

Multimodal Transportation Integration

A Framework for Sustainable Planning



Note: these presentation slides must only be used in conjunction with its associated session recording dated March 23, 2021 and available through TAAG

3/23/21



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



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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

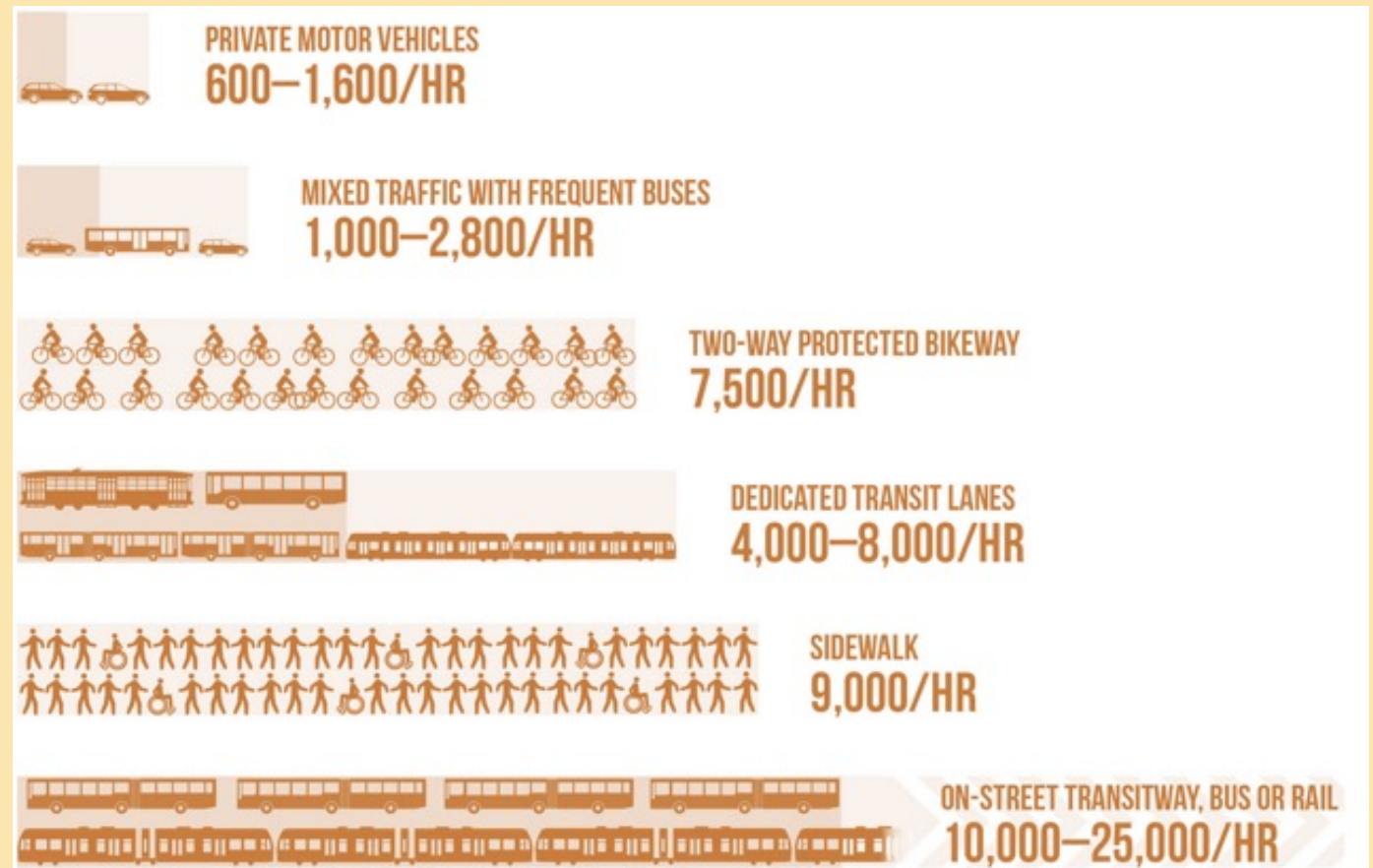
Planning, policy and infrastructure to facilitate connections between modes

- 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

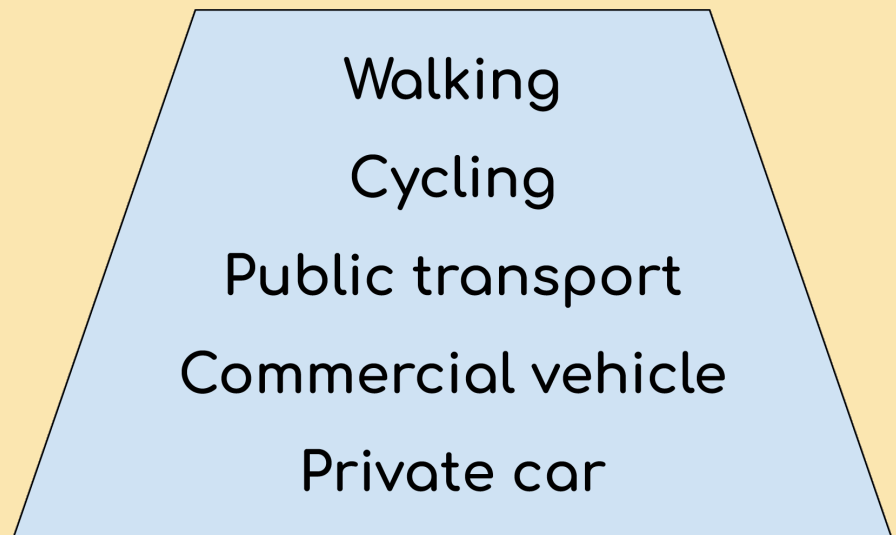
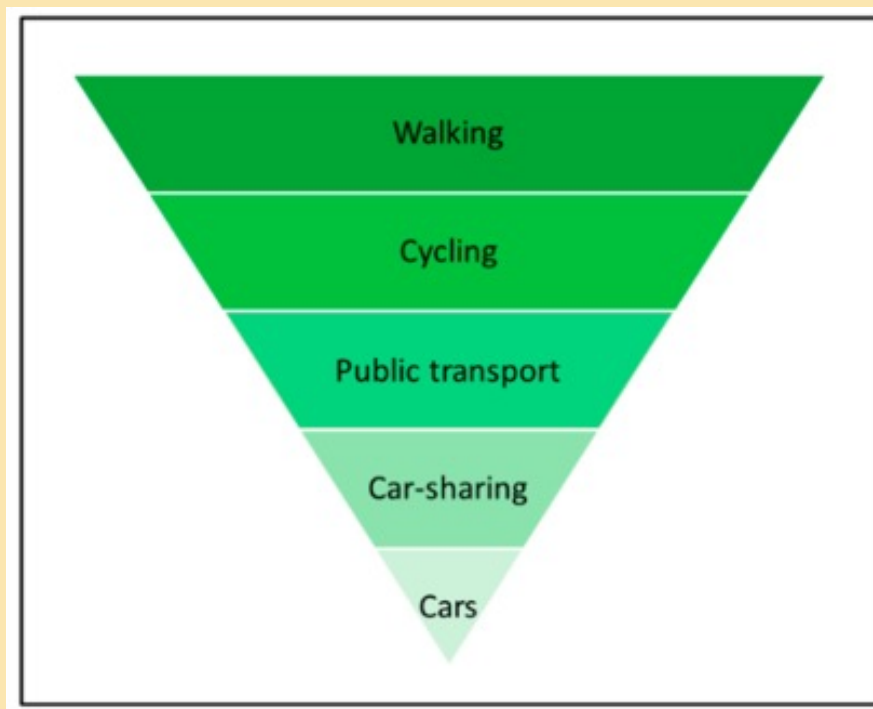
If you give people more choices, people will choose a wider range of options, based on their personal needs



