Data and the State

PUBPOL 2130 / INFO 3130

Transit and Infrastructure

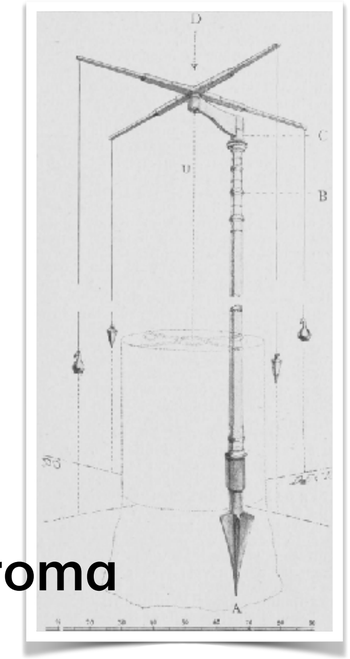
Lecture 15, Tuesday Mar 18

Announcements

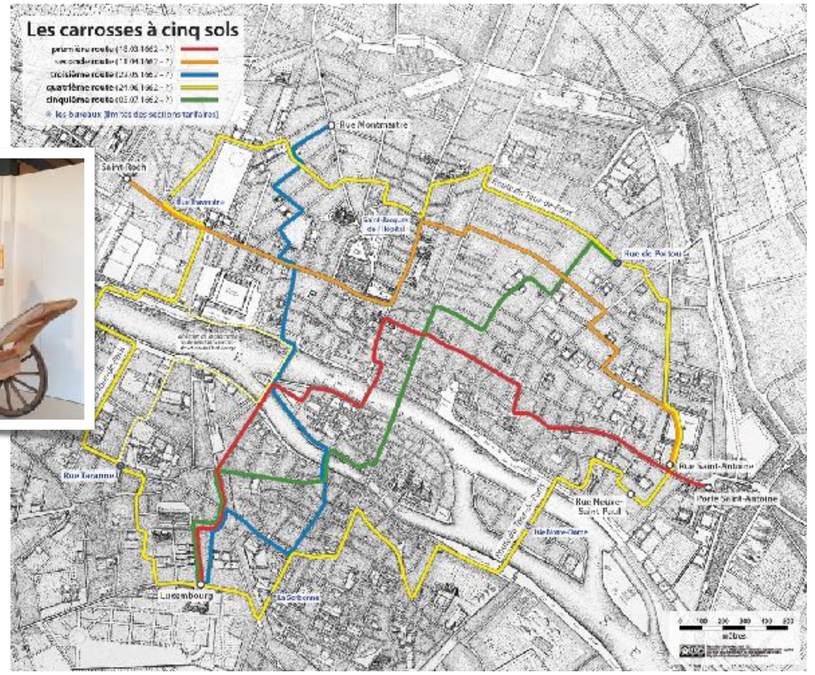
- Guest speaker **Nick Klein** (City and regional planning) this Thursday
- In-class exam Tuesday, same format. I'll distribute practice problems today.
    - Weapons (SIPRI papers, graphs, flows, commensurating units)
    - Elections (Rodden, precincts, spatial data transfer/MAUP)
    - Migration (Moretti, ACS and PUMS, drivers of migration, microdata)
    - Organs (Healy, STAR/OPTN, out-of-sequence allocation, integer programs)
    - Transit (Shoup, isochrones, tragedy of the commons, infrastructure, OSMnx, networks)
- How to study? Review notes and slides, review readings (*on paper?*), review notebooks and make sure you see how some of the key code blocks work
- **Review session?**

Mass transit

- **Roman road network** required substantial engineering and planning (materials, drainage, milestones, specialized surveying tools, labor force)
- 1662 Paris **carosses à cinq sols** (“five-cent coaches”) — public access to horse-drawn carriages riding on planned routes
- proposed by mathematician/philosopher Blaise Pascal in 1661 — Paris was 2nd largest metro in the world, still with medieval city planning
- innovative idea: transit as a policy problem



