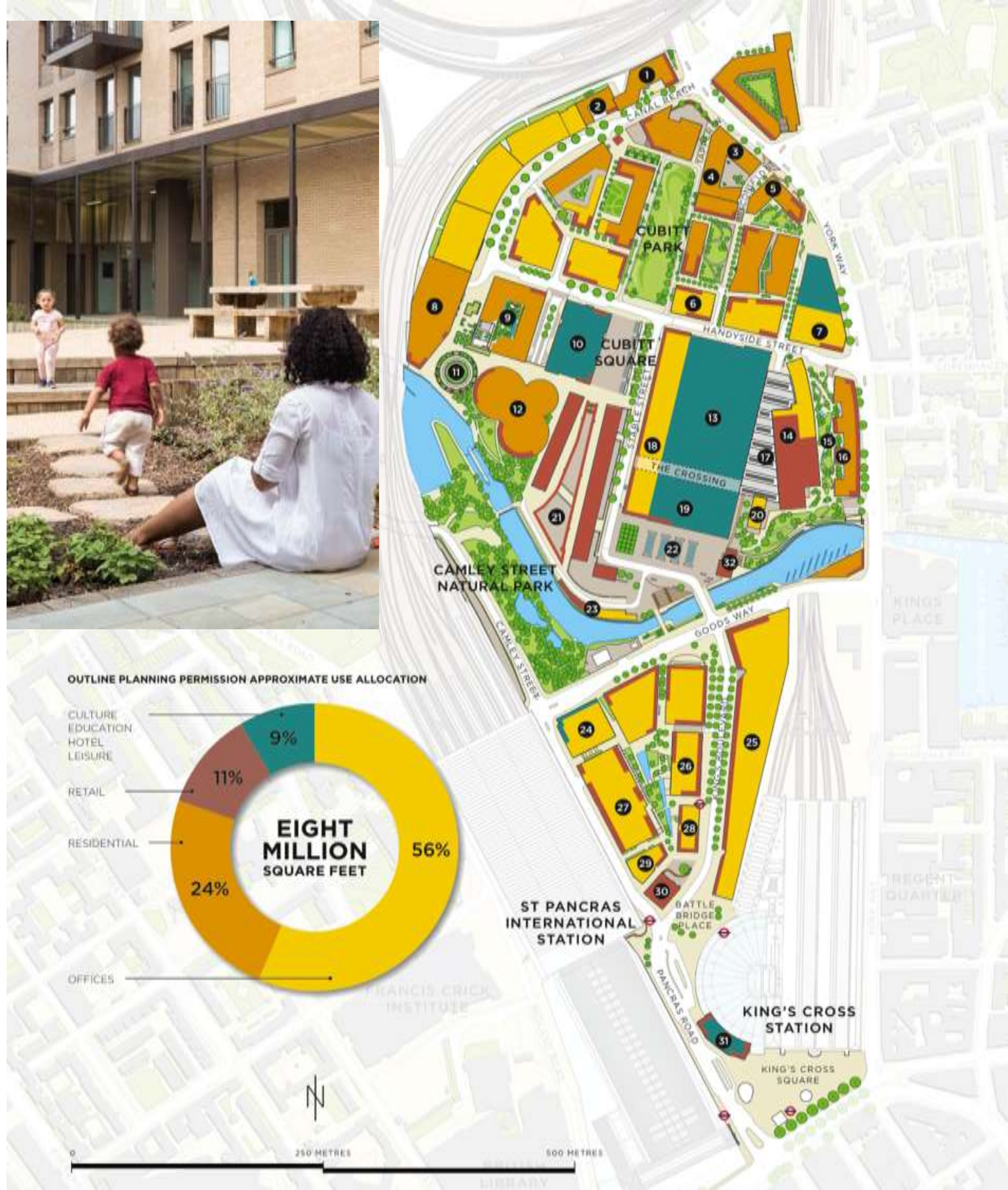
London King's Cross Central On 26 ha

280, 000 m2
of new workspace

46, 000 m2
of retail, cafés, bars, restaurants and leisure facilities

2,000
new homes

A new university
Educational, hotel, cultural facilities



London King’s Cross Central

Mixed use

5000 students (Granary Complex)
650 student’s housing rooms
50 new buildings
Residential buildings (2000 homes including affordable homes)
Office buildings (One Pancras Square)

A concentration of high tech economy

Google new UK headquarters is a low-rise building longer (330 m) than the Shard skyscraper is tall.
Google has spent about 650 million £ (RMB 6.8 Billion) to buy and develop a 1 ha site. The finished development will be worth up to 1 billion £ (RMB 10.5 billion) .
Google presence is expected to draw other technology companies to King's Cross - especially small start-ups - and help bump up rents.

