

How Major Cities around the World are Sustaining the Transit Services to the Growing Passengers

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CONTENT

- Population growth
- Transit in major cities
- Ridership demand growth
- Network capacity limitations
- Solutions
- Best practices

TOKYO



HONG KONG



BEIJING



PARIS



MOSCOW



NEW YORK



LONDON



TORONTO



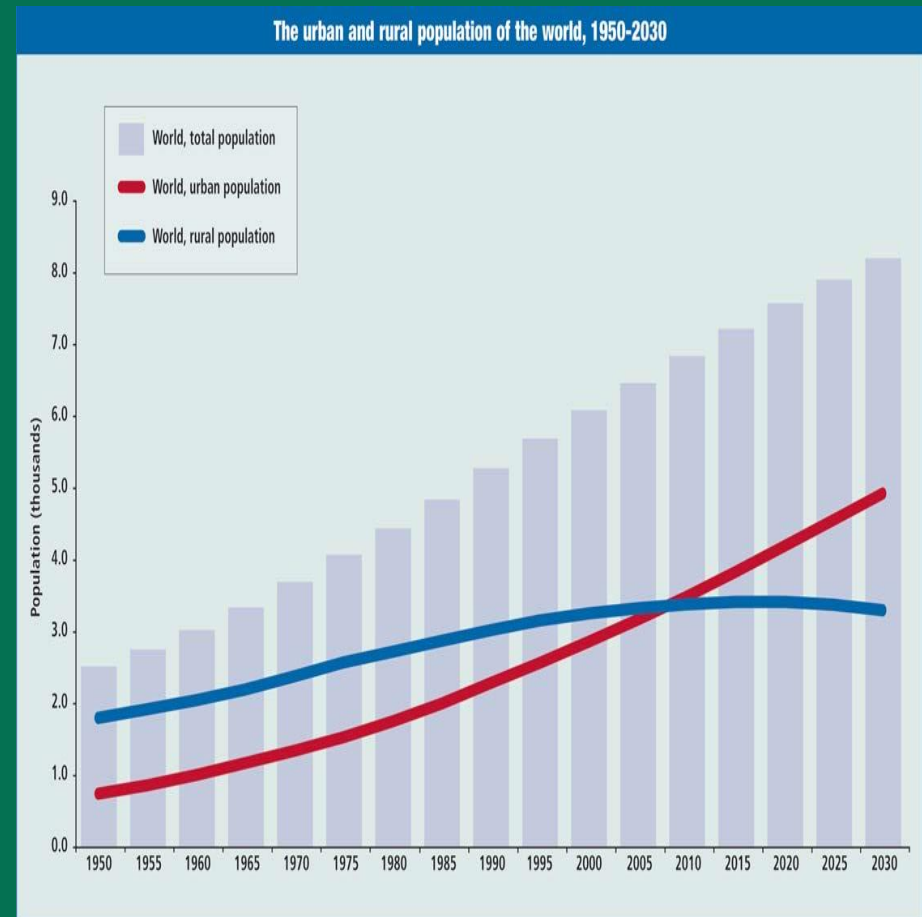
GLOBAL RIDERSHIP

- 160 million passengers/day
- 50 billion/year
- 7.9% increase 2012-2015



UN PROJECTIONS - 2030

- World population over 8 billion
- Rural population to decline
- Urban population 4.9 billion (~60%)
- Average growth 1.7% / year



URBAN POPULATION GROWTH

TABLE 2. TOTAL, URBAN AND RURAL POPULATION BY MAJOR AREA, SELECTED PERIODS, 1950-2030

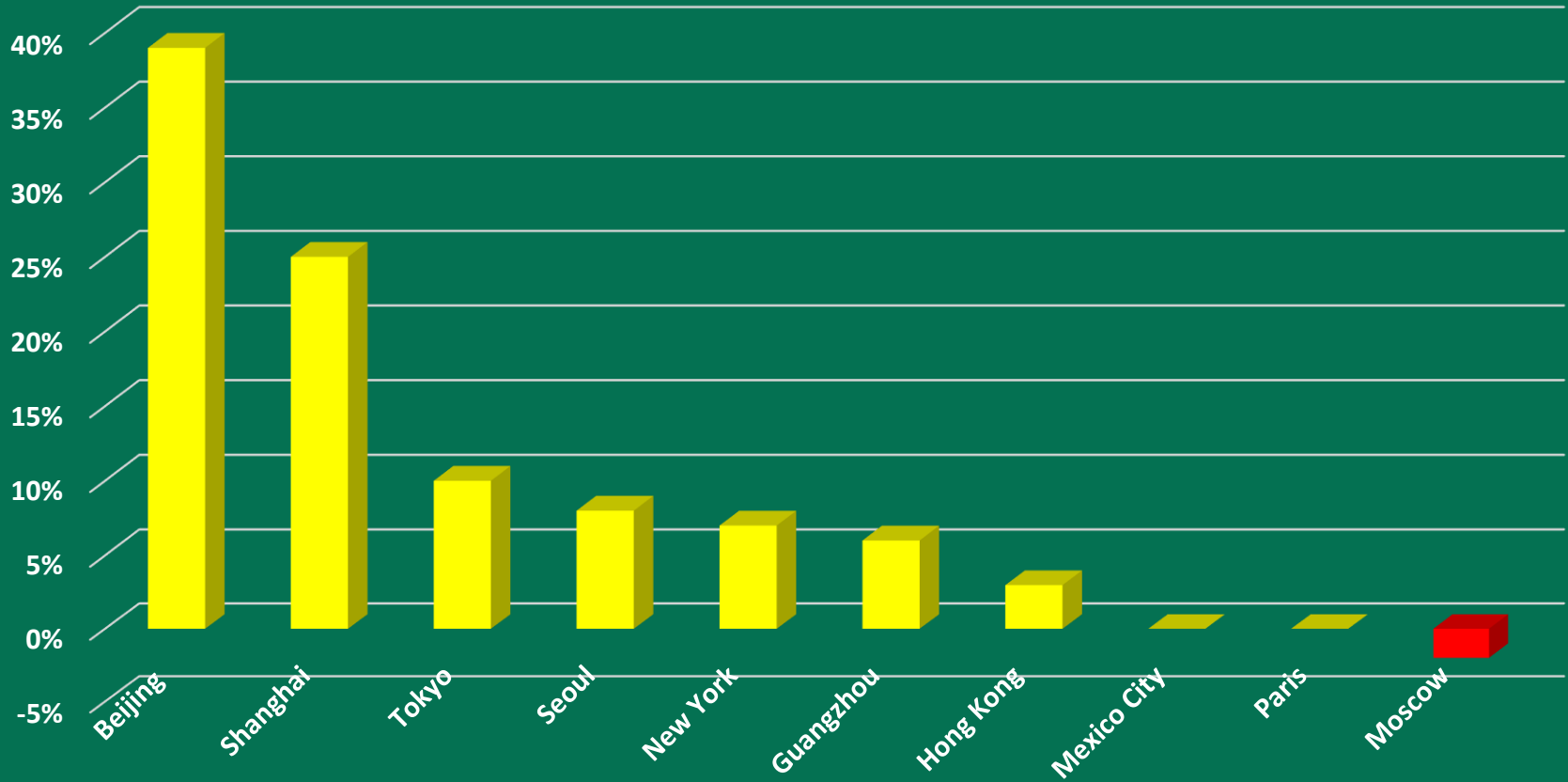
Major area	Population (millions)					Average annual rate of change (percentage)	
	1950	1975	2000	2005	2030	1950-2005	2005-2030
Urban population							
Africa	33	105	294	347	742	4.29	3.04
Asia	234	575	1 363	1 553	2 637	3.44	2.12
Europe	277	443	522	526	546	1.17	0.16
Latin America and the Caribbean.....	70	197	394	434	609	3.31	1.35
Northern America.....	110	180	249	267	347	1.62	1.05
Oceania.....	8	15	22	23	31	1.96	1.18

