SOUTH AFRICA ROAD FEDERATION

Non-Motorised Transport Practitioner's Course

11 NOVEMBER 2020

Session 3: Planning for Pedestrians and Cyclists – understanding the context

SARF
founded in 1950

Pedestrian route network planning

Introduction to planning process (1)

- Network and route planning approaches are essential to decrease haphazard provision for walking and cycling by holistically planning of networks and routes for NMT.

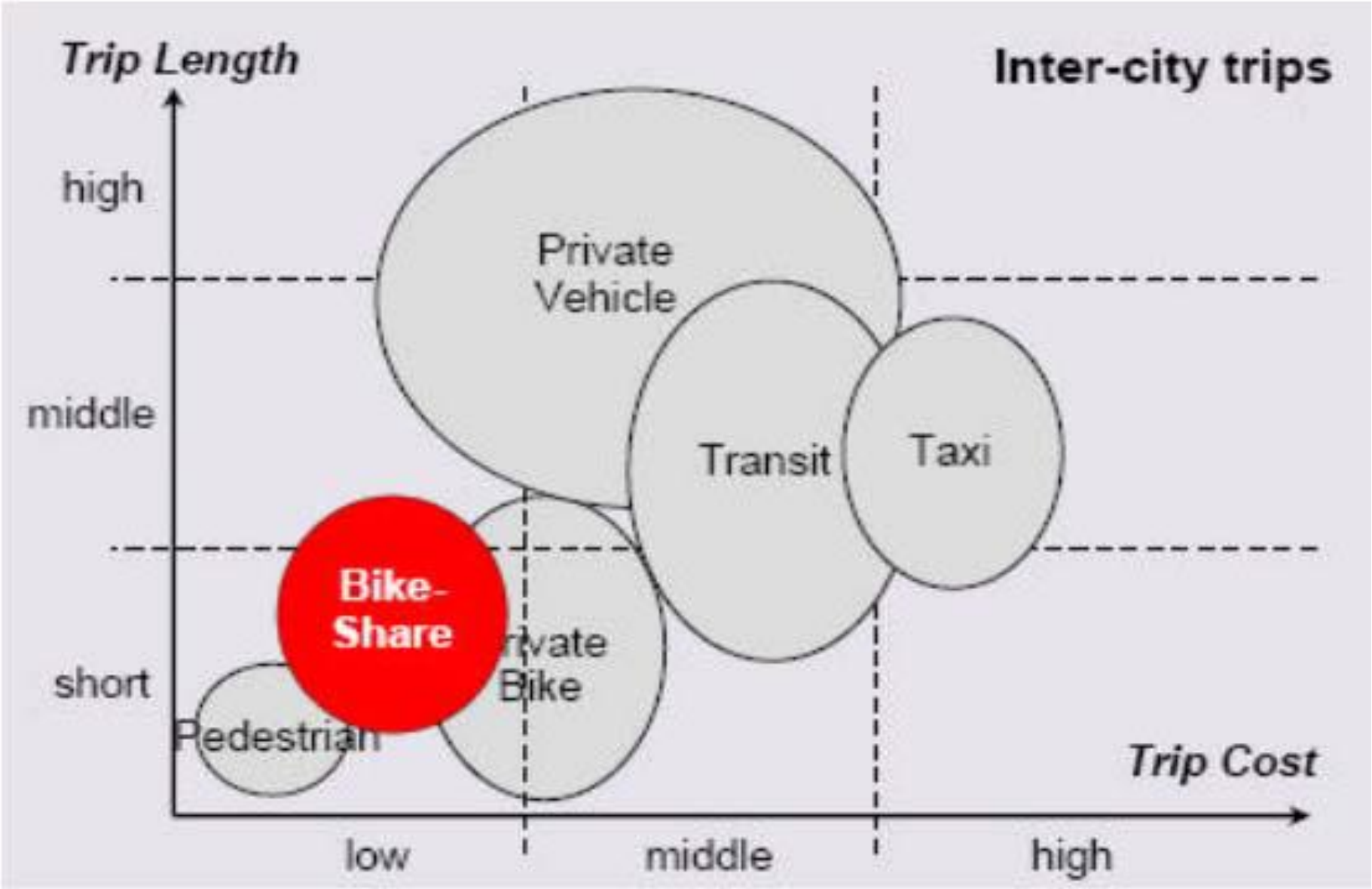
- This is done by translating NMT demand estimates (actual or predicted) into a complete network, while also looking at constraints such as existing road classification, physical barriers (freeways, railways, rivers, mountainous terrain), user types, etc.

- NMT (walking and cycling) are the most efficient means of mobility over short distances. Over longer distances, public transport or cars (with passengers) offer greater efficiency.

