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CIUDADES
+ HUMANAS Y SOSTENIBLES

2014 CONMEMORACIÓN DIÁLOGOS DE ALTO NIVEL **RIO+20**



ALCALDÍA MAYOR
DE BOGOTÁ D.C.

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REGULATING LAND USE FOR MORE COMPACT CITIES, URBAN SUSTAINABILITY AND ENERGY EFFICIENCY

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URBAN MORPHOLOGY
_____ &
COMPLEX SYSTEMS INSTITUTE



**The objectives of energy efficiency,
economic growth & social inclusion
are reinforcing and simultaneously achieved
by compact urban forms**

Economic geography, infrastructures and urban form are key drivers for urban Energy/GHG emissions



Economic Geography (trade, economic structure)

Income (consumption)

Technology: efficiency of energy end-use

(buildings, processes, vehicles, appliances)

Infrastructure and Urban Form

(energy supply infrastructure, transportation network, density,
land use mix, accessibility)

Transportation modes and buildings

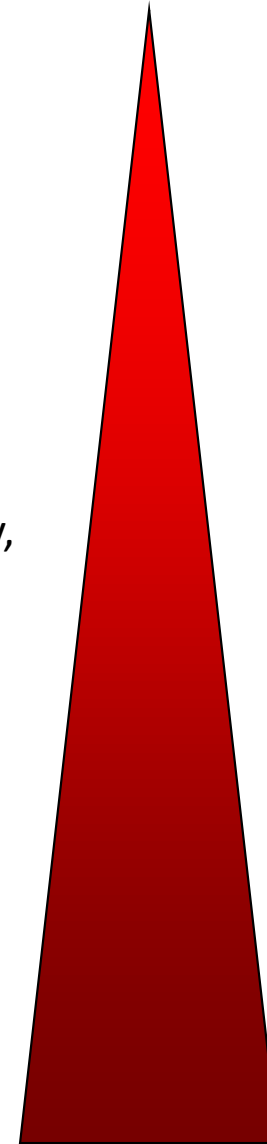
(choice of transport modes, building and site design)

Fuel substitution (imports)

Energy systems integration (co-generation, heat-cascading)