- Europe 0.16%
- North America 1.05%
- Asia 2.12%

• Is the ridership growth proportional?

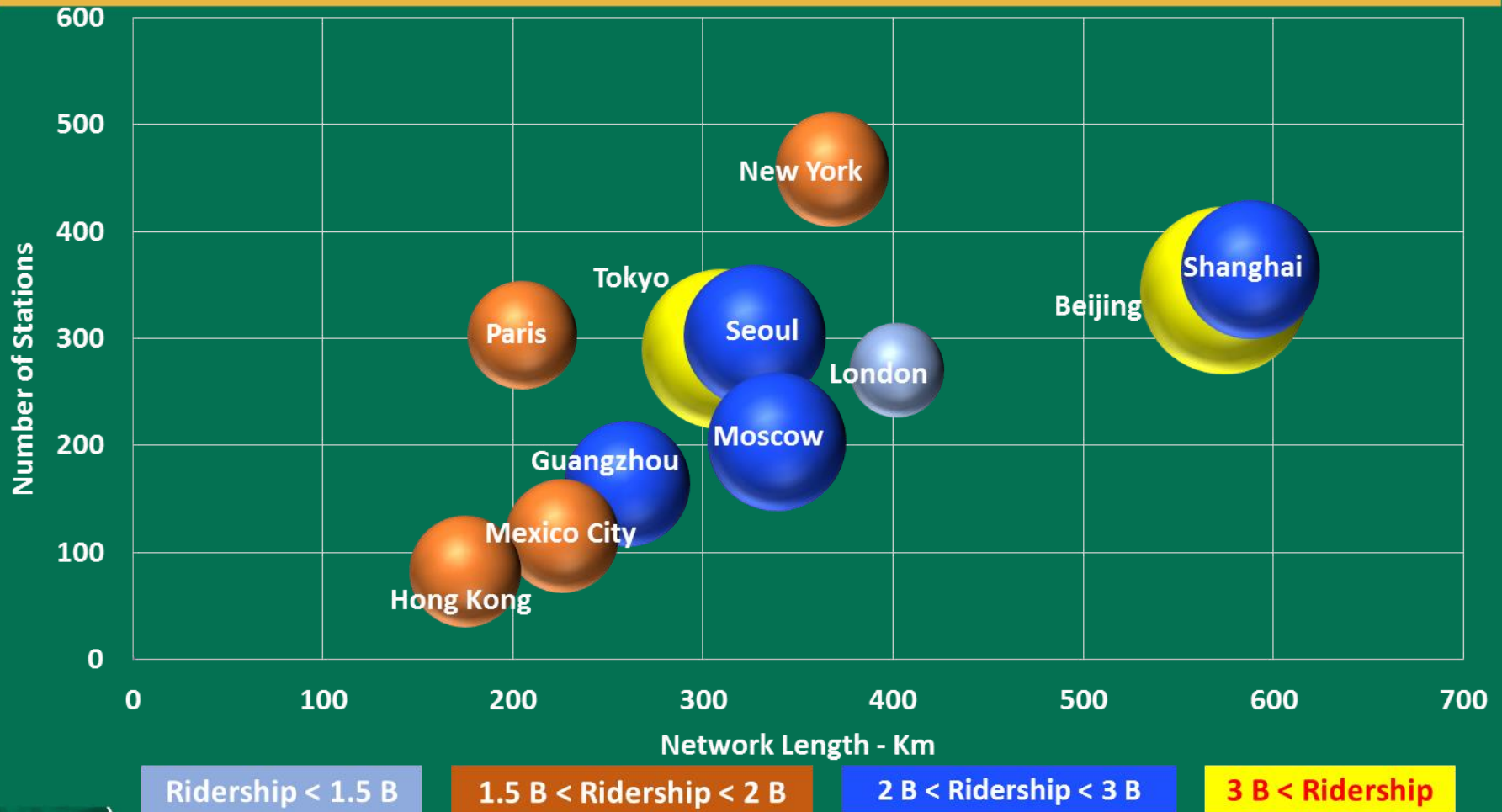
RIDERSHIP GROWTH

Ridership Growth 2014 - 2012

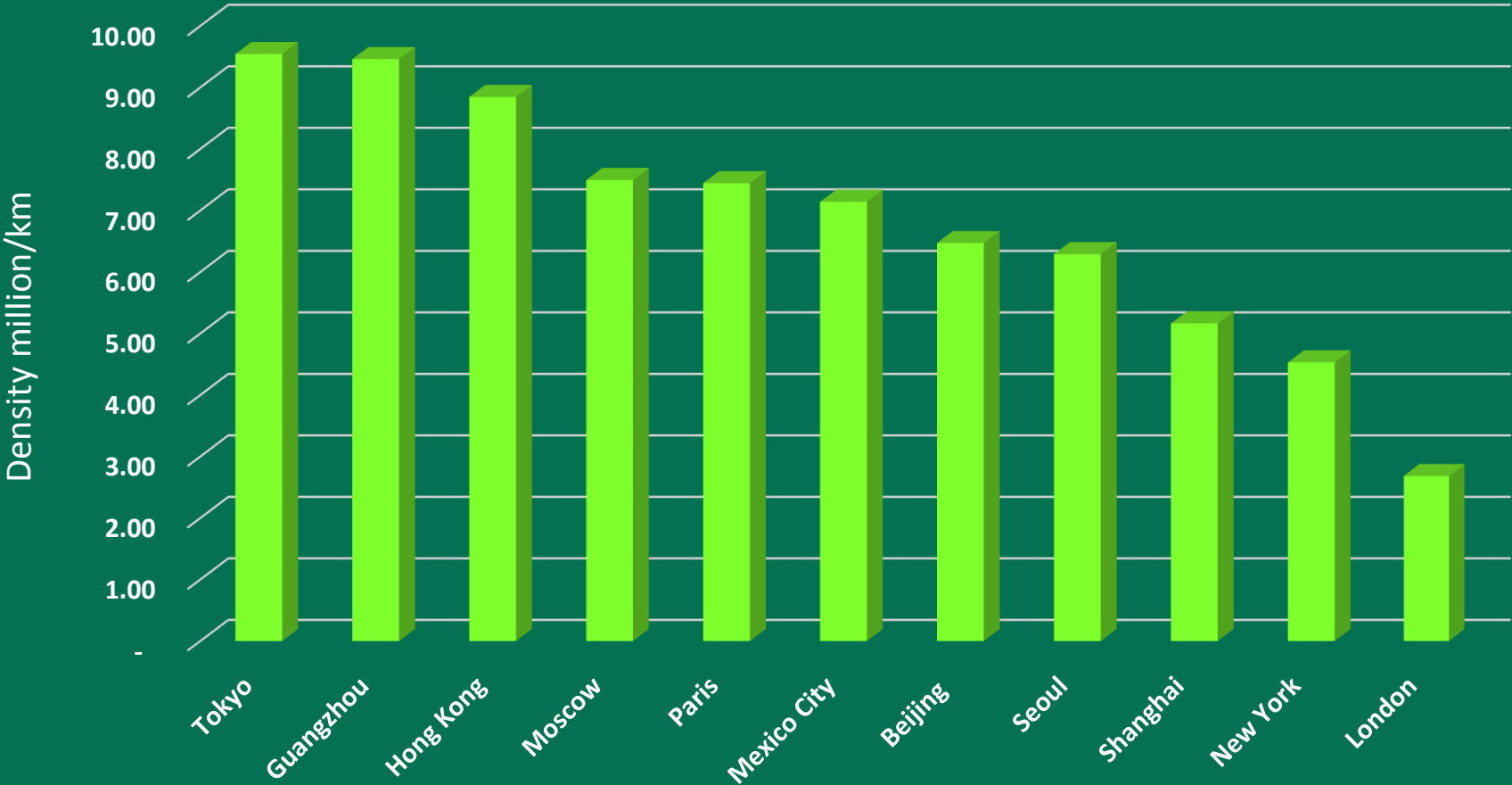


http://www UITP.org/sites/default/files/cck-focus-papers-files/UITP-Statistic%20Brief-Metro-A4-WEB_0.pdf