- An important part of the planning is to understand the challenges that private (especially single occupancy) cars present in the space considerations of a city and citizen mobility

ETHEKWINI 5 YEAR NMT PLAN

NMT (walking and cycling) most efficient means of mobility over short distances



Introduction to planning process (2)

- Planning for NMT is mainly about *facilitating movement from origins to their destinations or to public transport corridors* or public transport routes.
- This is best done through a *system of interconnected routes and networks*. This will aid in improved safety, growth of use, and user functionality.

Planning for NMT modes

- Pedestrian Network Master Plans (DEA Manual, 2014)
- Pedestrian Route Network Planning (DoT NMT Manual, 2014).
- Cycling Route Network Planning

Pedestrian Network Master Plans (DEA Manual)

Questions asked when planning walking networks:

- How many people currently can or could walk?
- Where do they walk to and what routes do they take?
- What is the purpose of their trip?
- What are the existing facilities and infrastructural barriers?
- What are the social, weather, safety and other barriers?
- Where are the missing connections/links? Priorities?
- What are the land-uses, trip origins and trip destinations?
- How secure is the network? *(Crime Prevention through Environmental Design (CPTED) principles of safety in design, need to be taken into consideration when designing land uses for pedestrian infrastructure).*

Pedestrian Network Master Plans (DEA Manual)

Pedestrian network requirements

- **Walkability -** Pedestrian networks should facilitate *easy crossing of intersections with accessible connections to other neighbourhoods and public transport facilities*. Networks should provide *continuity, linking origins with destinations*. **As far as is practicable, routes should follow desire lines.**
- **Attractiveness -** Pedestrian networks should ensure an *interesting and attractive streetscape* and should encourage possibilities for initiatives on, and next to, the public space. Routes should cater for people to *stop, rest, chat and/or window shop* in pleasing surroundings.

Pedestrian Network Master Plans (DEA Manual)

Pedestrian network requirements (cont.)

- **Comfort -** The requirements of *people with special needs* (for example, people who are mobility impaired, who are travelling with small children, have many items to carry, etc.) should be taken into account. *Adequate design standards should be used in terms of width, grade and quality*. Dropped kerbs are required at intersections for special needs users.

Pedestrian Network Master Plans (DEA Manual)

Data collection requirements (also see Session 12)

- User needs and behaviour characteristics (trip purposes and travel patterns);
- Existing road traffic volumes and speeds
- Road classes and hierarchies
- Identification of conflict points
- Desire lines and route choices
- Pedestrian accident data
- Barriers to greater levels of walking, e.g. topography, rivers, railway lines
- Distances travelled and time taken to travel
- Environmental and traffic impact assessments.

Pedestrian Network Master Plans (DEA Manual)

Data collection techniques

- Specialist reference groups and stakeholder engagement.
- Desk top reviews – desire lines, e.g. Google Maps.
- Site visits.
- Pedestrian walkway condition audits.
- Observations and personal interviews.
- Various other techniques (Session 12).

Pedestrian Network Master Plans (DEA Manual)

Integration with Public Transport

- *Public transport interchange points* must be regarded as key origins and destinations.
- Pedestrian networks should radiate to and from key points of origin and destination.
- Pedestrian networks should cater for facilities such as seating, shade and water as much as possible.

Planning for NMT modes in new developments
(DoT NMT Manual, 2014)

Planning for NMT modes in *new developments*

- NMT neglected in the past in planning new urban layouts and developments – this trend needs to be reversed:
  - NMT should be the first input considered in planning as it requires certain fundamentals to be adhered to, as below.
  - NMT to be located along contour lines to minimise gradients.
  - NMT can follow watercourses in order to maximise mobility without reducing developable land.
  - NMT facility placement needs to consider safety, user function ability and security to ensure good and well-lit sightlines and easily controlled access to facilities and developments.
  - NMT should be considered as the primary mode of transport for short trips and scholars (e.g. Sasolburg, Secunda and Richards Bay).

Planning for NMT modes in ***existing developments***

- Important *guidelines to be recognised while planning within a system of existing facilities and infrastructure*, will include the following processes:
  - Status Quo Assessment
  - Situational Analysis
  - Needs Assessment
  - Prioritization subject to Budget Constraints
  - Development of Programmes
  - Development and implementation of Plans.

How to do Pedestrian Route Network Planning (1)

Basic steps (DoT NMT Manual, 2014).

- Step 1: Desire Line Route Assessments
- Step 2: Base Map to Assess Land Use and Origin and Destinations
- Step 3:Impact of Transport Environment on Pedestrian Behaviour (opportunities, restrictions)
- Step 4: Develop Tested and Refined Network Based on User Requirements

How to do Pedestrian Route Network Planning (2)

Step 1: Desire Line Route Assessments

- Planning pedestrian routes and networks requires a fair amount of data.
- Typical questions to be answered upfront and information needed are:
  - Who are the current users and potential users of NMT facilities?
  - Where are the desire lines originating from and what are their destinations i.e. what are the facilities that people need to access within 1km – 5km?
  - Layout of existing pedestrian desire lines and shortcuts commonly used and where do these desire lines intersect or join with public transport routes and major motor vehicle roads?

