Public Transit:

GGR424 - Transportation Geography & Planning

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What is public transit?

- Regularly scheduled vehicle trips
- Open to all paying passengers
- Can carry multiple passengers
- Whose trips may have different origins, destinations, and purposes

"transit is about multiple people riding in one vehicle even though they are not intentionally travelling together or even going to the same places"

Walker (2011)

Public Transit Benefits: Efficiency

https://www.reddit.com/r/Damnthatsinteresting/comments/daugu5/public_transport_vs_private_transport/

What makes transit useful? Seven demands of public transit:

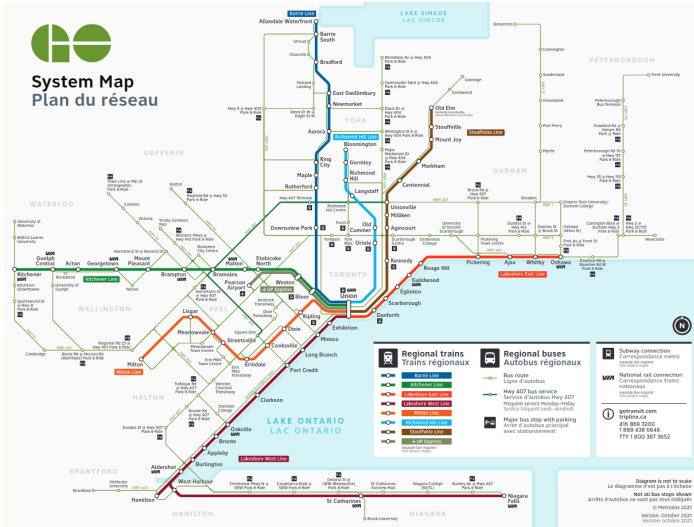
1. It takes me *where* I want to go
2. It takes me *when* I want to go
3. It is a good use of my *time*
4. It is a good use of my *money*
5. It *respects* me in the level of safety, comfort, and amenity it provides
6. I can *trust* it
7. It gives me *freedom* to change my plans

Walker (2011)

Components of a public transit system:

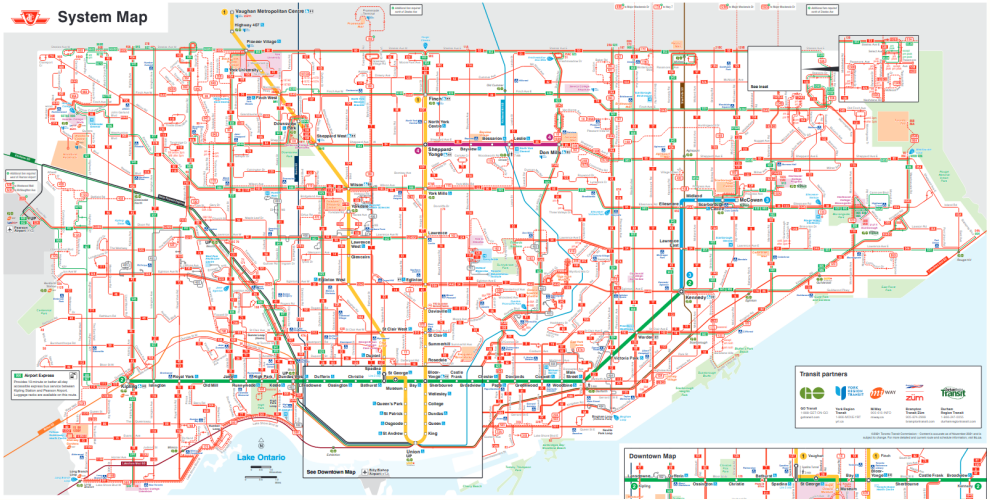
- **Network** - the combination of all connecting routes and stops
- **Routes** - connections between stops, usually fixed
- **Vehicles** - that traverse routes on set schedules
- **Stops** - where people access and exit the network, or transfer between routes