groma



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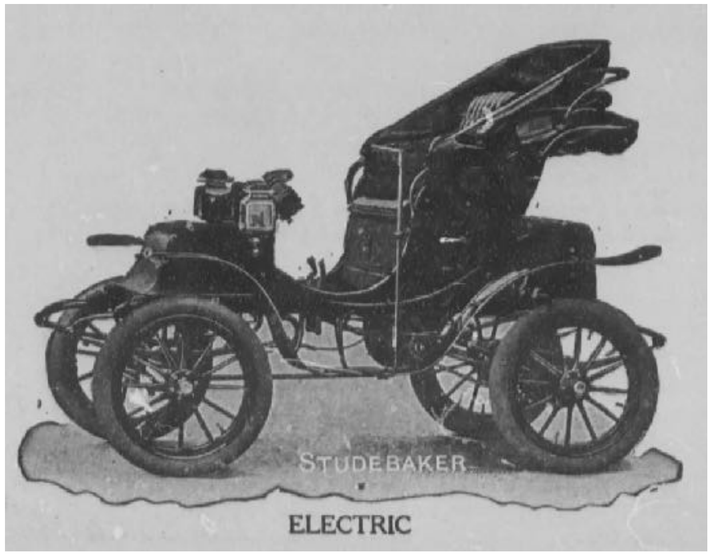
19th century explosion

- **omnibuses** (larger coaches on fixed routes)
- **streetcars** (still horse-drawn, now on tracks)
- **railways** (steam trains for long-distance travel, U.S. and Europe)
- **subways** (underground, starting London 1863 - still steam!)

Rapid Transit in 1877 - First Horse Car run in Manchester

Engines and personal transit

- internal combustion engine around 1900
    - automotive **buses** 1910s
    - rise of the **cars** 1950s—present. Leads to massive highway expansion, dividing cities and killing neighborhoods.
- **high-speed rail** — Japan introduces Shinkansen 1964
- subway expansions 1970s
- “smart transit” — contactless payment, electric fleets



Subway systems

	City	Country	Name	Service opened	Last expanded	Stations	Lines	System length	Annual ridership (millions)
1	Shanghai	China	Shanghai Metro	1993[125]	2024[126]	409[Nb 27]	19	808 km (502 mi)[127][Nb 28]	3,647.6 (2023)[R 19][Nb 29]
2	Beijing	China	Beijing Subway[72]	1971[Nb 12]	2025[73]	424[Nb 13]	29	879 km (546 mi)[74][Nb 14]	3,445.7 (2023)[R 19][Nb 15]
3	Guangzhou	China	Guangzhou Metro[Nb 22][Nb 21]	1997	2024[89]	276[Nb 23]	15[Nb 24][Nb 21]	705.28 km (438.24 mi)[90]	3,128.9 (2023)[R 19]
4	Shenzhen	China	Shenzhen Metro	2004	2024[130]	319[Nb 30]	16	583.35 km (362.48 mi)	2,705.3 (2023)[R 19]
5	Seoul	South Korea	Seoul Metropolitan Subway[Nb 61][Nb 62]	1974[322]	2022[323]	337[324]	11[324]	358.46 km (222.74 mi)[324][Nb 62]	2,403 (2022)[R 72][R Nb 20][R Nb 21]
6	Tokyo	Japan	Tokyo Metro	1927[307]	2020[308]	142[309]	9	195.1 km (121.2 mi)[310]	2,380 (2023[Nb 44])[R 65][R Nb 18]
7	Moscow	Russia	Moscow Metro[356]	1935	2024	235[Nb 78]	16	525.8 km (326.7 mi)	2,288.5 (2023)[357]
8	Chengdu	China	Chengdu Metro	2010	2024[80]	296[Nb 19]	13	632.84 km (393.23 mi)[81]	2,109.2 (2023)[R 19]
9	Delhi	India	Delhi Metro	2002[220]	2025[221]	232[Nb 45]	10	350.71 km (217.92 mi)[Nb 46][222]	2,032 (2023[Nb 44])[R 39]
10	New York City	United States	New York City Subway	1904[426][Nb 97]	2017[427]	423[Nb 98]	28	399 km (248 mi)[428]	2,027.3 (2023)[R 111][R Nb 3]
11	Hong Kong	China	Mass Transit Railway	1979[Nb 26]	2022	99[101]	10	174.7 km (108.6 mi)[102]	1,770 (2024)[R 20][R 21][R Nb 6]
12	Hangzhou	China	Hangzhou Metro[93]	2012	2025[94]	254[Nb 25]	12	516.2 km (320.8 mi)[95]	1,469.76 (2024)[R 19]
13	Cairo	Egypt	Cairo Metro	1987[159][Nb 37]	2024[160]	84[159][Nb 37]	3	106.8 km (66.4 mi)[161][162][163]	1460.0 (2023)[164]
14	Chongqing	China	Chongqing Rail Transit	2004	2025	263[Nb 20]	12	560.04 km (347.99 mi)[82]	1,456.94 (2024)[R 19]
15	Wuhan	China	Wuhan Metro	2004	2024[140]	312[Nb 31]	12	518.1 km (321.9 mi)[140]	1,455.61 (2024)[R 19]
16	Paris	France	Paris Métro	1900[175]	2025[176]	321[Nb 39][177]	16	245.6 km (152.6 mi)[178]	1,411.46 (2023)[R 28][R 29][R Nb 7]
17	Xi'an	China	Xi'an Metro	2011	2024[145]	232[Nb 32]	12	402.3 km (250.0 mi)[R 19][Nb 33]	1,399.02 (2024)[R 19]
18	São Paulo	Brazil	São Paulo Metro[Nb 9]	1974[52]	2021[53]	89[53]	6	104.4 km (64.9 mi)[53]	1,196.5 (2023)[R 15]
19	Singapore	Singapore	Mass Rapid Transit	1987	2024 [366]	142[367]	6	242.6 km (150.7 mi)	1,183.7 (2023)[R 89][R Nb 24]
20	London	United Kingdom	London Underground[409]	1863[1][Nb 90]	2021[1]	272[410]	11	402 km (250 mi)[410]	1,181 (2023)[Nb 44][R 109][R Nb 27]

