# Land Use and Transport for Low Carbon Cities

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UNCRD - Environmentally Sustainable Transport (EST) Forum

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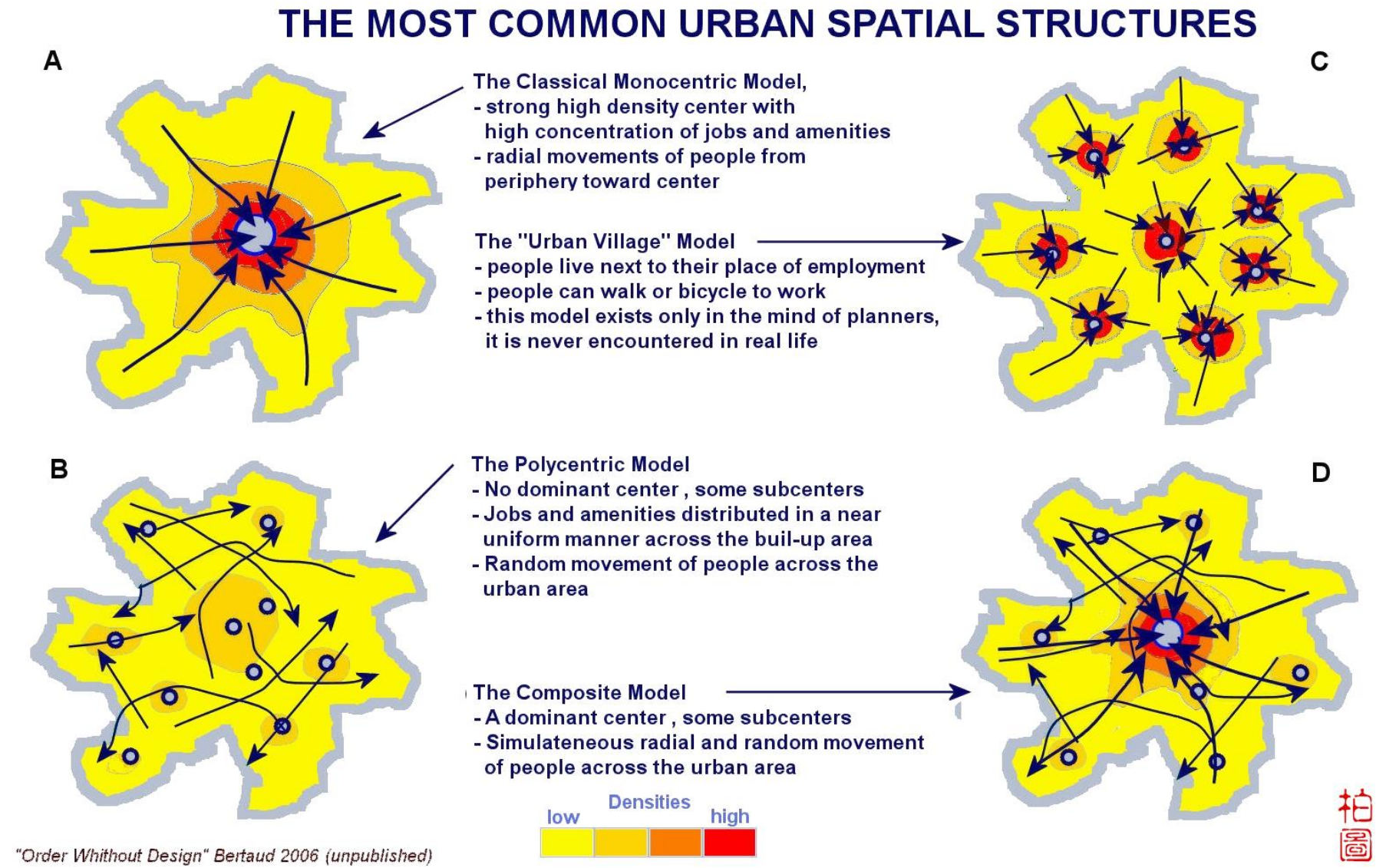
# Urban structures



# Urban Transport Planning Approach

## Traditional Approach

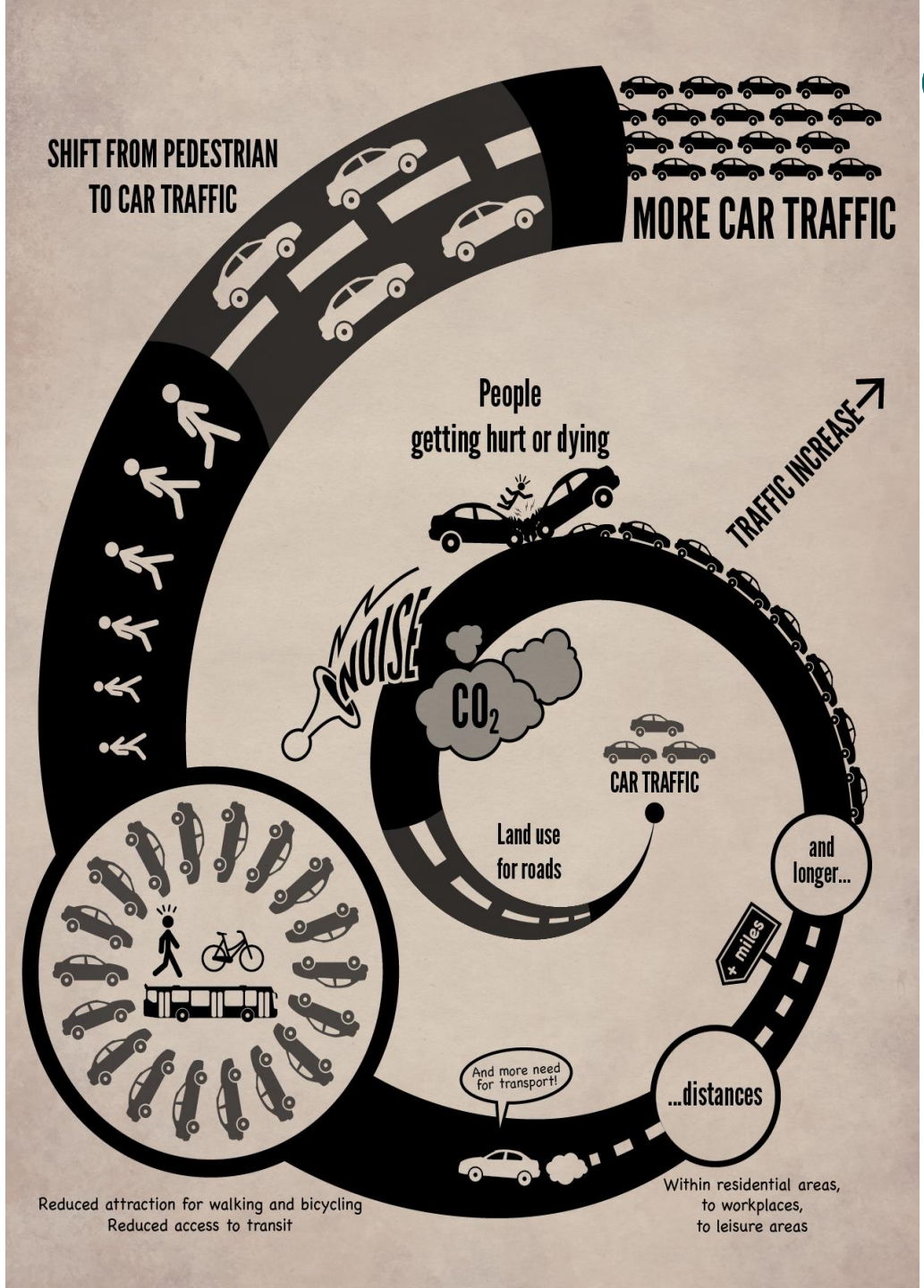
- Focus on automobiles
- Expand road networks
- Predict and Provide
- Parking is a need for cars