Types of transit network layouts: **Radial**



https://www.gotransit.com/en/trip-planning/system-and-route-map

Types of transit network layouts: **Grid**

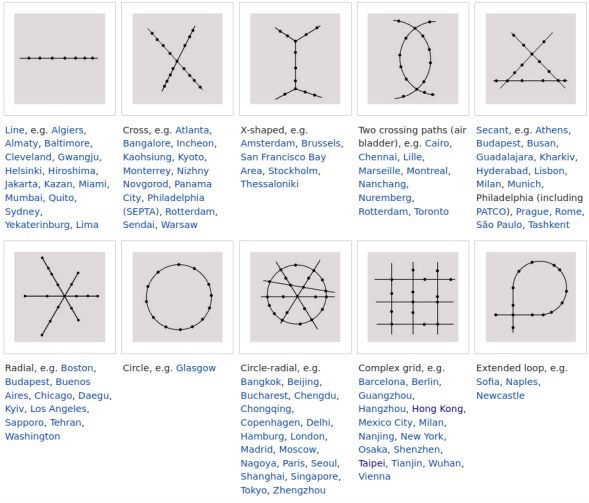


https://www.ttc.ca/routes-and-schedules/

Types of transit network layouts: **Circle-Radial**

https://metromap.fr/en

Types of transit network layouts:



Line, e.g. Algiers, Almaty, Baltimore, Cleveland, Gwangju, Helsinki, Hiroshima, Jakarta, Kazan, Miami, Mumbai, Quito, Sydney, Yekaterinburg, Lima

Cross, e.g. Atlanta, Bangalore, Incheon, Kaohsiung, Kyoto, Monterrey, Nizhny Novgorod, Panama City, Philadelphia (SEPTA), Rotterdam, Sendai, Warsaw

X-shaped, e.g. Amsterdam, Brussels, San Francisco Bay Area, Stockholm, Thessaloniki

Two crossing paths (air bladder), e.g. Cairo, Chennai, Lille, Marseille, Montreal, Nanchang, Nuremberg, Rotterdam, Toronto

Secant, e.g. Athens, Budapest, Busan, Guadalajara, Kharkiv, Hyderabad, Lisbon, Milan, Munich, Philadelphia (including PATCO), Prague, Rome, São Paulo, Tashkent

Radial, e.g. Boston, Budapest, Buenos Aires, Chicago, Daegu, Kyiv, Los Angeles, Sapporo, Tehran, Washington

Circle, e.g. Glasgow

Circle-radial, e.g. Bangkok, Beijing, Bucharest, Chengdu, Chongqing, Copenhagen, Delhi, Hamburg, London, Madrid, Moscow, Nagoya, Paris, Seoul, Shanghai, Singapore, Tokyo, Zhengzhou

Complex grid, e.g. Barcelona, Berlin, Guangzhou, Hangzhou, Hong Kong, Mexico City, Milan, Nanjing, New York, Osaka, Shenzhen, Taipei, Tianjin, Wuhan, Vienna

Extended loop, e.g. Sofia, Naples, Newcastle

https://en.wikipedia.org/wiki/Rapid_transit

Routes Characteristics:

- Technology
- Level of separation from other transport
- Capacity
- Comfort/Safety
- Frequency
- Stop Spacing
- Reliability
- Network hierarchy

Routes - Technology

https://en.wikipedia.org/wiki/Public_transport

Routes - Level of separation from other transport

1. Completely separated (can be above, below, or at ground-level)
   - e.g. TTC Subway Lines
2. Separated from other traffic, but with at-grade crossing
   - e.g. Spadina Streetcar, Eglinton LRT, Highway 7 BRT
3. Shared with traffic
   - e.g. Most TTC bus and streetcar routes

Routes - Level of separation from other transport

1. Completely separated (can be above, below, or at ground-level)
   - many names, e.g. Rapid Transit, Metro, Underground, Heavy Rail, etc.
   - Run in exclusive Rights Of Way (ROW)

Routes - Level of separation from other transport

2. Separated from other traffic, but with at-grade crossing
   - LRT (Light Rail Transit)
   - BRT (Bus Rapid Transit)

https://en.wikipedia.org/wiki/Light_rail

Routes - Level of separation from other transport

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https://en.wikipedia.org/wiki/TransMilenio

Routes - Level of separation from other transport

3. Shared with traffic

https://en.wikipedia.org/wiki/Bus

Routes - Capacity

Can be measured per vehicle, or per route in a given time (e.g. an hour)

https://en.wikipedia.org/wiki/Medellin_Metro

Routes - Comfort & Safety

Some components can be measured like crowding, but many are subjective

Routes - Frequency

In transit planning & operations, frequency is often measured by a routes scheduled **headway**, the time between vehicles

"Frequency is freedom" - Walker

example of a TTC stop schedule (501)