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

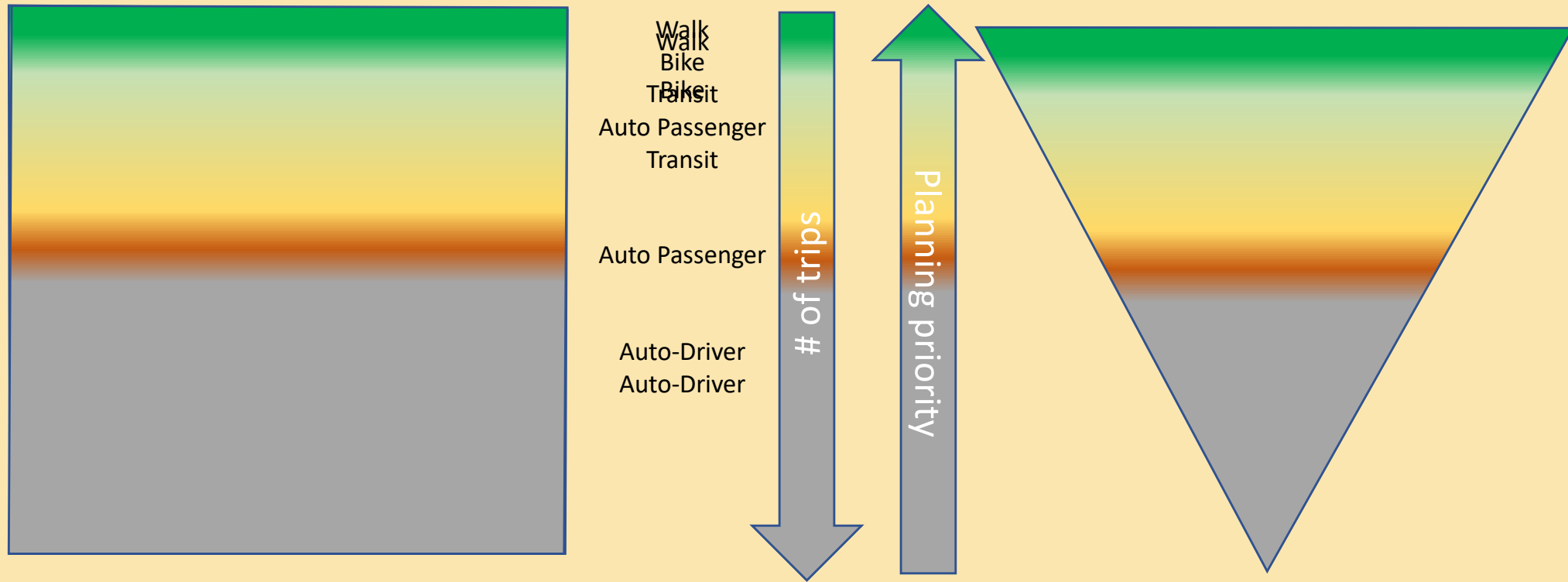
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Inverting (?) the pyramid



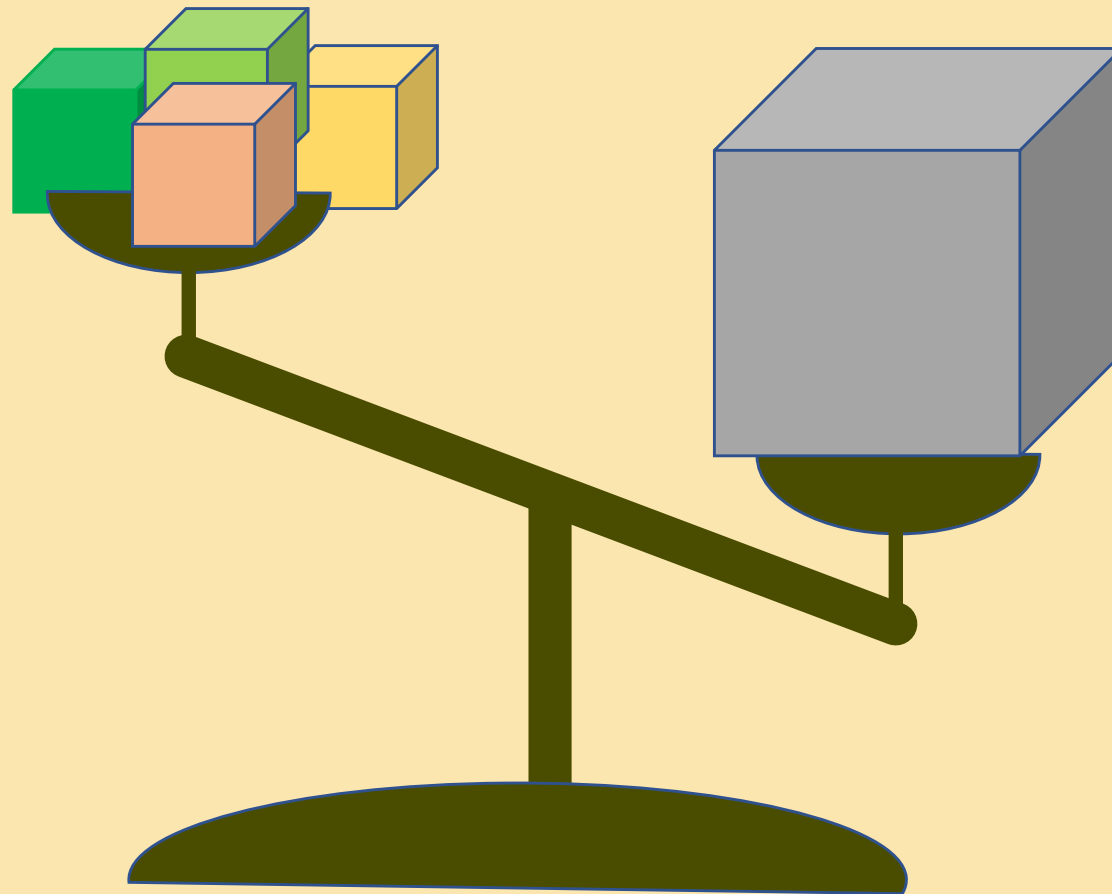
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Inverting the Pyramid



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Balancing the Scale

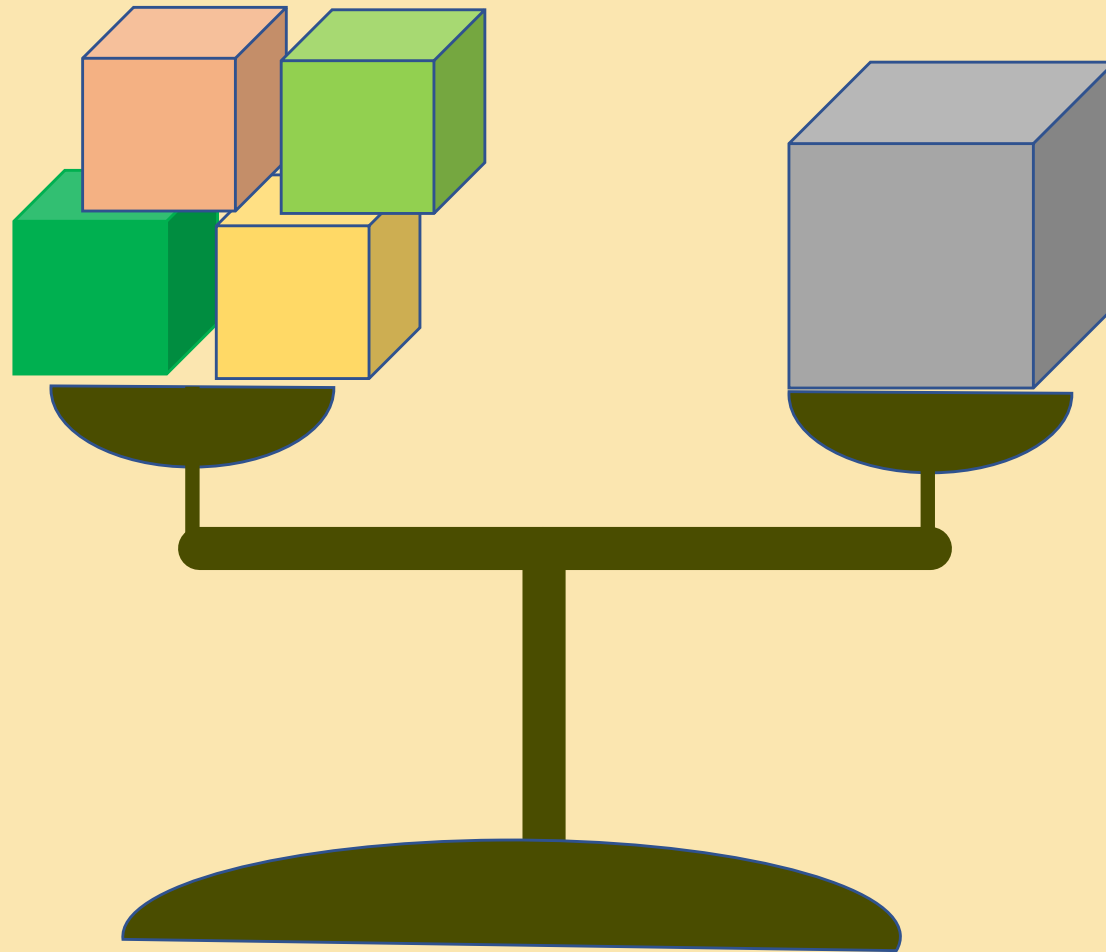


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2021-03-21

Multimodal Transportation Integration

Balancing the Scale



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2021-03-21

Multimodal Transportation Integration

What makes a good network?