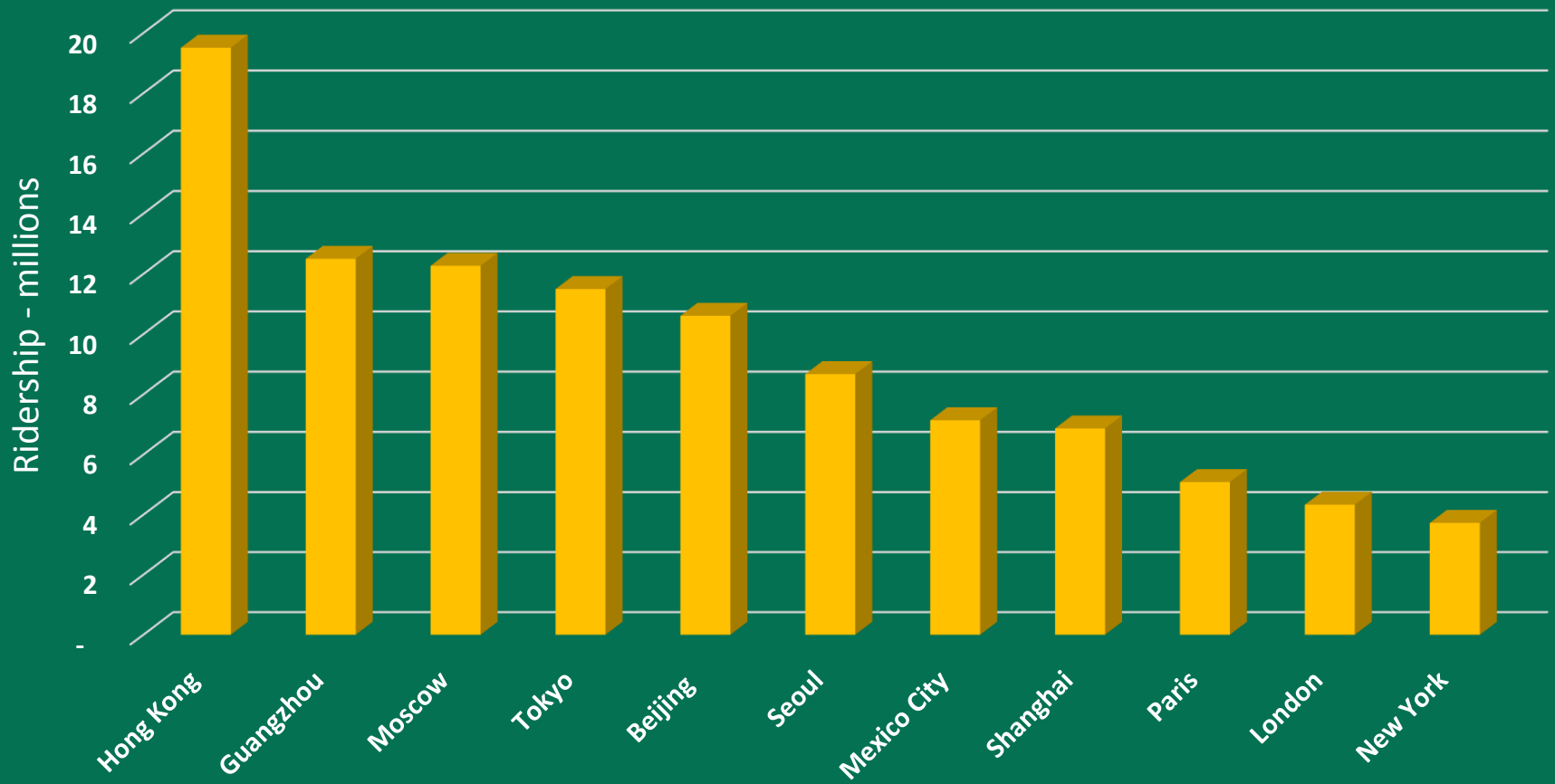
TOP RIDERSHIP CITIES



AVERAGE NETWORK DENSITY



AVERAGE RIDERSHIP/STATION



PERFORMANCE CRITERIA

- Safe
- Reliable
- Sustainable
- Clean
- Accessible
- Comfortable

SOLUTIONS

Long term (\$\$\$\$\$)

- New infrastructure
- New lines

Short term (\$\$)

- Using the existing infrastructure efficiently
- Maximizing the capacity



London 2050 (Part 5).

CBTC in New York development continues as \$223.3 million contract awarded.

Further progress on the development of the Communications Based Train Control (CBTC) system on the Queens Boulevard Line connecting Queens and Manhattan in New York this week with the announcement of who has been awarded a \$223.3 million contract. The radio-based CBTC technology provides real-time data on vehicle position and speed conditions, allowing system...



The Victoria Line In London Only Be...

