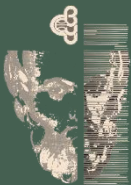


THE DEVELOPMENT OF CONTEMPORARY URBAN TRANSPORTATION IN RELATION TO URBAN STREET NETWORK

Peter Nikolov, Boryana Nozharova



Varna
Free
University

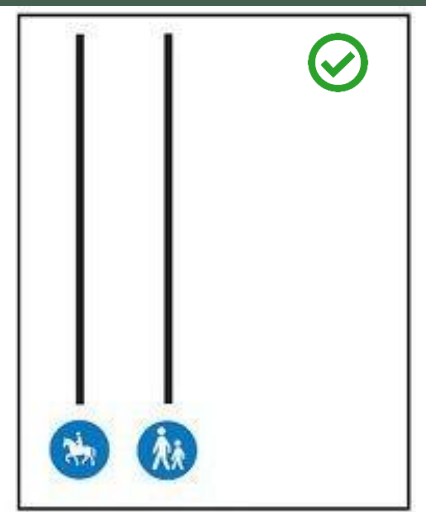


COMPLEX SYSTEM

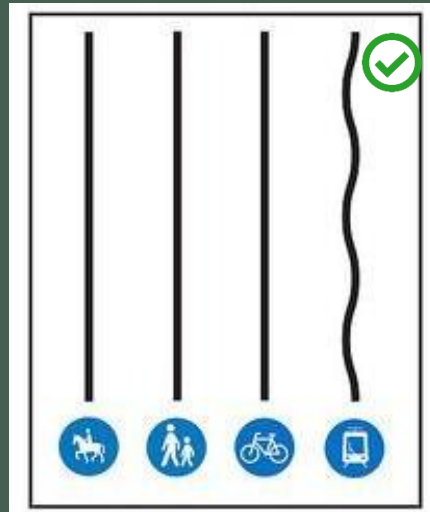
- ❖ pattern of settlements
- ❖ organization of production
- ❖ availability of infrastructure



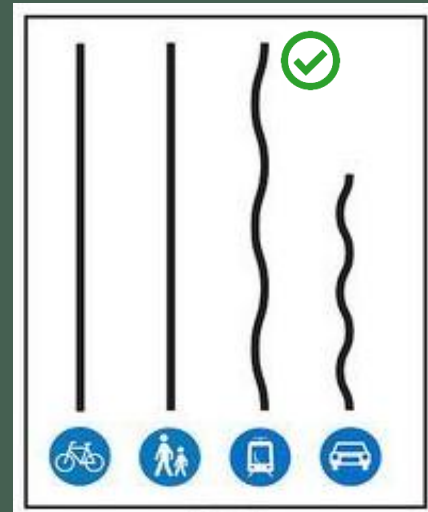
WHAT SHOULD BE THE SCALE?



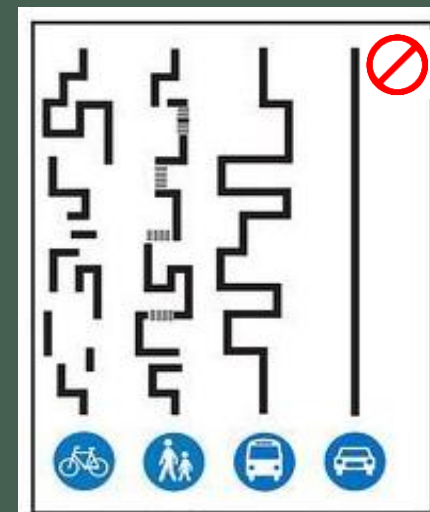
1800

100
years

1900



1920






30
years

1950



FROM THE PEDESTRIAN CITY TO XXI-ST CENTURY MOBILITY

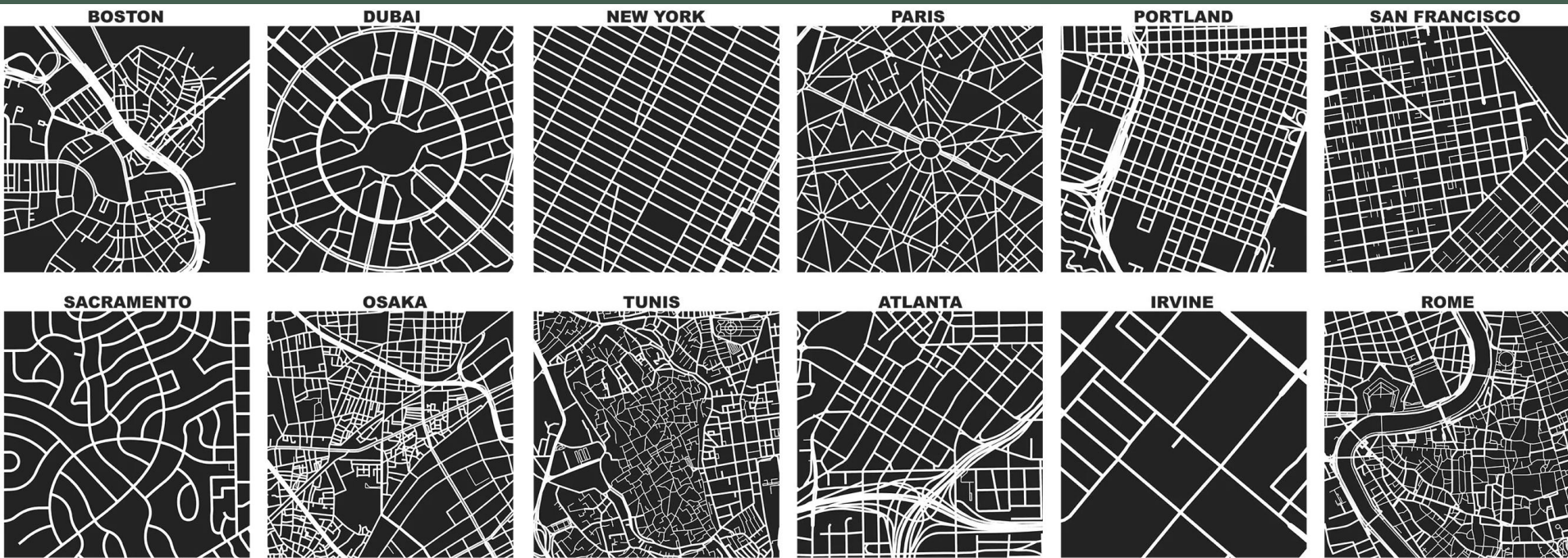
The evolution of street patterns since 1900 shows how street designs adapted to the needs of the automobile over time.