China: 14 of top 20 by length

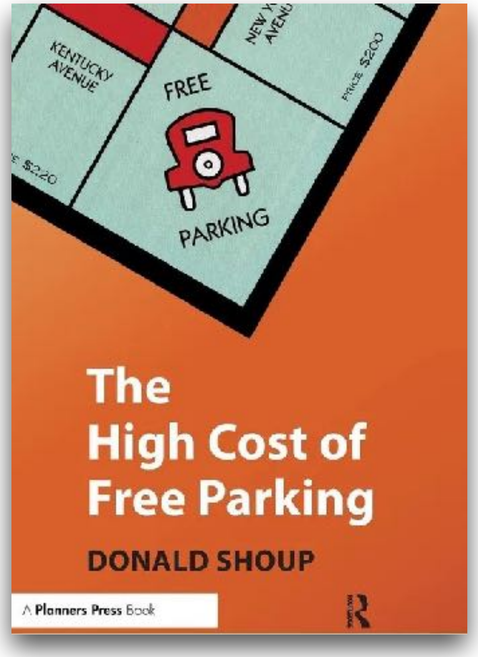
China: 10 of top 20 by ridership

Top U.S. subway cities by ridership:

- New York
- D.C.
- San Francisco
- Chicago
- Atlanta
- Boston
- Philadelphia

Shoup

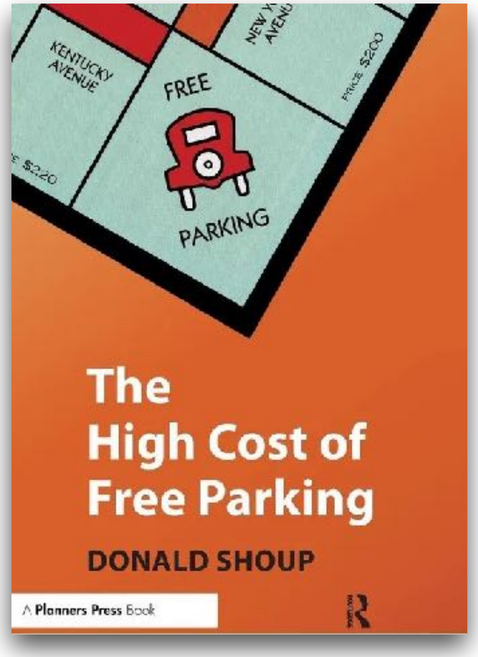
- Donald Shoup, engineer and urban planner at UCLA, died just last month (Feb 2025; see **NYT obit**)
- "The Twenty-First Century Parking Problem": free parking and the tragedy of the commons
- Aristotle: "What is common to the greatest number has the least care bestowed upon it. Every one thinks chiefly of his own, hardly at all of the common interest."
- ***Tragedy of the commons*** coined by ecologist Garret Hardin 1968, arguing that "mutual coercion, mutually agreed upon" would be necessary to lower the birthrate
- Analogy to medicine and lead treatments (the do-something problem)



2005

Shoup

- Vehicle ownership rates near **800** cars per 1000 people in United States in 2000 (update: 860 by 2020)
    - China's car ownership exploding — per 1000 people, has grown from approx. 2 (1980) to 6 (1990) to 16 (2000) to 58 (2010) to **210** (2020)
    - this is roughly exponential growth, tripling every 10 years
- Transport systems have vehicles, rights-of-way, terminal capacity
- All transit generates public burden
- NYC 1900 had 2.5 million pounds of **horse manure** on the streets every day!



