

**Beyond Public Transport**

**Pedestrians and Transit Oriented Development (TOD)**

**The World Bank**

**Australian Government AusAID**

**ESMAP**  
Energy Sector Management Assistance Program

**PPIAF**  
PUBLIC-PRIVATE INFRASTRUCTURE ADVISORY FACILITY

Cluster 5/Module 2 (C5/M2): Pedestrians and Transit Oriented Development (TOD)

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## Why is Walking Important?



- **All trips involve walking**
  - To/from another mode (e.g., public transport, auto/parking) or
  - For the entire travel distance (competes as a mode)
- **Motorized travel can be reduced if walking becomes safe, secure, easy and pleasant**
  - Increasing the use of public transport
  - Replacing motorized trips

First, we should think about why walking is important.

Walking plays an essential role in personal travel. All trips involve walking to and from another mode. The ease of walking may affect our choice of whether to use a bus or car for a trip.

In some cases, walking also is a reasonable alternative to the car or the bus for making the complete trip. Sometimes it faster and more convenient to walk than to drive your car to a destination, find a parking space, and park.

We can reduce motorized travel by making walking more attractive. The use of public transport can be increased if walk access is improved. Some motorized trips can be replaced with walk trips.

## Walking Time Impacts Trip Decision Making More than Riding Time

Traveler's Perception Walking Time to In-Vehicle Time			
Mode	Work	Leisure	Other
Car	1.37	1.74	1.55
Bus	1.67	1.66	2.02
Rail, Metro	1.99	1.97	1.37

*\*Source: The Demand for Public Transit, A Practical Guide, TRL, UK, 2004*

Travel time is one of the key factors in a person's choice of travel mode. Many studies have found that people value walking time more highly than in-vehicle time.

For example, people traveling to work by metro value one minute of walking time as equal to two minutes of in-vehicle time. In other words, their perception is that if they spend one minute walking, but two minutes traveling in a vehicle, they have spent the same amount of time doing each activity. The comparisons between perceptions of time spent using various modes can be described as their "relative weight."

It is also interesting that the relative weights for walking are higher for bus, rail, and metro than they are for car.

These results suggest that focused efforts on improving walking times can produce substantial results. One minute of walking savings for a metro commuter is perceived as being equal to saving two minutes of travel within a metro vehicle.

## Which Walking Environment is Best?



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The walking environment is also important. People are concerned about personal safety.

The environment in the picture in the upper left of the screen picture is not attractive. People must walk in the street along an expressway. For some people, environment feels dangerous because there little activity on the street.

The environment in the lower left is slightly better because of the trees and grass along the boulevard. However, there is little pedestrian activity and the noise the busy arterial makes walking less attractive.

The pictures on the right are more inviting to walkers. The walking path is tree-lined and integrated into environment. There is lots of pedestrian activity.



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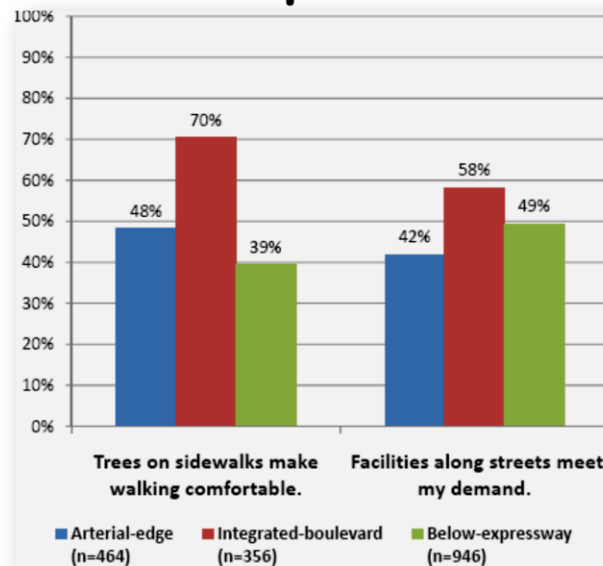


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## Corridor Walkability BRT User Perspective