	Gridiron (c. 1900)	Fragmented Parallel (c. 1950)	Warped Parallel (c. 1960)	Loops and Lollipops (c. 1970)	Lollipops on a Stick (c. 1980)
Street Patterns					

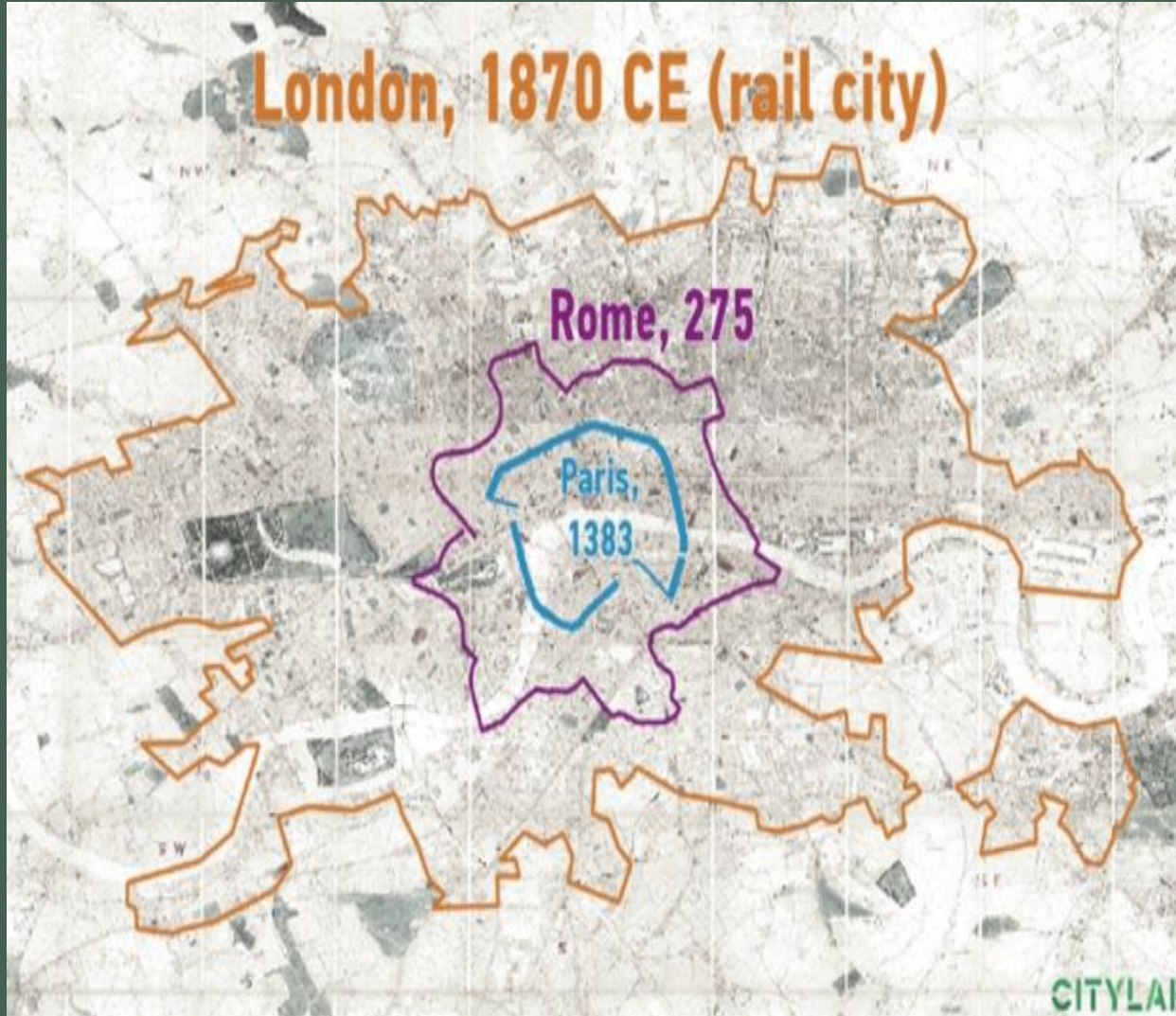
Source: Southworth, M. & E. Ben-Joseph, 2003. *Streets and the Shaping of Towns and Cities*. Washington, DC: Island Press.
 Courtesy of Michael Southworth and Peter Owens.