## Sustainable Approach (non-traditional?)

- People centred planning
- Focus on green areas
- Walking, Cycling and Public Transport
- Car restraint measures

# Experience from Traditional Approach

- High demand for space
- High impact on health and environment
- High impact on traffic
- High demand to travel
- Urban sprawl
- Increased trips and lengths

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# Is the use of space efficient?

# Car-oriented planning

Delhi: current situation

Is this the future we are heading to ?

# Car-oriented planning: indicators

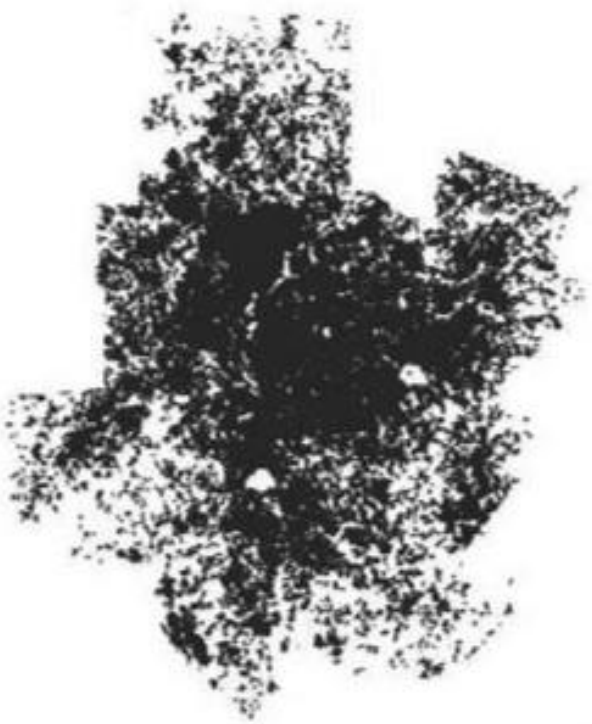
- Sources:
- 1. Colorado Springs, Colarado, USA – Source: http://en.wikipedia.org/wiki/File:Suburbia_by_David_Shankbone.jpg
- 2. Houston, TX, USA – Source: http://www.photohome.com/pictures/texas-pictures/houston/downtown-houston-4a.jpg
- 3. Ontario Highway 401, Canada – Source: http://en.wikipedia.org/wiki/File:Highway_401.png

Low density

Segregated zoning

Excessive road infrastructure

# Tale of two cities



Atlanta, GA, USA

- Population: 5.25 million
- Urban area: 4,280 $km^2$
- CO2 Emissions from urban transport: 7.5 T $CO_2$ /ha/yr (public + private transport)
- About 500,000 public transport trips / weekday

- Population: 5.33 million
- Urban area: 162 km2
- CO2 Emissions from urban transport: 0.7 T CO2 /ha/yr (public + private transport)
- About 2.6 million trips / day
- 953 million boardings/year