Value creation
50 new and restored buildings and structures

GOOGLE UK headquarter
1 Billion £ per ha

By 2020 up to 50,000 people will be studying, living and working in King's Cross

2008

2014

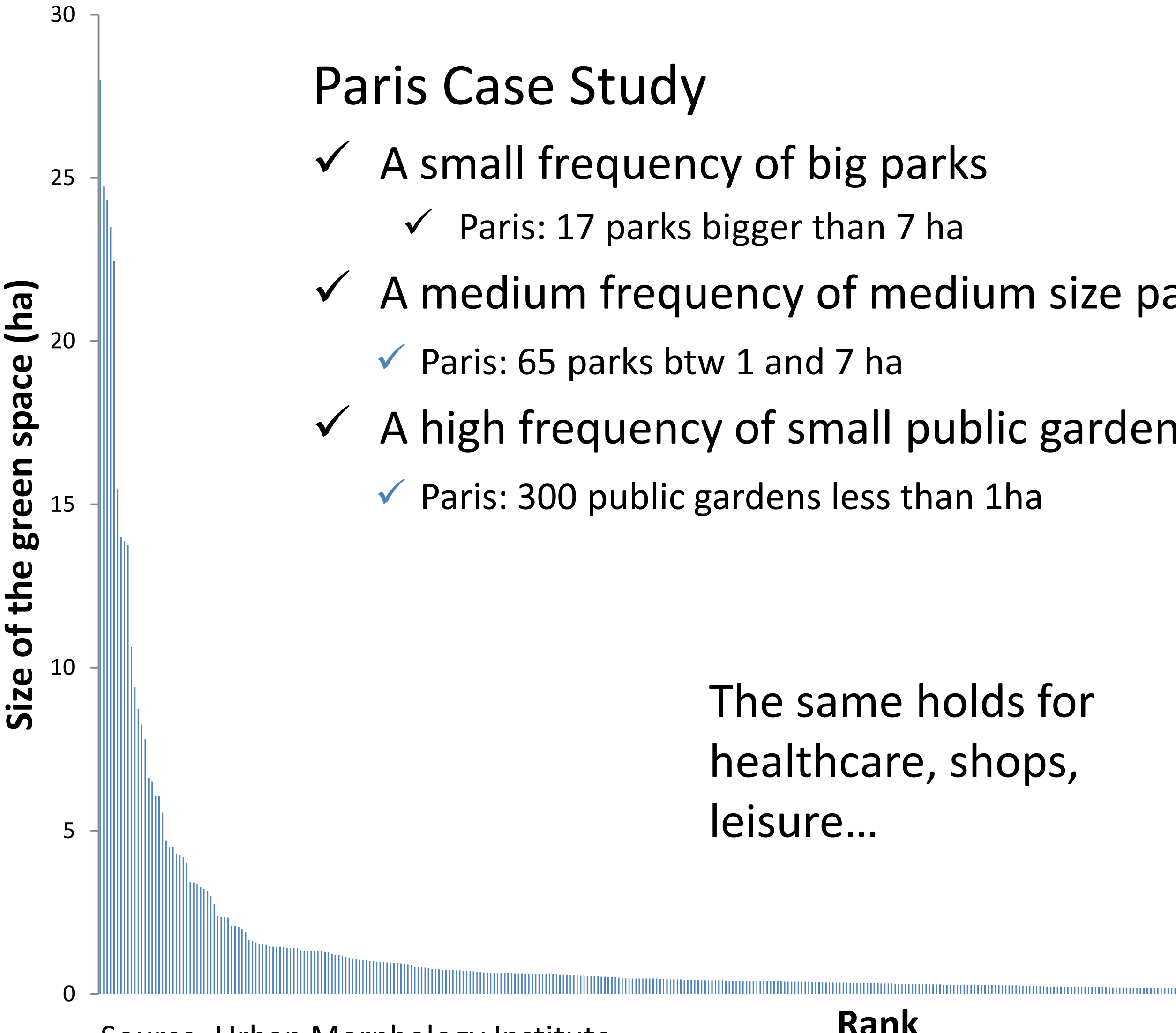
2017

2020+

8. Long Tail of Small and Medium Size Amenities

Accessibility is enhanced by a scale-free distribution of amenities within the urban fabric

In Paris intra-muros, scale free distributions enhance accessibility with a long tail of small elements