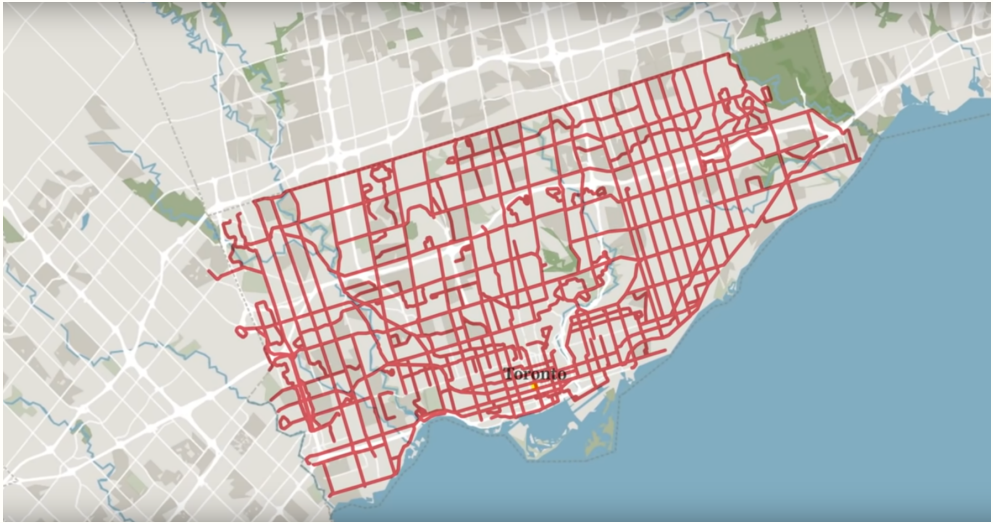
5 AM	5:30	5:38	5:46	5:48	5:55	
6 AM	6:03 6:51	6:11 6:59	6:19	6:27	6:35	6:43
7 AM	7:07	7:15	7:26	7:36	7:44	7:52
8 AM	8:01 8:49	8:09 8:57	8:17	8:25	8:33	8:41
9 AM	9:05 9:53	9:13	9:21	9:29	9:37	9:45
10 AM	10:01 10:47	10:09 10:55	10:17	10:25	10:30	10:39
11 AM	11:03 11:51	11:11 11:59	11:19	11:27	11:35	11:43
12 PM	12:07 12:55	12:15	12:23	12:31	12:39	12:47
1 PM	1:03 1:51	1:11 1:59	1:19	1:27	1:35	1:43

Routes - Frequency

e.g. bus that comes every 30 minutes, until midnight, 7 days a week:

https://www.youtube.com/watch?v=-ZDZtBRTyeI

Routes - Frequency



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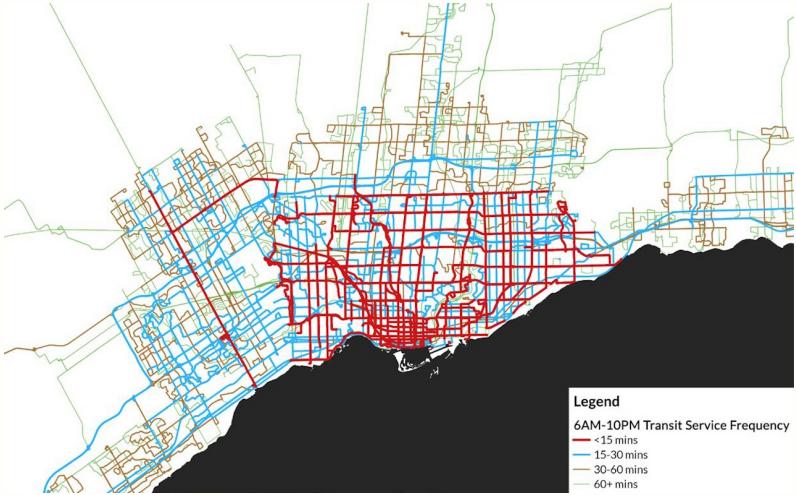
Routes - Frequency

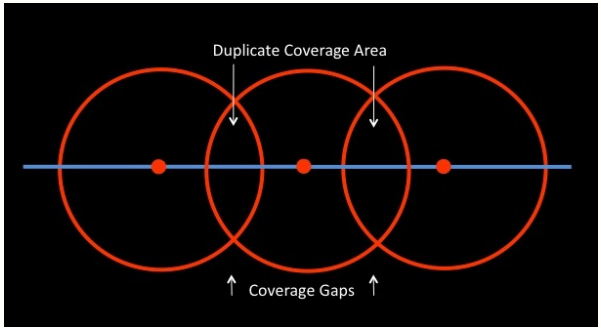


https://urbantoronto.ca/news/2021/11/board-trade-urges-frequent-transit-service-across-region