SQUARE-MILE NETWORK VISUALISATION

In Geoff Boeing's [Square-Mile Street Network Visualization](#), he explores different street grids at the same scale: one square mile. We can extrapolate quite a bit about the walkability of these cities from their street patterns, especially if they were built before or after the advent of the automobile.



THE CITY ON RAILS: 1840s-1950s



With the emerge of the industrial revolution transportation was no longer limited to human and animal power.

Railways enabled relatively affluent people to live away from the city, in the urban fringe, or in close located settlements.

Source: David Rumsey Historical Map Collection, CC BY-NC-SA.

Map: David Montgomery/CityLab

THE CITY ON RAILS: 1840S-1950S

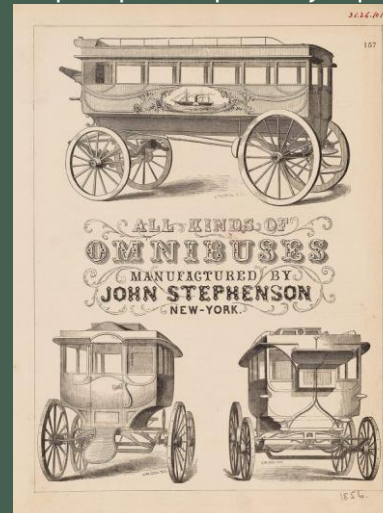
“When people who were riding inside wanted to get off the omnibus, they pulled on a little leather strap. The leather strap was connected to the ankle of the person who was driving the omnibus.”



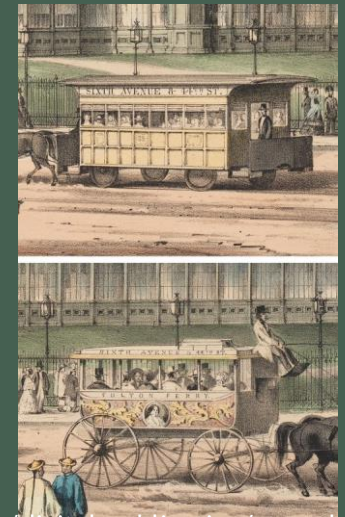
Source:
<https://ephemeralnewyork.wordpress.com/2011/10/27/manhattans-earliest-form-of-mass-transit/>



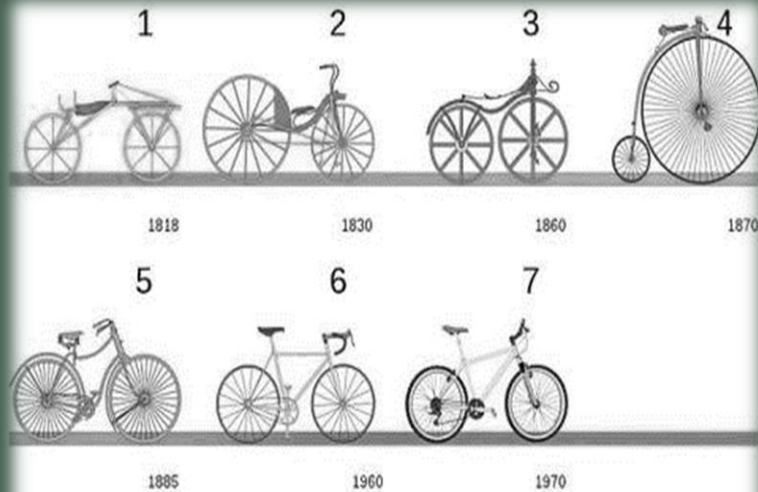
<https://philadelphiaencyclopedia.org/first-electric-trolley-2/>



<http://crystalpalace.visualizingnyc.org/digital-publication/struggle-for-the-shady-side-of-the-omnibus-public-transit-at-mid-century-and-the-new-york-crystal-palace/>