2005

Planning for parking

- **Parking meters** attempt a market solution
- American cars are parked 95% of the time, and there's a strong expectation for free parking
- This creates requirements for developers and loses a lot of land area to lots
- Cruising for parking generates immense policy costs, all passed on to consumers in prices
- "Free parking is an invitation to drive wherever we go."
- "**Poleodomogenic**" problems — caused by city planners

Stuart Cohen, Transportation and Land Use Coalition

Shoup's argument:

We need evidence- and data-based planning, just as we need evidence-based medicine

Commuting data

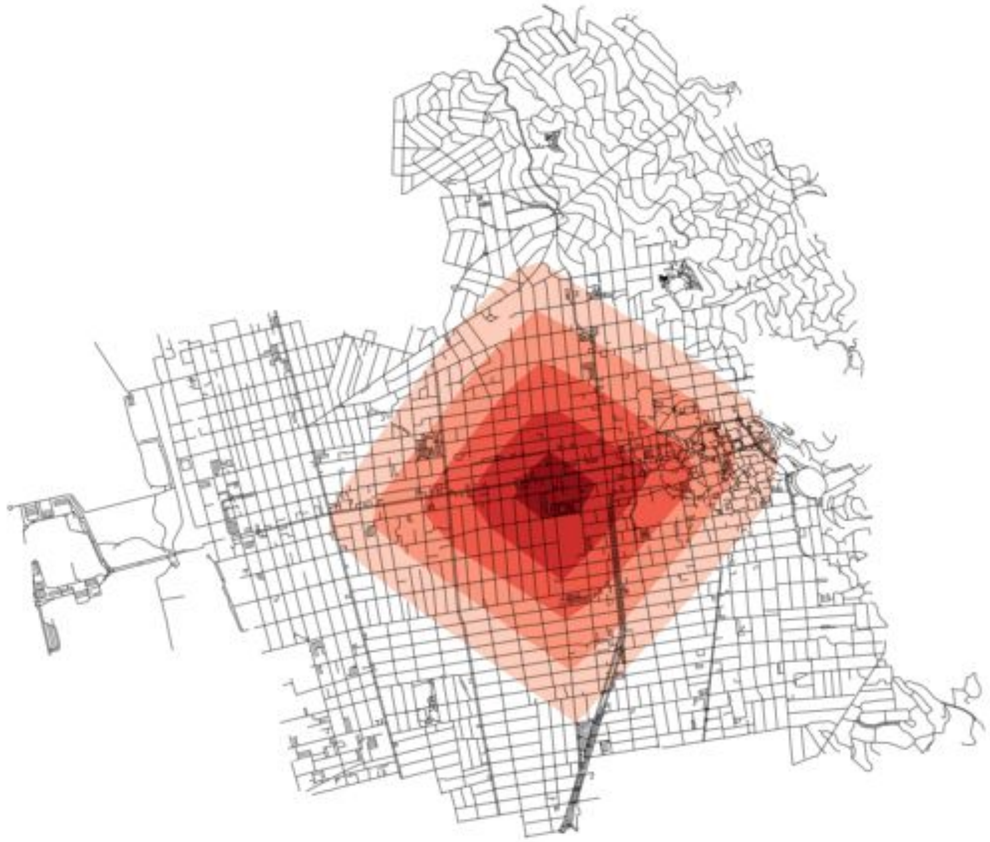
- How do Americans commute to work according to ACS?

