The Bike Transport Analysis (BTA) is a data analysis tool that measures how well bike networks connect people with the places they want to go. Because most people are interested in riding to local destinations only when it's a comfortable experience, this analysis has been specifically developed to recognise the low-stress bicycle connections.

The Bicycle Transport Analysis tool simplifies the ability to track the positive impact of bicycle infrastructure upgrades that enhance accessibility by bicycle in local town and city areas wherever they are.

The BTA score is developed in four stages: data collection, traffic stress analysis, destination access analysis, and score aggregation. Each of these steps is described below.

Data Collection

The BTA relies on data from two main sources: The Australian Census and **OpenStreetMap** (OSM).

For score development, the geographic units of analysis, population data, and jobs data is derived from census data where available. Custom geographic units are developed in place of census blocks when no suitable alternative exists. If fine-grained population data is unavailable, population distribution is inferred at a small scale from broader area population estimates. If comparable jobs data is not available, it is excluded from the analysis.

OSM data is open source data and publicly available worldwide, providing a fully-routable network of on- and off-street transport facilities including details about the types of bicycle facilities on any given street segment. OSM also supplies location and attribute data for all destination types in the analysis except population and jobs. The BTA downloads and utilises the most recent OSM data for the area within a city/LGA or catchments boundary plus a buffer distance around the boundary equivalent to the default catchment distance designated in the tool, 2.68 kilometres. Although OSM data quality varies between cities and countries, anyone can edit OSM to improve the BTA's accuracy.

The ability to rapidly incorporate recent upgrades in the local bicycle connections into the analysis has been particularly valuable to understanding the benefits in recent pop-up bicycle infrastructure installed as a response to the COVID pandemic.

Traffic Stress Analysis

The BTA relies on the concept of a low-stress bike network. The concept of Traffic Stress has emerged as a useful way to think of bicycle facilities in terms of the types of users who would be comfortable riding on them in a given situation. Since the measures are concerned with low-stress bicycling, the methodology focuses on roadway characteristics that generally translate to a Level of Traffic Stress 1 or 2 rating based on the scale originally developed by the **Mineta Transportation Institute** in the US.

In practical terms, this corresponds with the comfort level of a typical adult with an interest in riding a bicycle but who is concerned about interactions with vehicular traffic.

The OSM data used to build the bike network employs a system of tags to represent different elements of a roadway. A list of tags for bicycle facilities and destinations is available **here**. For a description of how OSM tags relate to on-the-ground bicycle facilities please refer to the tagging guidelines developed by People for Bikes . Please note that our methodology also accounts for some

edge cases involving obsolete or non-standard tagging. For a full review of the logic, we invite you to review the **source code**.

Once the transportation network has been identified, every street segment is rated along with intersections for high or low traffic stress. You can follow the logic using **this analysis logic spreadsheet.**

While OSM data gives a great base on which to build, it can vary in terms of the availability of detailed roadway characteristics. To account for situations where OSM data is not sufficient, default assumptions based on OSM's hierarchy of roads. (The defaults are given in the **spreadsheet** linked above.) The default assumptions are only used when OSM data is missing.

The BTA evaluates traffic stress for each link in the transportation network by applying the logic outlined in the spreadsheet to the street characteristics documented in OSM. The resulting Stress Network map visualizes the stress rating of every street segment with blue representing low-stress routes and orange representing high-stress routes.

Destination Access Analysis

Once street segment stress ratings have been established, every geographic unit or block which corresponds to a local destination and whether those blocks are within biking distance and can be reached on the low-stress network is determined. The BTA assumes a biking distance of 268 kilometres as measured along streets or paths, the distance an average rider would travel in ten minutes riding at sixteen kilometres per hour. Detours are a strong disincentive to trips by bicycle, so it is also assumed that a low-stress route is only available if it doesn't force a person to go out of their way by more than **25%** compared to the equivalent car trip. It is also assumed that a geographic data block is connected to any road that either follows its perimeter or serves its interior. **In practice, this means an arrival at a destination whose front door is on a stressful street is also possible if by a low-stress street if it is around the corner but part of the same block.**

Finally, the assumption is made that two data evaluation blocks are connected if and only if there is an unbroken low-stress connection between them. In other words, even a short stretch of stressful biking negates a potential connection. This is consistent with the Traffic Stress concept and also highlights the importance of a continuous network, rather than the patchwork of facilities that is common in many Australian cities.

The available transport network is used as the route from each data evaluation block to every other data evaluation block within biking distance, and notes whether a low-stress connection is possible between the two. The number and types of destinations available in each data evaluation block are also summarised in the analysis. Using this information, together with the knowledge of which data evaluation blocks are connected on the low-stress network, the total number of accessible destinations is calculated on the low-stress network and compared that with the total number of destinations that are within biking distance regardless of whether they are accessible via the low-stress network.

Destinations outside the evaluated area but within the surrounding buffer or catchment area are included in the analysis to enable calculating accessibility from points located on the edge of the city analysis boundary. This ensures that the quality of the bike network in neighbouring cities or unincorporated areas contributes to the city's BTA score if there are destinations located within that catchment area and reflects the reality that bicycling activity continues across all parts of a metro region.

Points are assigned on a scale of 0 to 100 for each destination type based on the number of destinations available on the low-stress network as well as the ratio of low-stress destinations to all destinations within biking distance. The scoring places higher value on the first few low-stress destinations by assigning points on a stepped scale. Beyond the first few low-stress destinations, points are prorated up to 100 based on the ratio of low-stress to high-stress connections to those destinations.

For example, a data evaluation block with low-stress access to only one park out of five nearby parks would receive 30 points. A data evaluation block with low-stress access to two parks out five would receive 50 points (30 for the first park, 20 for the second). A data evaluation block with low-stress access to four parks out of five would receive 85 points (30 for the first, 20 for the second, 20 for the third, and 15 out of the remaining 30 points for connecting one of the remaining two parks).

The BTA's six scoring categories are:

1. People: Access to other people in the city based on the resident population distribution
2. Opportunity: Access to jobs and educational institutions
3. Core Services: Access to critical services such as health care
4. Recreation: Access to public recreation outlets
5. Retail: Access to shopping areas
6. Transit: Access to major public transport hubs

Three of the scoring categories are composed of a mix of destination types constituting subcategories. For instance, the Recreation category encompasses the subcategories Community Centres, Parks, and Trails. In these cases, the category score is calculated by combining the scores of each of its member destination type/subcategory scores. Weights for each destination type are used to represent their relative importance within the category.

For census blocks where a destination type is not reachable by either high- or low-stress means, that destination type is excluded from the calculations. For example, the Opportunity score within a city with no University or higher education is produced by excluding the Higher Education destination type so the score is unaffected by its absence. As noted in the Data Collection phase, cities may lack jobs data, in which case they will not receive an Opportunity Employment score and the overall Opportunity score will only reflect access to educational institutions.

We use the category scores to calculate one overall score for each data evaluation block, weighting each category according to its relative importance. The step thresholds, destination scoring, and weighting assumptions are all described in **this spreadsheet**.

Score Aggregation

Data evaluation block scores are used to calculate scores for the whole city by weighting each data evaluation block according to its population and then averaging destination type (subcategory) scores across the city. The same category weights are applied in the block-level calculations to calculate citywide category scores and an overall city score. Like the block-level calculation, the citywide calculation excludes destination types that are not represented anywhere in the city. For example, if a city has no rail stations or bus transfer stations, the transit score is not factored into the overall score.