Will Paris' €23bn metro expansion help unify the city?

City links: Improving public transport in the French capital, topping a Seattle freeway with a linear park and a makeshift community library in war-torn Damascus feature in our roundup of this week's best city stories



Plans to modernise four London Underground lines 'double' in cost

3 August 2015 | London

Facebook, Twitter, Email, Share icons



The modernisation plans include new tracks, longer platforms, a new signalling system and rebuilt depots

The cost of modernising signalling on four Tube lines has more than doubled.

HONG KONG MTR NETWORK

Map of Hong Kong MTR Lines



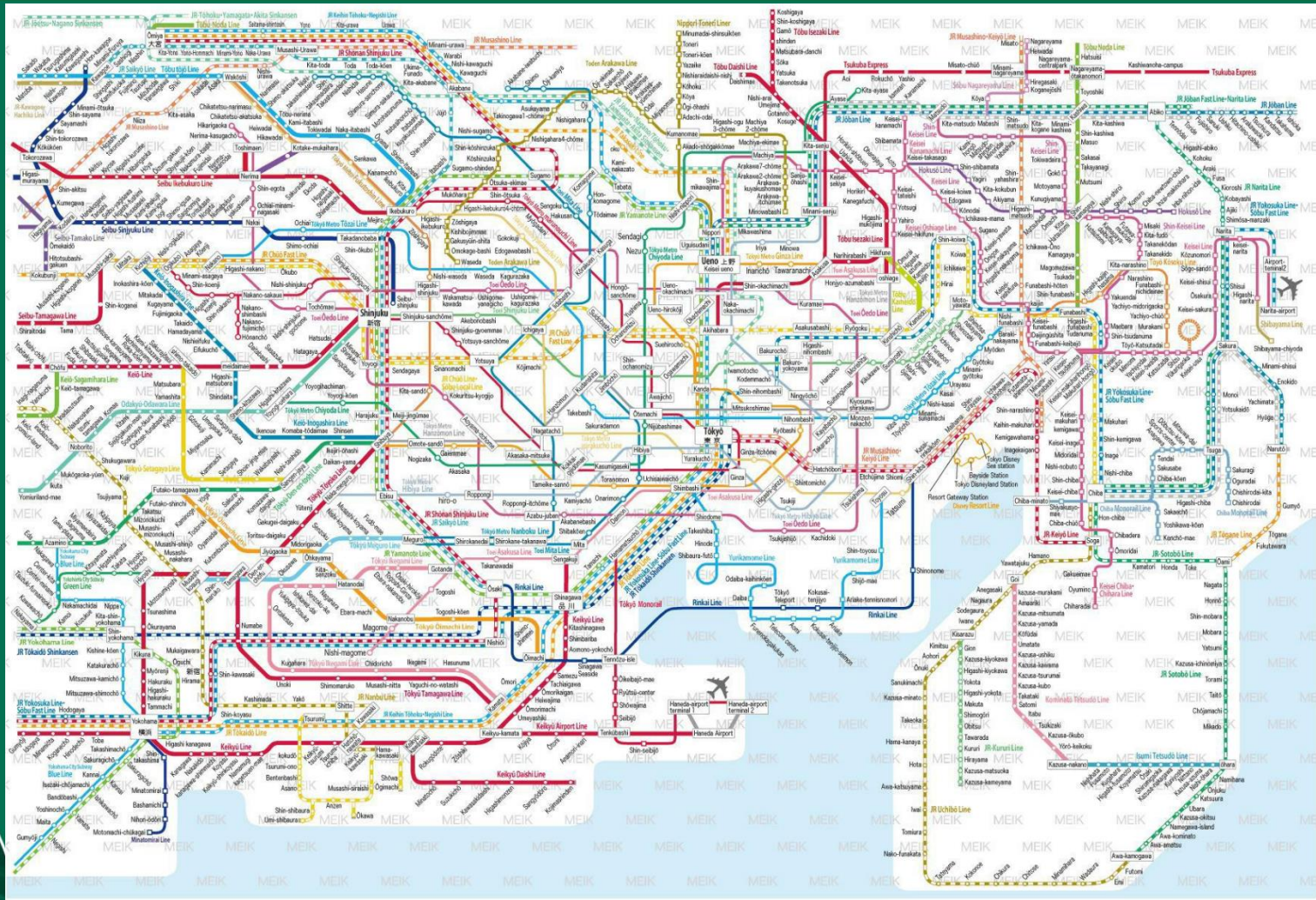
MTR SEVEN LINE MODERNIZATION

1. Tsuen Wan – red line
2. Island – blue line
3. Kwun Tong – green line
4. Tseung Kwan O – purple line
5. Disneyland Resort – pink line
6. Tung Chung – orange line
7. Airport Express – green line

