Multimodal Transportation Integration
A Framework for Sustainable Planning

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Session Overview

• Integration?
• Why Integrate?
• What makes a good network?
• What makes a good interface?
• A word on Complete Streets
• What’s Important?
• Q&A
Integration?

**Network**
Infrastructure and service to accommodate multiple modes
- Roadways
- Parking lots
- Transit routes
- Transit modes
- Bike paths, lanes, routes and trails
- Sidewalks and trails

**Interface**
Planning, policy and infrastructure to facilitate connections between modes
- Intersections
- Stations
- Shared corridors

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Why Integrate?

- Efficiency
- Effectiveness
- Environment
- Equity
- CHOICE

Guo and Gandavarapu (2010)

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Why Integrate?

- **Efficiency**
- **Effectiveness**
- **Environment**
- **Equity**
- **CHOICE**

Some people

- Cannot drive
  - Youth
  - People with disabilities
  - Community visitors

- Should not drive
  - Age
  - Impairment

- Do not want to drive
  - Environment
  - Cost priority
  - Mom/Dad taxi

If you give people more choices, people will choose a wider range of options, based on their personal needs.

In an ideal scenario, we would choose our destination based on the nature and quality of the personal experience at that destination.
Inverting (?) the pyramid

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Inverting the Pyramid

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Balancing the Scale

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Balancing the Scale
What makes a good network?

**Completeness**

*Availability of the street network* for bicycling and walking, and dedicated facilities in other areas.

**Density**

Providing *options for travel* between locations for people who walk and bike. Research shows that areas with high street density have higher rates of walking and lower rates of driving. More dense networks are also more *resilient* - a closure of one street will be less likely to inhibit travel.

**Directness**

Route directness considers the *variation in trip distance* between the route a bicyclist or pedestrian will actually travel versus the shortest available path.

**Access**

Can people can use the bicycle and pedestrian network to reach *important destinations* like jobs, training, shopping, or transit stations.

**Quality**

People walking or biking are more sensitive to the *physical attributes* of a facility than a person driving a motor vehicle.

FHWA-HEP-18-032 - Guidebook for Measuring Multimodal Network Connectivity - February 2018

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Network connectivity

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What makes a good interface?

- Safety
- Accessibility
- Location
- Convenience

Sources:
- NACTO Urban Bikeway Design Guide
- NACTO Urban Street Design Guide
- NACTO Transit Street Design Guide
- OTM Book 18

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What makes a good interface?

References:
Ontario: OTM Book 18

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What makes a good interface?

Milton

Bikes and Cars
Shared Lanes
Bike Lanes
Buffered Lanes
Separated lanes

References:
Ontario: OTM Book 18

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What makes a good interface?

Intersection – Crossing marking

Bikes and Cars
- Shared Lanes
- Bike Lanes
- Buffered Lanes
- Separated lanes

References:
Ontario: OTM Book 18

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What makes a good interface?

Intersection – Bike box

References:
Ontario: OTM Book 18

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What makes a good interface?

Intersection Bike signals

Bikes and Cars
- Shared Lanes
- Bike Lanes
- Buffered Lanes
- Separated lanes

References:
Ontario: OTM Book 18

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What makes a good interface?

![Image of a street scene with various zones highlighted]

- Frontage Zone
- Pedestrian Through Zone
- Street Furniture / Curb Zone
- Enhancement / Buffer Zone

Cars and Peds – The Sidewalk Zones Curbs

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What makes a good interface?

Curb extensions increase the overall visibility of pedestrians by aligning them with the parking lane and reducing the crossing distance for pedestrians.

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What makes a good interface?

Basic design

Bikes and Peds – the Multi-use Trail

Toronto Multi-Use Trail Design Guidelines, Toronto: 2015

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What makes a good interface?

Higher Capacity design

Bikes and Peds – the Multi-use Trail

Toronto Multi-Use Trail Design Guidelines, Toronto: 2015

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What makes a good interface?

High Volume Pedestrians

Bikes and Peds – the Multi-use Trail

Toronto Multi-Use Trail Design Guidelines, Toronto: 2015

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What makes a good interface?

- Bike Parking
  - Racks
  - Lockers
  - Shelters
  - Rooms

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What makes a good interface?

**• Bikes on Board**
  - Rarely a good idea
  - OK for off-peak trains or bike-cars where space is not an issue

**• Bike Racks**
  - Industry standards

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**Buses and Bikes**
- Bikes on-board
- Bike Racks
- Bike parking

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What makes a good interface?

NACTO: Transit Street Design Guide

Buses and Cars –
The Bus Lane
Shared Lanes
HOV Lane
Bus Lane

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What makes a good interface?
What makes a good interface?
What makes a good interface?

The shared street
Shared Street
Closed to traffic
Limited traffic

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What makes a good interface?

• Previous examples have dealt with most of the mode interface issues

• What’s left?
  • Accessible
    • Network
    • Mobility
  • Amenities
  • Information

THE BUS STOP

Where it all comes together
A word on Complete Streets

**What are Complete Streets?**

- Complete Streets are streets that are safe for everyone: people who walk, bicycle, take transit, or drive, and people of all ages and abilities.

- A Complete Streets policy ensures that transportation planners and engineers consistently design and operate the entire street network for all road users, not only motorists.

- Complete Streets offer wide-ranging benefits. They are cost-effective, sustainable and safe.

https://www.completestreetsforcanada.ca/what-are-complete-streets/

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A word on Complete Streets

What are Complete Streets?

• in Montréal: *Rues Conviviale*: Friendly Streets

• Others - Europe, Boston, SF: Liv(e)able Streets

• Hamilton: Complete Liveable Better Streets

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A word on Complete Streets

What are Complete Streets?

• Tailor accommodation to demand and conditions

• Important from a network perspective
What’s Important?

• Broad planning perspective
  • Modes
    • All modes
  • Geography
    • Regional / city-wide perspective
• Needs
  • Commuters
  • Students
  • Tourists
  • Farmers
  • freight haulers
  • Mobility needs
• Stakeholders
  • Representative of needs

• Imagination and creativity in design (within regulatory limits)
• Network assessment
• Broad success measures
  • Modal levels of service
  • Multi-modal level of service (MMLOS)
  • Qualitative indicators
Further Reading

NACTO Guides

• https://nacto.org/publication/urban-bikeway-design-guide/
• https://nacto.org/publication/urban-street-design-guide/streets/
• https://nacto.org/publication/transit-street-design-guide/

FHWA Technical Assessment

• Guidebook for Measuring Multimodal Network Connectivity
  • https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_connectivity/

OTM Book 18: Cycling Facilities

• https://otc.org/research/otm-book-18/

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Thank You!

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