Urban renewables, urban afforestation

Adapted from IPCC, 2014 and GEA, 2013



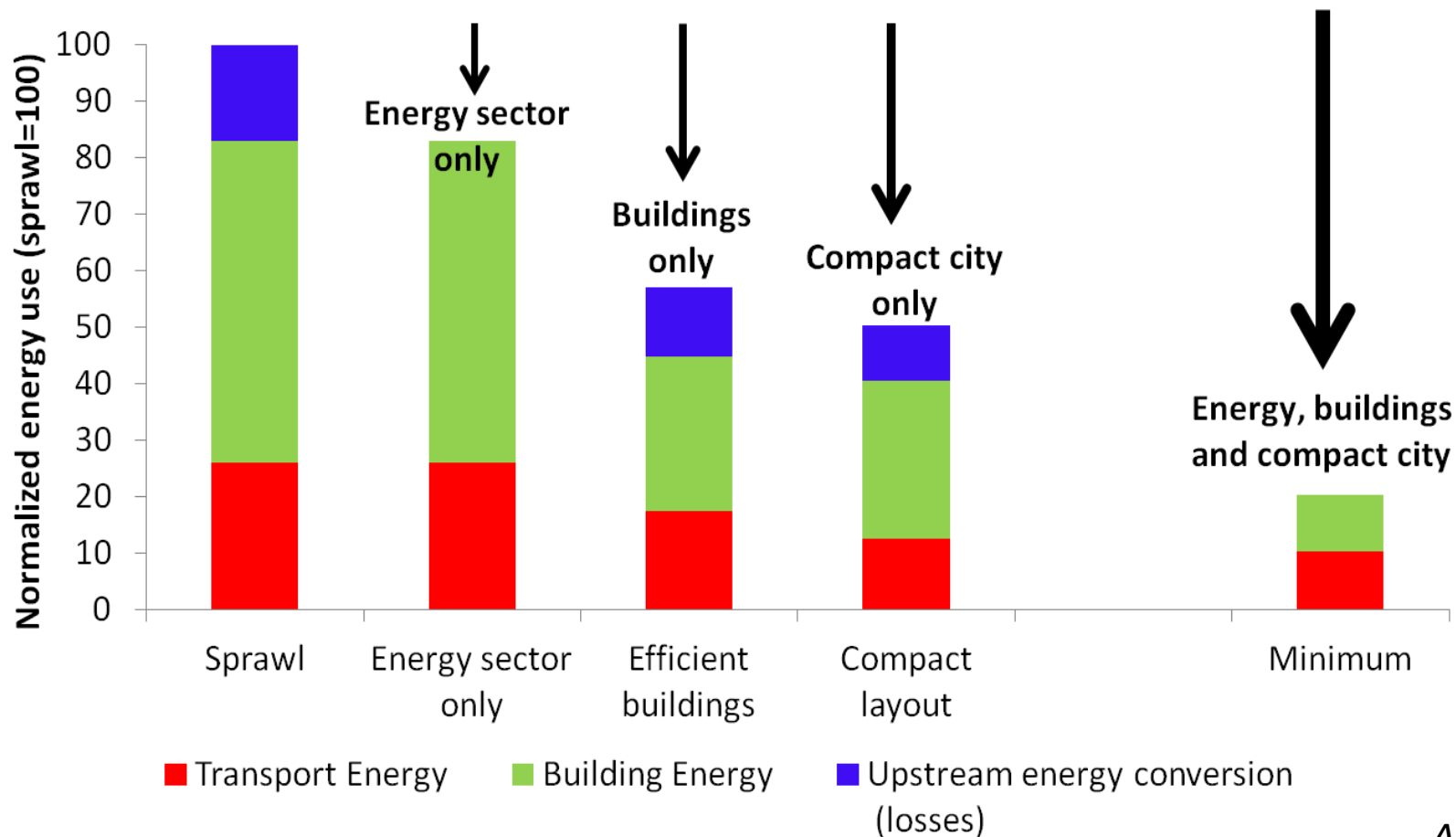
Decreasing order
of impact



Increasing level of
urban policy leverage

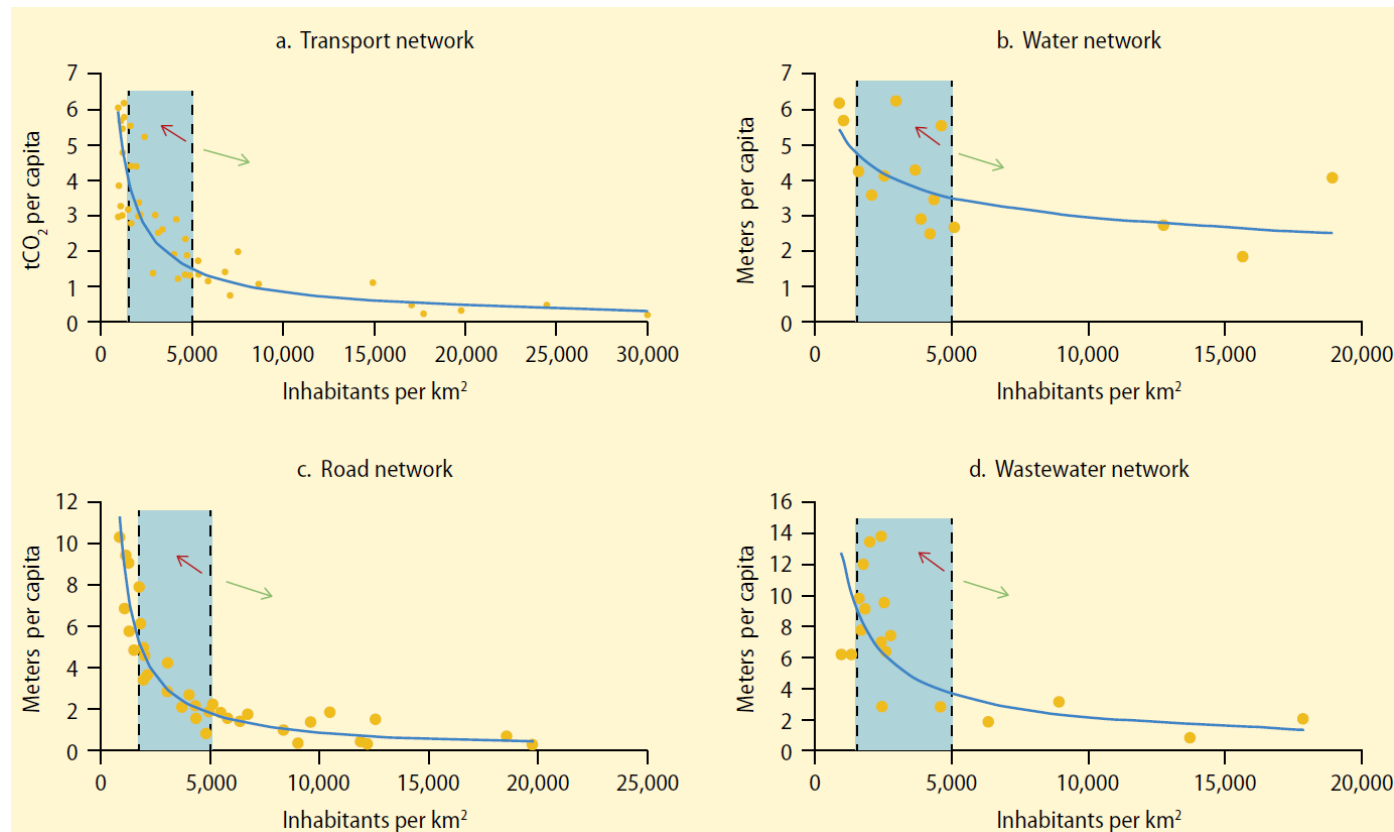


Compact urban form is the most powerful leverage for climate change mitigation