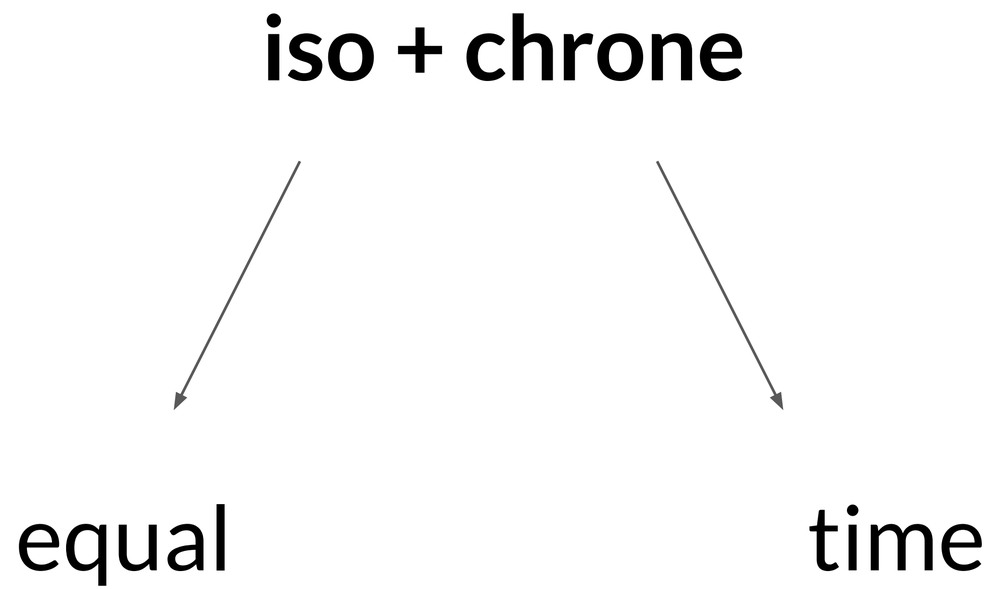
	Drive alone 	Carpool 	Public transit 	Walk 	Bike 	Taxi, Motorcycle, Other 	Work from home 
2013	76.4%	9.4%	5.2%	2.8%	0.6%	1.6%	4.0%
2023	69.2%	8.6%	3.5%	2.5%	0.5%	1.2%	13.8%

Isochrones

PUBPOL 2130 / INFO 3130
March 17th, 2025
Jennah Gosciak

What are isochrones?