Completeness

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



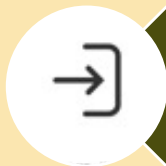
Density

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

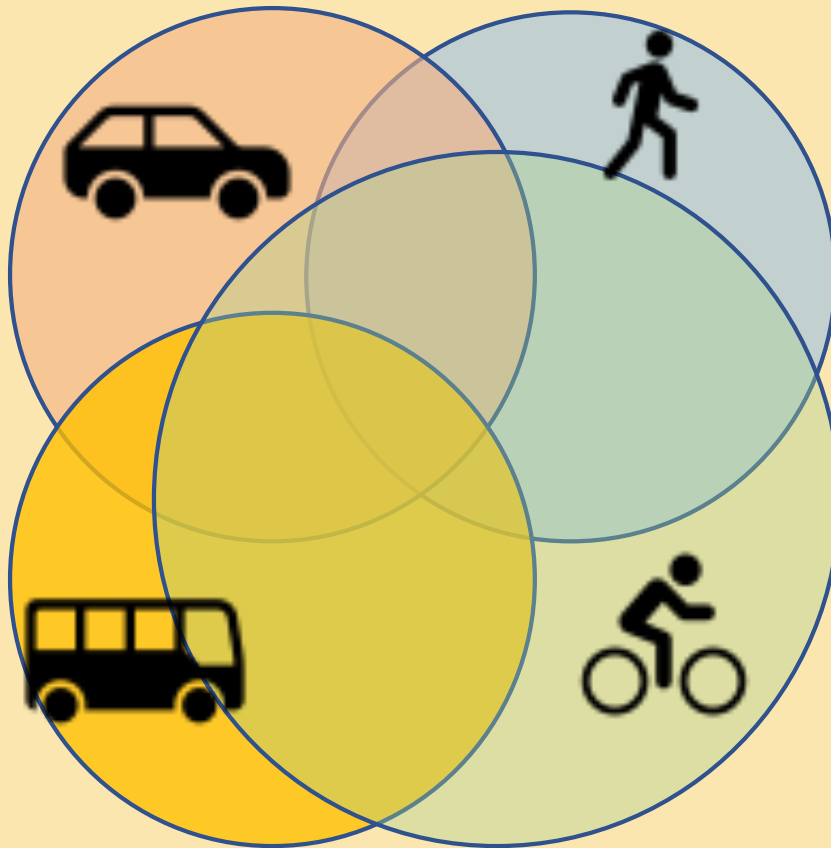
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Network connectivity



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What makes a good interface?



- Safety
- Accessibility
- Location
- Convenience

Sources:

NACTO Urban Bikeway Design Guide

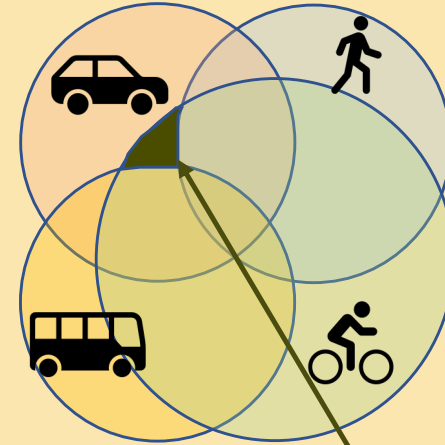
NACTO Urban Street Design Guide

NACTO Transit Street Design Guide

OTM Book 18

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What makes a good interface?



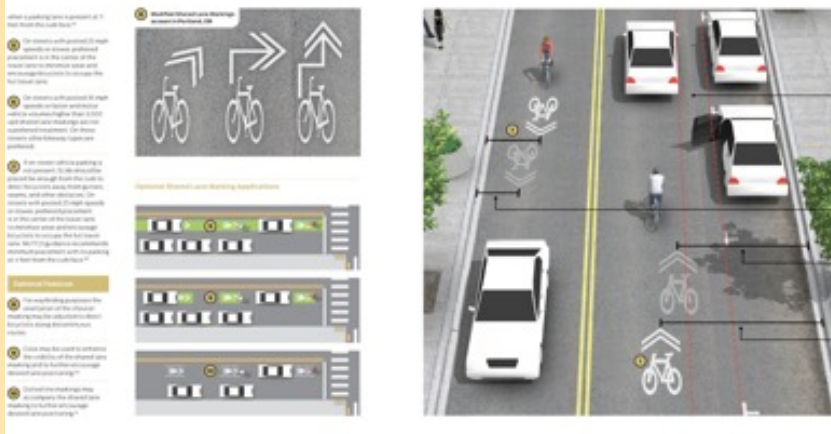
Bikes and Cars

Shared Lanes

Bike Lanes

Buffered Lanes

Separated lanes



References:

NACTO: Urban Bikeway Design Guide, Second Edition

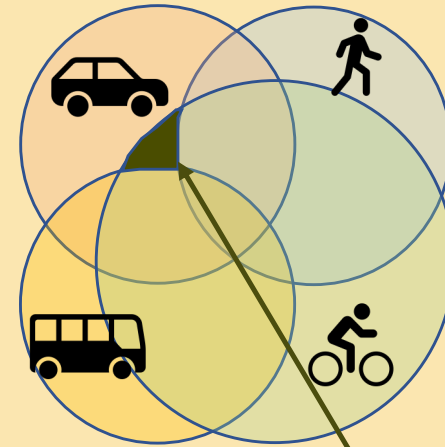
Ontario: OTM Book 18

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What makes a good interface?



Milton



Bikes and Cars

Shared Lanes

Bike Lanes

Buffered Lanes

Separated lanes

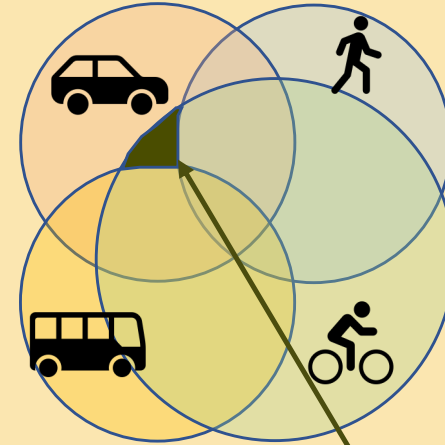
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What makes a good interface?