Adapted from GEA, 2013

Low density and fragmentation increases infrastructure costs, energy consumptions and carbon emissions



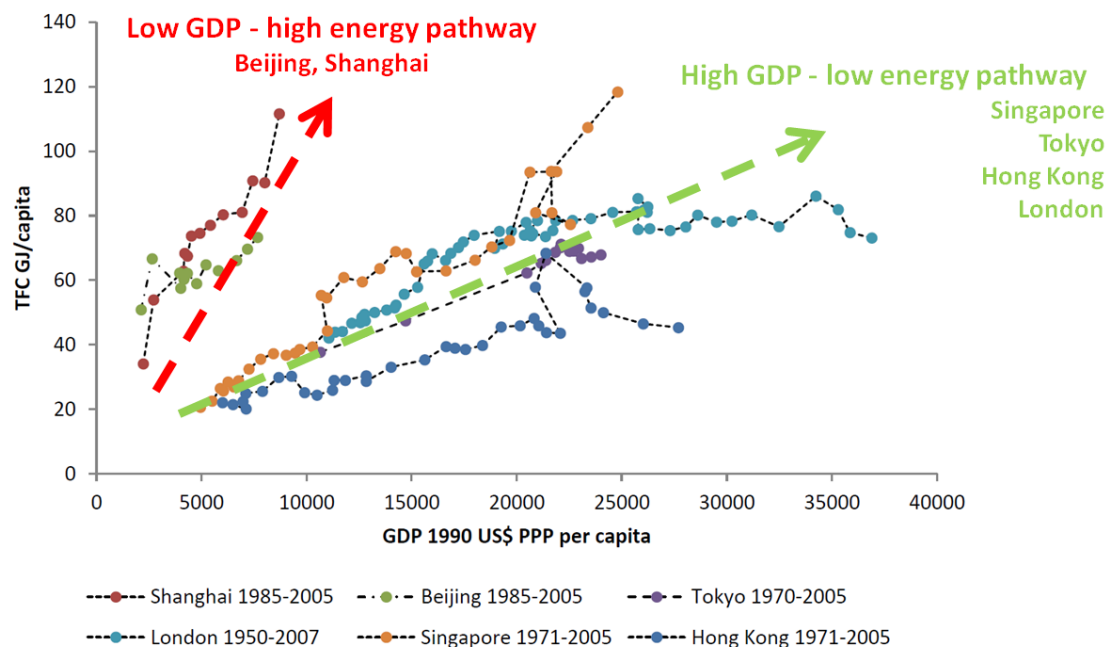
From Paris or Manhattan ($\approx 20,000$ inhab/km²) to the average Chinese city (5,000 inhab/km²)