Routes - Stop Spacing

TTC Bus & Streetcar routes have stops every 100m-300m

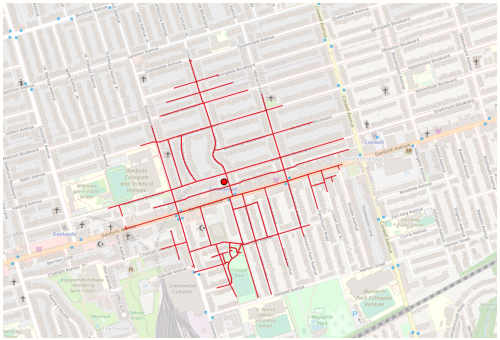
More stops means better local access, but reduced speeds and longer travel times because the vehicle needs to make more stops. i.e. a trade-off.

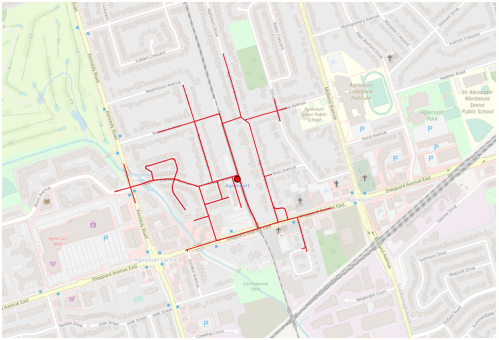


https://humantransit.org/2010/11/san-francisco-a-rational-stop-spacing-plan.html

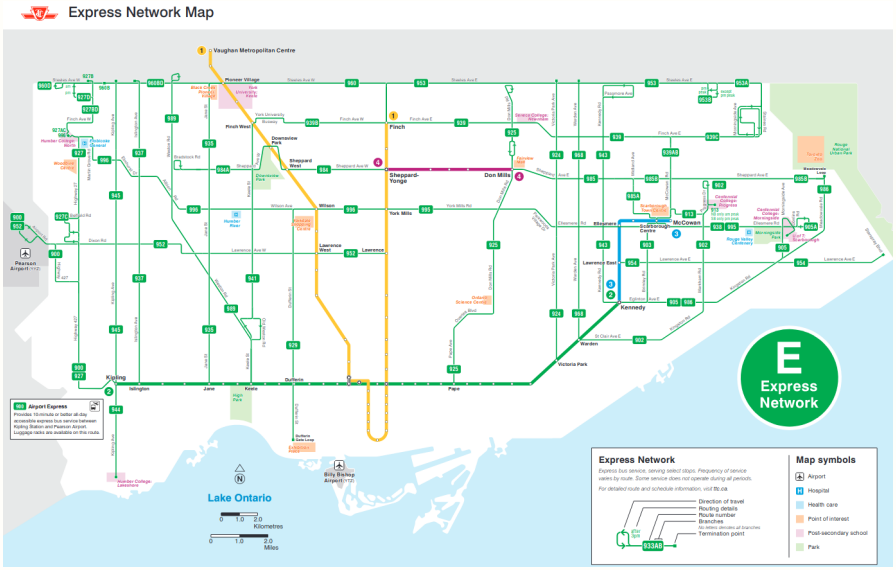
Routes - Stop Spacing

Local access to a stop depends on urban form / street networks (more on this next week)





Routes - Stop Spacing, e.g. having "express" and "local" buses

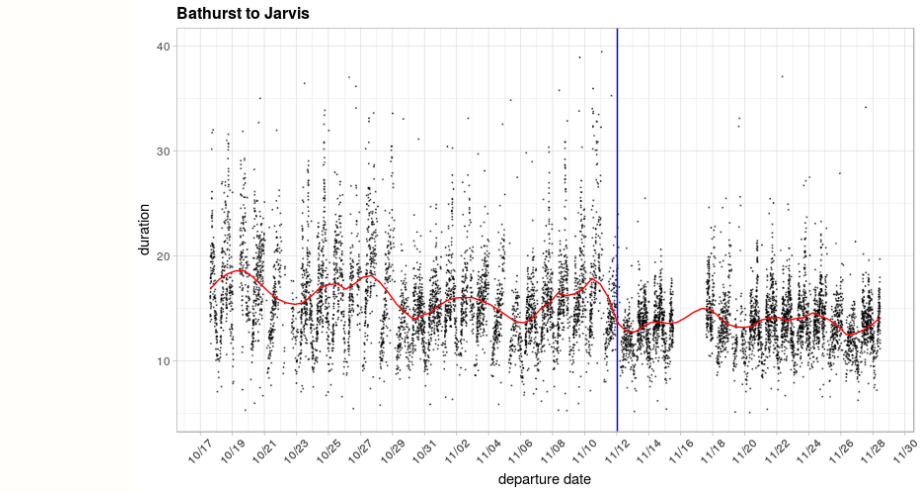


Routes - Reliability

Does the vehicle arrive on time?