Bikes and Cars

Shared Lanes

Bike Lanes

Buffered Lanes

Separated lanes

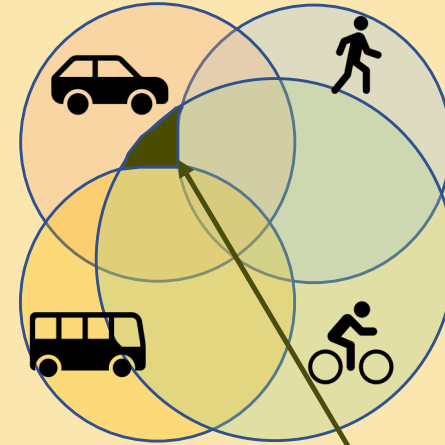
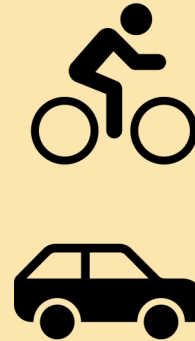
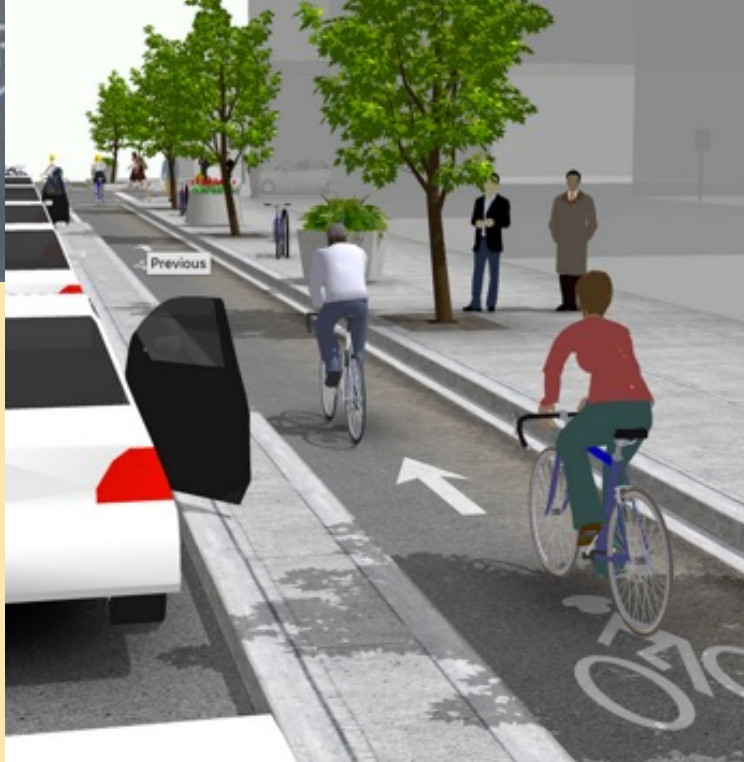
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What makes a good interface?



Bikes and Cars

Shared Lanes

Bike Lanes

Buffered Lanes

Separated lanes

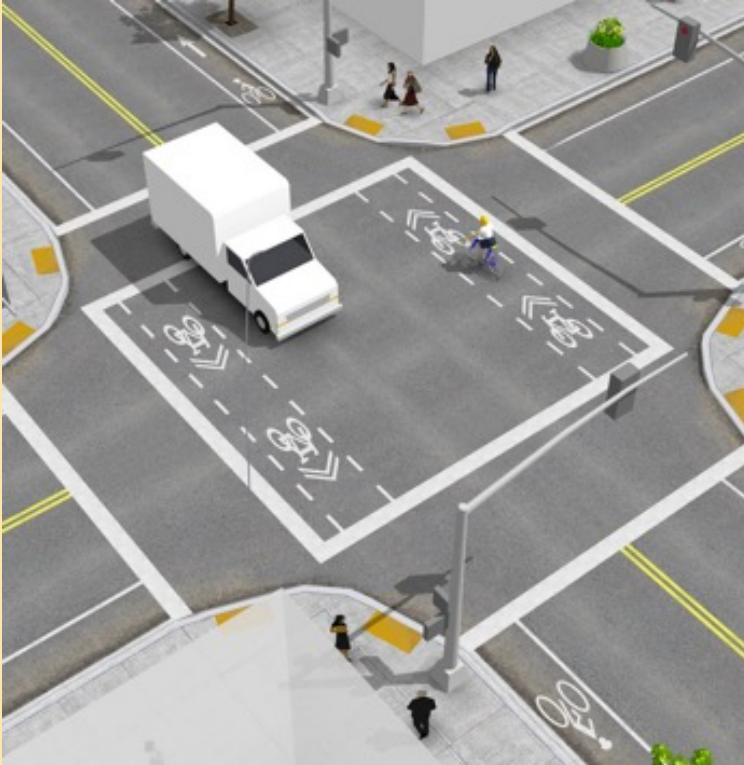
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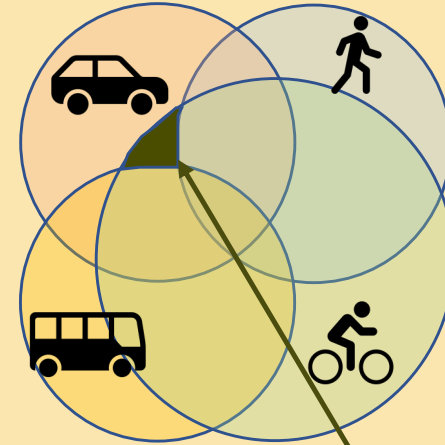
Ontario: OTM Book 18

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What makes a good interface?



Intersection – Crossing marking



Bikes and Cars

Shared Lanes

Bike Lanes

Buffered Lanes

Separated lanes

References:

NACTO: Urban Bikeway Design Guide, Second Edition

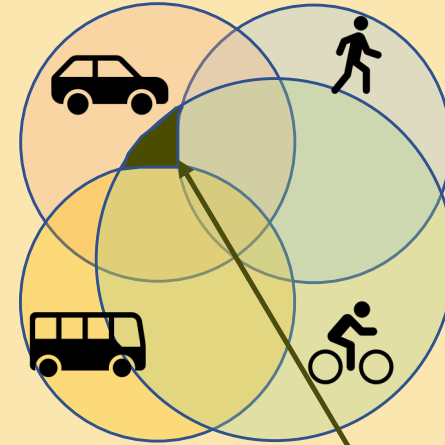
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What makes a good interface?



Intersection – Bike box



Bikes and Cars

Shared Lanes

Bike Lanes

Buffered Lanes

Separated lanes

References:

NACTO: Urban Bikeway Design Guide, Second Edition

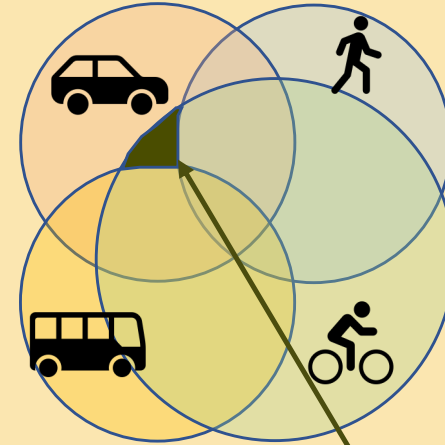
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What makes a good interface?