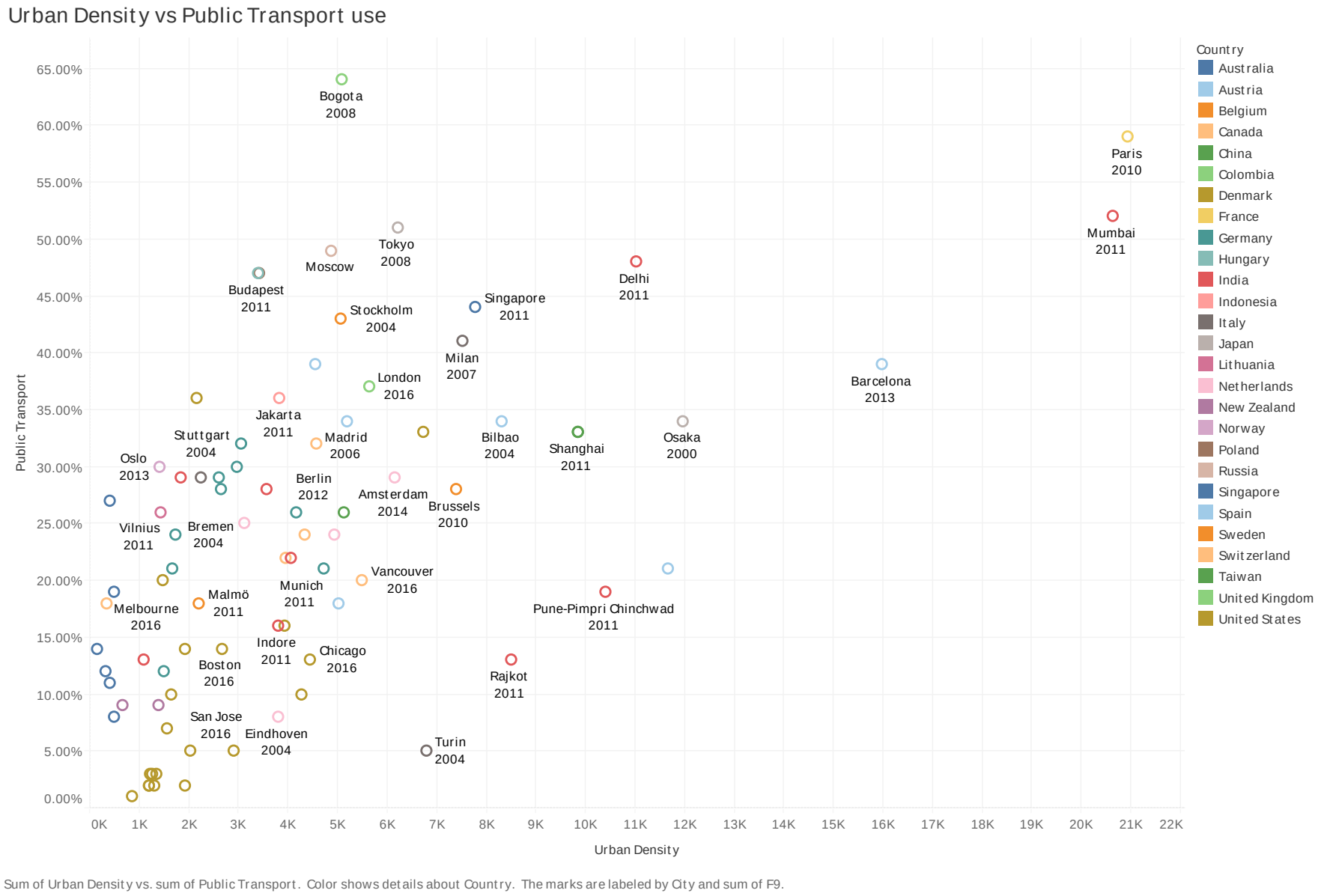
Barcelona, Spain

# Way we move

- Cities with similar population and the use of private transport


Figures not to scale. Source: The Neptis Foundation, 2007

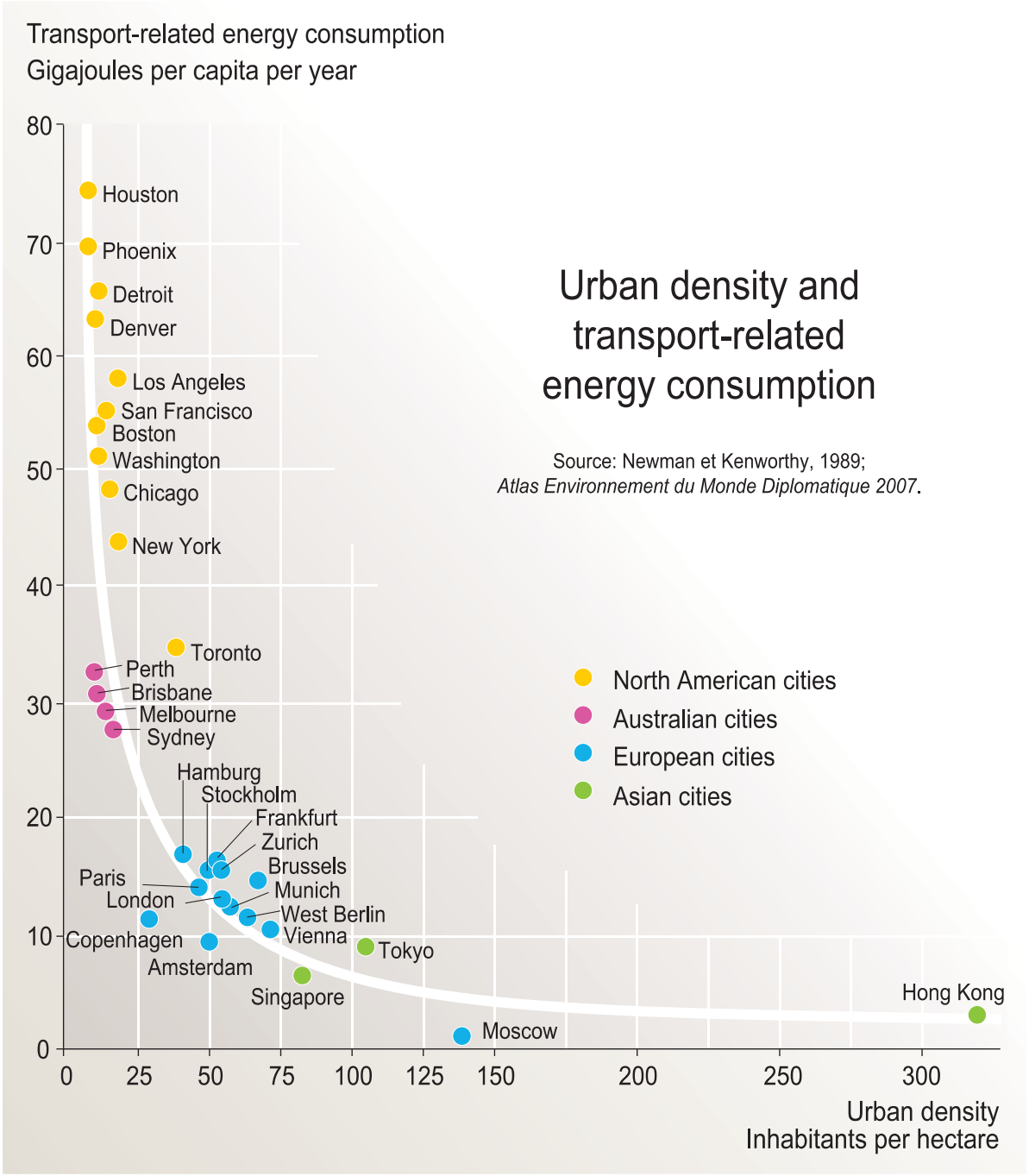
# Public Transit and urban density




Sum of Urban Density vs. sum of Public Transport. Color shows details about Country. The marks are labeled by City and sum of F9.