Routes - Reliability

Expected travel times, e.g. along King Street before and after reducing traffic:

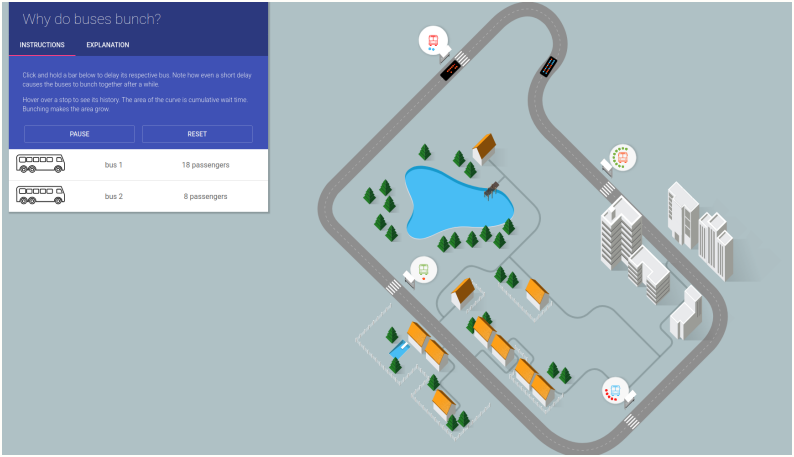


Routes - Reliability

What causes "bus bunching"?

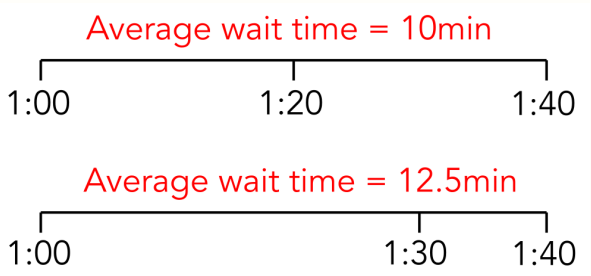
Routes - Reliability

What causes "bus bunching"?



https://setosa.io/bus/

Routes - Unreliability affects wait times:



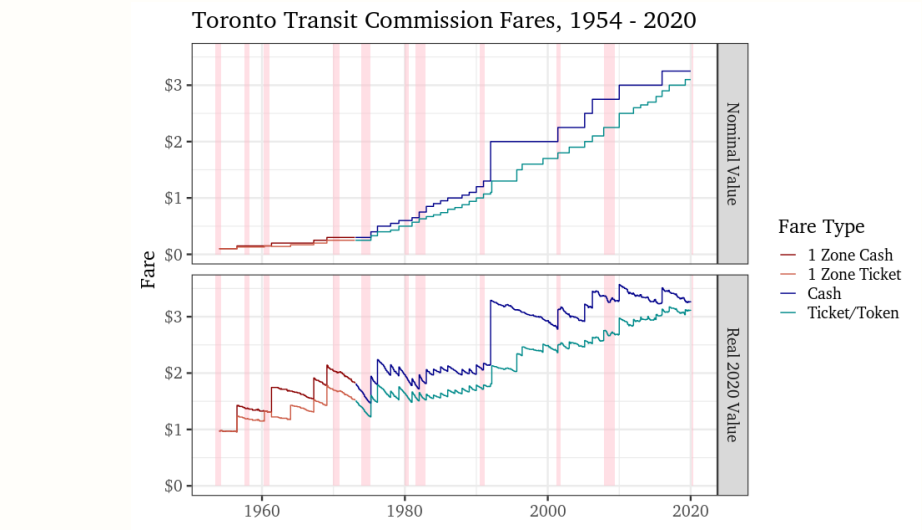
Fare Types

- Flat fares (e.g. TTC)
- By distance (e.g. GO Transit)
- By zone
- Daily/weekly/monthly passes
- Discounts (e.g., child, students, senior, low-income)
- No fare

Payment Technology

- Cash
- Tokens/Tickets
- Card (ca be tap on only, or tap on and off)