Intersection Bike signals



Bikes and Cars

Shared Lanes

Bike Lanes

Buffered Lanes

Separated lanes

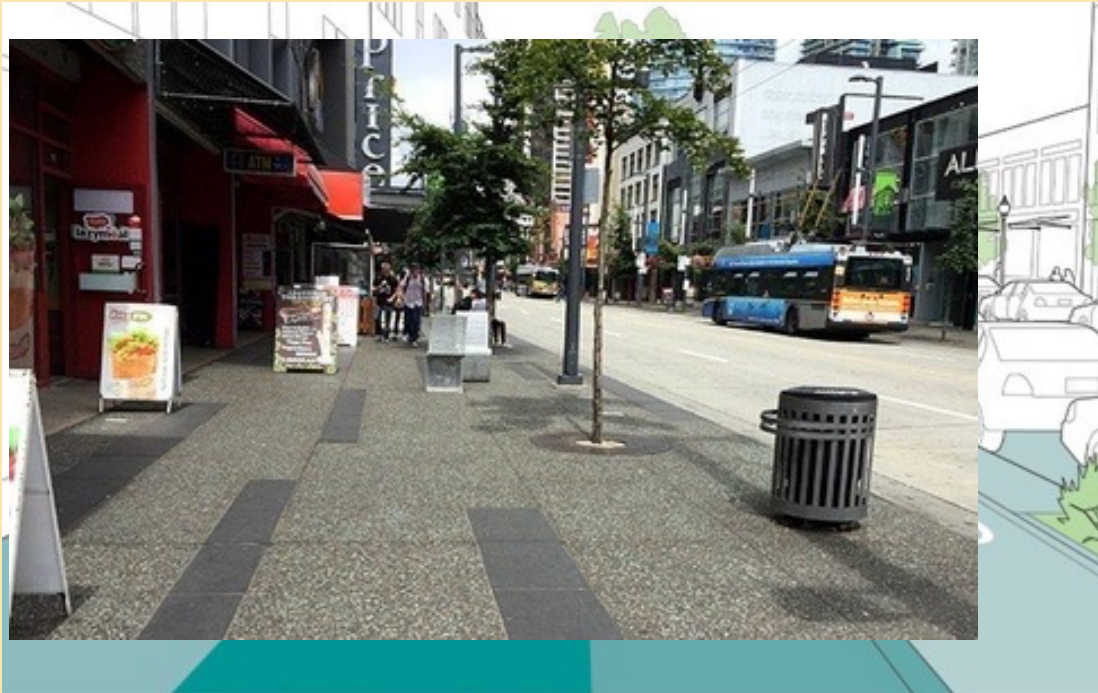
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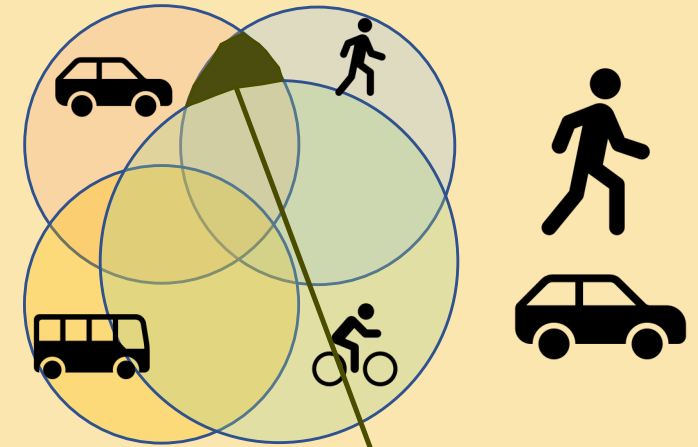


**Frontage
Zone**

**Pedestrian
Through Zone**

**Street
Furniture /
Curb Zone**

**Enhancement
/ Buffer Zone**



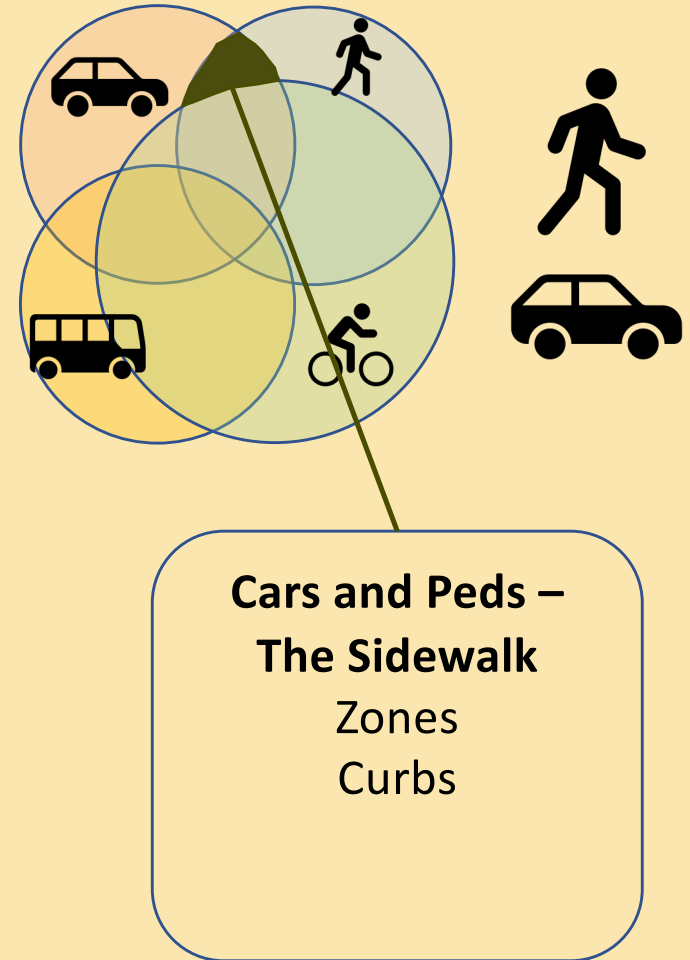
**Cars and Peds –
The Sidewalk**
Zones
Curbs

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What makes a good interface?

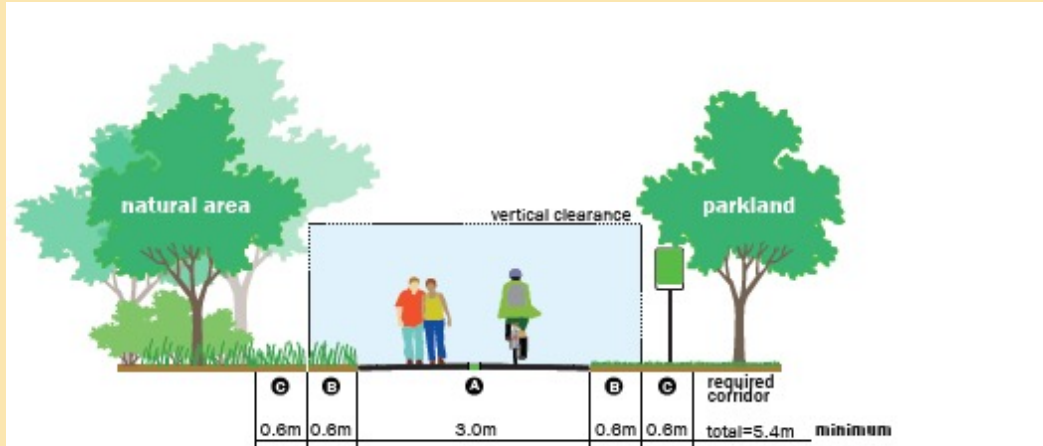


Curb extensions increase the overall visibility of pedestrians by aligning them with the parking lane and reducing the crossing distance for pedestrians



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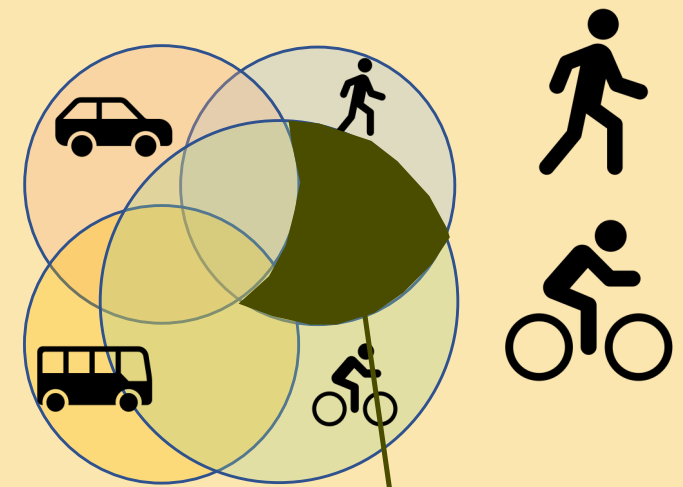
What makes a good interface?