- Road network investment cost per capita + **300%**
- Water network investment cost per capita + **40%**
- Carbon emissions for transportation per capita + **150%**

Undifferentiated road network investments induce urban sprawl

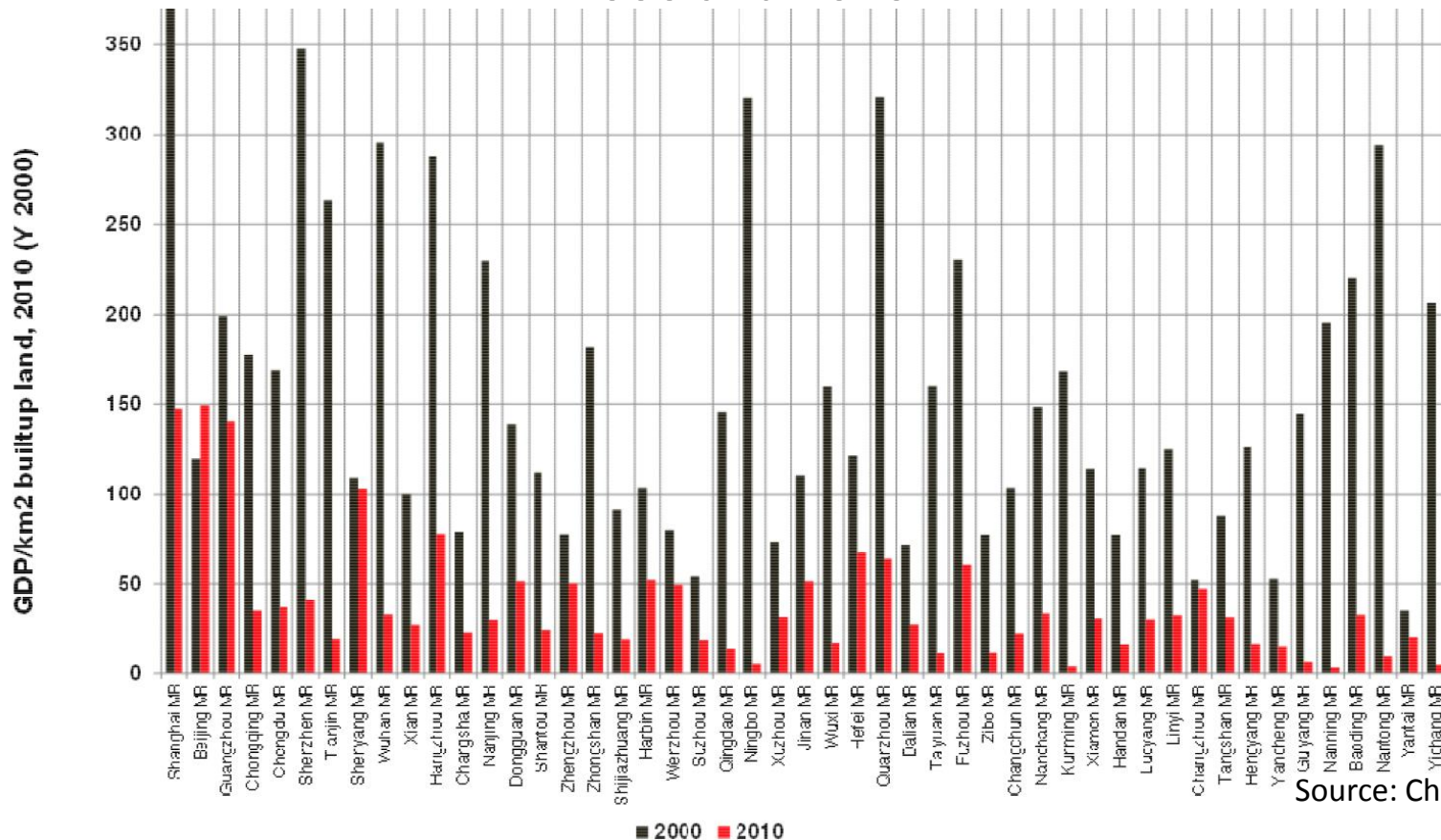
Massive investments in road networks infrastructures induce:

- Undifferentiated isotropic urban development
- Flat distribution of urban densities
- Flat distribution of land and real estate prices
- Waste of land
- Car dependency and congestion



They lock cities into a pathway of high energy intensity and low energy resilience, while jeopardizing the benefits of agglomeration economies

Additional GDP per additional km² has fallen dramatically in almost all new urban developments in Chinese cities between 2000 and 2010



-90%

Drop in marginal productivity of land in Shenzhen (2000-2010)

-60%

Drop in marginal productivity of land in Shanghai (2000-2010)

Agenda for action

Articulating densities and transit through land use policies and regulations in order to increase urban sustainability, energy efficiency and long term value creation

Compact urban forms are articulated, accessible, diverse and adaptive

Articulated density

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

Accessibility and proximity

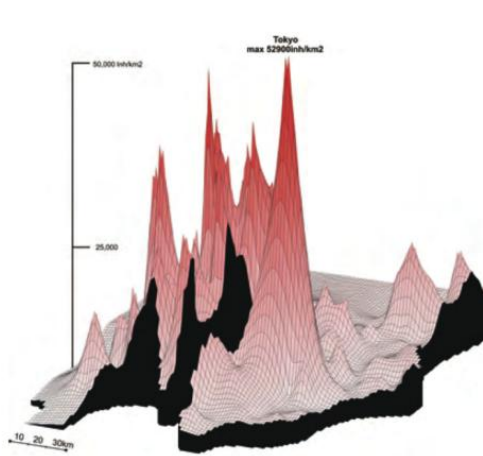
- Each part of the city is easily accessible
- Easy access to public transit infrastructures
- Seamlessly interconnected transit infrastructures
- Daily amenities accessible by foot (shops, health, education, culture, sport)
- Intense and connected street network (high number of intersections per km²)

Mixed use and adaptive

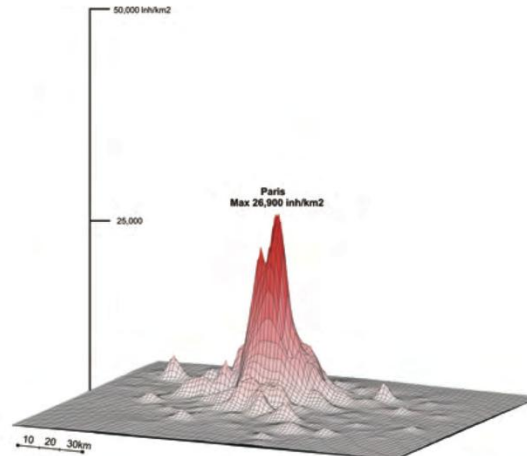
- Jobs, housing and retail are mixed on the city, district, community and building scale
- Land use is highly flexible