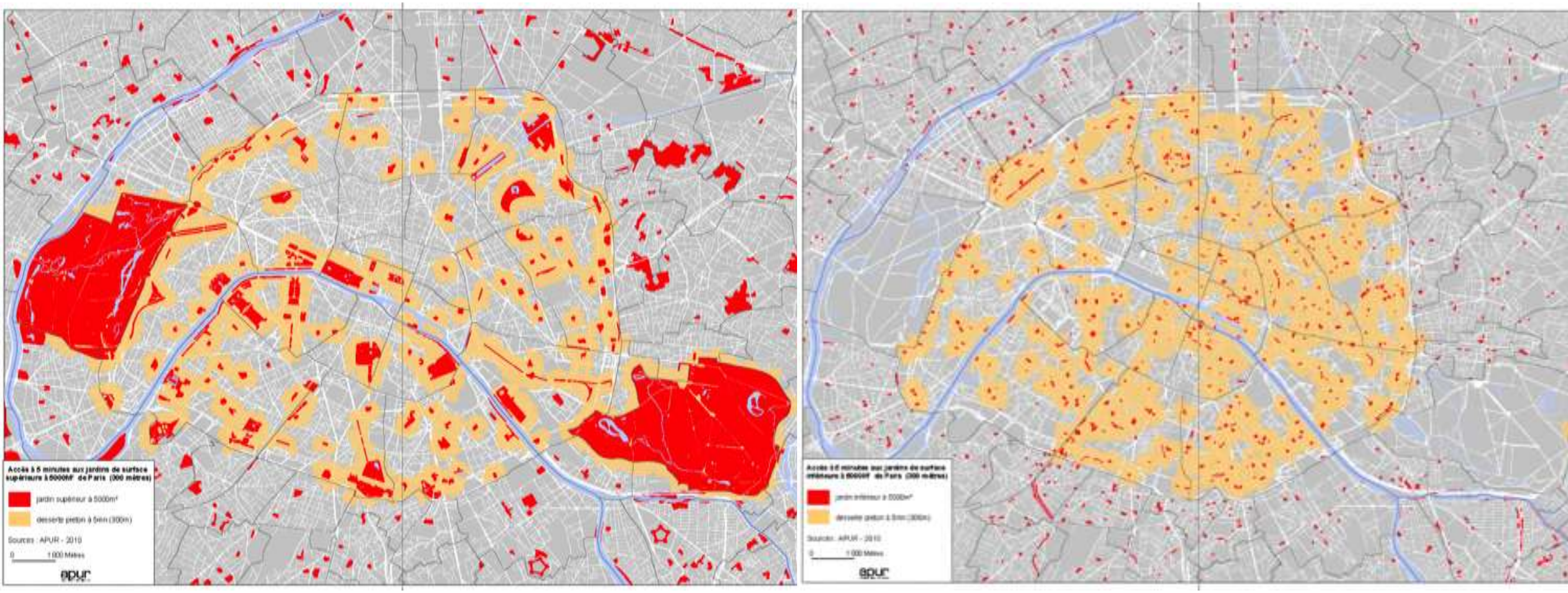


Paris Case Study

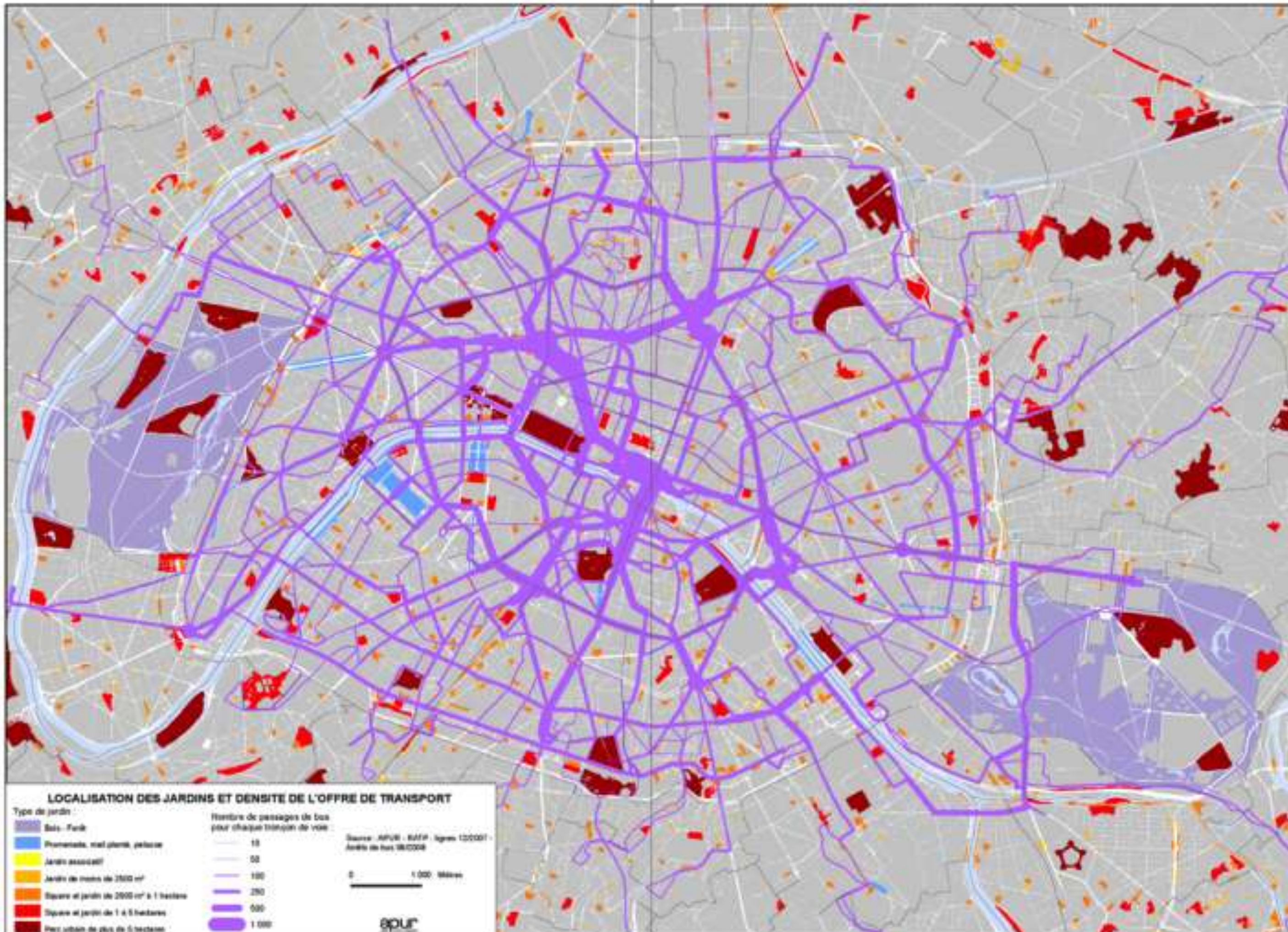
- ✓ A small frequency of big parks
  - ✓ Paris: 17 parks bigger than 7 ha
- ✓ A medium frequency of medium size parks
  - ✓ Paris: 65 parks btw 1 and 7 ha
- ✓ A high frequency of small public gardens
  - ✓ Paris: 300 public gardens less than 1ha