Fares - e.g. TTC Fares over time

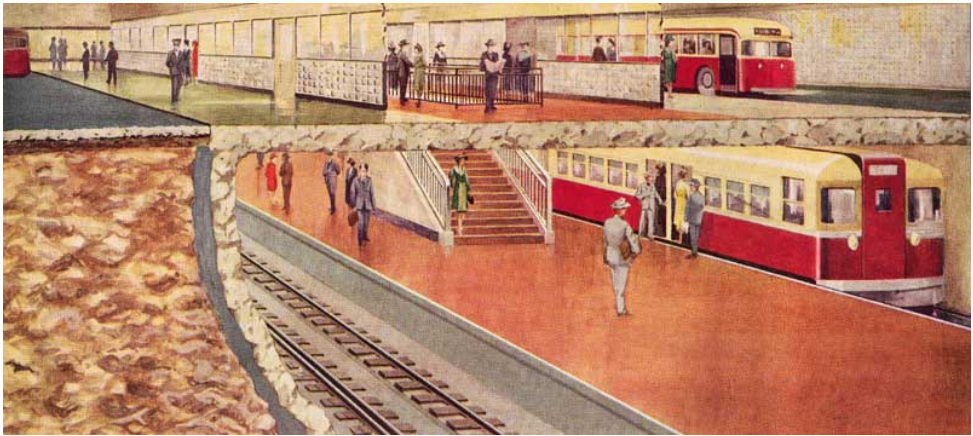


https://github.com/Nate-Wessel/TTC-funding

Stops - Local Stops

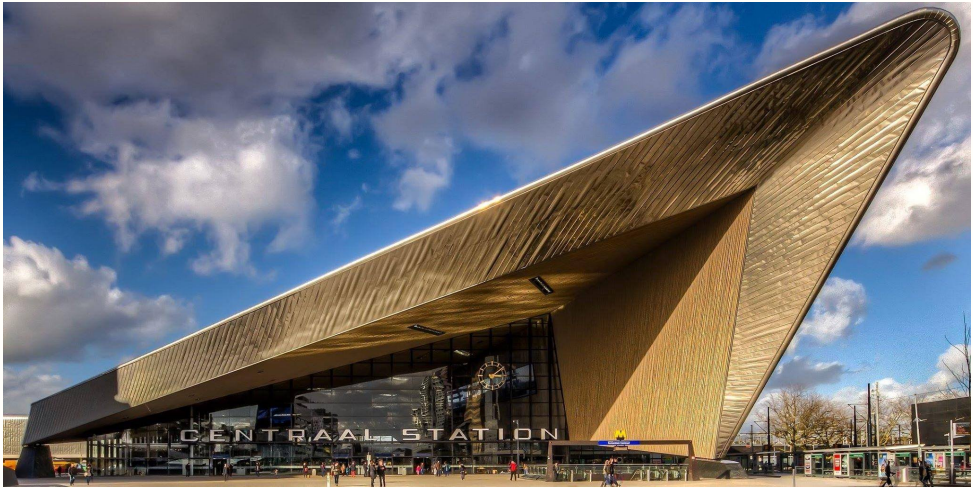
Stops - Transferring

Stops - Major stations are key transferring locations



https://www.toronto.ca/explore-enjoy/history-art-culture/online-exhibits/web-exhibits/web-exhibits-transportation/canadas-first-subway/canadas-first-subway-why-a-subway/

Stops - Major stations can be iconic public spaces:



https://www.reddit.com/r/architecture/comments/20ceny/the_new_rotterdam_central_train_station_opened/

Stops - Access Mode

e.g. in the GTHA:

- 91.8% by walking
- 7.4% by car
- 0.6% by other mode (mostly bike)

RICHARD WHITE PHOTOGRAPHER (2010123); TRANSIT TORONTO COLLECTION (2016)

Stops - Land-Use Around Stops

Whitby GO Station:

Transit Oriented Development

- Focusing urban development near major public transit hubs
- Often includes a mix of residential, retail, and commercial buildings
- Goals include increasing transit ridership, local active travel, and reducing sprawl

Transit Oriented Development

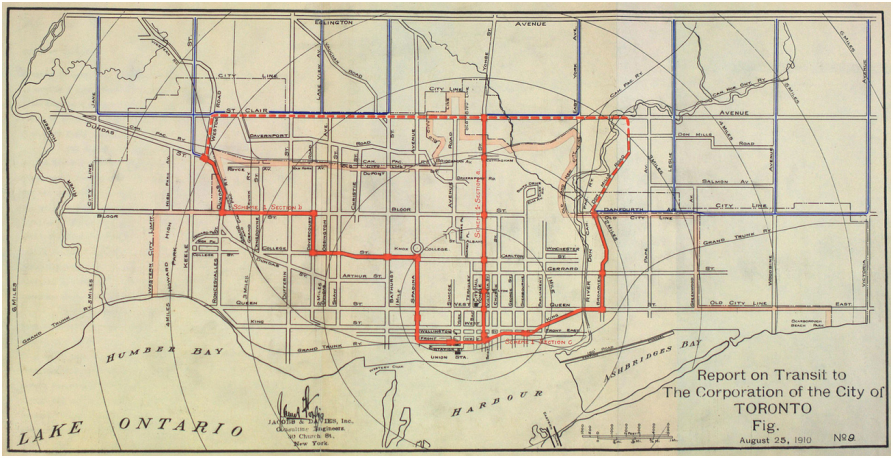
e.g. Marine Drive Station in Vancouver, when built in 2009 and in 2018