Basic design



Toronto Multi-Use Trail Design Guidelines, Toronto: 2015



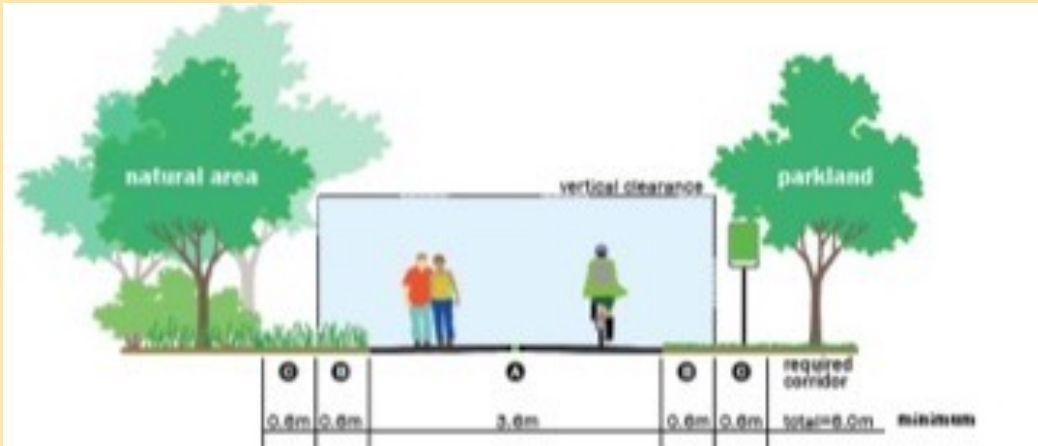
**Bikes and Peds –
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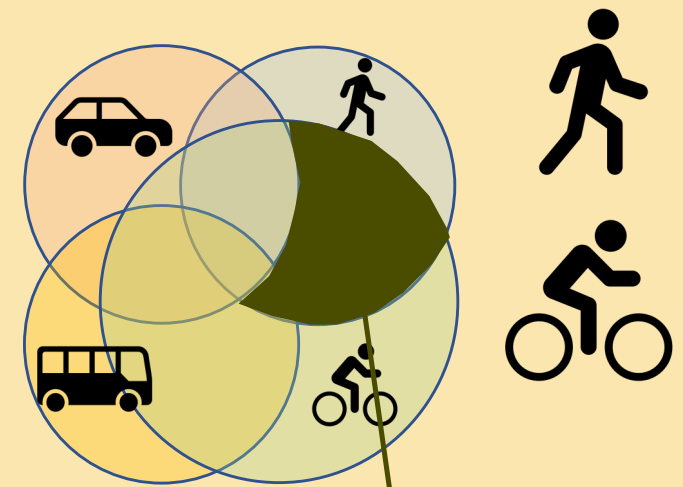
What makes a good interface?



Higher Capacity design



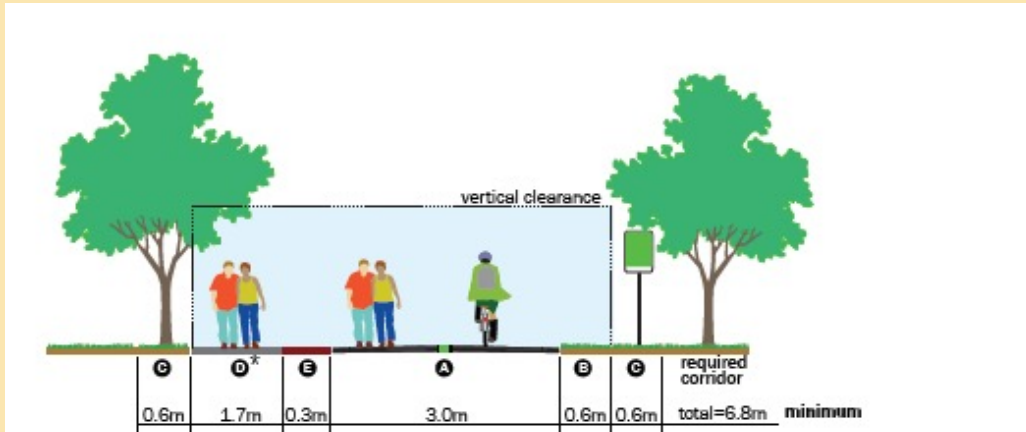
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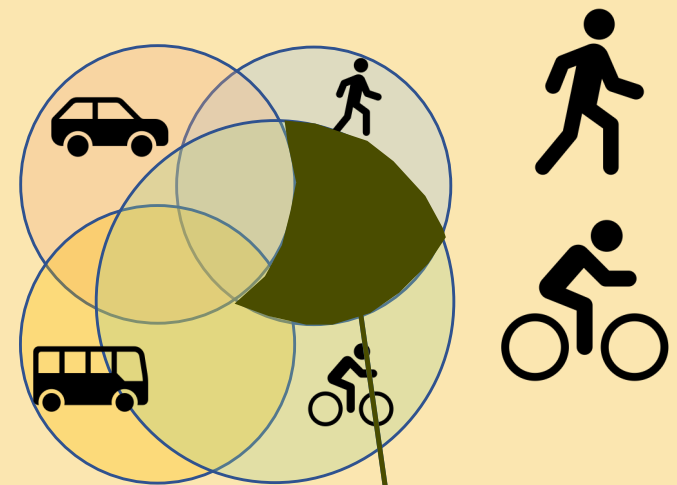
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What makes a good interface?



High Volume Pedestrians



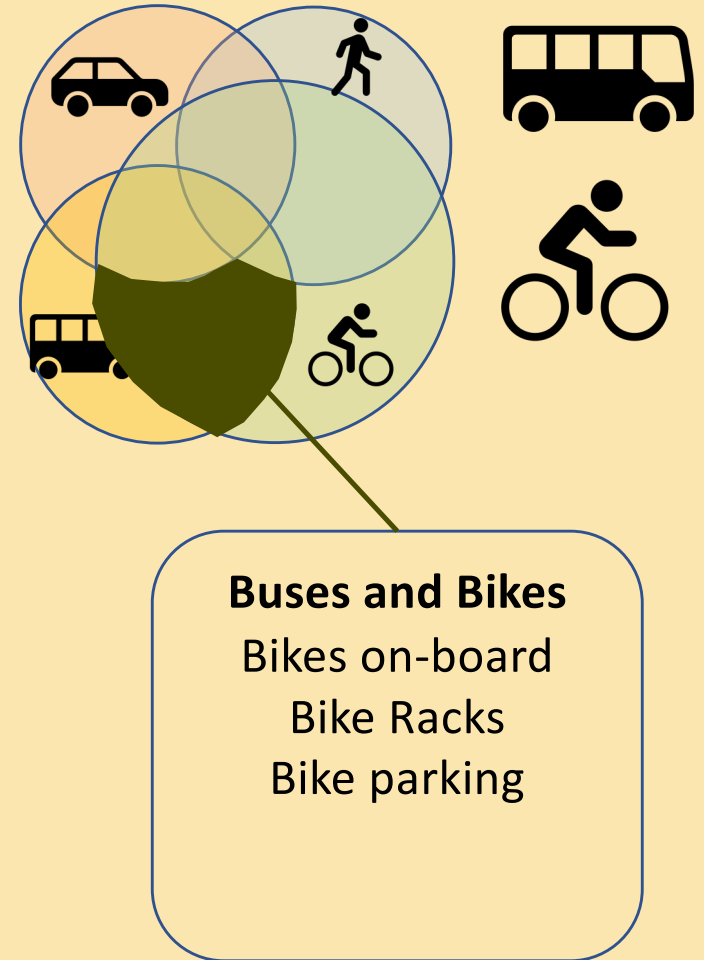
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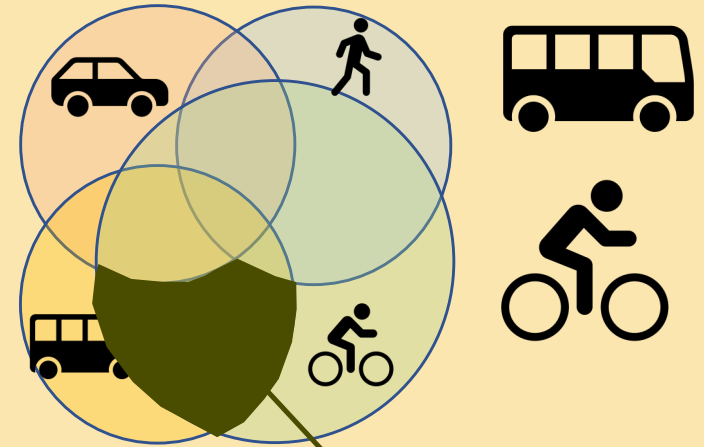
- Bike Parking
 - Racks
 - Lockers
 - Shelters
 - Rooms



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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