Source: Kodukula and Rat, 2018

# Urban density and energy



# Sustainable approach

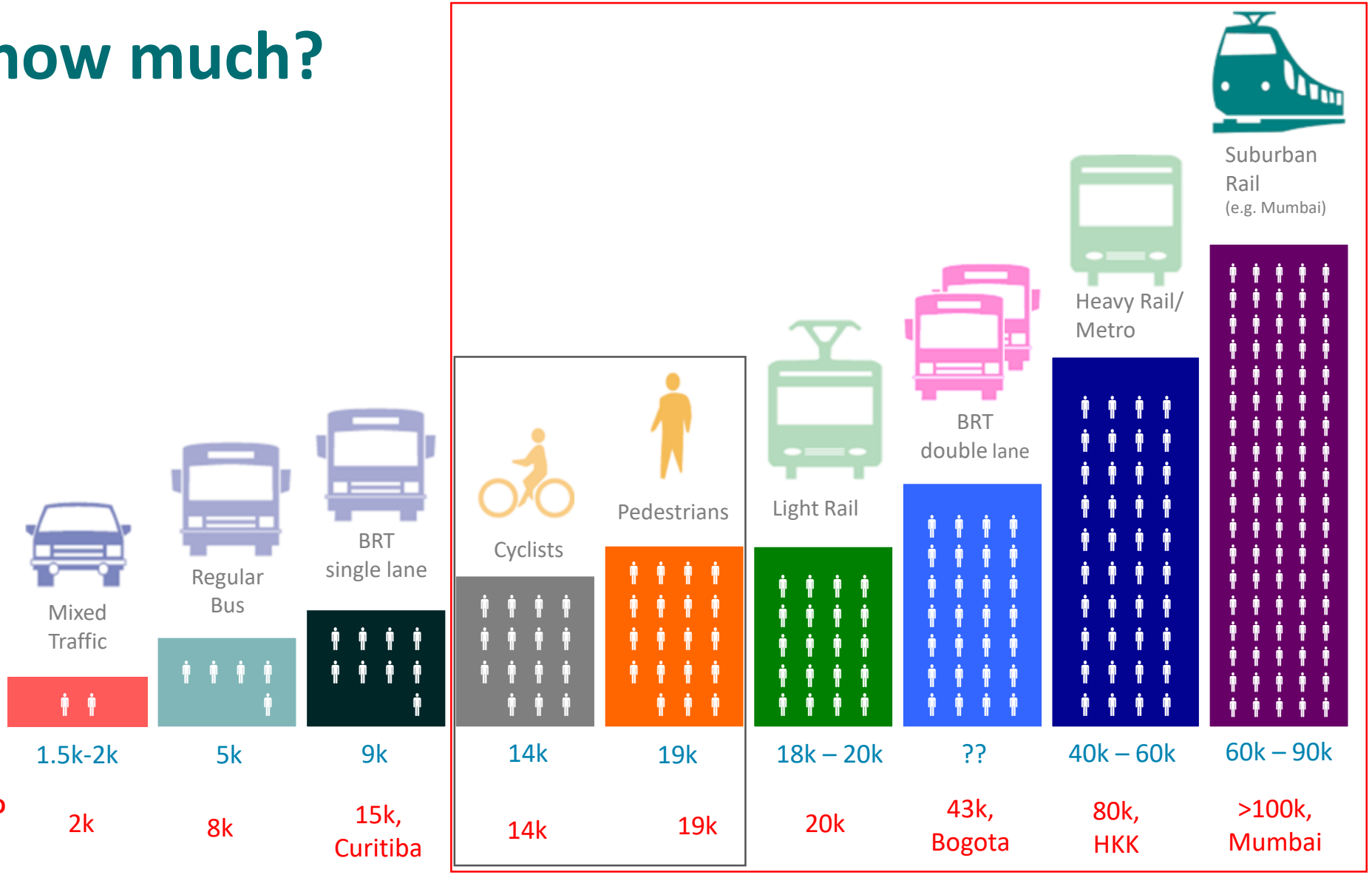
- Integrating Land Use and Transport!

# Integration is not rocket science

- To increase access to Public Transport, Walking and Cycling so as to reduce dependency on personalized modes.
- To encourage people to travel short distances and make fewer trips.
- To encourage compact mixed use development near new or existing public transportation infrastructure that provides housing, employment, entertainment and civic functions within walking distance of transit.
- To reduce the fuel and energy consumption in the motorized forms of transport, reducing pollution and adverse impact on natural environment.

# What carries how much?

Equivalency road width:
In order to carry 20,000 automobile commuters PHPD, a highway must be at least 18 lanes wide. (assumption 1.2 passengers per automobile)

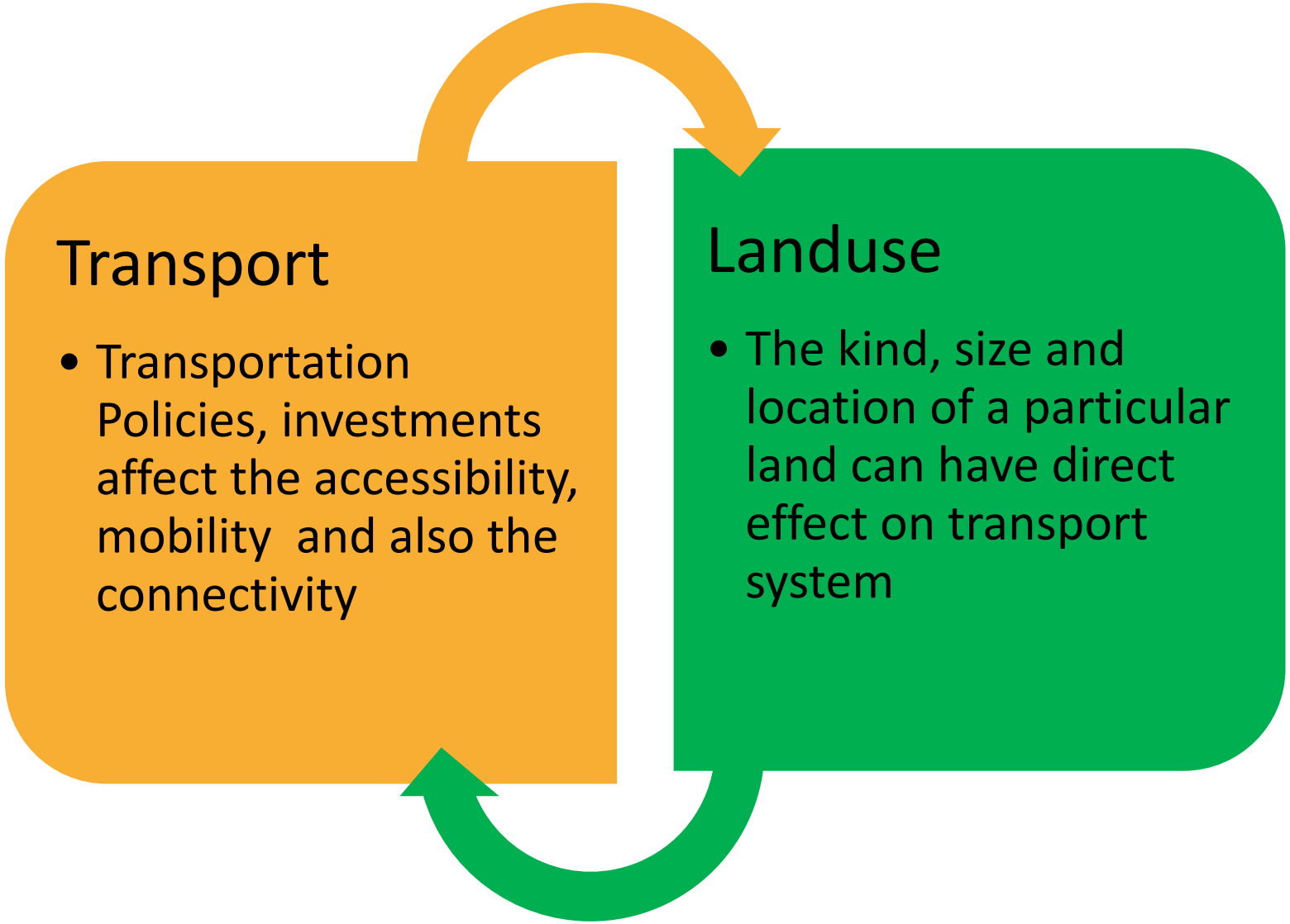



| | Mixed Traffic | Regular Bus | BRT single lane | Cyclists | Pedestrians | Light Rail | BRT double lane | Heavy Rail/ Metro | Suburban Rail (e.g. Mumbai) |
|---|---|---|---|---|---|---|---|---|---|
| **PPHPD Range** | 1.5k-2k | 5k | 9k | 14k | 19k | 18k – 20k | ?? | 40k – 60k | 60k – 90k |
| **Maximum PPHPD achieved** | 2k | 8k | 15k, Curitiba | 14k | 19k | 20k | 43k, Bogota | 80k, HKK | >100k, Mumbai |

Source: Manfred Breithaupt (2016) based on Botma & Papendrecht, TU Delft 1991 and own figures

# Accessibility + Mobility

- Accessibility: the ease of reaching a desired destination
- Mobility: Movement required (type of movement..)



