Character and Form

human scale

Overview

Indicator name	**Permeability**		
Indicator number	29	**Indicator type**	Core
Objective	To measure the walking and cycling permeability of the road network, reflecting the walkability and connectivity of an area		
Application guidance	Intersection density is a method of assessing one aspect of a built environment. The density of intersections relays information about street design and connectivity, both of which impact walkability. High intersection density may correspond to more walkable environments that promote healthy lifestyles. This indicator will support practitioners to understand the extent to which an urban area permits ease of movement for people walking and cycling. Based on the outcome of the analysis, practitioners can determine whether there are ample crossing opportunities for people walking and cycling to access other parts of the network. Practitioners can use the *intersection density* metric to measure the number of junction points or nodes available for people walking and cycling.		

Metric

Intersection density

Related indicators

Access and Connection

2 Walking paths
7 Equitable access
8 Steepness

Comfort and Safety

24 Pedestrian crowding

Character and Form

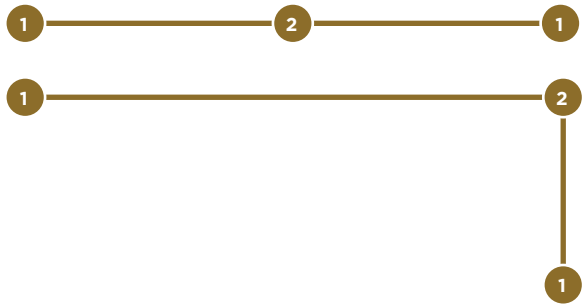
32 Street space for pedestrians
35 Legibility

Recommendation

- Additional analysis could be conducted on a project basis to measure the ratio between the area of a 1km walk or cycle from the project site following the current or proposed network versus a 1km polygon from the site
- To enrich the data and analysis, additional data collection of pedestrian and cycling features could be collected, for example a survey of through-site links or mid-block crossings
- Analysis on the type of intersection and presence of pedestrian and cycling enabling facilities could be undertaken to provide a more sophisticated analysis of the value of an intersection in enabling pedestrian and cycling crossing. Intersections that do not provide crossing opportunities for pedestrians and bicycle riders should be excluded from analysis
- To improve the measurement of connectivity, intersections can be weighted by number of roads links connected and/or road hierarchy. An intersection with more road links has greater connectivity.

Metric – Intersection density

Metric unit	Intersections per km^2
Description	To measure the number of intersections per square kilometre
Spatial coverage	Applicable to all NSW
Spatial application	This metric is most suitable for area-based analysis on NSW 1km hexagon mesh binning
Calculation methodology	**Obtain road network node** 1. Obtain TfNSW Road Track Path Network routable dataset, enhanced for pedestrian activity 2. Export node point layer as junction location data **Calculate the number of intersections** 3. Calculate the number of road links for each junction. Junctions that only have 1 or 2 road links connecting will be excluded, because they are considered a continuation of the network (joining of two links) or a corner as per the diagrams below



4. Buffer the remaining junction points to 20 metres to account for structures such as intersections
5. Combine buffers using GIS to create single polygon features at each intersection
6. Place a point at the centroid of each intersection polygon

Calculate intersection density

7. Summarise intersection points in GIS using 1km hexagon mesh binning to present a per square kilometre value

Data representation

8. Assign colour based on the classification below
   - Intersection densities of >70 (GS) and >40 (ROM) correspond to a Level of Service A
   - Intersection densities of <40 (GS) and <20 (ROM) correspond to a Level of Service F

   Unit: Intersections per km^2

Metric – Intersection density (Cont.)

Assumption	• Walking and cycling share common characteristics for permeability and are treated the same • All intersections provide an opportunity for crossing • Intersection points within 20m of each other have been combined to remove duplicate intersection points without excluding valid data
Limitation	• A comprehensive state-wide all road classes dataset of bike or pedestrian lanterns and crossings is not currently available • Spatial extent and completeness of additional datasets used to enhance the network (ie. mid-block crossings and bike lanterns only captured for classified roads, through-site links only for City of Sydney)
Data source	TfNSW Road Track Path Network, enhanced for pedestrians

Reference

- Rodrigue, JP., Comtois, C. and Slack, B., The Geography of Transport Systems (2006) pp.64: transportgeography.org/
- TfNSW, Walking Strategic Business Case (2021)