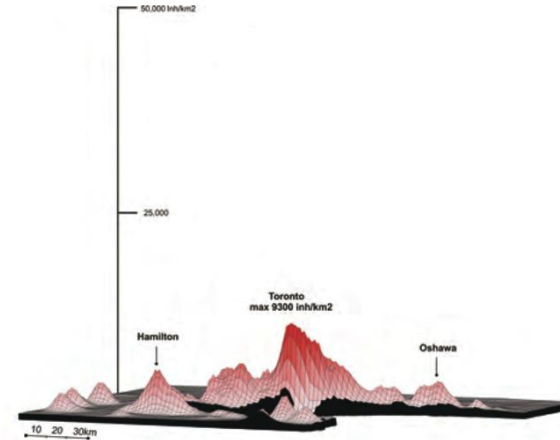
Efficient and resilient cities are not flat. They are sharp multi fractal landscapes.



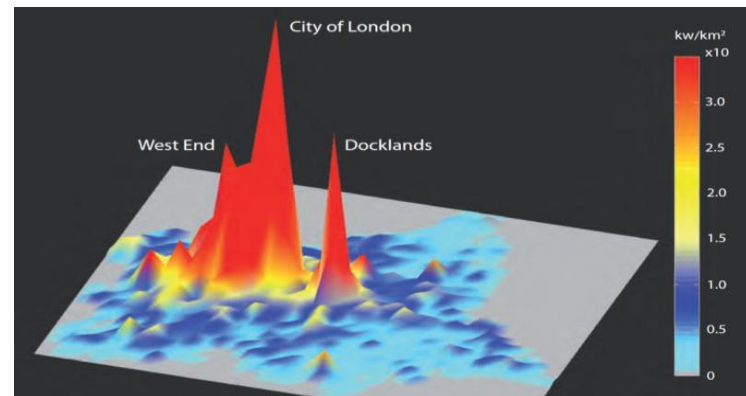
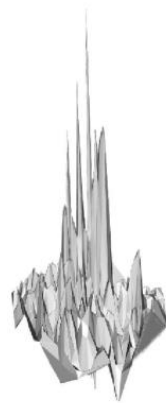
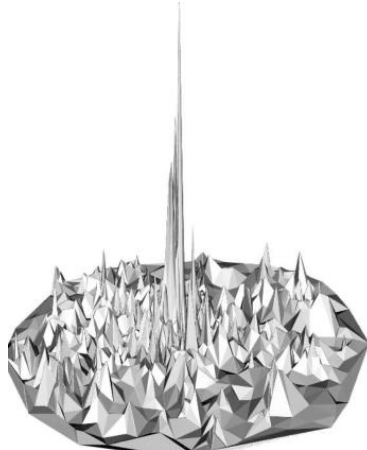
Tokyo
4.9 tCO₂e/cap
146 ktCO₂e/US\$bn



Paris
5.2 tCO₂e/cap
112 ktCO₂e/US\$bn



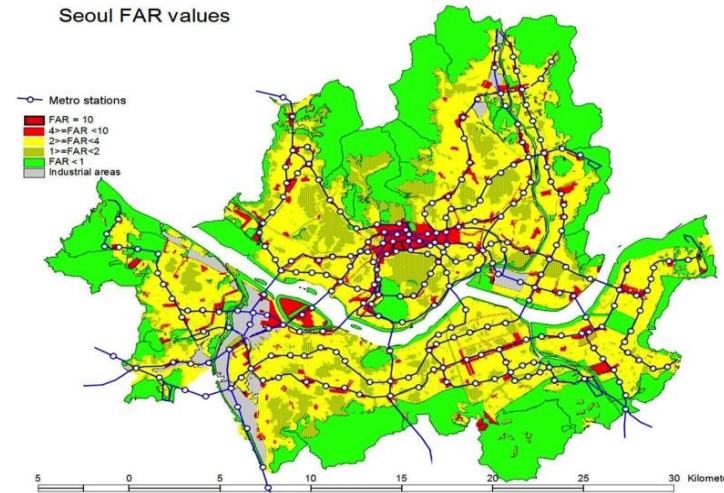
Toronto
11.6 tCO₂e/cap
286 ktCO₂e/US\$bn