# The 3Ds of land-use

- Density
- Diversity / mixed land use
- Design

- Destinations (availability of jobs etc.)
- Distance to transit

# High density / compact development

Barcelona, Spain – Source: http://www.indie-holidays.com/destinations.php?city=2

- High density does not necessarily mean high-rise
- High rises require large setback that result in similar density as low rise development
- Mid-rise development (say 80% residences in 6-10 storey apartments) is optimal.
- It is important to note that most S. Asian cities already have high densities

# Density: How not to…

- Inhuman scale
- Not integrated with transit
- Segregated zoning

- *What is the problem with a downtown?*

Houston, TX, USA – Source: http://www.photohome.com/pictures/texas-pictures/houston/downtown-houston-4a.jpg

Source: http://travelingcolors.net/post/24217917137/urban-sprawl-las-vegas-nevada-by-cocoim

# Diversity

- Is this diversity?

# Diversity

- Mixed Land-use reduces the necessity to make some trips
- Distance travelled is greatly reduced
- Complemented by a good public realm with space for walking and cycling

Source: City of Buenos Aires, 2015

# Design: Who do we give the space?

Source: City of Buenos Aires, 2015

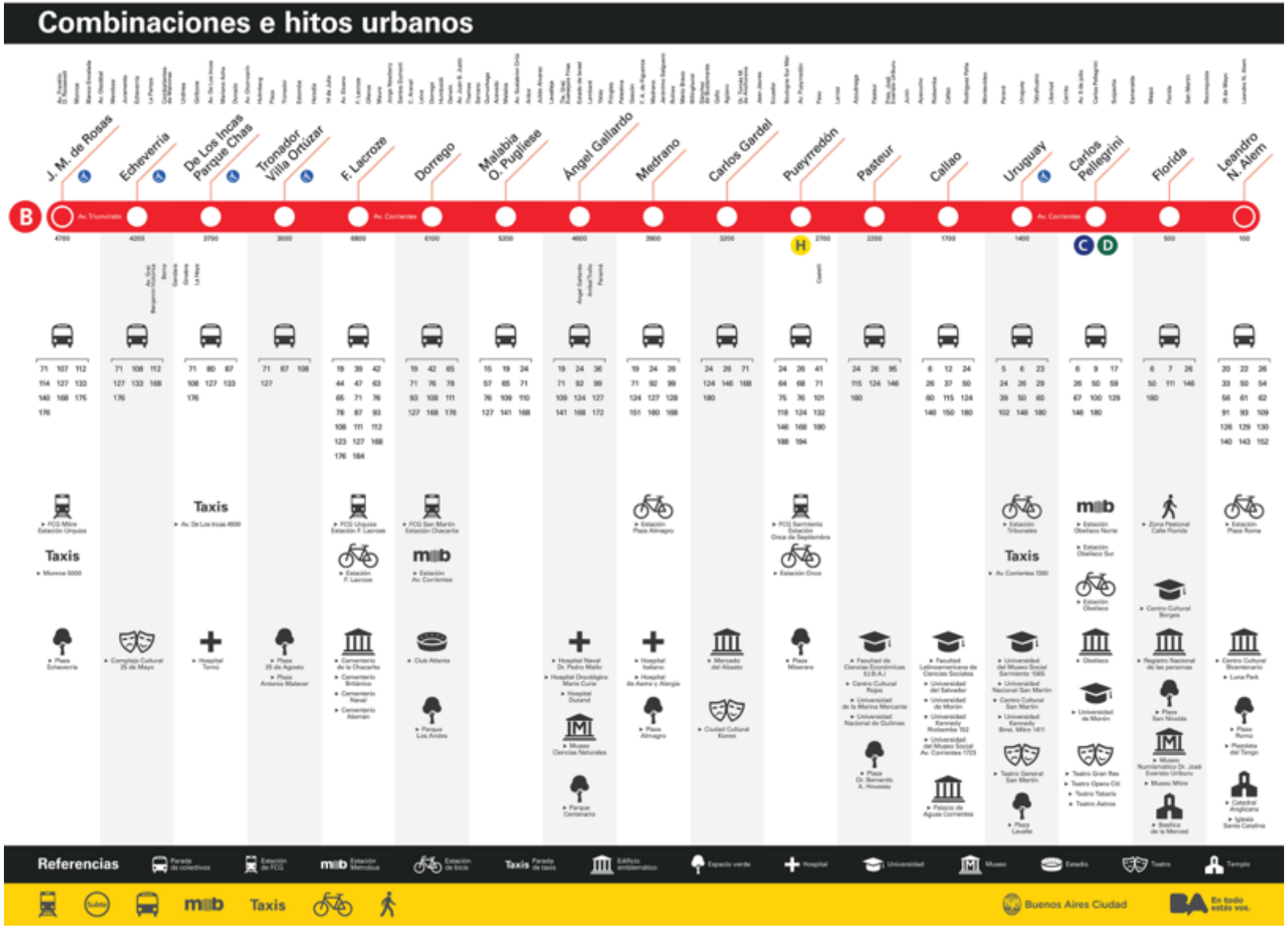
# Who do we design the spaces for

*Intersección Gascón, Costa Rica y J. Álvarez - Antes y después*

Source: City of Buenos Aires, 2015

# Design of services

- Not just urban space

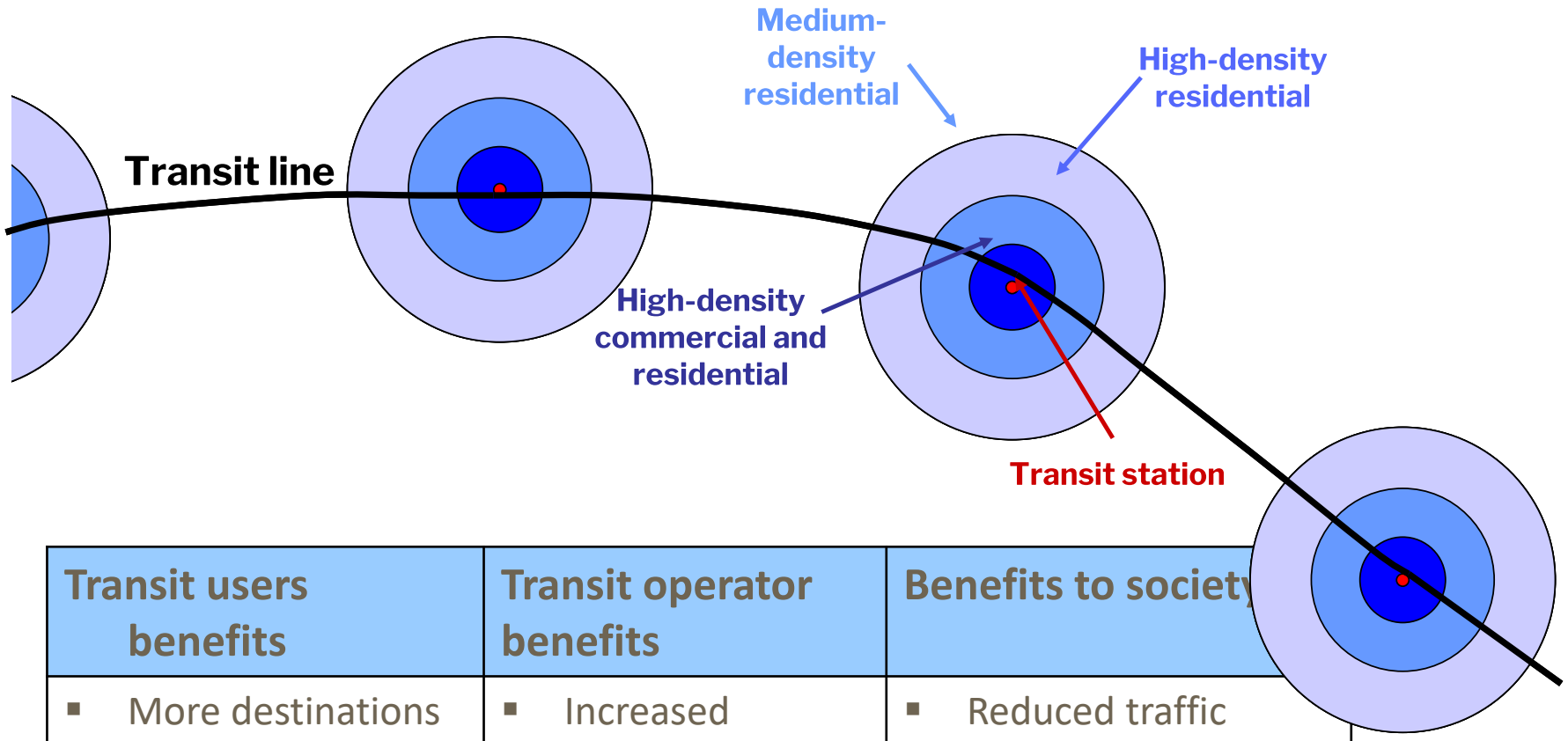



Source: City of Buenos Aires, 2015

# Pedestrian friendly connections

## to encourage walkability


# Transit Oriented Development (TOD)

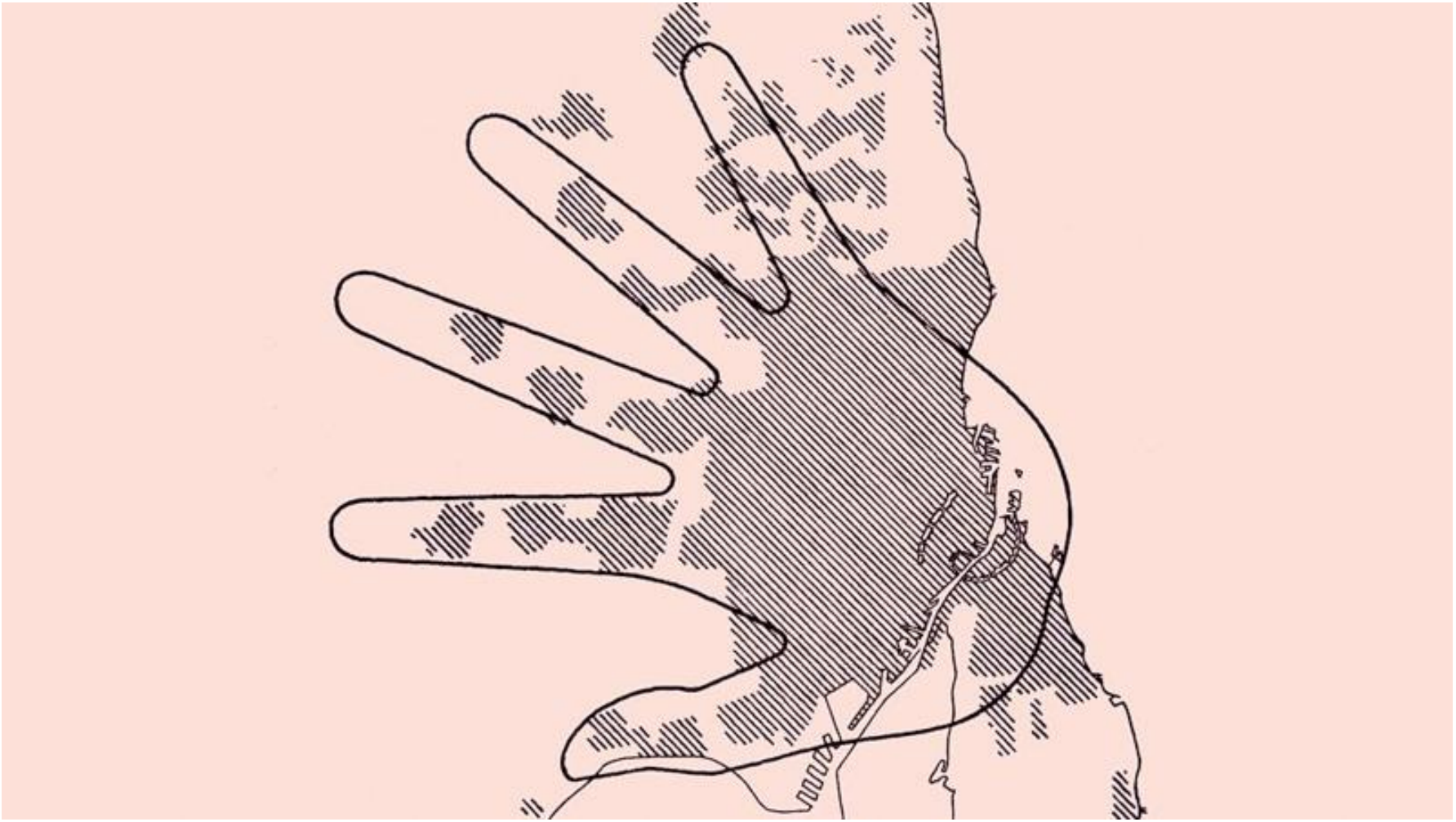



| Transit users benefits | Transit operator benefits | Benefits to society |
|---|---|---|
| ▪ More destinations near transit stations<br>▪ Better walking conditions<br>▪ Increased security near transit stations | ▪ Increased ridership<br>▪ Lower costs per rider<br>▪ Better image | ▪ Reduced traffic<br>▪ Reduced public infrastructure / service costs<br>▪ Community liveability<br>▪ Increased property values / business activity / tax |

