Unit 3: Transport Study, Traffic Data and Analysis Methods

Module 3-1

Transport and Traffic Data

Austroads

Today's presenter

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Outline of this Module

- Traffic studies and surveys

- Sources of traffic data

- Evaluation and analysis of traffic data

Traffic Studies and Surveys

Traffic Studies

"If you cannot tell the system performance yesterday, you cannot hope to manage your system today"

Data is important to measure system performance

- A traffic engineer's laboratory is the surrounding roadway system (Ramezani 2018)

- What types of data can we collect?

Source: Ramezani (2018)

Survey Types

| Point	Linear	Area
Traffic volume	Travel time	Origin/destination surveys
Speed	Delay	Noise, fuel & emissions
Vehicle mass/dimensions	Queuing	Parking data
Pedestrians		Traffic generation
Cyclists		

Traffic Volume

Traffic volume is an expression of the flow rate in vehicles per unit time

- vehicles/hour or vehicles/day

- Further classification into modes and people is common

Applications of traffic volume surveys:

- Facility planning, design, capacity

- Monitor variation and trends of traffic flow over time

- Assist in road classification

- Validating predictions from traffic forecasting models

- Estimating loading on pavements and bridges

- Distribute travel demand in a network
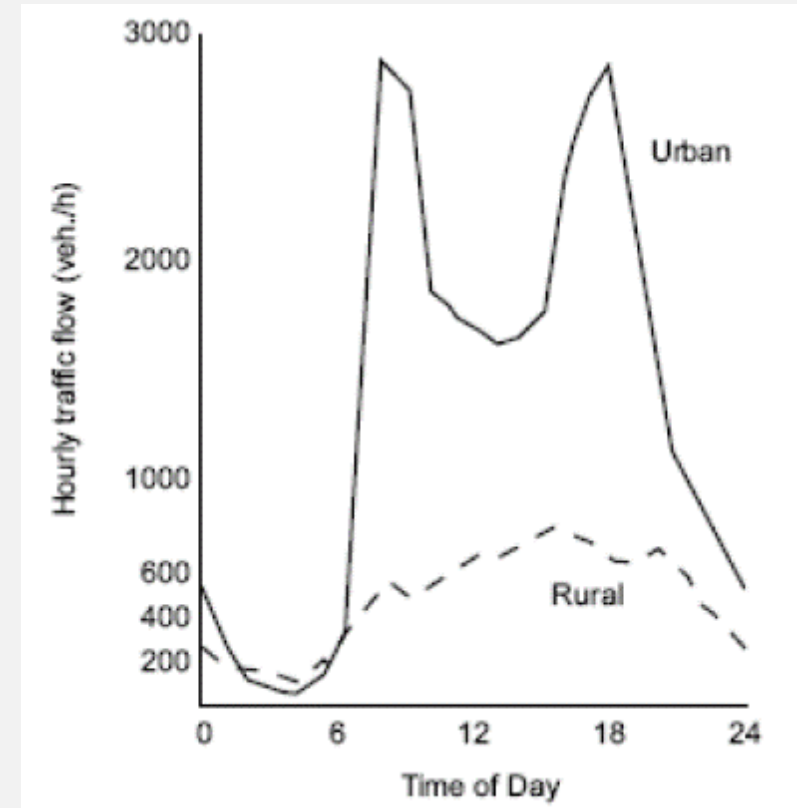
Typical hourly traffic volume.
Source: Austroads (2020)

Speed

Applications of speed surveys:

- Determining the need for traffic control devices (Austroads 2020)

- Assisting in road design

- Evaluating the effectiveness of speed limits

- Finding relationships between speeds and crashes

- Evaluating the change in traffic conditions before and after treatments are applied

See Section 3.5.2, Austroads (2020)

Time mean speed

$$Speed = \frac{\sum_i V}{n}$$

Space mean speed

$$Speed = \frac{\sum_i distance_i}{\sum_i time_i}$$

Pedestrian and Bicycle

Increasing trend to provide for pedestrians and cyclists

• Bicycles are defined as vehicles and can be surveyed in a similar manner

• Best surveyed in a constrained environment similar to a road such as a footpath

• Pedestrians come in different definitions (parent with a child, pedestrians with disabilities)

Application of pedestrian and bicycle surveys:

• Assists in developing more active transport initiatives

Source: Next City (2015)

Travel Time, Delay and Queuing

Travel time and delay surveys can be completed simultaneously

A vehicle is in a queue when it is dictated by the actions of the vehicle or traffic ahead of it

Applications:

- Measure system performance

- Evaluate before-and-after effects of traffic improvements

- Identify locations and causes of congestion

- Determine the need for traffic signals

- Develop optimum timing sequences at traffic signals
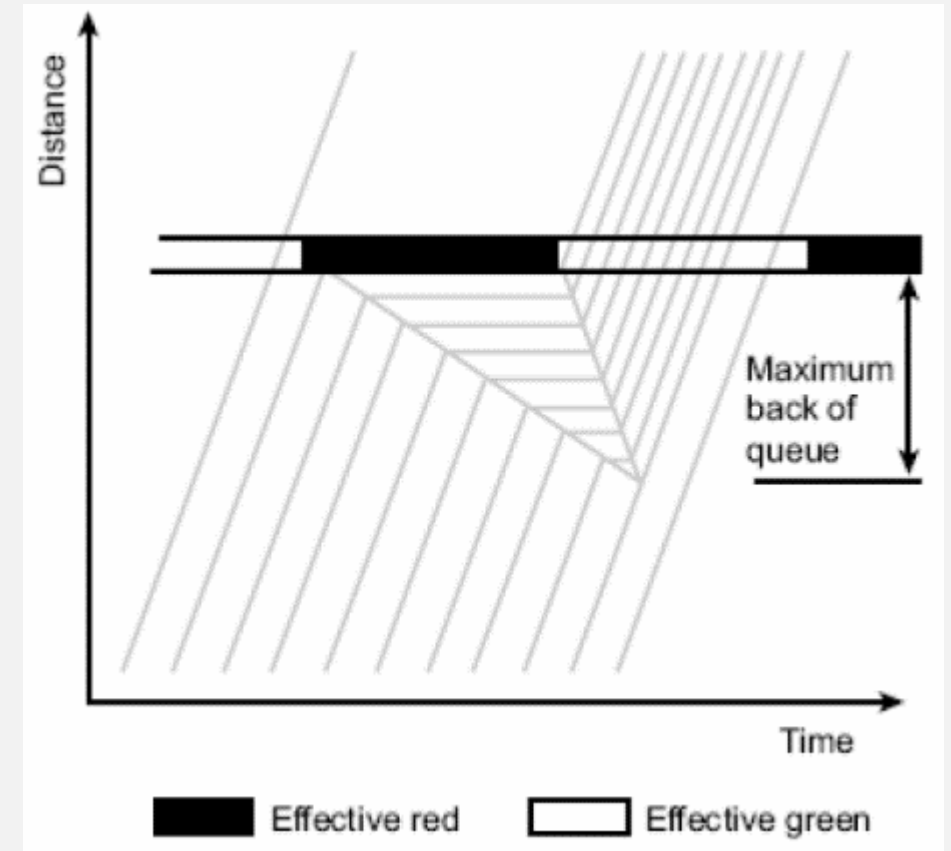
Typical time-space diagram. Source: Austroads (2020)

Origin-Destination (O-D)

10,000 vehicles per hour
5,000 vehicles per hour
2,500 vehicles per hour
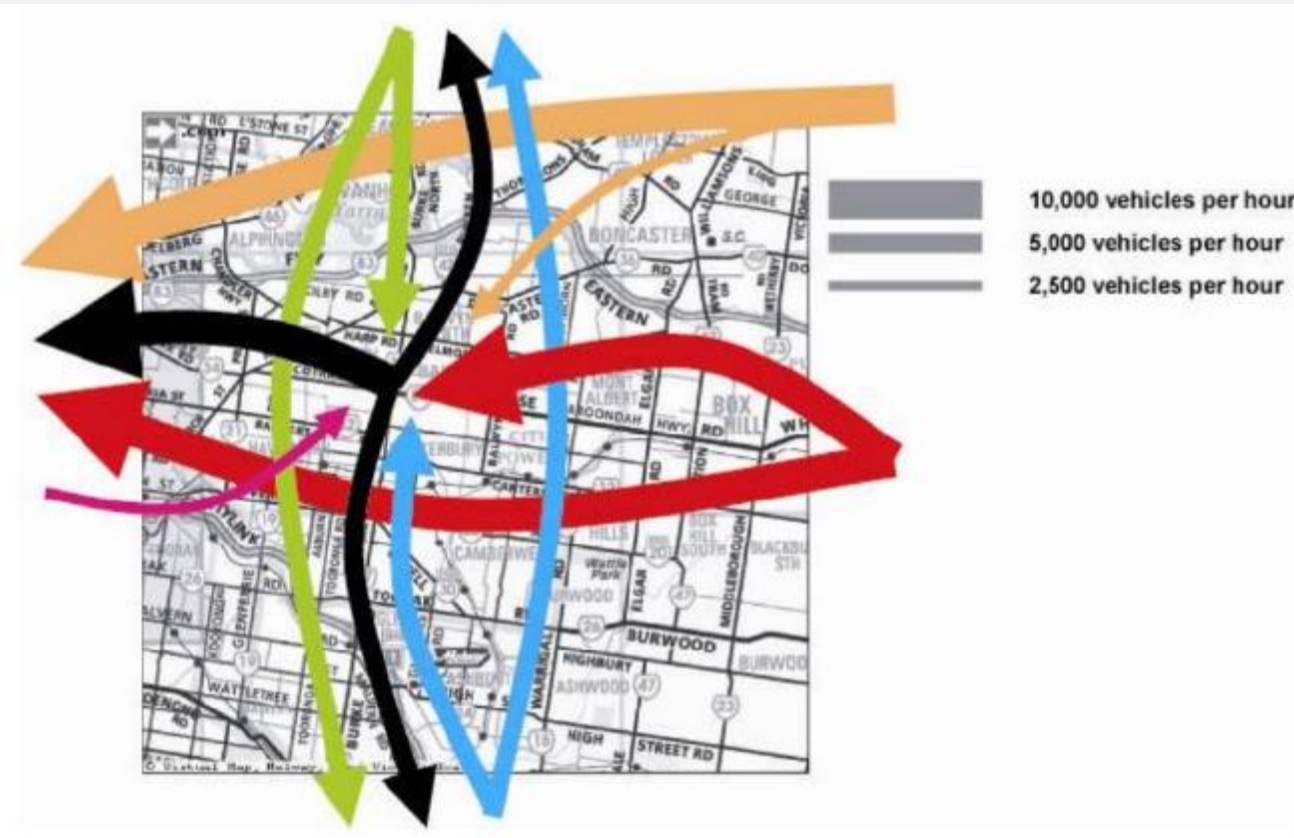
Basic O-D trip graphic. Source: Austroads (2020)