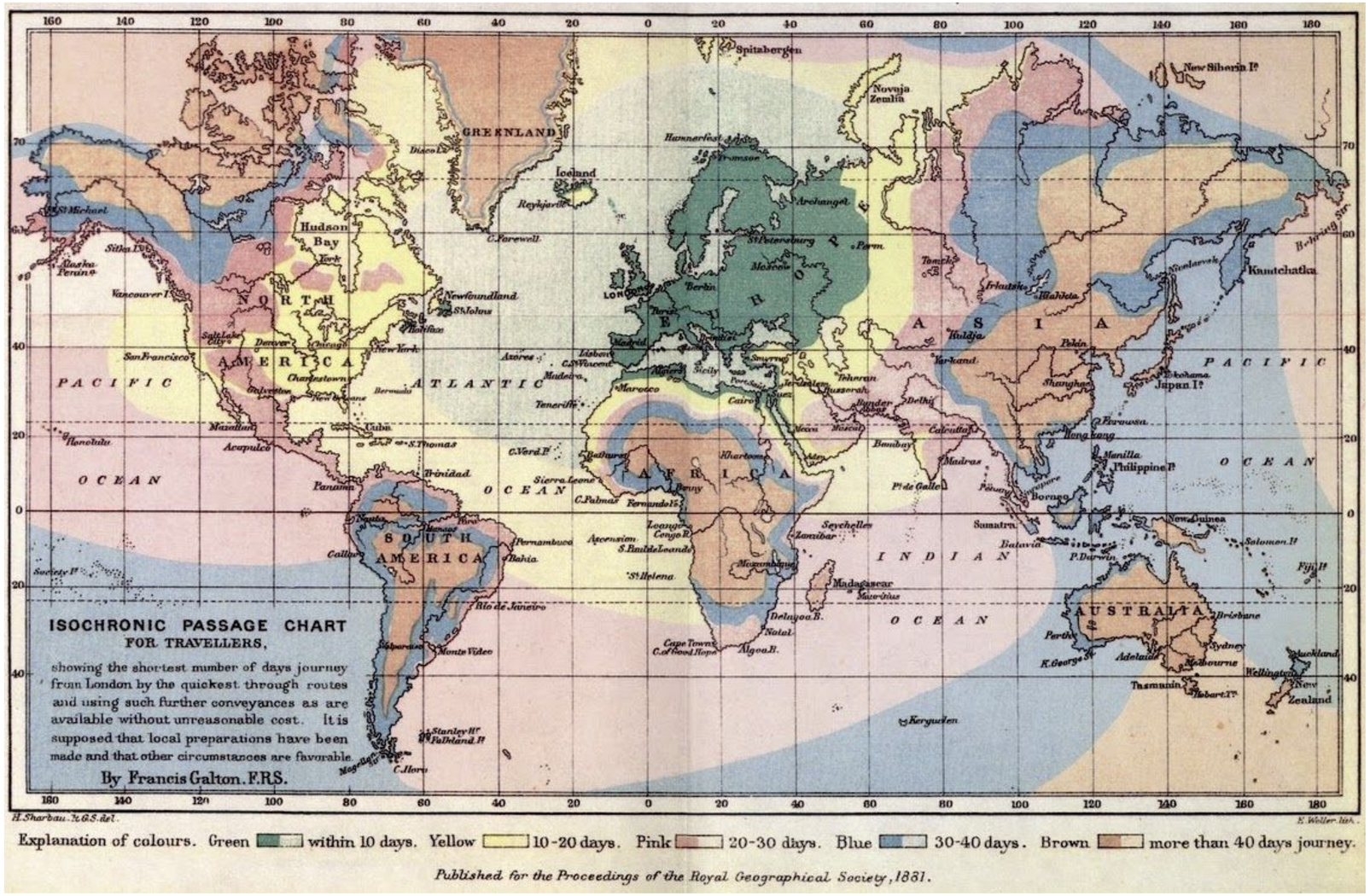

iso + chrone
equal
time

History

Created by Francis Galton to study travel from London

Used:

- Time tables
- Average postal time
- Private information
- Past voyages



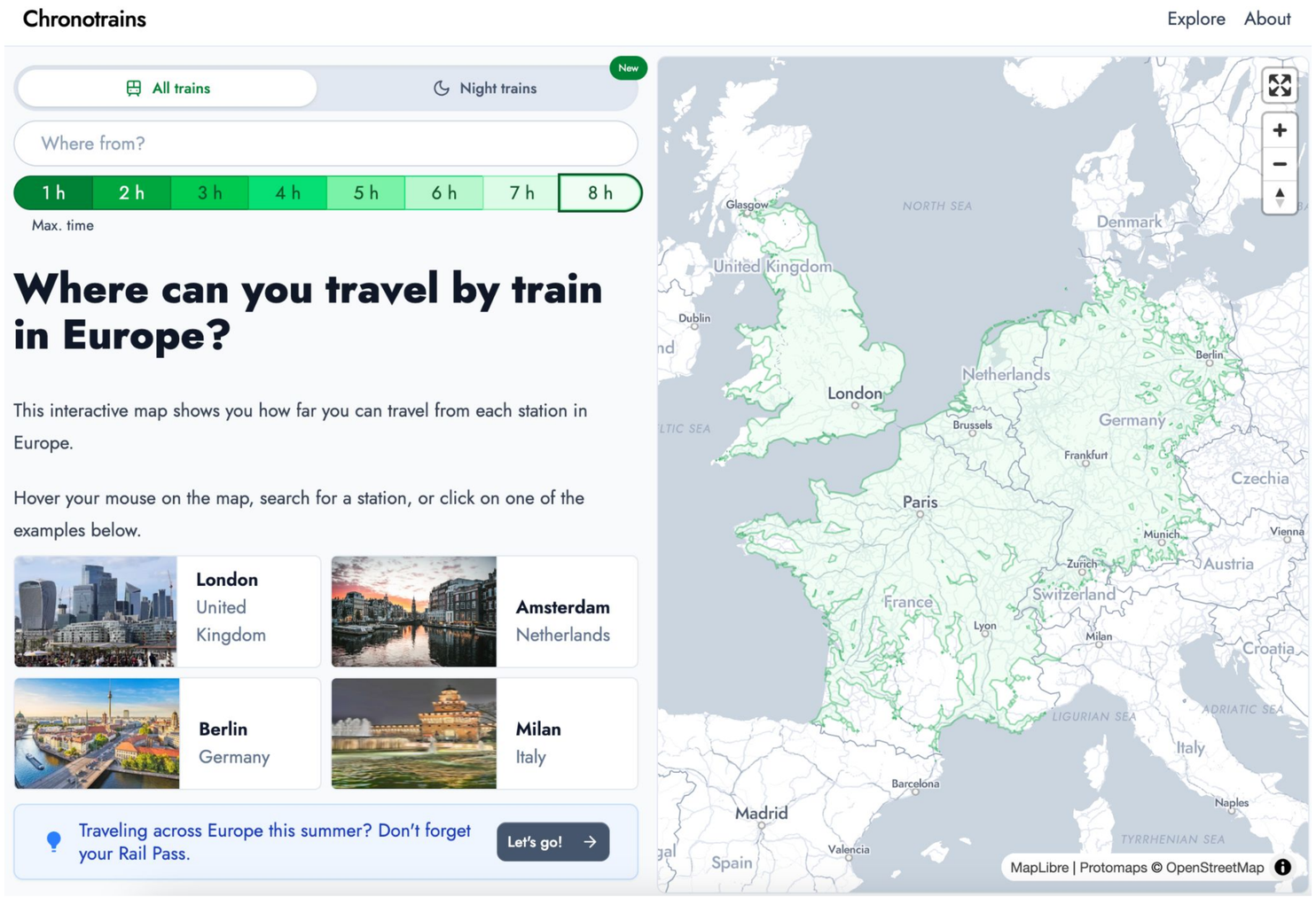
Use cases today

- Site selection
- Service coverage
- Assessing and improving transit
- Business decisions (e.g., estimating reach)