Desire lines and short cuts

Desire lines and short cuts

How to do Pedestrian Route Network Planning (3)

Step 1: Desire Line Route Assessments (cont.)

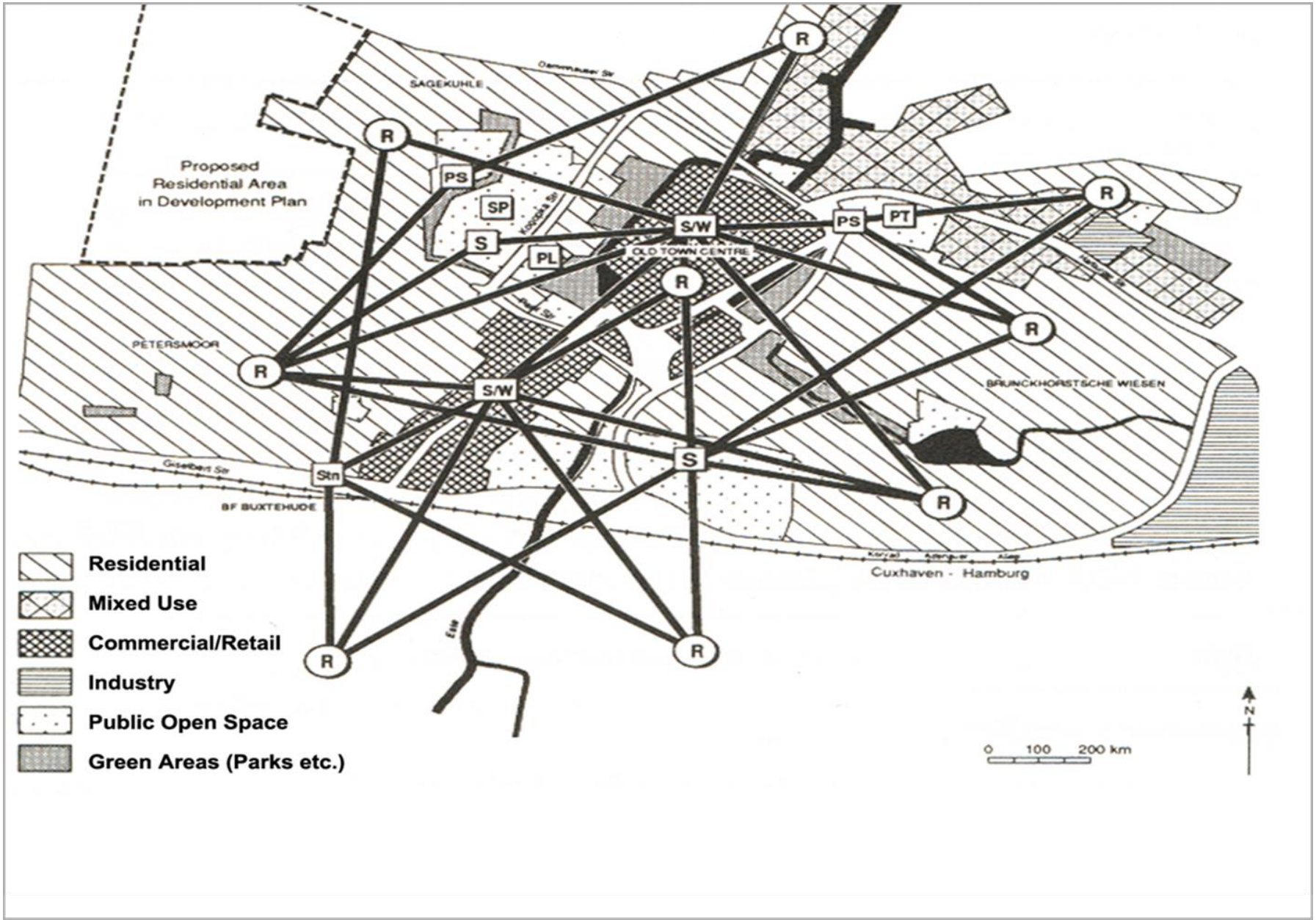
- What role does walking play in the city framework, in terms of the cost, mobility, comfort and accessibility to various modes of transport (*Session 5 – Walkable Communities*)
- What are currently hazardous road sections on existing roads and where it is unsafe for people to walk due to various reasons?
- Data that is also useful to collect includes current and future road traffic volume and speeds; identification of conflict points and crash data; topography as well as the categories of road users.