Range from simple studies that determine the amount of traffic passing through an area to metropolitan wide surveys

Applications:

- Provide valuable information on where motorists desire to travel

- Provides data on traffic diversion due to new traffic management schemes

See Section 3.5.4, Austroads (2020)

Noise, Fuel and Emissions

Noise is defined as unwanted sound and road traffic is the biggest contributor to community noise levels

Surveys types include

- Decibel readings
- Community reaction surveys

Fuel and Emissions are a major issue facing the current climate

Survey types include

- Individual vehicle-based surveys
- Area-wide surveys

Noise, fuel and emissions results are often presented as indexed values
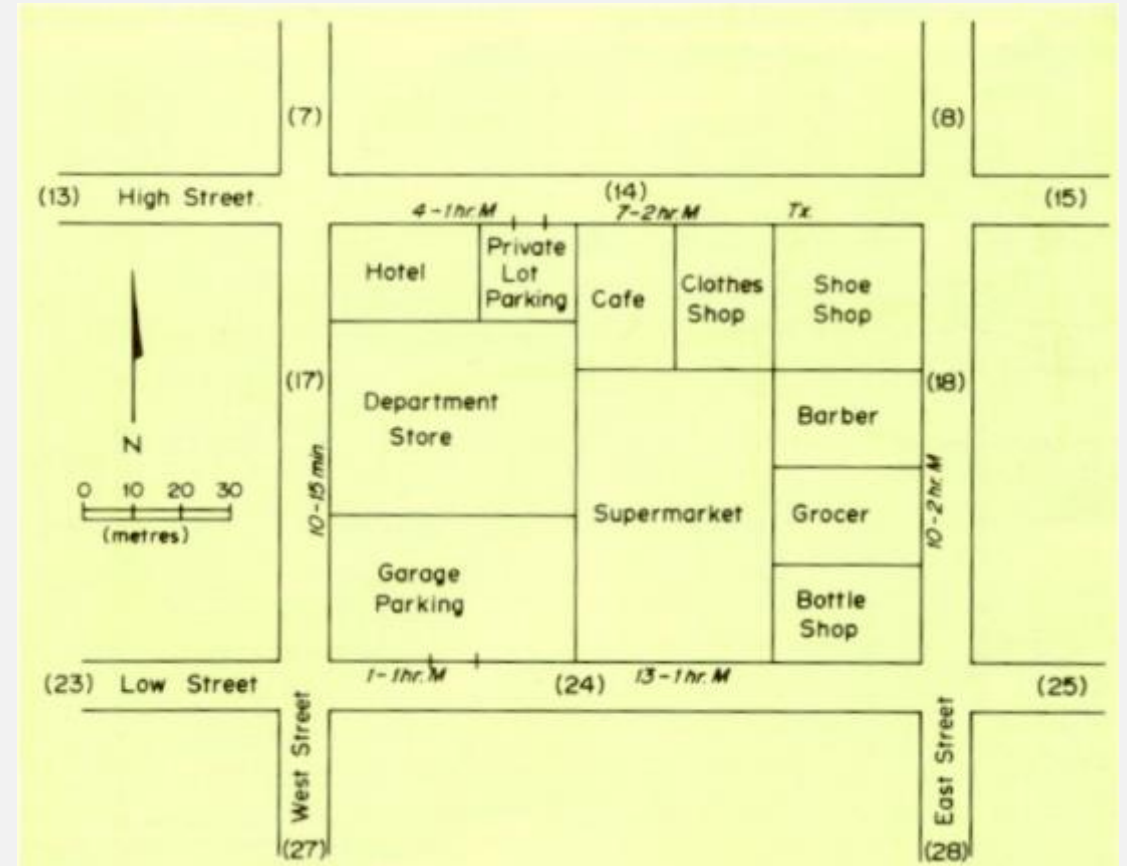
Parking Surveys