MTR's PLAN

- 2015: Single contract \$350m
- Largest resignalling award at the time
- CBTC technology solution
- Interoperable

TOKYO



TOKYO

- Over 3b ridership
- On time, clean
- 32 trains/hour
- 2 new lines
 - Tokyo Station to the Rinkai
 - Central Tokyo to Shinagawa



PARIS



PARIS MODERNIZATION

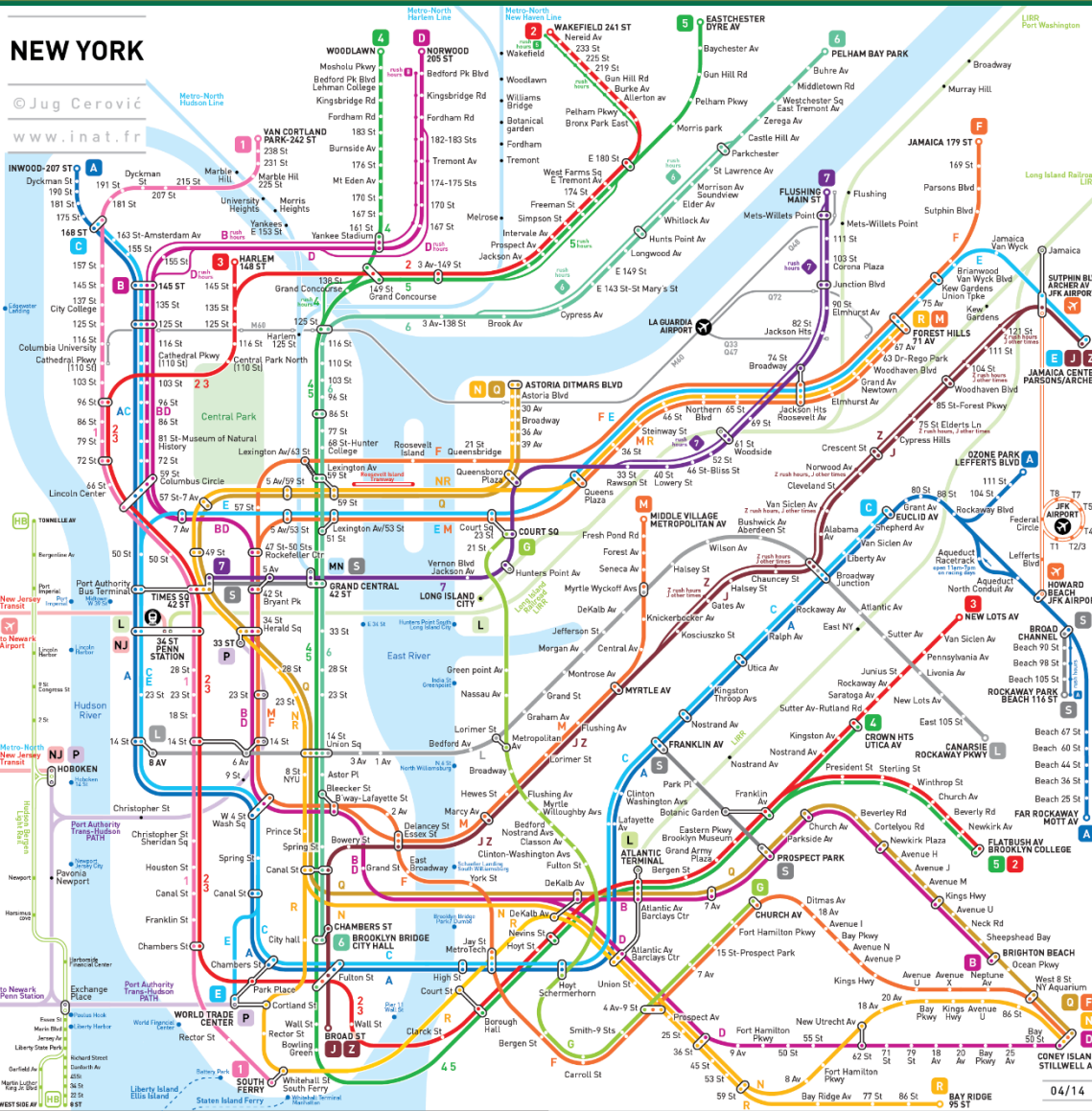
- Since 1900 - over 5million/day
- UTO: Line 1, 14
- Headway 105 => 85 sec (over 40 trains)
- Capacity up by 10%
- Power saving 15%



PARIS AUTOMATION

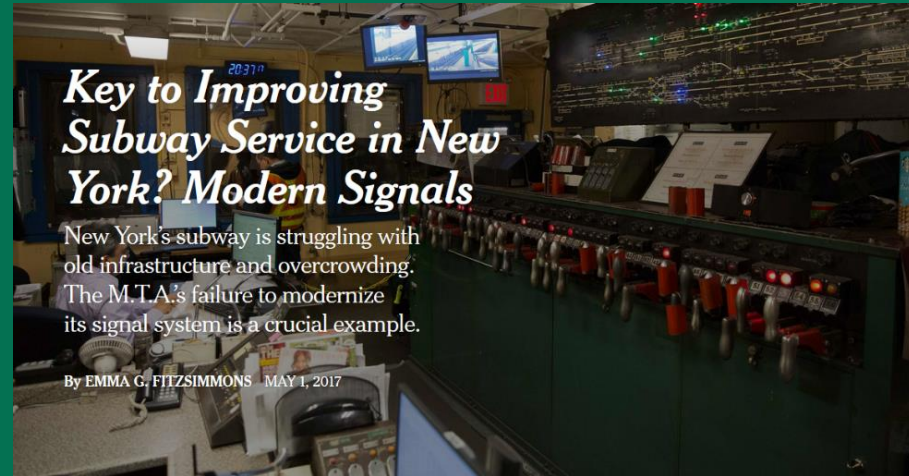
Line 14 (Meteor) UTO / 30%	1998
RATP Metro Line 1 UTO / 30%	2011
RATP Metro Line 3	2012
RATP Metro Line 13	2013
RATP Metro Line 5	2013
RATP Metro Line 9	2018
RATP Metro Line 10	2020
RATP Metro Line 12	2020
RATP Metro Line 4	2022