How to do Pedestrian Route Network Planning (4)

Step 2: Base Map to Assess Land Use and Origin and Destinations

- Local planning documents map the existing land uses, roads and the hierarchy of roads.
- Contain detailed information about land use zones, growth areas, major residential subdivisions, commercial or community developments. They are a most useful source of primary data about likely origins and destinations of pedestrian trips.
- Trip desire lines (straight lines connecting the main origin and destination location) can then be plotted by directly linking the main origins and destinations *using manual or computerised methods.*

Base Map to Assess Land Use and Origin and Destinations



How to do Pedestrian Route Network Planning (5)

- **Step 2: Base Map to Assess Land Use and Origin and Destinations (cont.)**
- Higher concentration of pedestrians expected near popular destinations (trip generators). Origin-destination survey or a simple mapping of important future/ current NMT origins and destinations very useful, amongst them looking at:

  Residential areas, Schools and universities, Offices and industries, Shopping areas and markets, Leisure, tourist and entertainment facilities, and Natural areas.
- An inventory of these locations can be mapped using a basic land use map in a GIS-system. *It is also possible to detect existing pedestrian desire lines, based on aerial photography data and site visits to communities, to identify the pedestrian trip needs.*

How to do Pedestrian Route Network Planning (6)

Step 3: Impact of Transport Environment on Pedestrian behaviour

- Transport data in relation to pedestrians must be mapped, e.g. public transport routes, accident hotspots for pedestrians, functional classes of roads and speed limits within the vicinity of the project. This requires and in-depth knowledge of the route(s) to be developed
- Identify main infrastructure barriers, e.g. highways, swamps, railway lines, insecure areas, and the like, obstructing logical origin-destination connections and add to the base map.
- These barriers can be the cause of missing links in existing network. As special provision may have to be made to establish the desired pedestrian connections (e.g. foot bridge across river or railway line), these barriers require special attention when developing the pedestrian network.

How to do Pedestrian Route Network Planning (7)

Step 4: Develop a Tested and Refined Pedestrian Network Based on User Requirements

1. Completeness
2. Directness
3. Less Conflict
4. Speed Appropriateness
5. Attractiveness
6. Barrier Free
7. Safety (crime, traffic, etc.)

How to do Pedestrian Route Network Planning (8)

Tested and Refined Network Based on User Requirements

1. Completeness

- The different route elements should form a coherent unit and link NMT users' departure and destination points. This includes a consistent and complete network from beginning to end. This requires that:
  - Easy access to main network points of origin and destination.
  - NMT network be integrated with the public transport network.
  - A hierarchical network approach must be followed (i.e. *provision of a city-wide, primary and secondary network*).
  - Routes must not end in the middle of a road corridor i.e. routes must have connectivity. A well-connected network of streets and pedestrian routes/paths means that it is easy for the pedestrian to get around.

How to do Pedestrian Route Network Planning (9)

Tested and Refined Network Based on User Requirements

2. Directness

- Connections to link NMT users as directly as possible to their destinations. This requires that:
  - There must be limited detours.
  - Short-cuts must be used as much as possible over natural or man-made barriers (e.g. railway lines, rivers).
  - Care must be taken not to plan the NMT route to follow vehicle routes, as NMT users will take the shortest route (and may wish to avoid vehicle emissions and noise pollution)
  - The network must offer choice between alternative routes for trips with different purposes.
  - There must be adequate provision of crossings (pedestrian crossings; traffic light crossings; underpasses and bridges) to satisfy having the shortest route and a continuous route.

How to do Pedestrian Route Network Planning (10)

Tested and Refined Network Based on User Requirements

3. Less Conflict

The NMT network design must ensure that:

- Good intersection layouts should be encouraged to avoid conflicts between pedestrians negotiating crossing of roads and streets (*new layouts suggested in DoT NMT Manual*).
- There should be no obstacles (road furniture) within the NMT paths (poles, signposts, parked cars, containers, and the like).

How to do Pedestrian Route Network Planning (11)

Tested and Refined Network Based on User Requirements

4. Speed Appropriateness

Imperative to introduce speed control measures to improve road safety. Either vehicle speed reductions near pedestrian precincts and walkways, or completely segregating pedestrians from high volume, high speed vehicles.

This requires that the pedestrian network should:

- Limit encounters between NMT and high volume, high speed motorised traffic through segregation (provision of separate walkways) and traffic calming measures on collector roads.
- Reduce conflict between motor or bicycle traffic and pedestrians wherever possible by segregated or separated pedestrian routes, or speed reduction.
- Special care along freight routes that it traverses and the safety needs of pedestrians be taken into consideration.

How to do Pedestrian Route Network Planning (12)

Tested and Refined Network Based on User Requirements

5. Attractiveness

The NMT facilities should be designed, in such a way as to make them attractive and pleasant for walking and cycling, and safe for use by women and children. This requires that:

- Connections should pass through attractive, shaded or green environments that are maintained with gardening services.
- Create a pedestrian friendly environment that has a positive relationship to an area's land use. A mix of complementary land uses and appropriate densities is necessary to make walking a realistic option.
- Adequate benches, waste bins and related cleaning and removal services must be provided along the full route.