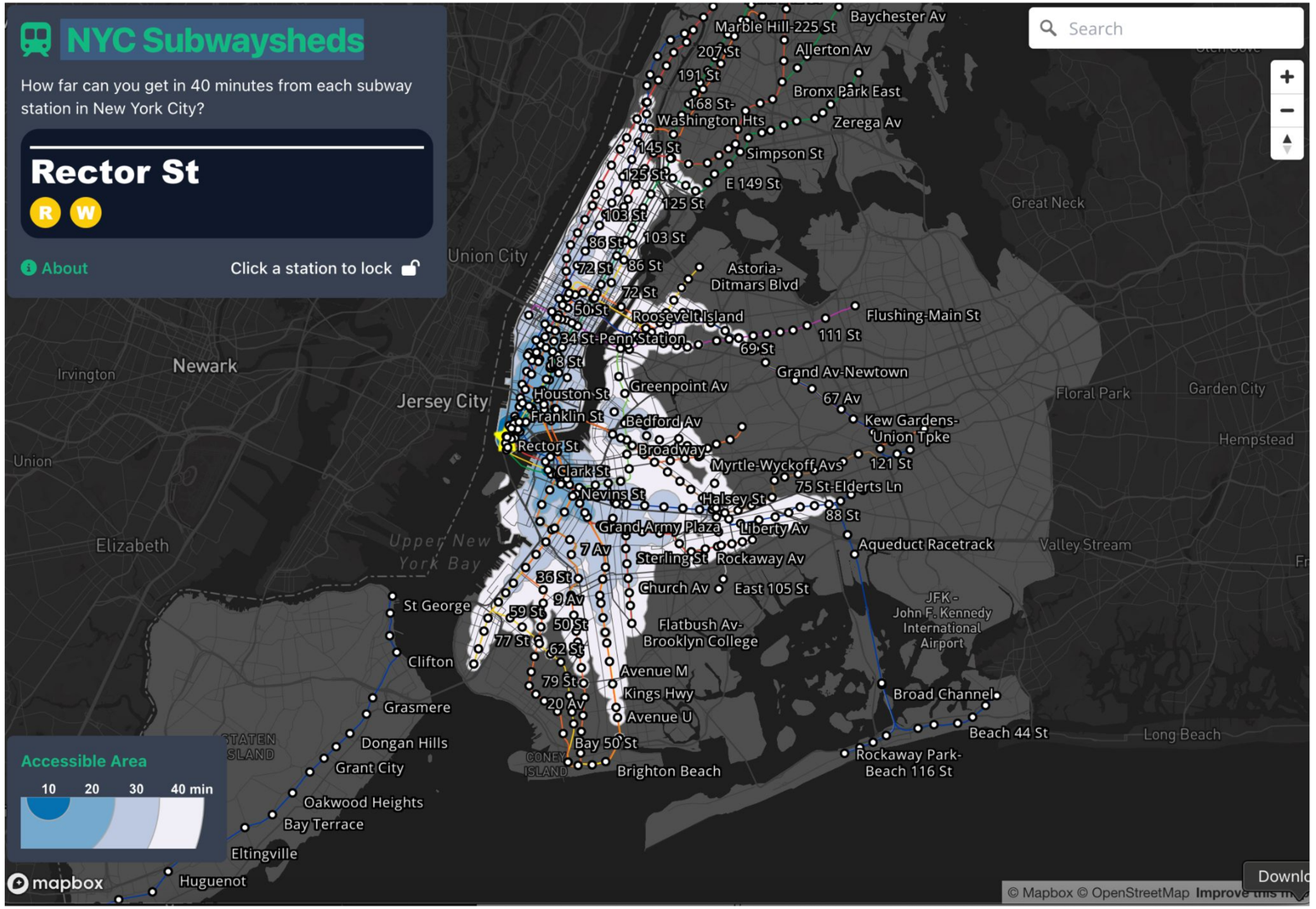
Use cases today

- Site selection
  - *Where should I locate a new store?*
- Service coverage
  - *How much of the area will a new hospital serve?*
- Assessing and improving transit
  - Identifying areas that need greater transit connectivity
- Business decisions (e.g., estimating reach)
  - Advertising, supply chain planning, predicting customer interactions, etc.