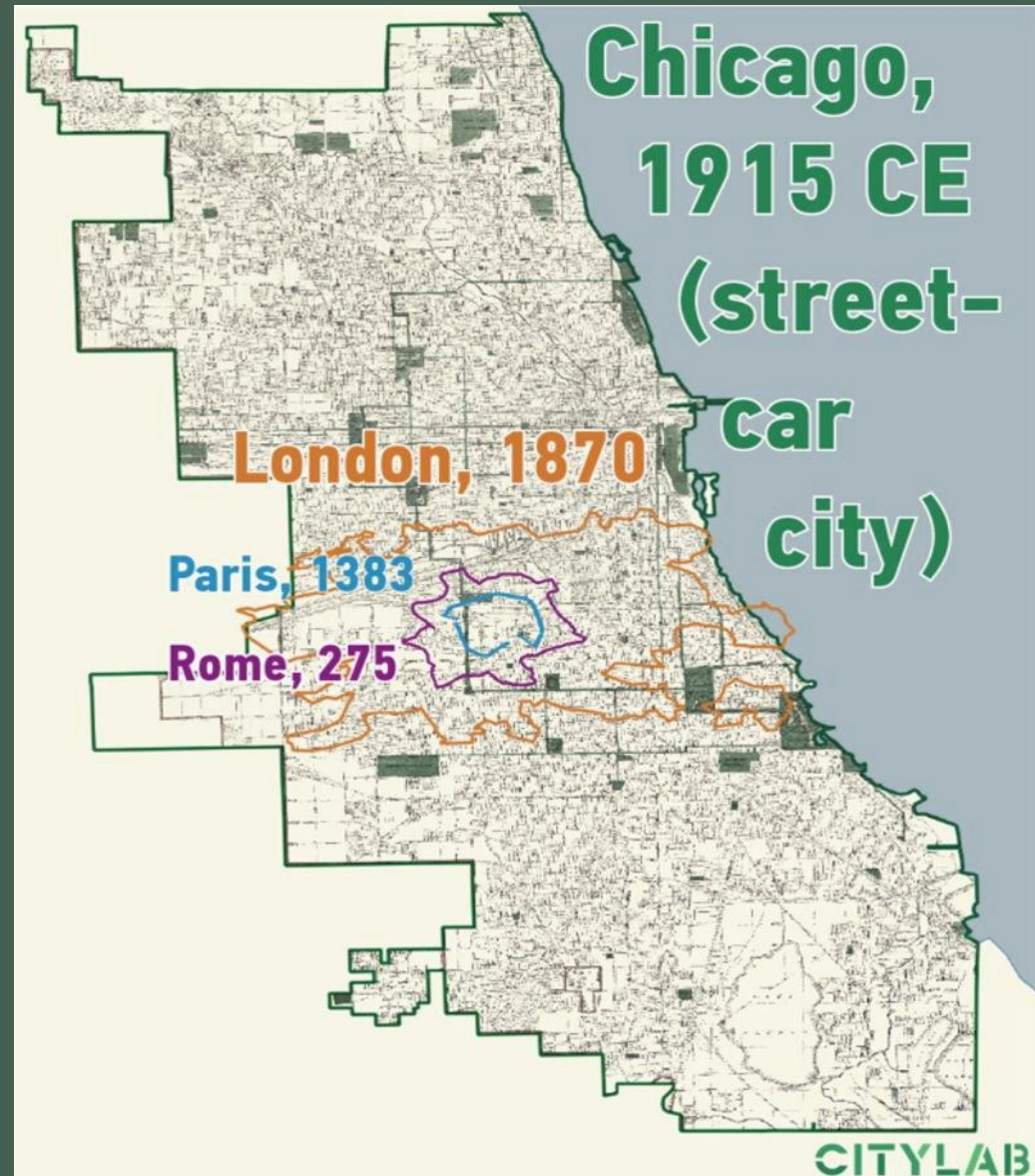


THE CITY OF BICYCLES AND STREETCARS:



Chicago: The development of a comprehensive streetcar and elevated train network allowed Chicago to grow far beyond the pre-industrial limits of cities. Middle-class people could commute on rails and live farther from their workplaces.

Source: Harvard Map Collection, Harvard College Library.
 David Montgomery/CityLab



<https://www.bloomberg.com/news/features/2019-08-29/the-commuting-principle-that-shaped-urban-history>