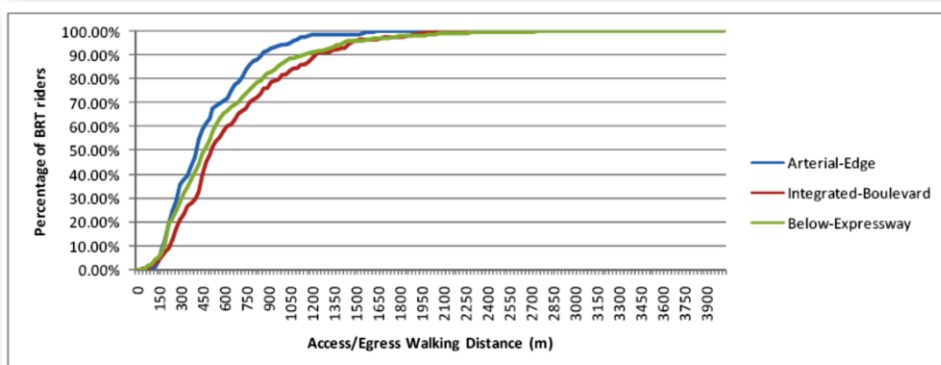
\* From paper by Yang Jiang done for World Bank

The walkability of streets has been studied through surveys. A recent survey of people riding the Bus Rapid Transit (BRT) service was conducted in Jinan, China. The survey found that integrated boulevards were much more popular with users than other types of streets.

As shown in dark red bars on the chart, almost 60% of the users agreed that the facilities along the boulevards meet their needs. Over 70% of users agreed that the trees on the sidewalks make walking comfortable.

The results for the users of arterial-edge streets and below-ground expressways were much lower, as shown by the shorter blue and green bars.

## BRT Users Walk Farther in Good Walking Environments

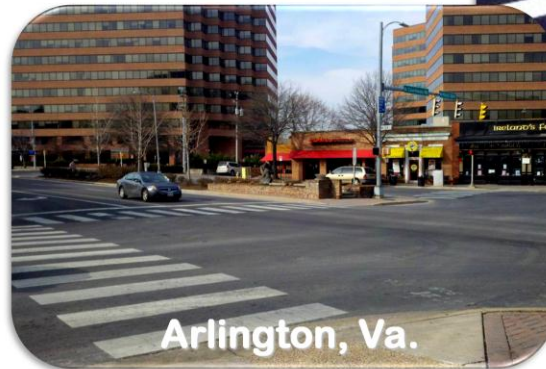


Walking Distance (m)	Arterial-Edge	Integrated-Boulevard	Below-Expressway
Mean	475	649	580
Median	412	520	458
Maximum	1635	2023	2738

The Jinan survey also revealed that users are willing to walk longer distances in good walking environments. People using an integrated boulevard walked an average of 649 meters to the BRT from their origins or destinations. This is 12% farther (69 meters) than people walking along expressways and 37% farther than people walking on edge arterials.

## Protected Surface Crossings are Generally Preferred

- No level changes
- Open and lighted
  - Secure and safe!



Walking often requires pedestrians to cross streets, which raises concerns about pedestrian safety. The pictures show two good examples of surfacing crossings in Arlington, Virginia (across the river from Washington, D.C.) and Singapore.

Both crossings occur at intersections with traffic signals. The crossing walkways are large and well-marked. They provide a visual sense to pedestrians that the crossings are safe and secure.

The signals are programmed to provide ample time for pedestrians to safely cross the streets while cross traffic is stopped.

## Guidelines for Making Crossings Attractive



- **At-grade guidelines**
  - Use bold, visible pavement markings
  - Protect pedestrians by using a signal with pedestrian phase or traffic table, “sleeping policeman”, or both
  - Put pedestrian refuges in median of wide roads
- **Grade-separated guidelines**
  - Pedestrian subway preferred to elevated crossing
    - Shorter climb, e.g., 2.5-3 meters versus 4.5-5 meters
  - Ramp grades <8%
  - Make sure well lighted (natural as well as artificial light), and busy (vendors, shops)
    - Can raise street, put partially above ground to admit more light

There are guidelines for making crossings attractive.

For at-grade crossings, pavement markings should be bold and highly visible to motorists.

If possible, pedestrians should be protected with a separate signal phase for walking.

A raised crossing — often known as a traffic table or sleeping policeman — can provide protection. On wide streets or crossings with complicated signal phasing, pedestrian refuges can be placed in the medians to provide safety.

Sometimes, at-grade crossings are not feasible and must be grade-separated.

Subways are preferred to elevated crossings because the climbs are shorter.

The ramp grades should be less than 8%.

For safety, subways should be busy with commercial activity and well-lit. Sometimes, the roadway can be raised to provide more natural light.



## Grade-Separated Pedestrian Crossings



Pedestrian Overpass, Beijing



Pedestrian Air Con.  
Overpass, Dubai



Pedestrian Subway,  
Bogota

These pictures show examples of different approaches to grade-separated crossings. The pedestrian overpass in Beijing requires walkers to make considerable effort to cross the street. They must up the stairs at one end, make the crossing, and then go down the stairs at the other end. For many users, this takes about twice as long as at-grade crossing with considerably more effort. The crossing is covered, but not climate-controlled.