https://www.google.ca/maps/@49.2081409,-123.1191561,497a,35y,50.44h,34.64t/data=!3m1!1e3

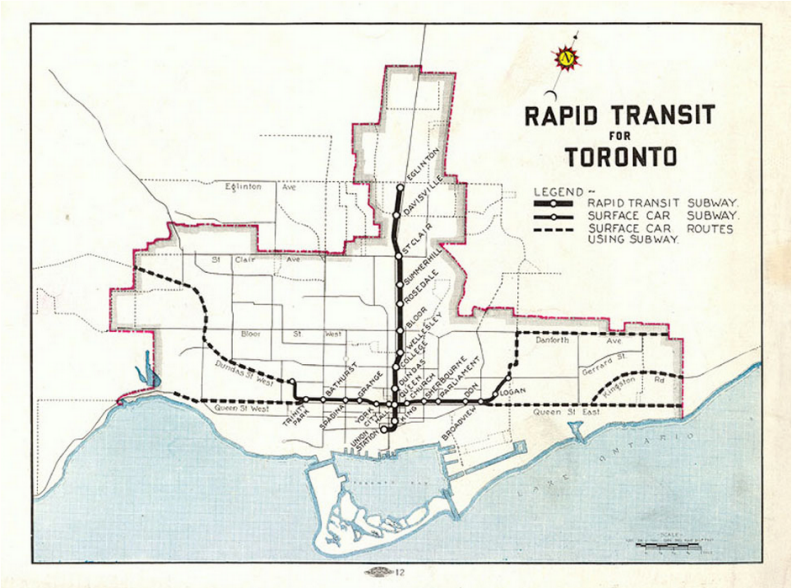
https://en.wikipedia.org/wiki/Transit-oriented_development

Public Transit Planning

- about improving public transit, with both big and small ideas



Public Transit Planning



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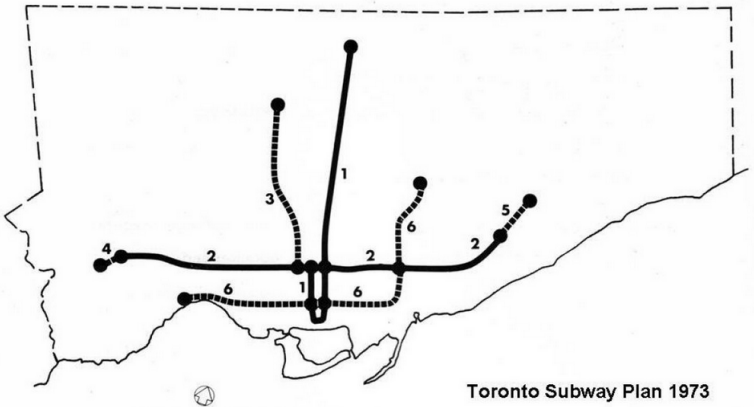
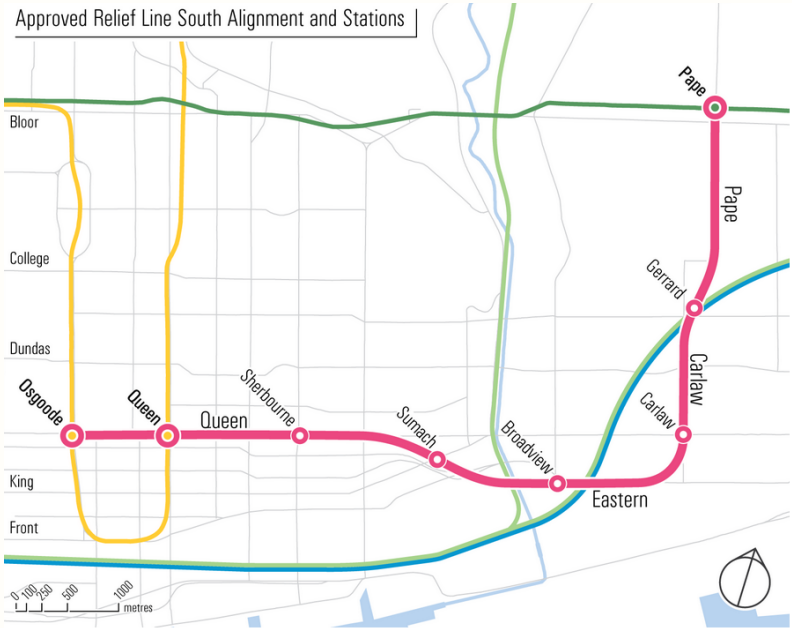