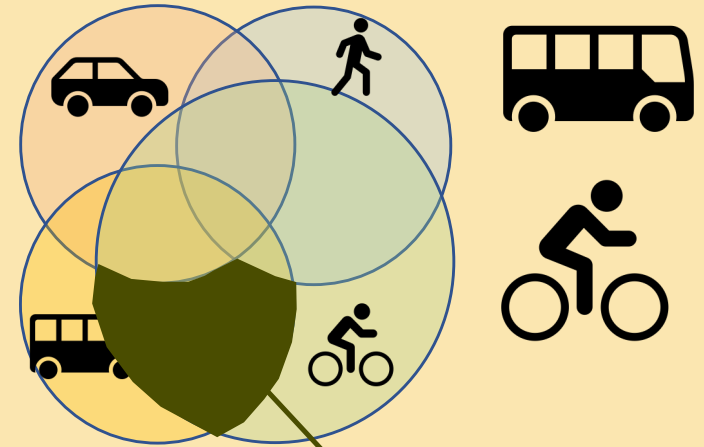
Buses and Bikes
Bikes on-board
Bike Racks
Bike parking



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- Bike Parking
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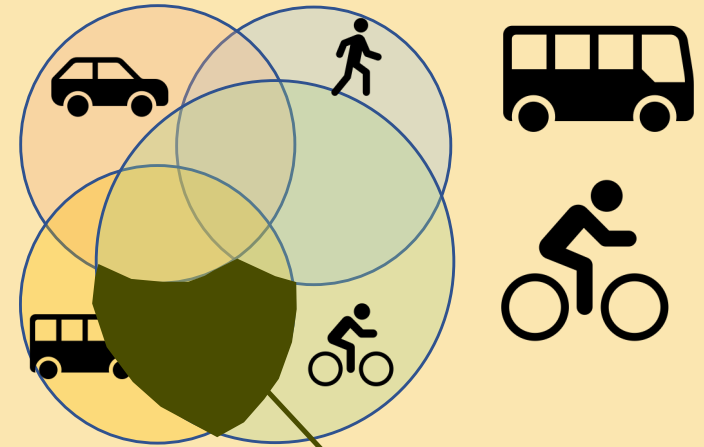
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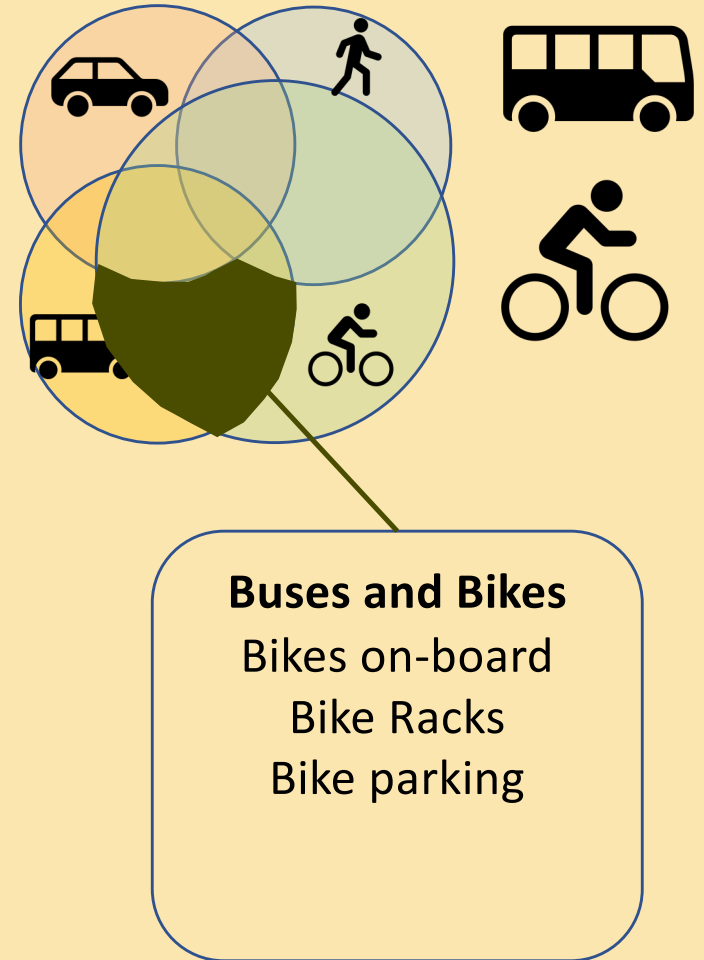


Buses and Bikes
Bikes on-board
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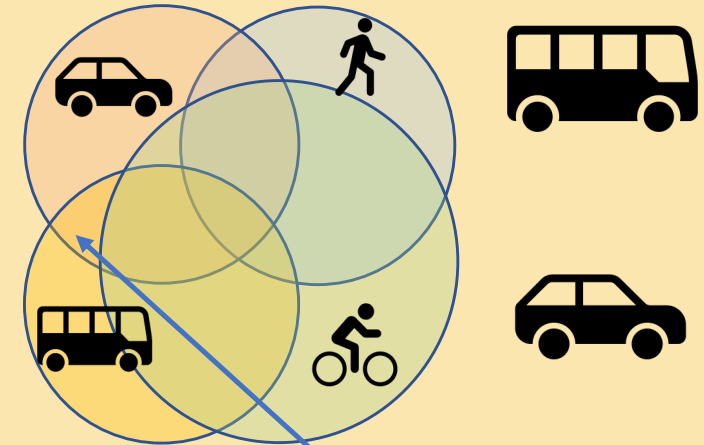
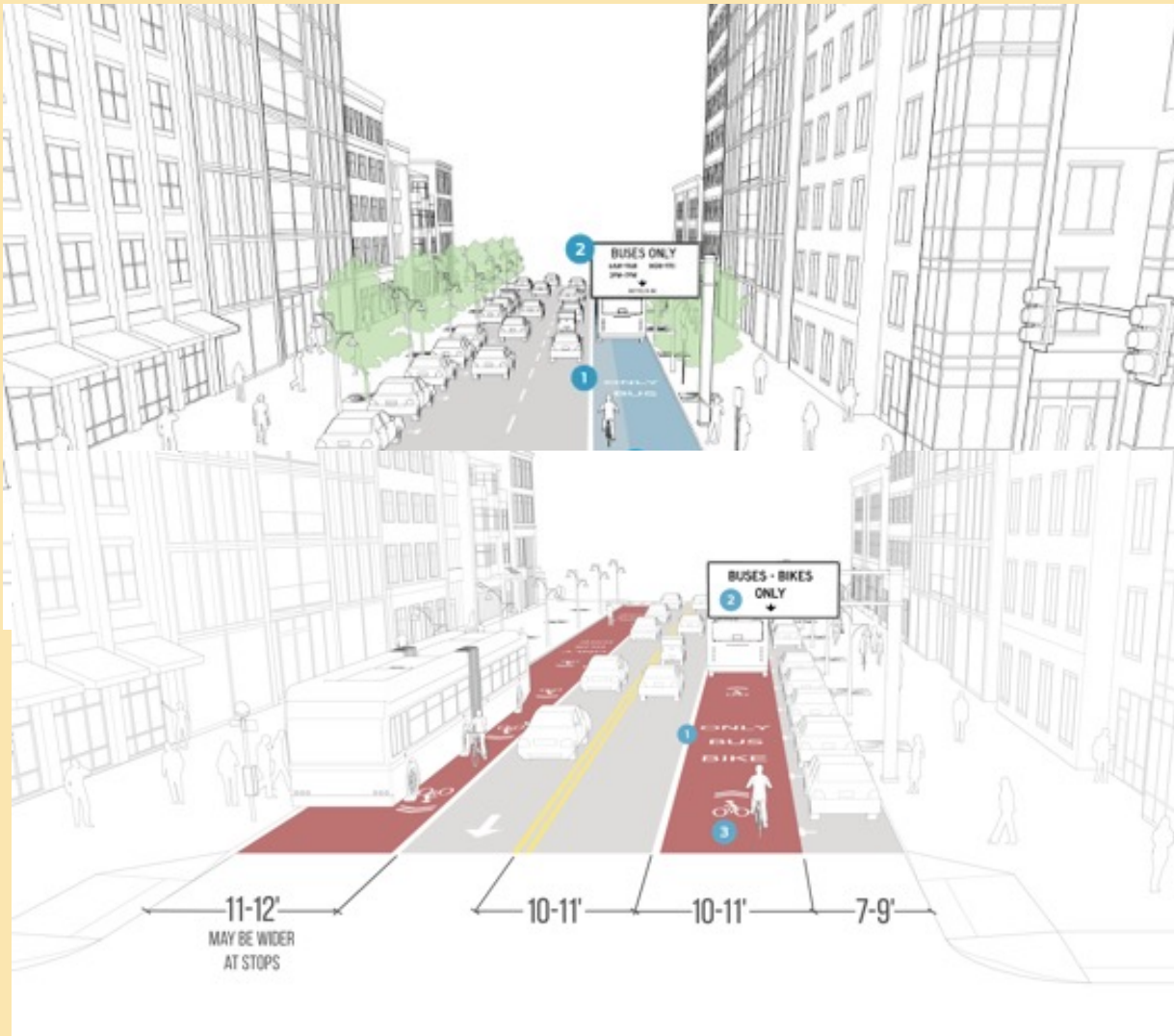
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What makes a good interface?