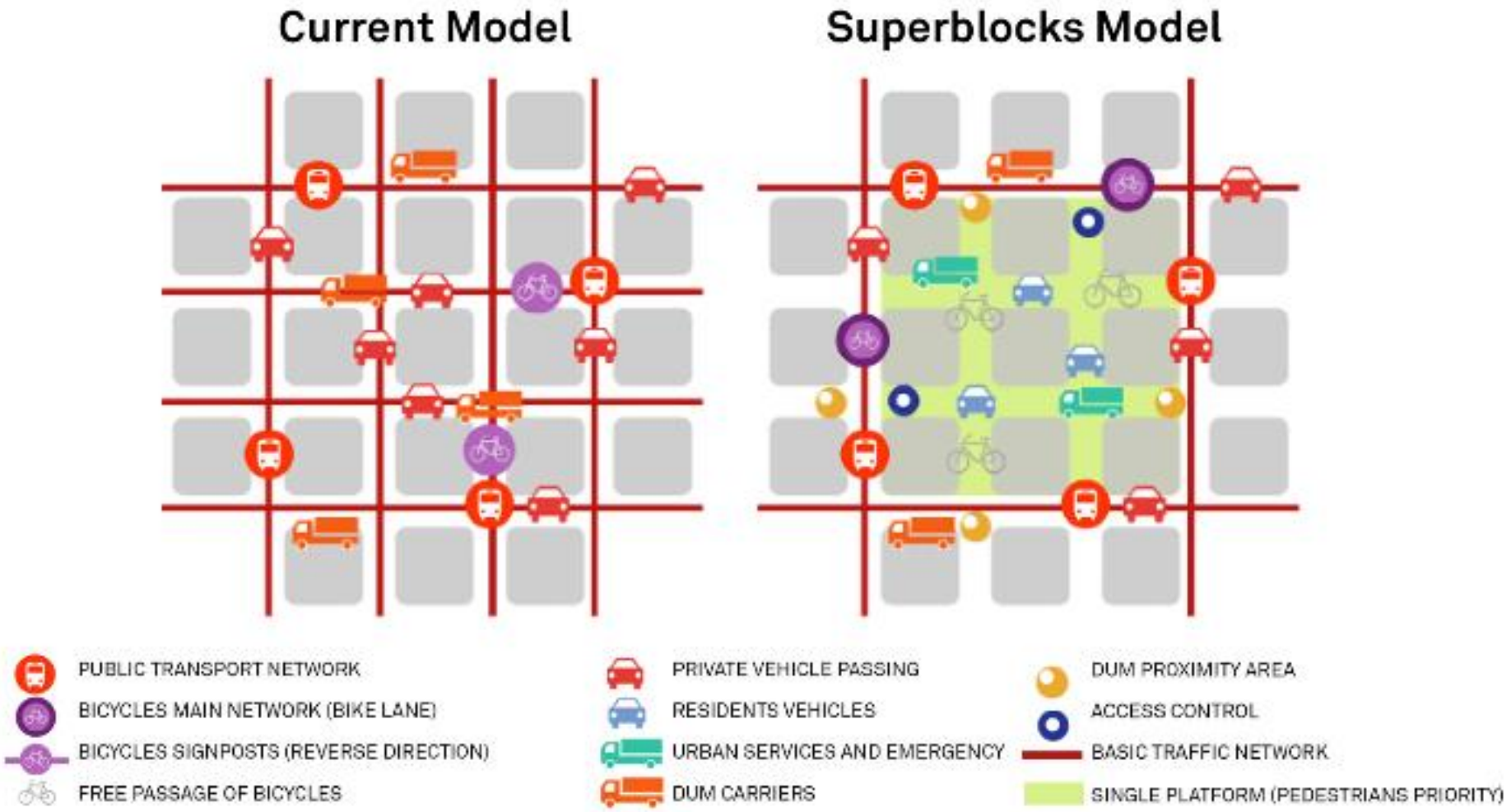
Source: Litman, 2006

# Copenhagen

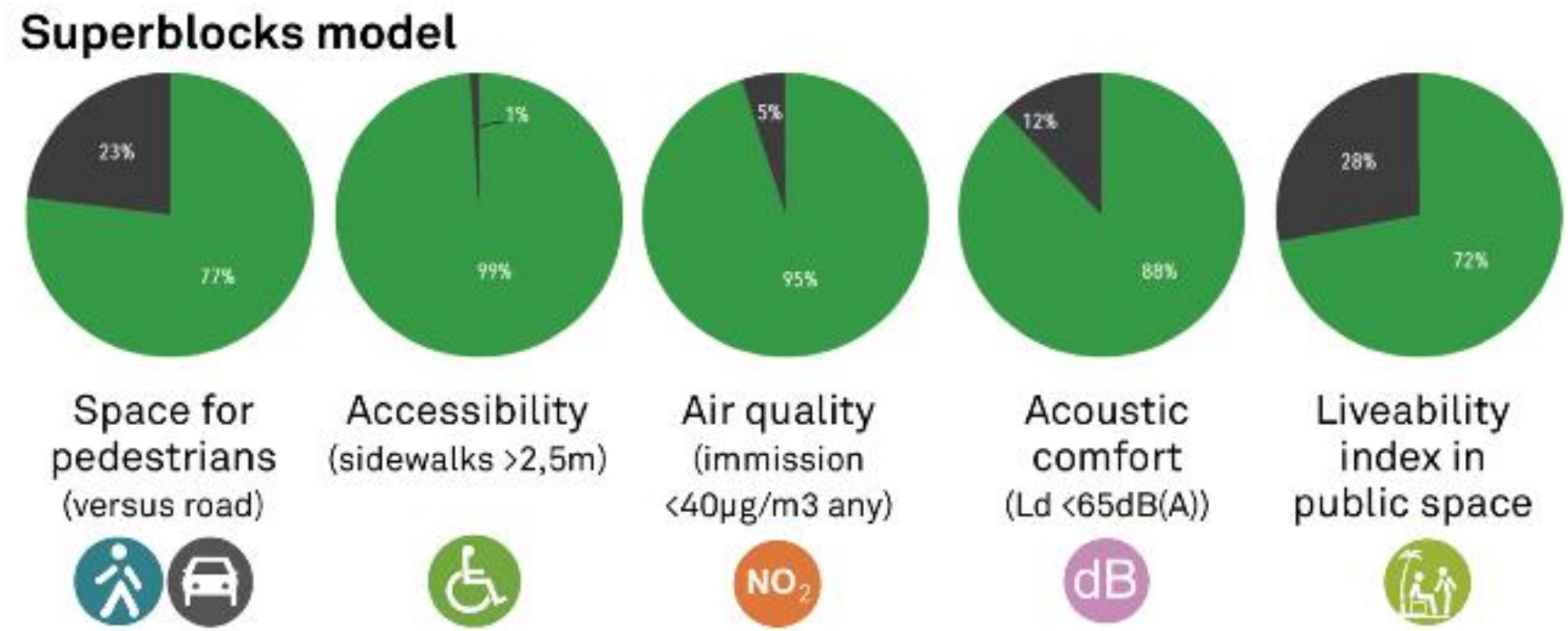
- Concept of 1947
- Over 170 kms of s-tog train lines
- Over 400 km of bicycle lanes