How to do Pedestrian Route Network Planning (13)

Tested and Refined Network Based on User Requirements

6. Barrier Free

Keep movement and information barriers to a minimum. NMT network should be:

- Cognisant of any challenges (e.g. steep slopes, difficult terrains, etc.).
- Not have sudden and frequent changes in direction.
- Include areas of rest and shelter, especially along longer distances.
- Be aware of any future conflict or obstacles along the proposed NMT path (e.g. lamp posts, informal activities, benches, encroachments).
- Not expose users to potential hazards (e.g. network which makes pedestrians cross at grade on a multi-lane highway).
- Make appropriate recommendations for information and way-finding systems to prevent barriers caused by lack of information
- Take cognisance of persons who have limited agility, endurance, speed and movement patterns (e.g. wheelchair users)

How to do Pedestrian Route Network Planning (14)

Tested and Refined Network Based on User Requirements

7. Safety

The personal safety of NMT users of utmost importance in order to maximise usage. Measures to be adopted include:

- Personal safety (security) should be taken into account in terms of potential criminal areas of concealment and have clear sight and splayed building and boundary corners wherever possible (CPTED design principle).
- Alternative connections be available to avoid insecure spots.
- Street lights should be provided if not already present.
- All vegetation should be controlled and managed to avoid offering shelter to potential criminals, i.e. no vegetation between 0.4 m and 1.5 m above ground unless security is provided.
- Parking on walkways should not be allowed (e.g. obstruction of children), which may require the use of bollards to ensure this.

Network connectivity and walkability-
A well-connected network of streets and pedestrian ways

2003 DoT Manual: Network connectivity (1)

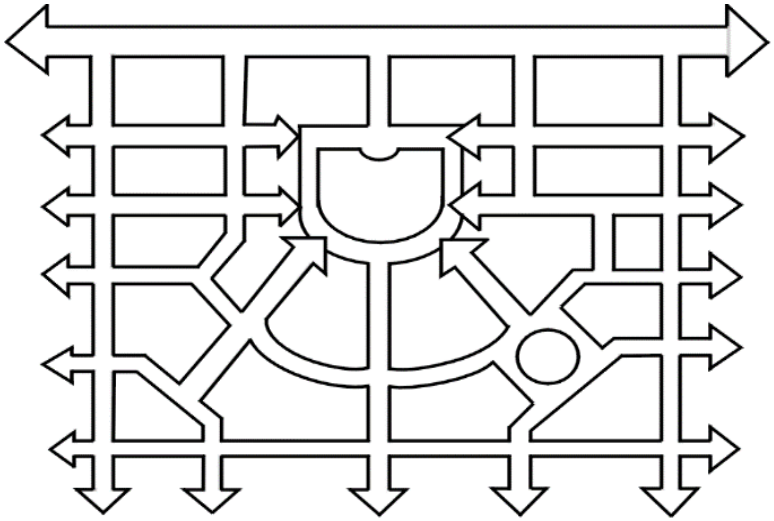
- A pedestrian and bicycle network should be designed to provide a high level of connectivity between origins and destinations, and to overcome barriers to walking (and cycling).

- The ideal is to provide a complete system of interconnected pedestrian and bicycle ways that connects all important locations in the network. These locations should include all major centres that are likely to be visited by pedestrians and cyclists.

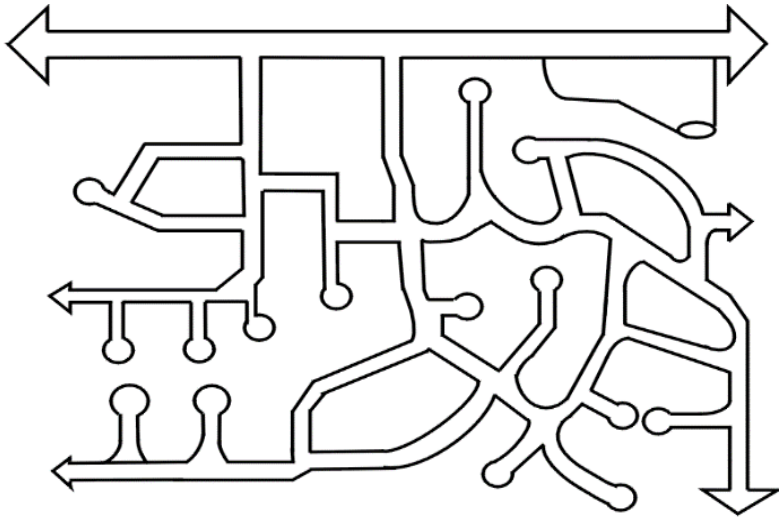
- Connectivity for pedestrians and cyclists can be achieved when an "open" road network is provided ***and*** (through a "closed" system).