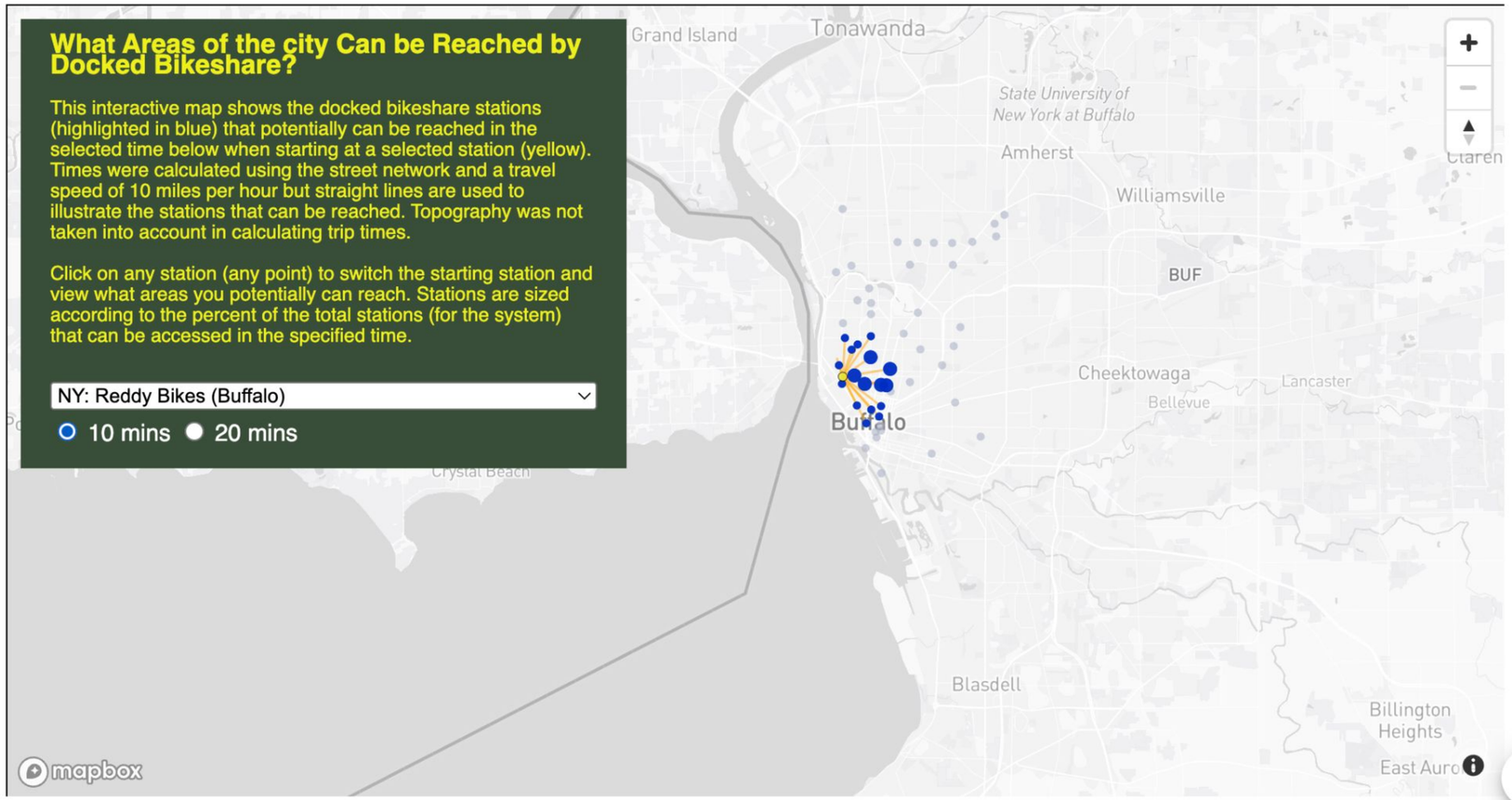
Chronetrains



NYC Subwaysheds



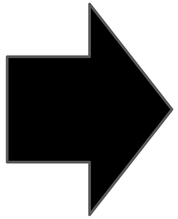
Bike Share (Bureau of Transportation Statistics)



Note: The map may take some time to load. If the map does not load after an extended period of time, try refreshing the page.

Walk to a Park Initiative

1 in 3 U.S. Residents
do not live within a
10-minute walk of a park or
green space



Goal: 85% of New
Yorkers to live
within walking
distance of a park

Walk to a Park Initiative