In Dubai, efforts are made to reduce this inconvenience. Escalators are used to transport users up and down from the overpass. The crossing is air-conditioned.

The pedestrian subway in Bogota is well-lit and is accessed by a pedestrian ramp. It provides users a pleasant way to cross the street.



## Climate is Important Factor in Walkability

- **Must be considered in most cities, at least in some seasons**
  - Hot/cold temperatures, humidity, wind, rain
- **Focus areas**
  - **Walking path**
    - To/from public transport
    - As a primary mode
  - **Waiting time for public transport**
    - Public transport stops
    - Public gathering places near public transport stops



Climate should be considered in efforts to improve walkability.

This is true in most cities, at least in some seasons, because of extremely hot or cold temperatures, humidity, rain, and snow.

The walking path is an obvious focus of planning. This is important both for access to public transport services and as an alternative mode to other alternatives such as car, motorcycle, and bus travel.

Waiting time areas are also important to the use of public transport. Weather protection and comfort is important for users waiting at stops. It also is important at public gathering places near public transport stops

# Providing Walkability in Extreme Climates

- **First-story Walkway (Skywalk) Network**
  - Minneapolis (cold winters)



13 KM

The City of Minneapolis addressed its severe winter problems through the construction of first-story walkways or skywalks.

The 13-kilometer network connects most of the major buildings in the central city and is integrated with the shops and stores in the buildings. The walkways are climate-controlled — heated in the winter and air conditioned in the summer. They also provide safe and convenient walkways for crossing streets.

## Providing Walkability in Extreme Climates

- **Underground Pedestrian Walkways**
  - Montreal, Toronto (cold winters)
  - Houston (hot summers)



Montreal – 32 KM



Houston – 11 KM

Underground pedestrian walkways are another way to provide climate-controlled walkways

Montreal constructed a 32-kilometer network to address the walking challenges of its severe winters.

Houston built a 11-kilometer network to provide convenient walking during its long, hot, and humid summers.

## Underground Walkways Integrated with Shopping



*\*Images From Wikipedia*

It is important to integrate the pedestrian walkways with shopping areas. These two images show how it was done in Houston and Montreal. The designs provide the look and feel of suburban shopping centers placed in a downtown urban environment.

## Pedestrian Volumes Are Important!

- Caution for planning skywalk and underground walkway networks
  - Take care not to “split” pedestrian volumes so that surface, other facilities are sparsely used



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Good pedestrian walking data are needed to effectively plan skywalks and underground walkways. Care must be taken not to split pedestrian volumes such that surface walkways are sparsely used and all pedestrians use the skywalks or underground walkways. If this is done, the street will be perceived as less safe and not walkable because of reduced activity.

## Streetscaping Can Provide Protection from the Weather



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Streetscaping is another way to improve walkability and provide weather protection. The street scene in Hanoi shows how the careful planting of trees can provide shade in hot climates and limited protection from the rain.

Shade and better protection from the rain can be provided through the use of covered sidewalks that are integrated into the designs of adjoining buildings. Examples of covered sidewalks are shown from Casablanca and Delhi. The covered sidewalks can also be beneficial to the shops because they may encourage more “window-shopping.”



## Guidelines for Walkable Environments



- **Safety**
  - **Pathways**
    - Wide enough to allow two-direction walking
    - Physically separated from high-speed vehicle traffic
    - Well lighted, open without hiding places
  - **Street Crossings**
    - “Protected,” 50-150 meters apart depending on environment
- **Sidewalks, pathways**
  - **Continuous, no gaps**
  - **No obstructions**
    - e.g., parked cars, vendors, merchandise
  - **Minimal level changes, if possible ramps not stairs**
- **Interesting, lively adjacent land uses**
  - **No parking lots, blank walls**
  - **Adjacency minimizes walking distances**
- **Good way-finding signage**

The key guidelines for developing walkable environments are common sense.

Safety must always be considered. The pathways should be physically-safe — wide enough to allow two-direction walking and physically separated from high-speed vehicle traffic. The pathways should provide a sense of personal security — well lighted and open, without hiding places. Street crossings should be protected and spaced 50-150 meters apart.

Sidewalks and pathways should be continuous with no gaps. There should be no obstructions, such as vendors, merchandise stands, or parked cars. Level changes should be minimized and ramps should be used when possible.

Walkable environment need interesting, lively adjacent land uses, not parking lots and blank walls. These land uses attract walking trips and minimize walking distances.

Finally, good signage is needed to guide walkers.