2003 DoT Manual: Network connectivity (2)

- The main difference between the open and closed types of networks is that the **open network allows traffic movement in as many directions as possible**, while such movements are restricted in the closed network.
- The closed system which focuses traffic onto a restricted number of high order roads and discourages traffic from using low order streets. **Benefit: Improved usage and safety of NMT users**. Link destinations through footpaths.



"Open" network



"Closed" network

Connectivity analysis techniques (1)

- Pedestrian network connectivity (Pedestrian Route Directness - PRD ratios)
- Desktop O-D desire line– network comparison
- Survey-based O-D desire line–network comparison
- Plastic space mapping (computerised network analysis technique, using time as unit scale rather than distance)
- Space syntax analyses urban morphology by looking at public open space and plots ‘axial lines’ which measure connectivity

Connectivity analysis techniques (2)

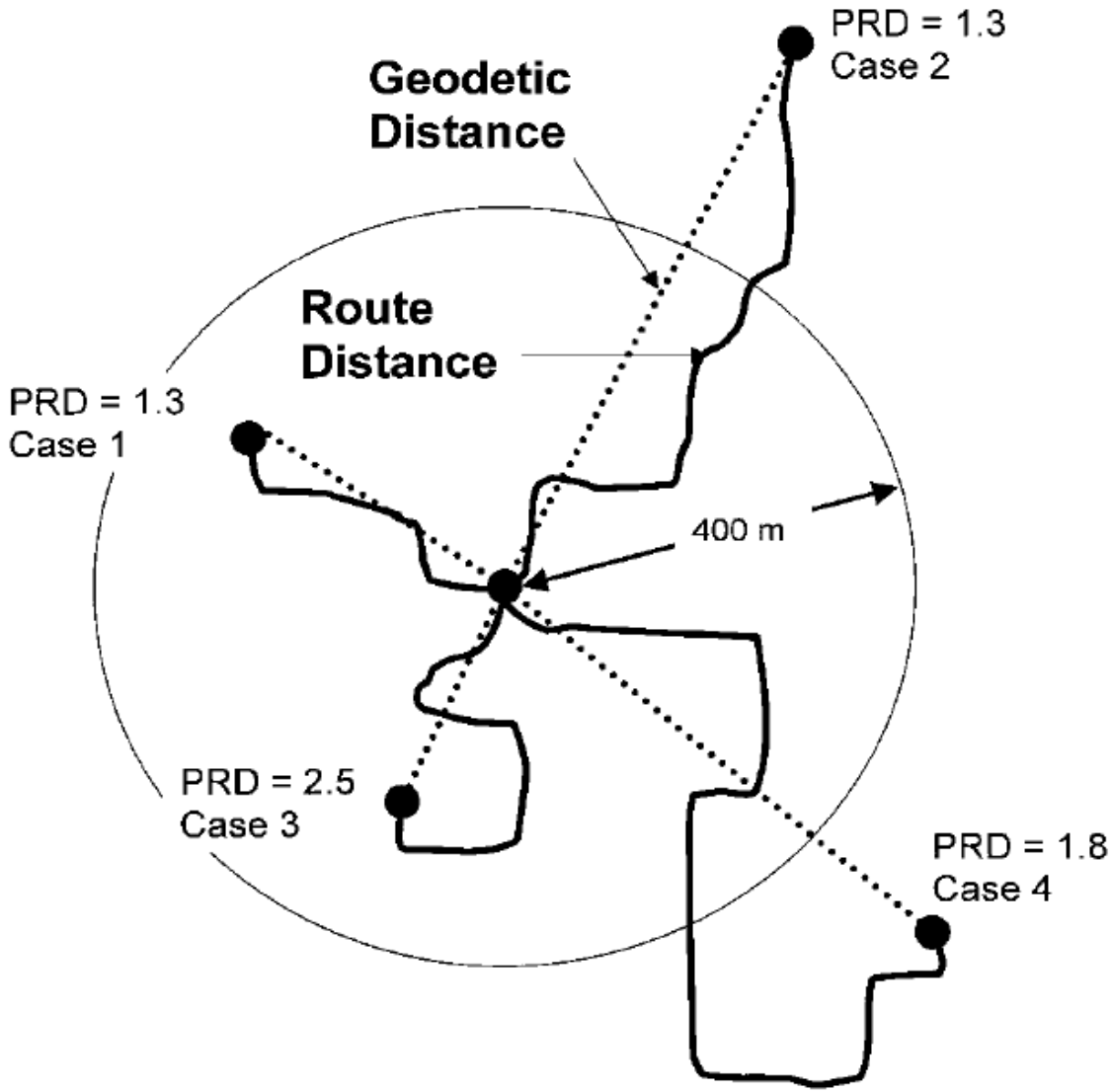
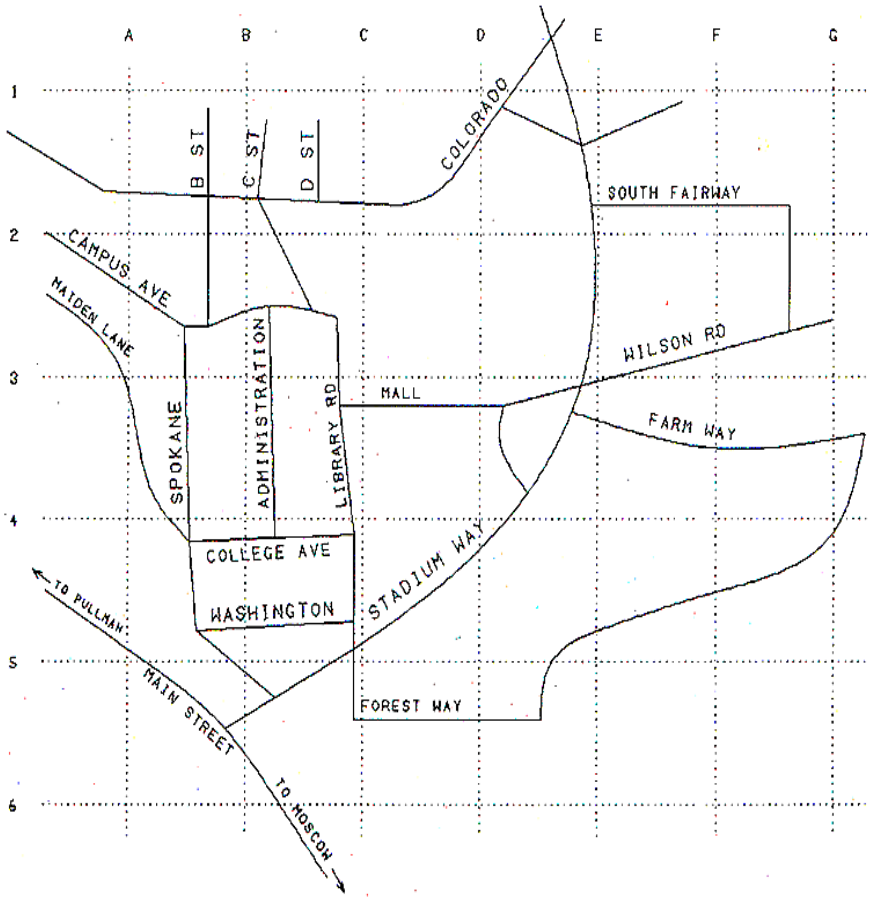
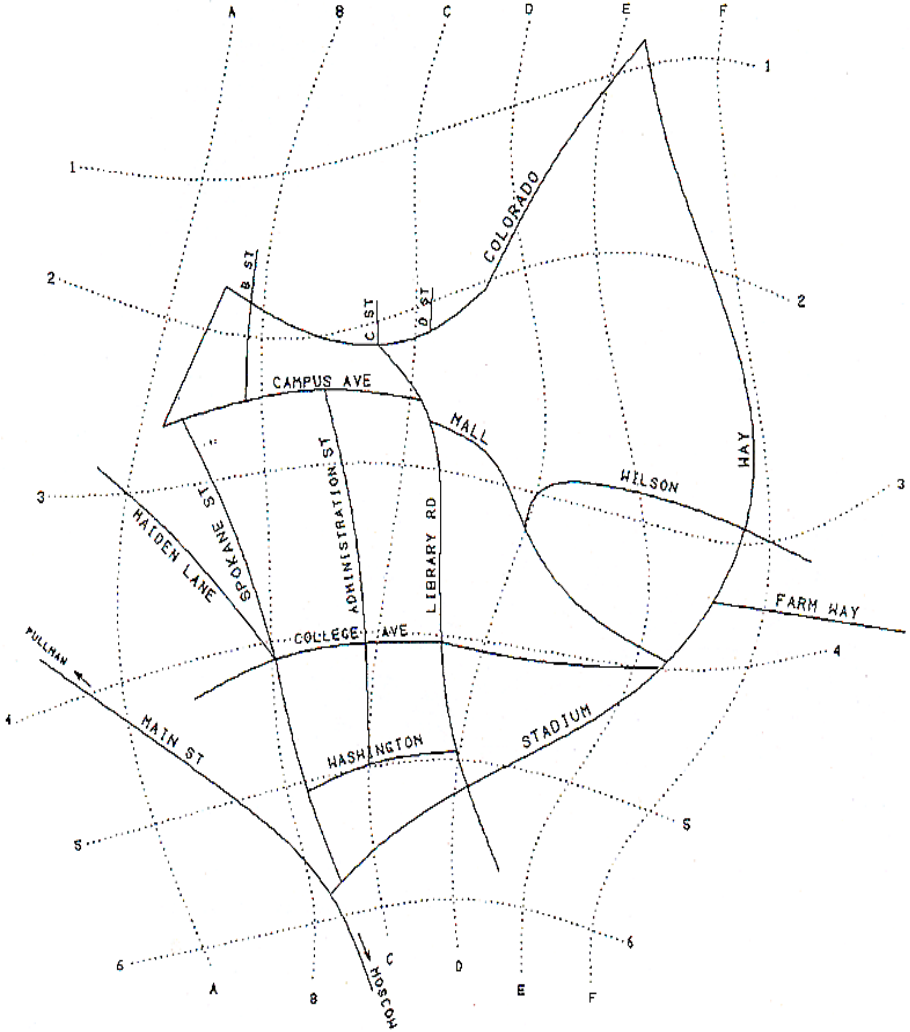