Present subway lines and TTC proposals
for future lines in Metropolitan Toronto.

KEY: 1: Existing Yonge-University Line, including northern extension
from York Mills to Finch scheduled to open in April 1974
2: Existing Bloor-Danforth Line.
3: Proposed Spadina Line.(Will through work with Yonge-University)
4: Proposed Western extension to Bloor-Danforth. Islington to Kipling
5: Proposed Eastern extension to Bloor-Danforth. Warden to Kennedy
6: Proposed Queen line. Humber to Eglinton and Don Mills.

Public Transit Planning



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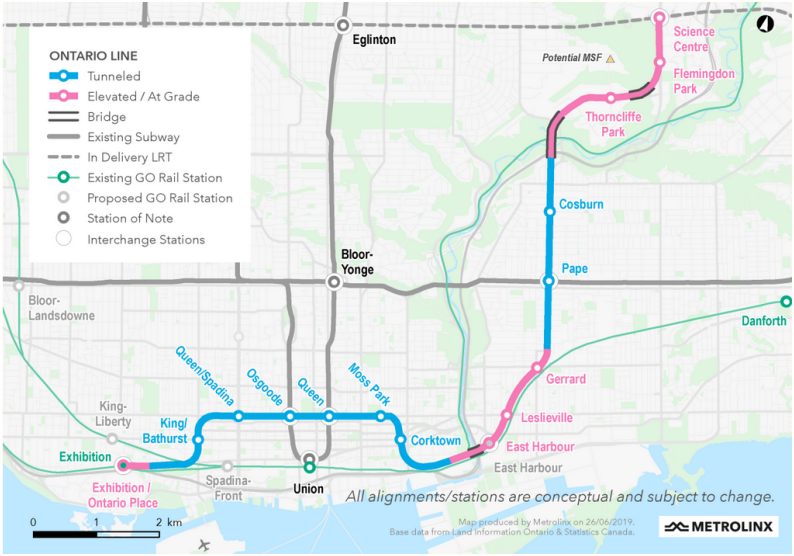

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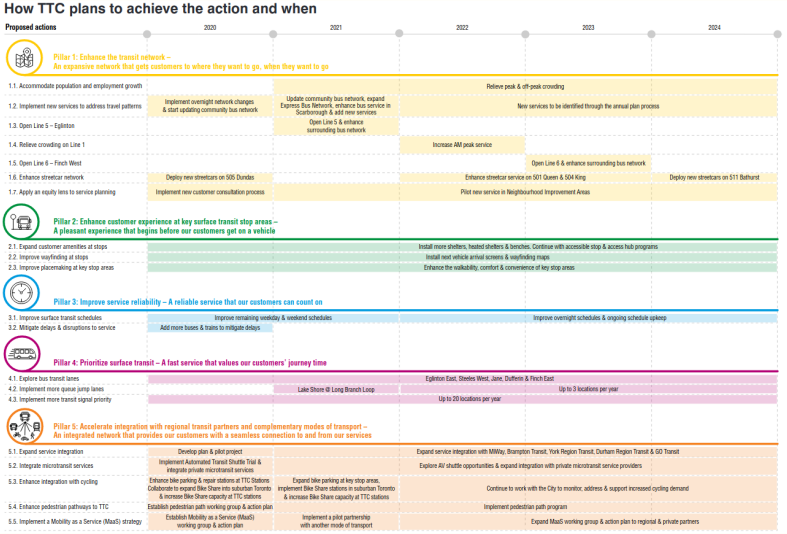

https://www.ttc.ca/about-the-ttc/projects-and-plans/5-Year-Service-Plan-and-10-Year-Outlook

Next week (Feb 7)

- Transportation and land-use
- Network analysis & GIS
- Land-use data
- Measuring accessibility

Following week (Feb 14)

- Travel surveys
- Other transportation-related data
- Maps for navigation
- Chat about the assignment