NEW YORK



NEW YORK SUBWAY

- Built over 100 years ago – end of Life (W4th St)
- Interoperable CBTC (I2S)
 - Canarsie - done
 - Flushing - construction
 - QBL - construction
 - 8th Ave – procurement
 - Culver line - procurement
- Backlog > 50 years



MTA's FUTURE

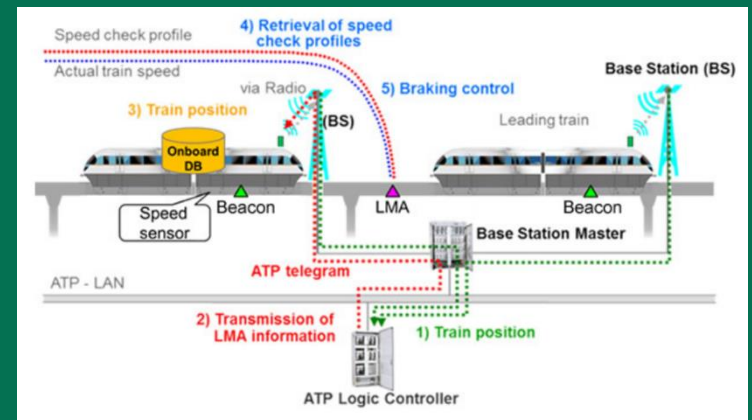
- 2016: Governor Cuomo - \$27 billion



- Largest investment in the history
- Leading MTA into 21st century

ROLLING STOK & SIGNALLING

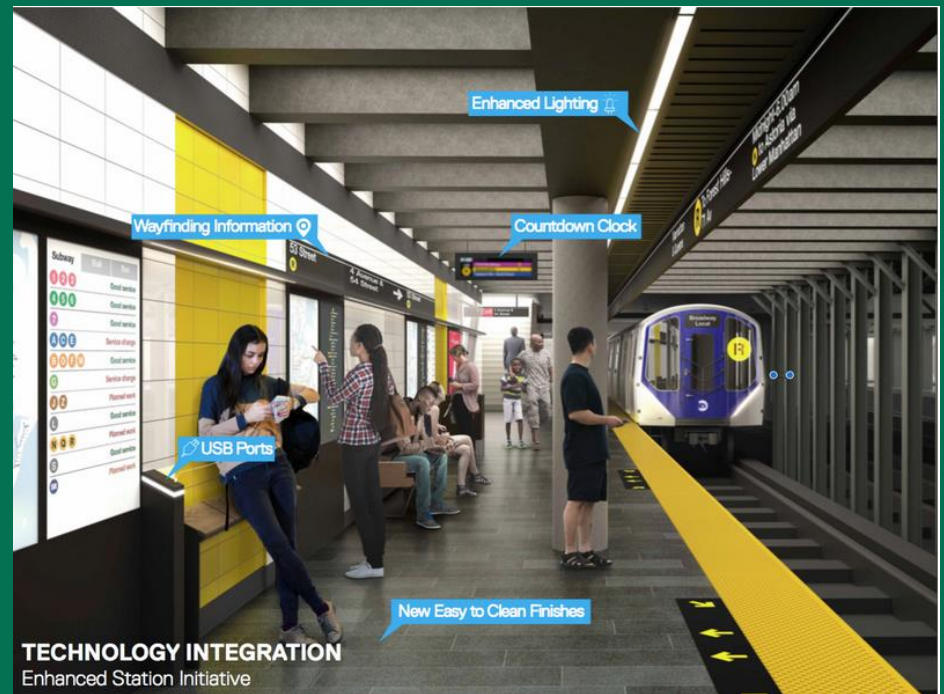
- 1025 New Subway Cars
 - Wider doors
 - Open gangway
 - Open space / Flip seats
- CBTC Implementation
 - Headway 90 sec
 - Dwell time 30 sec