The same holds for healthcare, shops, leisure…

Source: Urban Morphology Institute



The scaling of public parks ensures a general accessibility at less than 300 m in the whole Paris intra-muros city. On the right, accessibility at less than 300 m of the large public parks (more than 5000 m^2). On the left, accessibility at less than 300 m of the long tail of small public parks (less than 5000 m^2). The long tail of 260 public gardens less than half ha ensure general accessibility. (Source of the maps:APUR)

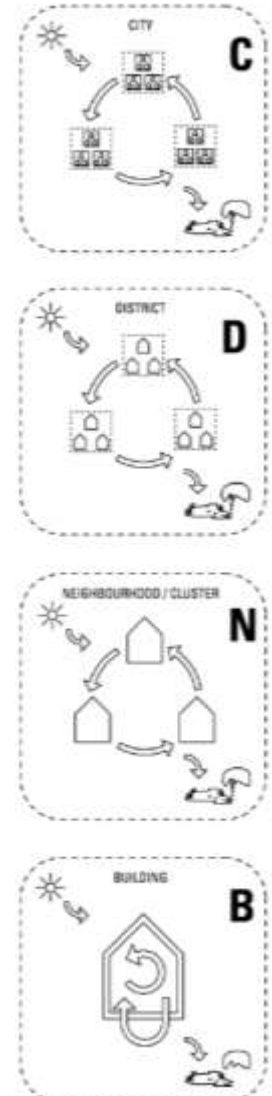


Source of the map: APUR

The scaling properties of the different sub-systems of the city are coherent one with the other. This map shows the frequency of buses along main streets over-layered on the map of public gardens. Streets are scaling, frequency of transit is scaling, gardens are scaling. Buses ensure accessibility to the larger amenities along main transit lines while the long tail of smaller streets ensures accessibility to smaller amenities. The different scales are well integrated.

9.Integrated Synergized Energy Planning

Most of the energy consumption is lost as non-functional waste energy. So the initial demand for useful energy can be reduced by more effective usage, such as by low-exergy strategies. Low exergy strategies consist in cascading and recycle energy flows according to their quality (electricity, mechanical, thermal) to improve the energy process overall. A key issue in improving the efficiency of urban energy systems is an optimal matching of various energy-demand categories with energy-conversion processes. This matching is usually achieved by exergy analysis. Exergy analysis considers quality differences in energy forms (which energy form is most adequate for delivering a particular task) and defines efficiency in relation to what thermodynamically represents an upper bond of energy conversion efficiency.



Mapping energy demand on the district scale allows quantifying the potential of low exergy strategies

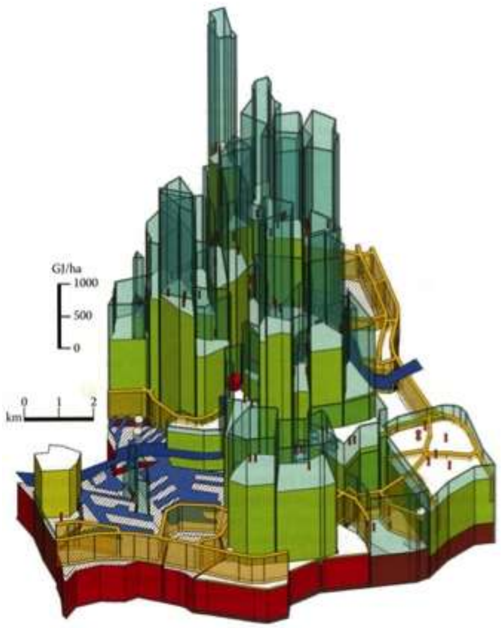
Energy mix on the district scale (REAP)

9.Integrated Synergized Energy Planning

Heat mapping

The purpose of a heat mapping is to provide a geographical imprint of the various thermal sources and sinks as well as infrastructures in an area, showing the net energetic – or even better exergetic – balance and providing planners a catalogue by which to design a thermal energy plan.

Local industries, for example, may require higher temperatures than dwellings, and similarly the heat generated in green houses may not have a temperature high enough to heat a living room. Upgrading the generally ubiquitous low-temperature renewable heat to a (less available) higher temperature by means of a heat pump requires additional energy, whereas industries using high-temperature heat may have lower-temperature residual heat available to start a heat “cascade”. The resulting exergy distribution will thus make optimal use of the quality of valuable high temperature heat.