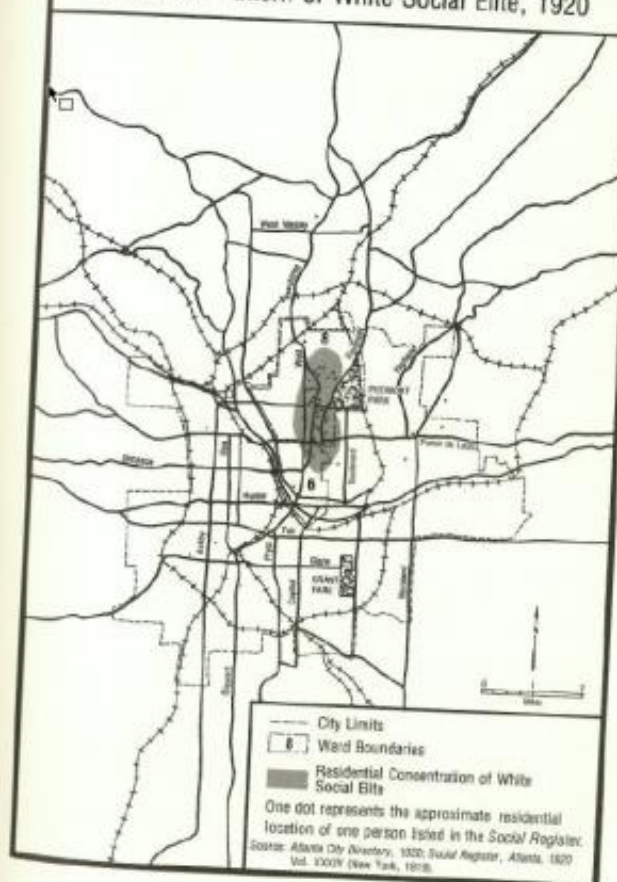


CITIES IN THE 1920'S AND 1930'S

ATLANTA
Residential Pattern of White Social Elite, 1908



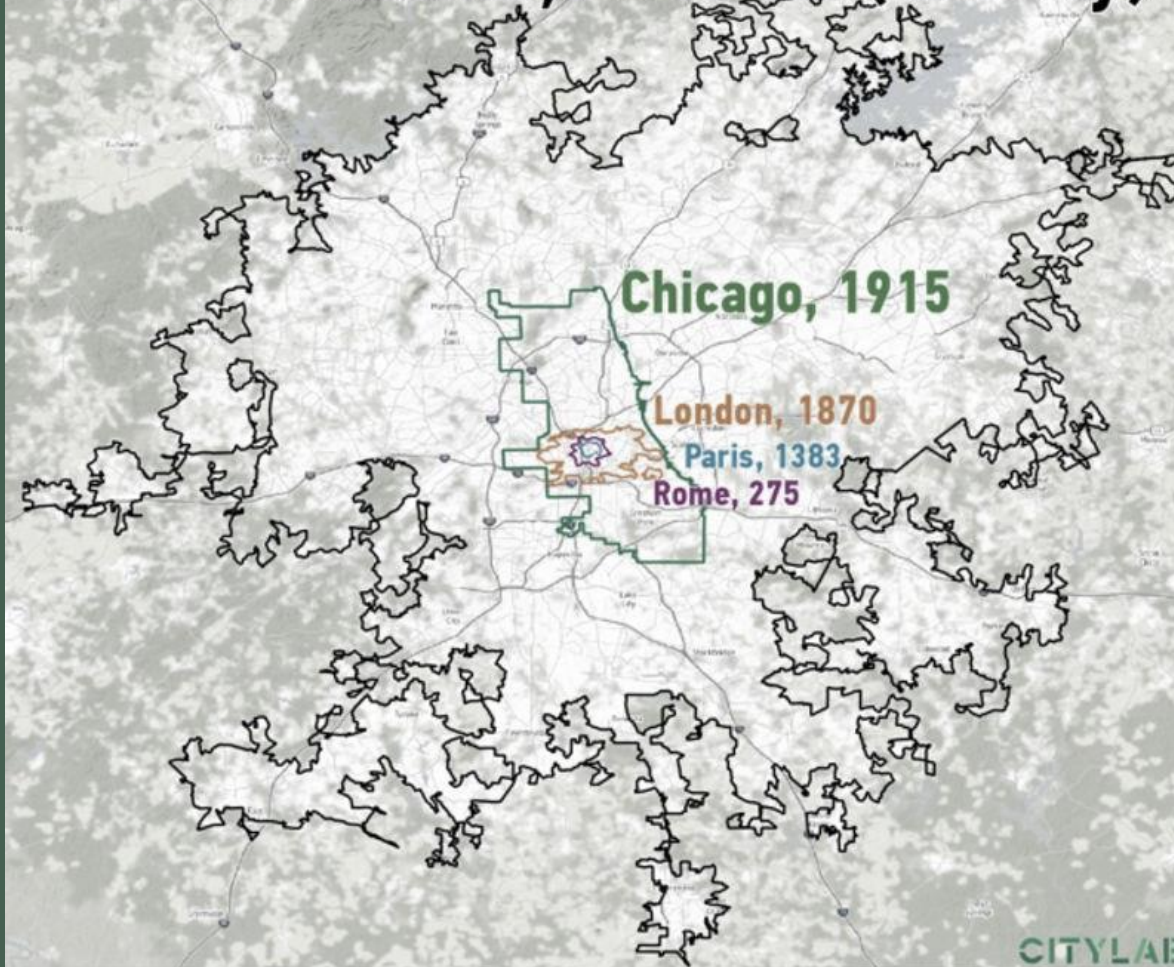
ATLANTA
Residential Pattern of White Social Elite, 1920



ATLANTA
Residential Pattern of White Social Elite, 1930



Greater Atlanta, 2010 CE (car city)