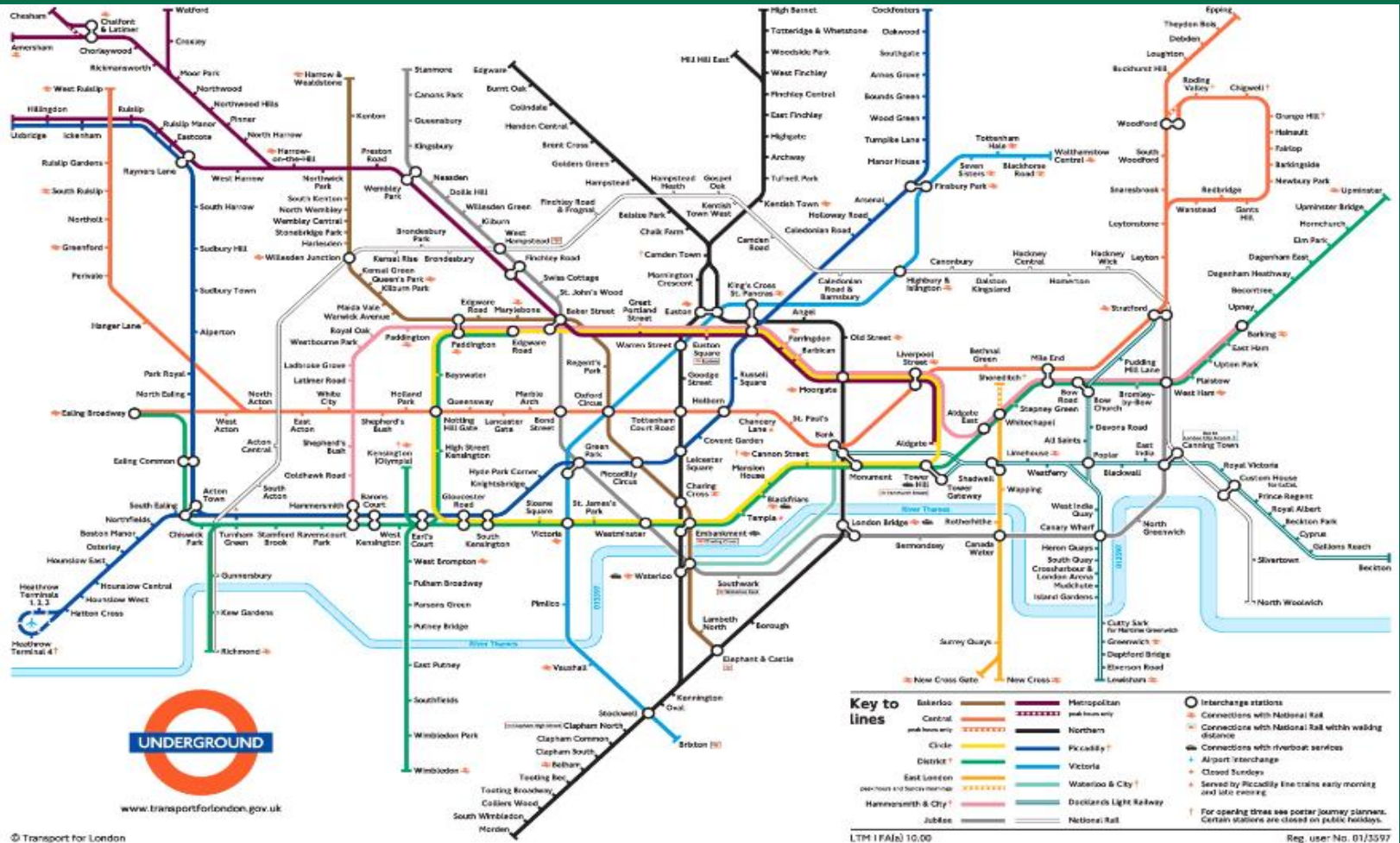
MODERNIZATION UNDERWAY

31 Station

- Modernization
- Safety
- Reliability
- Efficiency
- Consistency
- Wayfinding
- Wi-Fi & USB ports



LONDON



LONDON MODERNIZATION



TfL said it needs to replace old signalling equipment



LONDON 2050

- Demand increasing by 60%
- TfL's solution:
 - Heavily automated tube and sub-surface system
 - New trains: up-to-11% capacity gain with continuous internal space
 - Unattended Train Operation (UTO)

VICTORIA LINE

- Peak Tubes
- May 22, 2017
- 36 Trains/hour
- Headway 100 sec
- Dwell 40 sec



The Victoria Line Will
Soon Only Be Limited
By The LAWS OF
PHYSICS

By James O Malley on 25 Apr 2017 at 7:30AM

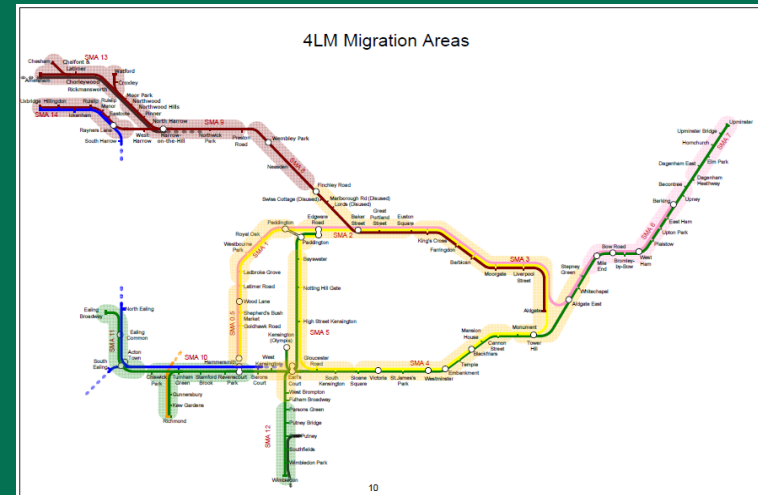
THE NEW TUBE FOR LONDON

- Faster, more frequent, more reliable
 - Piccadilly line
 - Bakerloo
 - Central
 - Waterloo
 - City lines
- Wider doors
- Platform edge doors
- Open gangway



4 LINE MODERNIZATION

- 40% of the LU Network
- Oldest built in 1863 (314 km track)
- Largest resignalling contract to date
- CBTC solution: 32 train/hr
- By 2022: capacity up 33%
 - District
 - Circle
 - Metropolitan
 - Hammersmith & City





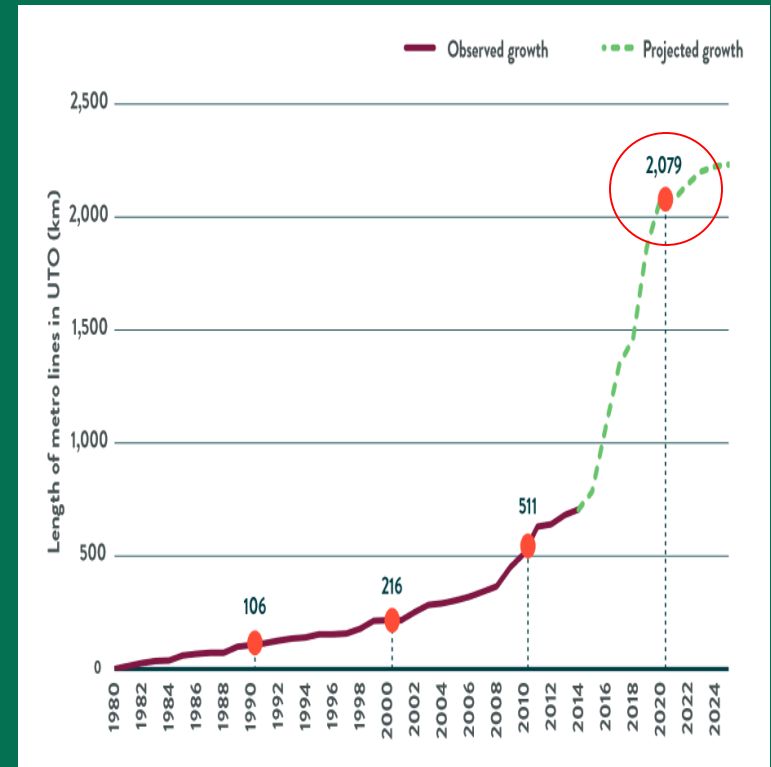
BEST PRACTICES

AUTOMATION

Year 2014

- Asia: 57 lines
- Europe: 26 lines
- North America: 10 Lines
- South America: 4 lines