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

**NACTO: Transit Street
Design Guide**

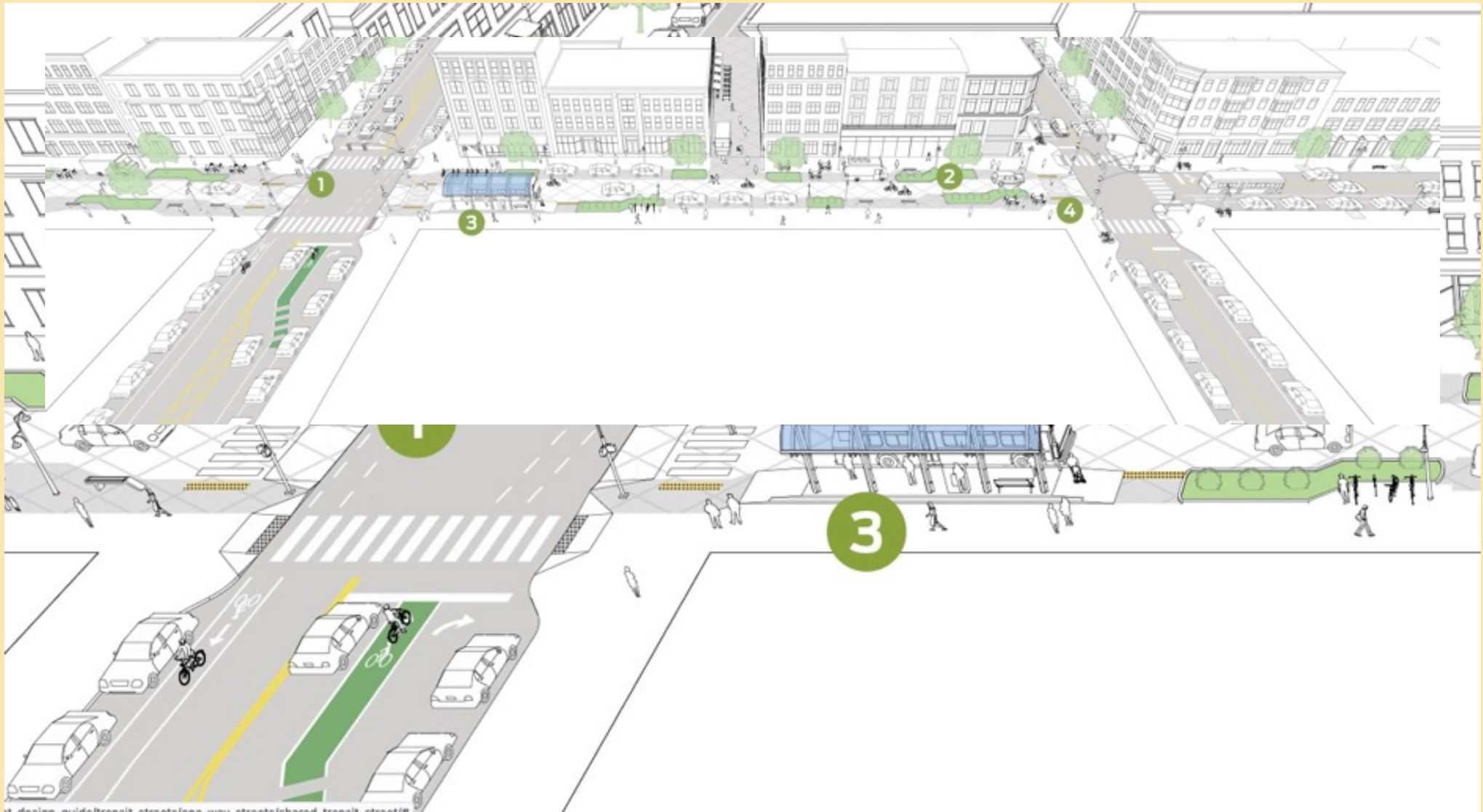
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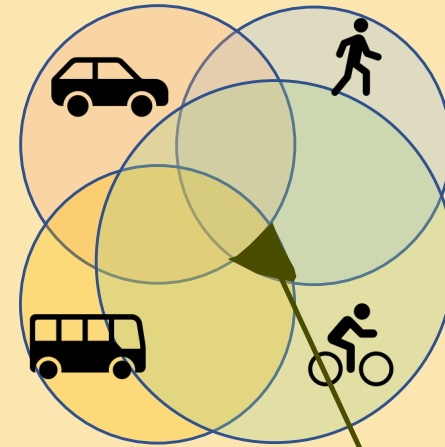
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What makes a good interface?



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What makes a good interface?



The shared street

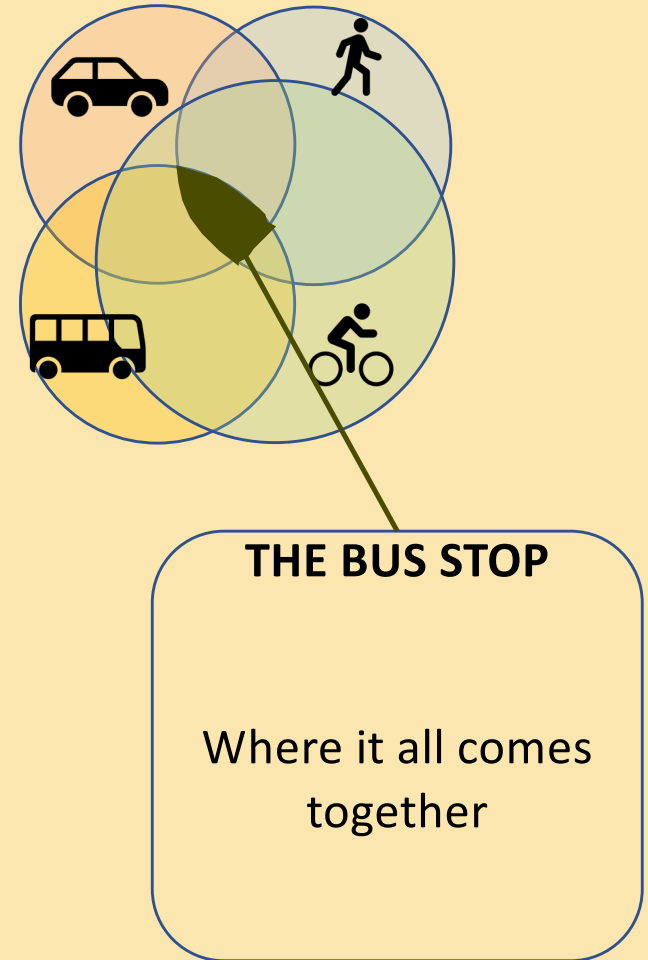
Shared Street
Closed to traffic
Limited traffic



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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



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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

Desired Conditions for CLB Typologies

	Pedestrian Realm	Cycling Facilities	Transit Service	Transit Service (on BLAST network)	Through Movement	On-Street Parking	Green Infrastructure
Urban Avenue	4	4	4	5	3	2	3
Transitioning Avenue	5	5	4	5	4	1	3
Main Street	4	4	3	4	2	4	4
Connector	4	4	3	3	2	2	4
Industrial Street	4	4	3	3	3	1	2
Neighbourhood Street	3	2	1	1	1	3	4
Rural Road	1	4	1	3	4	1	2
Rural Settlement Road	4	3	2	3	3	3	3

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A word on Complete Streets

What are Complete Streets?

- Tailor accommodation to demand and conditions
- Important from a network perspective

Desired Conditions for CLB Typologies							
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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

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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!

Please contact:

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w: transitplanner.ca

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