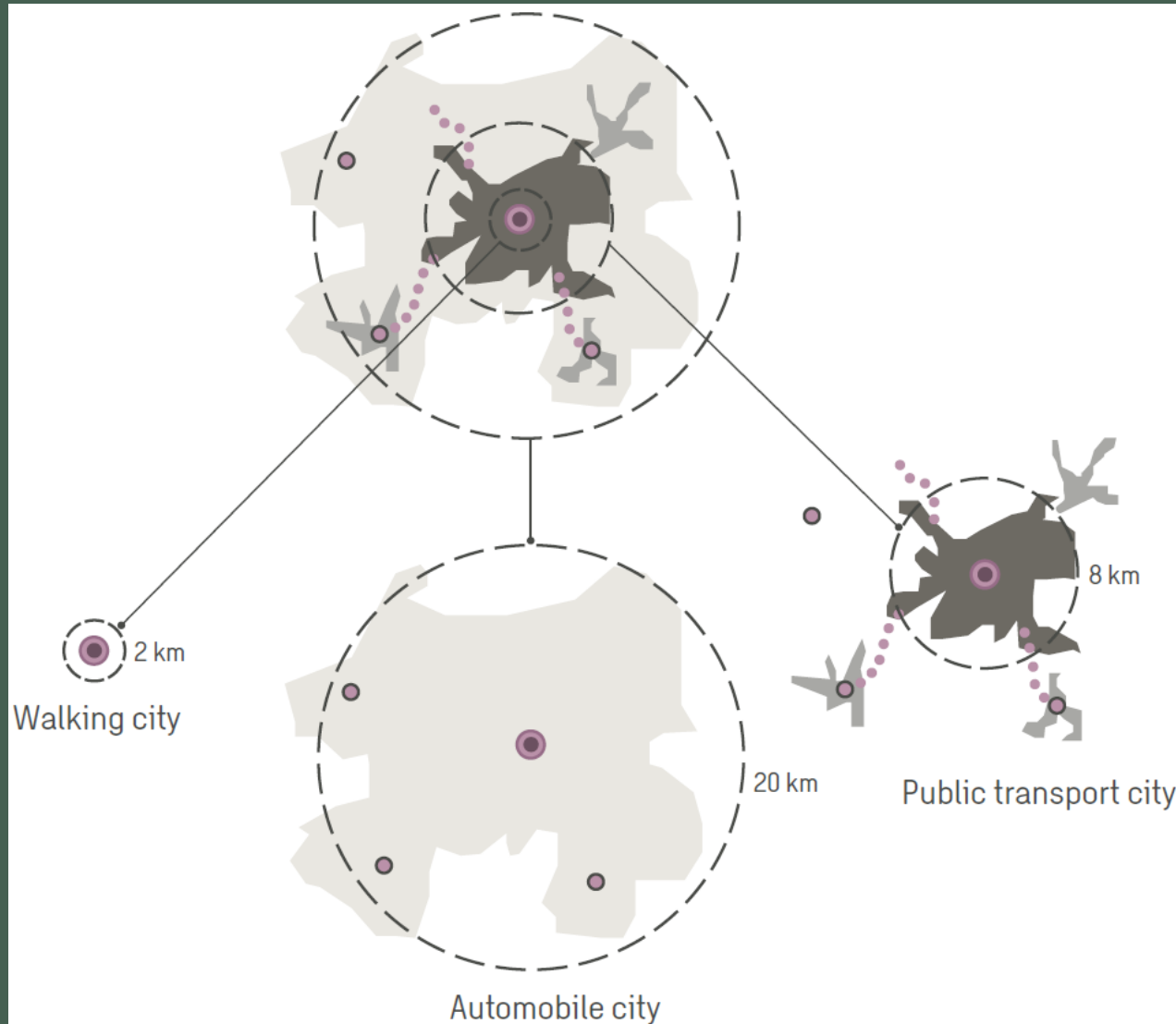


THE CASE OF ATLANTA:

The ubiquity of the automobile and an enormous government investment in expressways allowed Atlanta to disperse homes and jobs over a large area.

MAIN TRANSPORTATION MODES

	Walking city	Public transport city	Automobile city
Optimal dimensional radius	0-2 km	0-20 km;	0-40 km
Average speed	5 km/h	20 km/h	40 km/h
Land use / population density	Evenly distributed	Dense and concentrated around station areas	Dispersed, evenly distributed
Street networks	Permeable for easy access; enables good level of service for pedestrians	Permeable for pedestrians, networks to reach transit stops corridors enable good levels of transit service	Permeability less important, enables high levels of service for cars on freeways, arterials and local roads. Bus circulation often restricted by cul-de-sac road structure.
Block scale	Short blocks	Medium blocks	Large blocks
Potential level of access	Equally distributed among pedestrians	Decreases with the distance from stations	High for those with cars low for other groups, especially those with a dispersed activity pattern
Modal share	Dominated (> 80%) by walking trips	Dominated by public transport and walking trips	Dominated (> 80%) by automobile trips



Walking, public transport and automobile city, a combination of three overlapping city systems.