By 2025: over 2000 km



CBTC BENEFITS

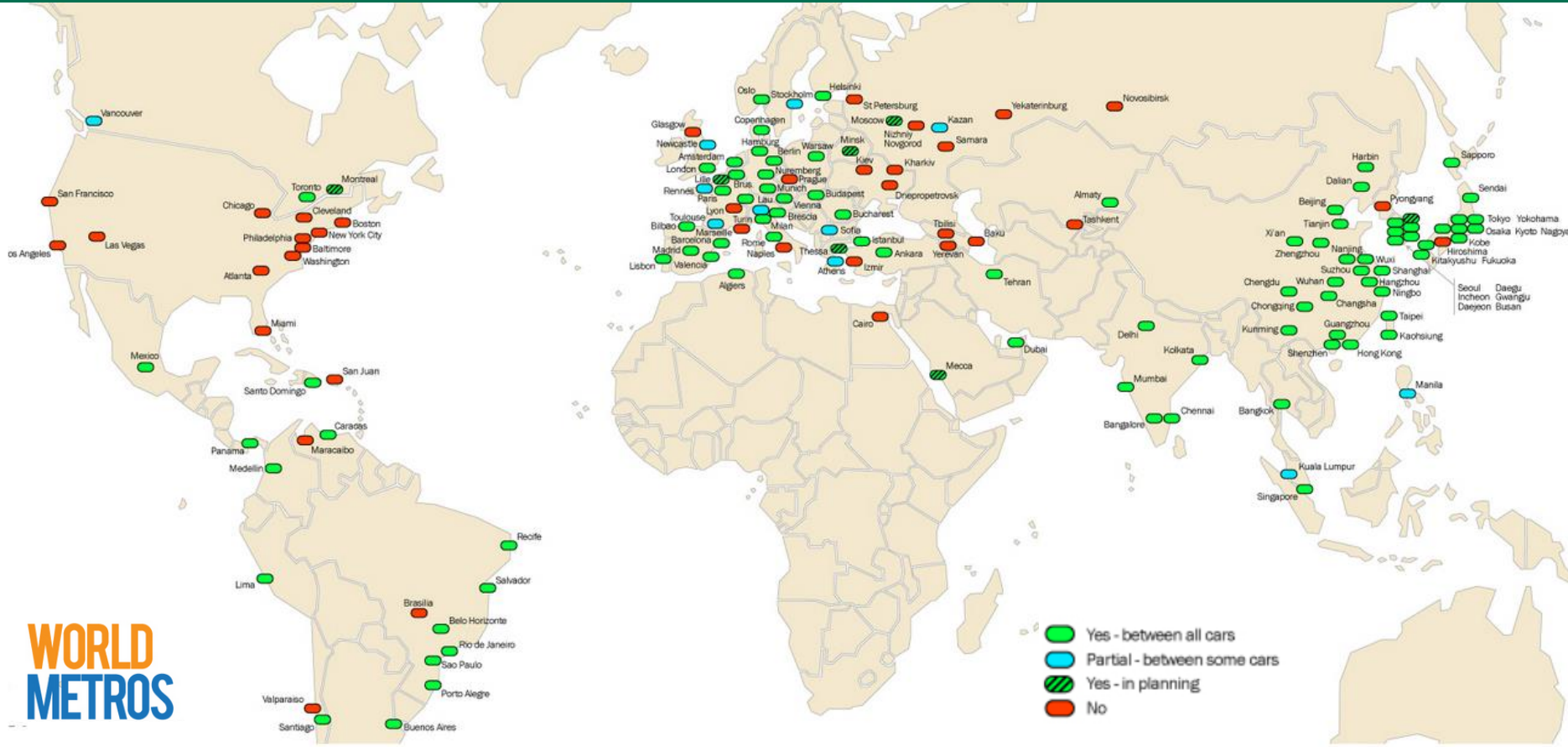
- Increased safety/reliability
- Increased capacity (40 train/hr)
- Operation flexibility
- More accurate train arrival time
- Reduced energy consumption
- Less crew (one or none)
- Reduced maintenance cost

OPEN GANGWAY

- Increased capacity >> 10%
- Redistribute passengers
- Enhanced security



WALK BETWEEN THE CARS



Courtesy of The Transport Politic - Yonah Freemark

ENTRY/EGRESS CAPACITY

Name	Model	Doors per car	Max cars	Max doors	Doors per 100'	Units	Door width		Car length		Max train length	Door width/train length
							Feet/Inches	Meters	Feet/Inches	Meters		
WMATA	1000-7000 series	3	8	24	4.00	Feet/Inches	4.17	50	75	600	16.67%	
						Meters	1.27		22.80	182.40		
RATP	MP-05	3	6	18	6.06	Feet/Inches	5.43	65	49.50	296.97	32.90%	
						Meters	1.65		15.05	90.28		
BART	A, B, C cars	2	10	20	2.86	Feet/Inches	4.50	54	70	700	12.86%	
						Meters	1.37		21.28	212.8		
BART	new D, E cars	3	10	30	4.29	Feet/Inches	4.50	54	70	700	19.29%	
						Meters	1.37		21.28	212.8		
NYC Subway B Division	R160B	4	10	40	6.67	Feet/Inches	4.17	50	60	600	27.78%	
						Meters	1.27		18.24	182.4		
NYC Subway A Division	R142/R188	3	11	33	5.84	Feet/Inches	4.50	54	51.33	564.63	26.30%	
						Meters	1.37		15.60	171.65		
Toronto	Rocket	4	6	24	5.33	Feet/Inches	4.93	59	75.00	450	26.32%	
						Meters	1.50		22.86	137.16		



ENTRY / EGRESS DESIGN



BEST PRACTICES

Performing feasibility studies

Developing ConOps/ConMaint

Implementing systems engineering

Learning from lessons

Eliminating/minimizing constraints

Automating (CBTC)

Designing configurable train consist

Increasing train capacity - gangway/design

Minimizing dwell time

Increasing entry/egress circulation

THANK YOU

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