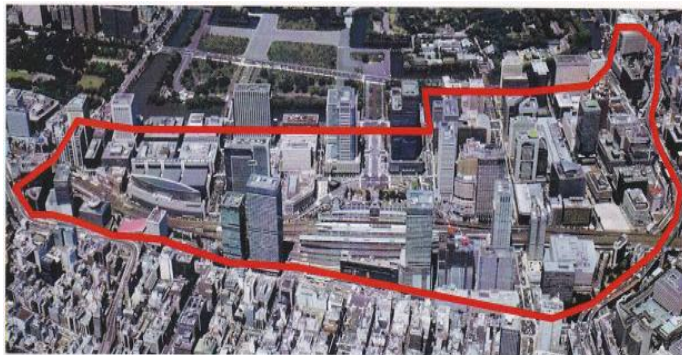
Smart investment in transit infrastructures induces long term value creation with climate and social cobenefits

The urban development model resting upon the articulation of transit and urban development has proven to be successful in terms of sustainability and economic productivity in many cities (Japan, South Korea, NYC, London or Hong Kong)

This urban development model concentrates investments and land value creation around transit hubs instead of wasting land.



Articulated density in Seoul



Transit hub in Japan



Transit hub in China

Land reforms are key to support the articulation of density with transit

The legal, financial and regulatory framework relative to land use must support and encourage this momentum to make cities more compact, sustainable and successful.

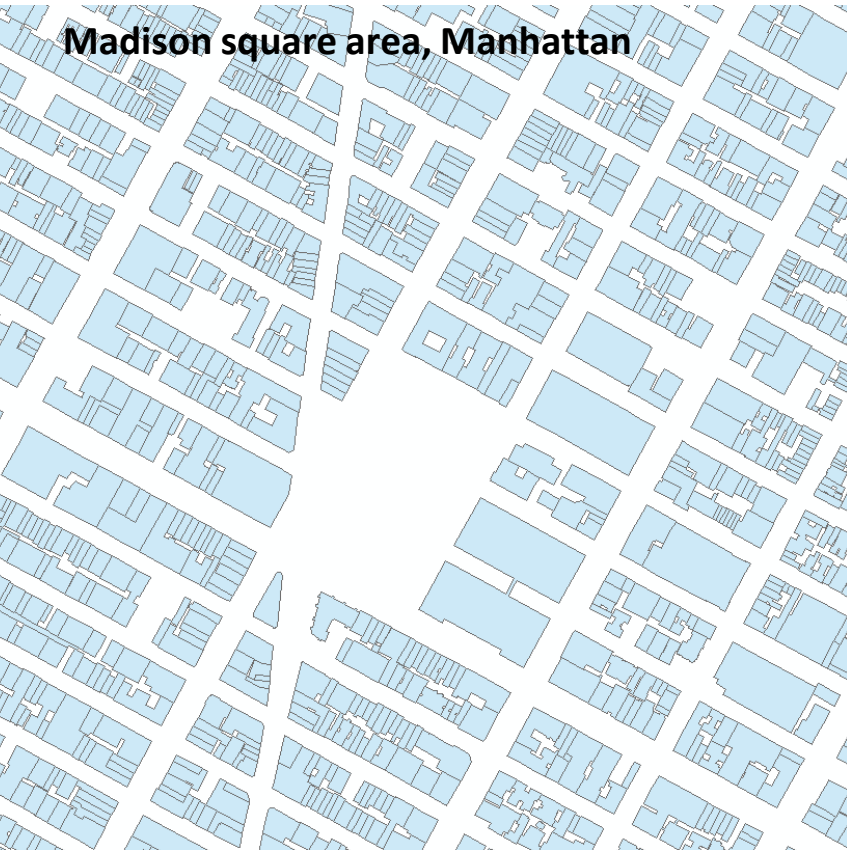
Building on international experience, China has recently engaged into ambitious reforms of land use frameworks:

- Enforcing **land price transparency** and addressing distortions in land markets
- Avoid over-sizing of urban street grids, and foster the **transition from superblocks to small block**, with a finer subdivision of land. At the present time, land is subdivided into too large plots, which prevents a multiplicity of investors to enter the land market
- Allow the subdivision of superblocks into smaller plots to support infill development and reintensification
- Introduce **fine grain mixed use** regulation instead of large scale zoning
- Reevaluate rigid **setback rules** that contribute to urban sprawl and produce inefficient urban forms. Solar envelope strategies are a good alternative to rigid setback rules
- Replace green space requirements in the block (30%) by a proximity and accessibility requirements to essential daily urban amenities

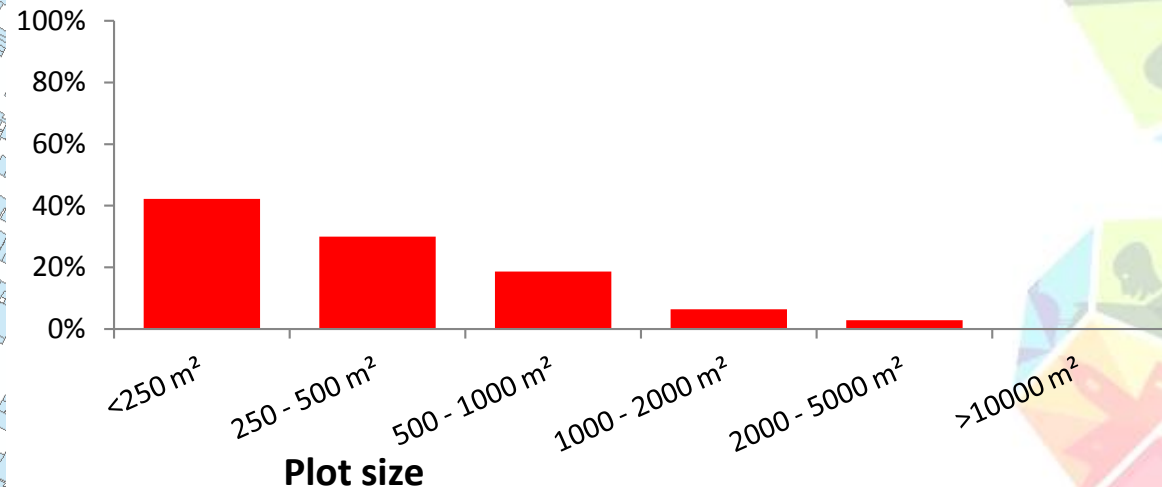


An exemple of land reform to increase urban flexibility and leverage investment opportunities: the role of platting

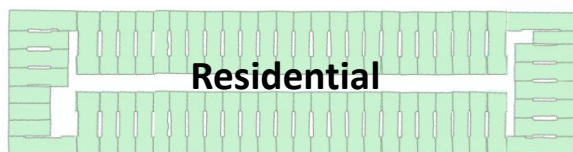
Madison square area, Manhattan



Fine grain platting allows consolidation over time: it supports differentiation, land use flexibility, adaptivity to market fluctuations and long term value creation

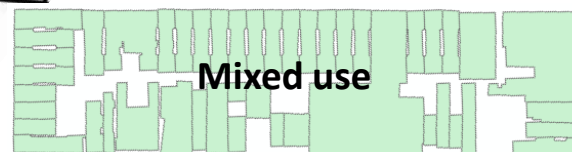


1811 plot subdivision
Average plot size: 205 m²



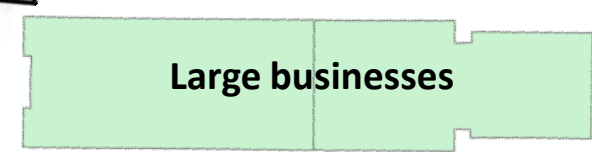
Residential

Intermediary plot consolidation
Average plot size: 255 m²



Mixed use

Extreme plot consolidation
Average plot size: 6,100 m²



Large businesses

THANK YOU FOR YOUR ATTENTION

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