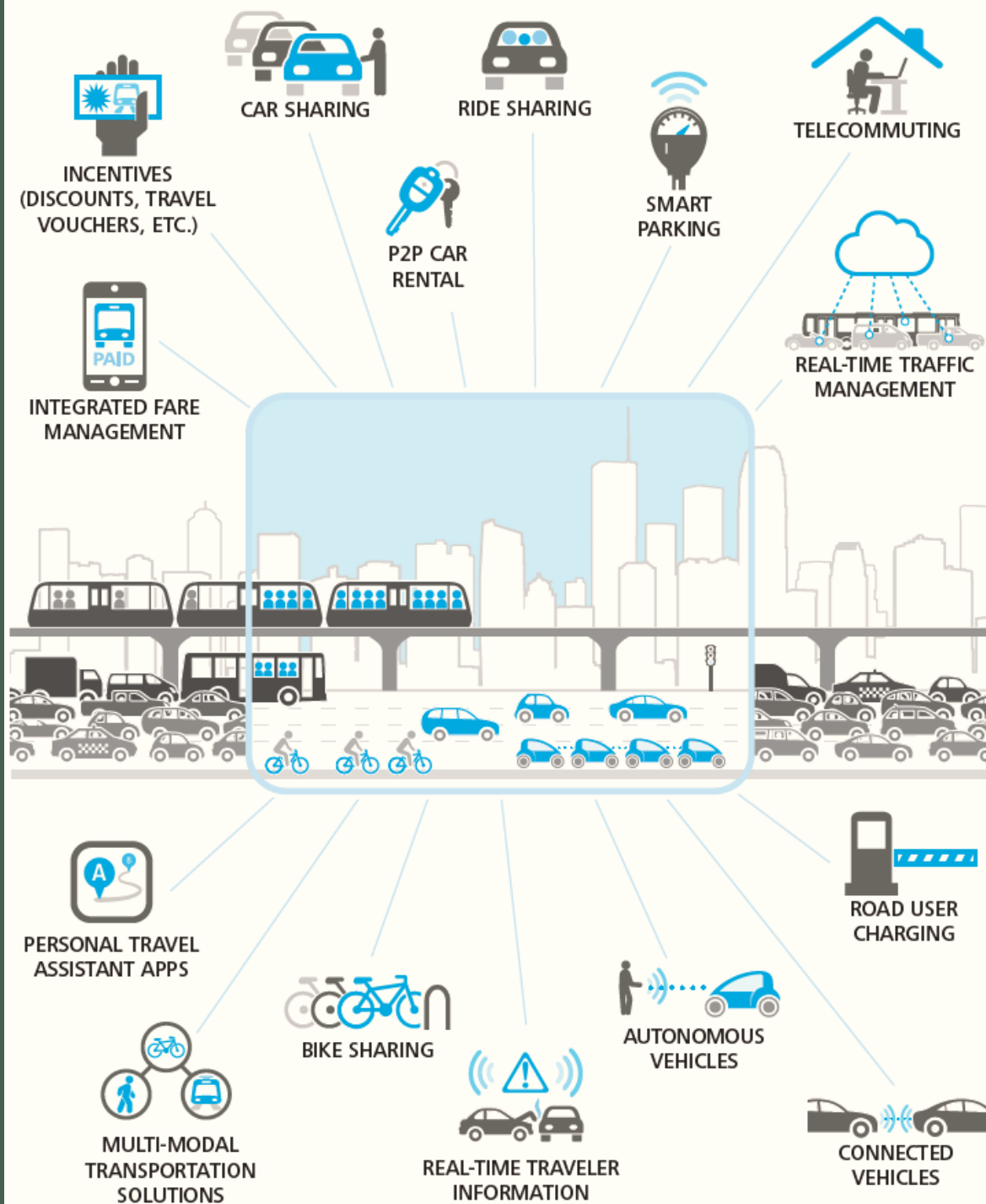


ARE PEOPLE ABLE TO PREDICT HOW TECHNOLOGIES WILL DEVELOP AND HOW WILL FUTURE TRANSPORTATION CHANGE OUR CITIES?

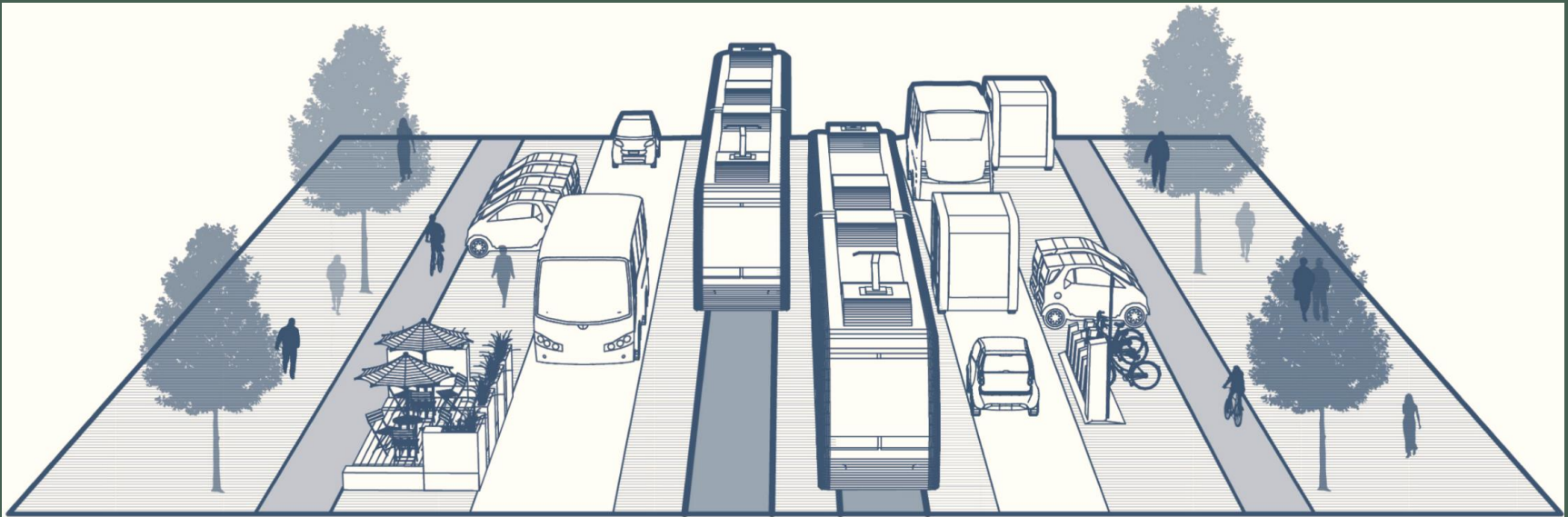




INNOVATIVE NEW WAYS TO HELP PEOPLE



FROM.....	TO.....
Individual car ownership, as predominant mean of transportation	Car ownership, as form of multimodal, on-demand, shared transport
Limited consumer choice and few service levels	More consumer choice and many service levels
Government funded public transit	Public and private transit operate in parallel
Unconnected, poor transportation systems	On - demand, connected systems using data to unleash efficiencies