Energy potential map in Rotterdam (REAP)

9.Integrated Synergized Energy Planning

Feasibility for a subway station district in a Chinese city

The Business as Usual (BAU) scenario is representative of the way transit-oriented development planning is typically done in China today. The Synergy scenario presents an alternative vision for local area development that includes district energy management. In the BAU scenario, each building has its own heating, cooling and ventilation (HVAC) system, and electricity is supplied from the grid.

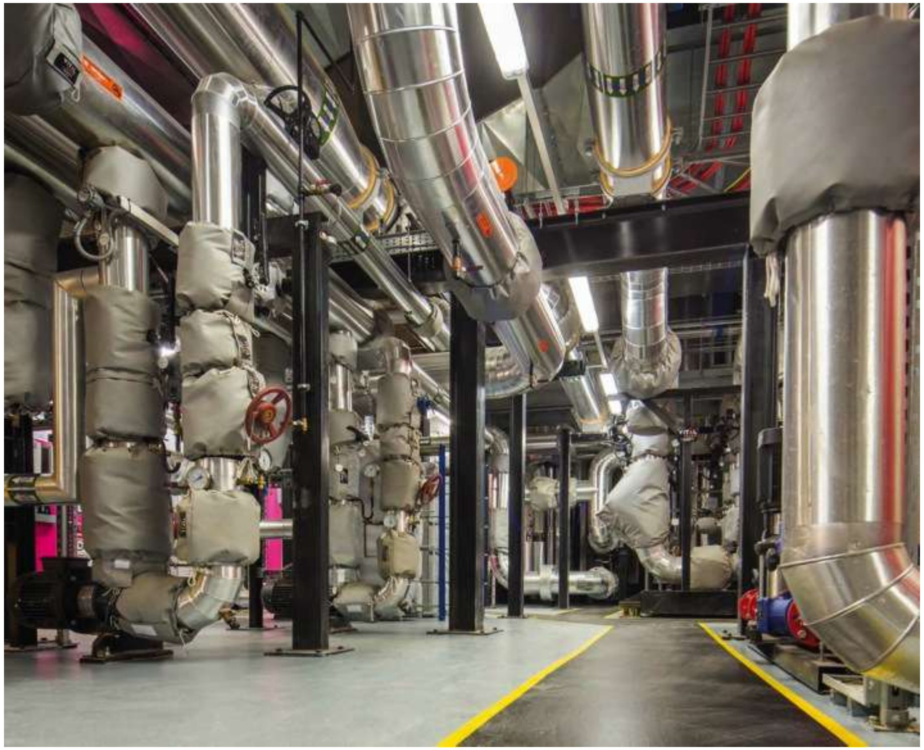
In the Synergy scenario, energy use in the district is optimized by means of:

- A District Cooling and Heating System (DCHS), which supplies hot and chilled water to the buildings in the district via a network of underground distribution pipes.
- A Smart Microgrid System, which complements the DCHS with a portfolio of smart energy technologies to further reduce energy costs.

	Description	Unit	BaU	Synergy	% Savings
Load	Cooling Demand	TR	49,669	44,953	9.50%
	Heating Demand	kW	88,818	77,373	12.90%
	Electrical Power Demand	kW	147,104	140,910	4.20%
CapEx	Heating & Cooling Equipment Cost	¥'0000	25,163	19,793	21.30%
	HVAC Plant Room Area	¥'0000	55,237	37,300	32.50%
OpEx	Demand Charge (¥/kW/yr)	¥'0000	10,592	10,145	4.20%
	Annual HVAC Operating Cost	¥'0000	13,170	9,724	26.20%
	Annual HVAC Water Consumption	¥'0000	443	323	27.20%
Total CapEx	Total Capital Expense	¥'0000	80,400	57,093	29.00%
Total OpEx	Total Operating Expense	¥'0000	24,205	20,192	26.20%

TSD Project, AECOM

9.Integrated Synergized Energy Planning in King's Cross Central



99%

of the development's heat demand is met from the on-site energy centre

79%

of the development's total power demand is offset by the CHP engines

Thank you for your attention

感謝諸位的時間

The World Bank seminar on TOD, Tianjin, June 2014

The World Bank