FIG. 1. Visual Representation of Four Connectivity Cases

Space syntax analyses urban morphology(3)





USA Walkability Index

- Various techniques available
  - Assess quality of environment in terms of clean air, safety, security, convenience, and so on.
- The **NEIGHBORHOOD WALKABILITY SCORE Survey** is a simple questionnaire designed for ease of use and a administration. *This survey is intended to evaluate the physical characteristics of the built environment around the individual respondent's home, and to be used in the urban and denser suburban areas of metropolitan regions*. A residential neighbourhood in this survey covers a 10- to 15-minute walking distance from home, corresponding to about 1 km. *depts.washington.edu/hprc/docs/pr_walk_survey.pdf*
- World Bank Index: Objective: to devise a kind of "walkability index," which would *rank cities across the world based on the safety, security, and convenience of their pedestrian environments*.

European Walkability Index

***European Walkability Index**. 17 factors analysed. The study identified different degrees of importance among the different factors.*

- Some, such as footway quality and proximity of walking to road traffic, appear to have little or no overall influence, notwithstanding certain localised effects.
- Others, including *lighting, footway width, footway gradient, weather, proximity to transport facilities or signage show a higher degree of importance*.
- However, five elements have demonstrated highly significant results. They are:
  - Footway accessibility
  - Ground level activity (land use connections)
  - Pedestrian crossing design
  - Traffic signal phasing
  - Time of the day. (ETC Proceedings)

Australia: Walkability Audit Tool

http://www.transport.wa.gov.au/mediaFiles/AT_WALK_P_Walkability_Audit_Tool.pdf

- *Tool for use by officials, consultants and community groups to identify issues to improve pedestrian safety, accessibility and amenity, identify appropriate countermeasures, and document findings in an audit report to develop an action plan*.
- Provides information on organising an audit, the standards for pedestrian facilities and how to use the forms with supporting information when conducting an on-site audit.
- Forms are designed that the auditor has the opportunity of rating the environment and recording comments whilst in the field.
- The guidelines provide detailed information on the specific aspects the auditor should look out for when completing the audit.

Why Canadians cycle more than Americans: A comparative analysis of bicycling trends and policies John Pucher *, Ralph Buehler Institute of Transport and Logistics Studies, University of Sydney, Newtown NSW 2006, Australia; Bloustein School of Planning and Public Policy, Rutgers University, 33 Livingston Avenue, Room 363, New Brunswick, NJ 08901, USA Received 26 May 2005; received in revised form 21 October 2005; accepted 1 November 2005

Abstract

In spite of their colder climate, Canadians cycle about three times more than Americans. The main reasons for this difference are **Canada's higher urban densities and mixed-use development, shorter trip distances, lower incomes, higher costs of owning, driving and parking a car, safer cycling conditions, and more extensive cycling infrastructure and training programs**. Most of these factors result from differences between Canada and the United States in their transport and land-use policies, and not from intrinsic differences in history, culture or resource availability. That is good news, since it suggests the possibility of significantly increasing cycling levels in the United States by adopting some of the Canadian policies that have so effectively promoted cycling and enhanced its safety.

GLOBAL STREET DESIGN GUIDE

Released in 2016, the Global Street Design Guide has served as a blueprint for safer and higher-performing streets, and as tool for addressing the 1.35 million road crash deaths and up to 50 million injuries that occur each year as a result of poorly-designed roads that prioritize automobiles.

High quality road design takes the needs of *all* road users into account. This supplement to the Global Street Design Guide—which gives the iRAP Star Rating for the existing and improved designs—will allow road designers everywhere to understand the scale of the safety benefit that good road design can deliver. The resource is free to download, and it will provide information and actionable solutions for those wanting to make safety upgrades to their streets.

https://globaldesigningcities.org/2020/09/29/star-rating-your-street-plans-with-irap-and-the-global-street-design-guide/