Sidewalk
9,000/HR

**Protected
Bikeway**
4,000/HR

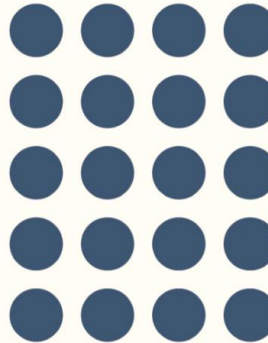
**Mixed Traffic
with frequent
microtransit**
**1,000–
2,800/HR**

**On Street
Transit lane,
Bus or Rail**
**10,000–
25,000/HR**

**Private
Autonomous
Vehicle Lane**
**600–
1,600/HR**

**Protected
Bikeway**
4,000/HR

Sidewalk
9,000/HR



TRANSFORMATIONAL SHIFTS IN URBAN TRANSPORT



THE THIRD DIMENSION

Over 15 start-ups globally that are actively involved in building a future flying car



ELECTRIFICATION

10 million cars will be either hybrid, plug-in hybrid, full electric or fuel cell EV by 2025



DIGITAL RAIL

Digital railways could enable an addition of up to 30% more trains to operate than today



MULTIFARIOUS MOBILITY



GREEN ZONING

90 sustainable cities globally will feature green transportation zones by 2025



SMART CITIES


Over \$250 billion investment globally in smart infrastructure investment



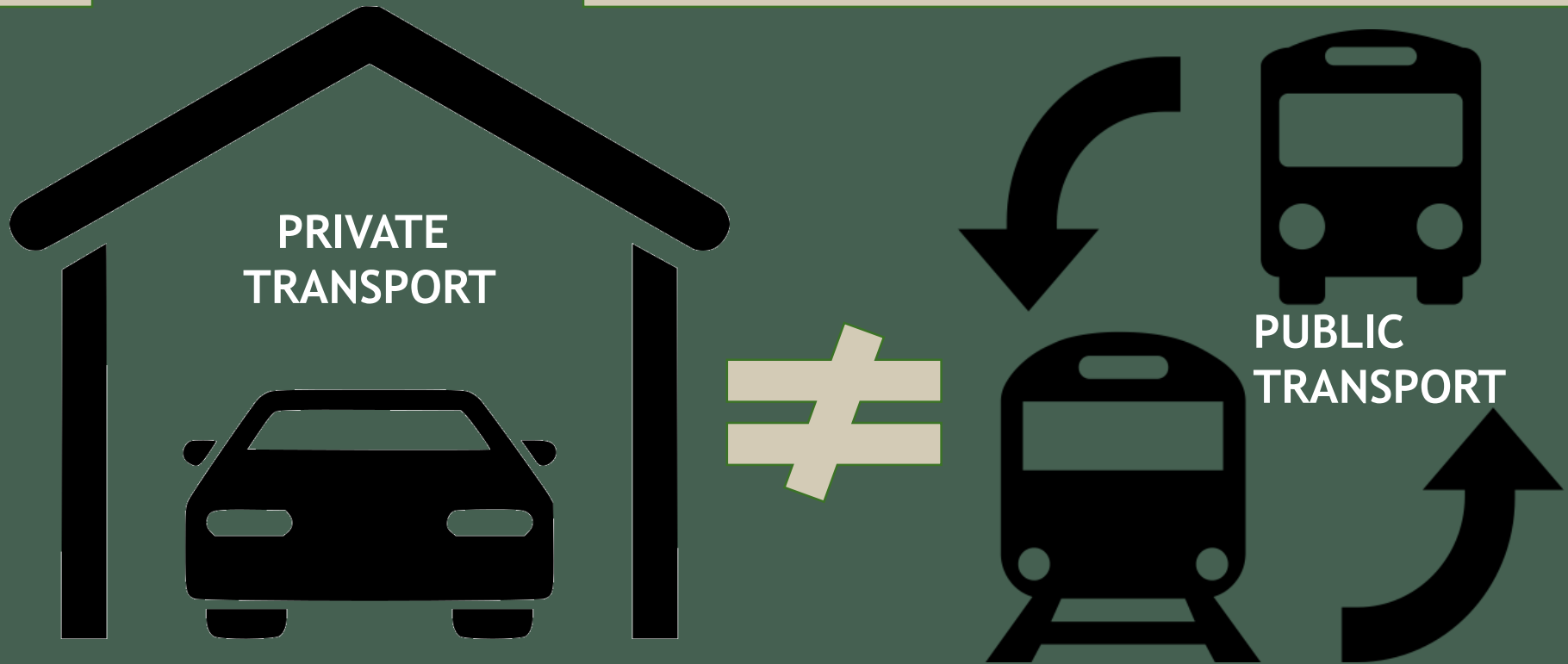


FUTURE STREETS:COMPONENTS

**Automobiles****Freight + Delivery****Ride-Hail Zones****Biking****Lighting****Scooters****Transit****Cameras****Parcel Locker****Signage****Vegetation****Digital Infrastructure****Parking****Solar Energy****Water****Electric Car Charging****Pedestrians****Street Furniture**



Conclusions



WALK - BIKE - SCOOTER - CARPOOL - BUS TO SCHOOL

2200





Varna
Free
University

THANK YOU FOR YOUR ATTENTION!

Peter Nikolov, Boryana Nozharova