# Barcelona


Current Model
Superblocks Model
PUBLIC TRANSPORT NETWORK
BICYCLES MAIN NETWORK (BIKE LANE)
BICYCLES SIGNPOSTS (REVERSE DIRECTION)
FREE PASSAGE OF BICYCLES
PRIVATE VEHICLE PASSING
RESIDENTS VEHICLES
URBAN SERVICES AND EMERGENCY
DUM CARRIERS
DUM PROXIMITY AREA
ACCESS CONTROL
BASIC TRAFFIC NETWORK
SINGLE PLATFORM (PEDESTRIANS PRIORITY)

# Superblocks benefits

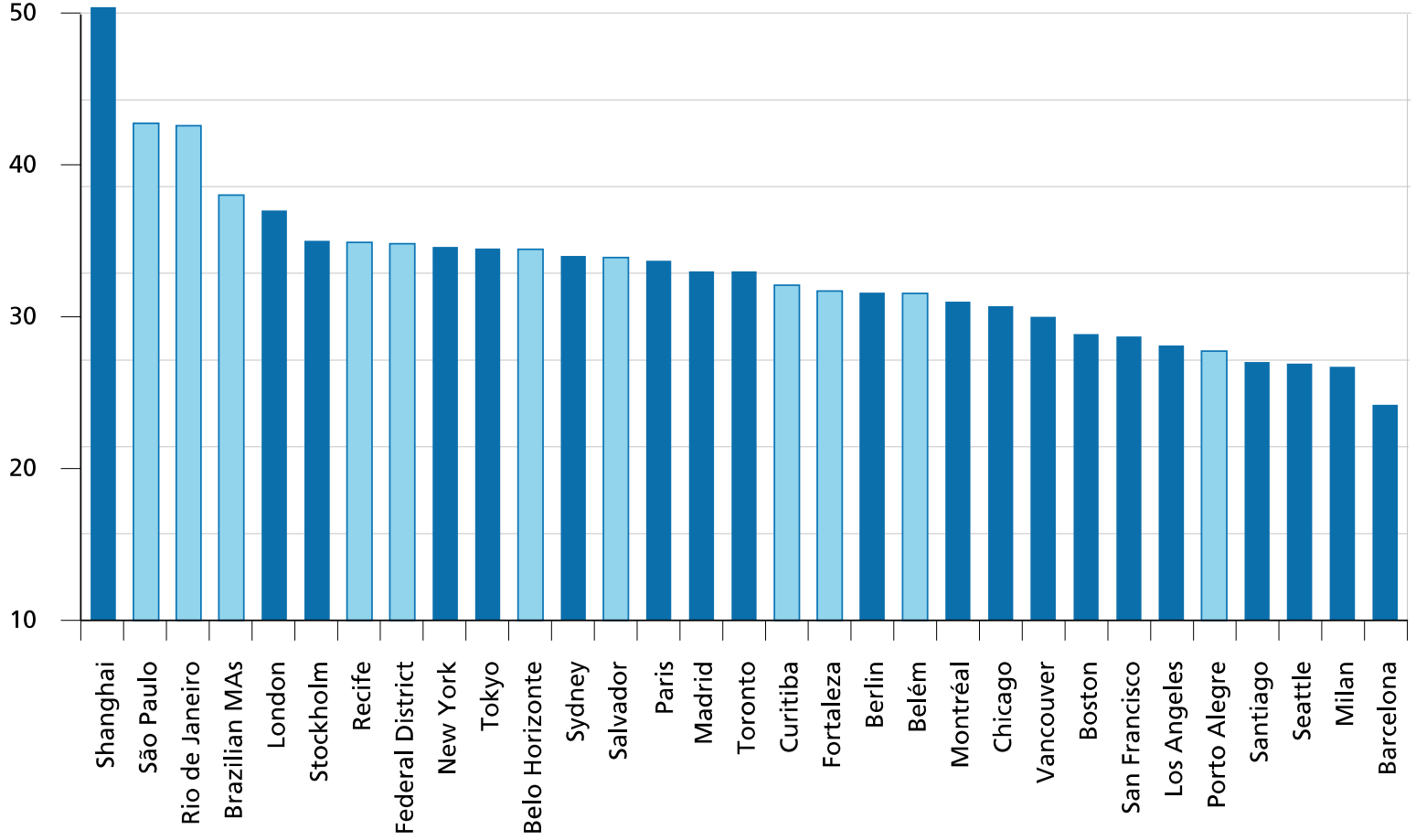


# We know it is bad…but

- Why do people still drive?

**Average time spent commuting to work in selected metropolitan areas in Brazil and other countries[1,2]**

(In minutes)




Source: Brazil - National Household Sample Survey (PNAD/IBGE); Santiago (Chile) – data available at: <http://www.sectra.gob.cl>; data from all other metropolitan areas from Toronto Board of Trade (2012).

Notes: [1] Tokyo: 2005; Santiago and Europe: 2006; Brazil: 2009; Australia, Canada, Shanghai and USA: 2010.

[2] Commute time data from Eurostat is available only at the regional level. However, the delimitation of these boundaries is not strictly defined and may vary greatly across European MAs. Data from the USA is based on Metropolitan Statistical Area.

Source: Pereira and Schwanen, 2013

# How do we do it?

- Integrate land use and transport
- Don’t focus on single corridor solutions
- Integrate, integrate, integrate
- Don’t control land prices but guide urban development
- **Know what kind of city you want!**

Source: City of Buenos Aires, 2015

# Thanks for the attention

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