Parking Supply

- Number and location of parking spaces

- Type of car park (kerbside, off-street)

- Parking restrictions/fees

Parking Demand

- Number of parking events over an allotted time

- Duration and turnover rates

- Trip purpose

Typical parking inventory map. Source: Austroads (2020)

Traffic Generation Surveys

Land use developments must undergo traffic generation surveys

- Shopping centres

- Sports and recreational centres

- Residential complexes

- Office blocks

Applications:

- Identifying road networks to upgrade if high traffic generation rates are found

- Used in transport impact assessments (TIA)

See Section 3.5.9, Austroads (2020)

Sources of Traffic Data

Sources of Traffic Data - Examples

Mass

WIM - ARRB CULWAY Source: ARRB (2017)

Traffic volume, speed

Axle detector. Source: ARRB (2017)

Traffic volume, travel time

AVI. Source: Infrastructure magazine (2017)

Traffic volume, speed, pedestrian, bicycle

VIPS. Source: ARRB (2017)

Sources of Traffic Data - Examples

Speed, travel time, delay, OD
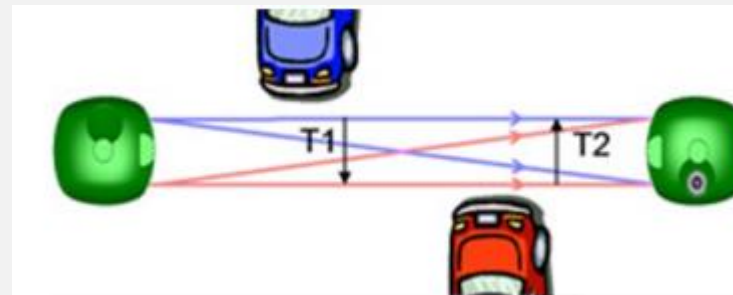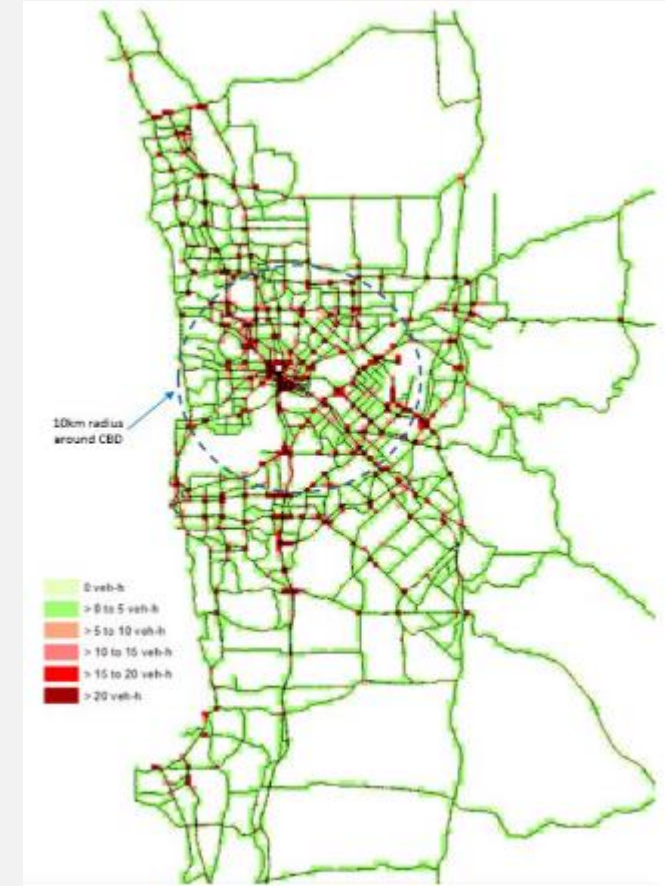
Traffic volume, speed

Speed

Laser speed measurement device.
Source: ARRB (2017)

TIRTL unit and operational graphic. Source: CEOS (n.d.)

Probe data – average hourly delay heat map.
Source: Bennett, Espada and Weeratunga (2016)

Sources of Traffic Data - Summary

Source	Type of survey data	Source	Type of survey data
Infrared puffin	Traffic volume, pedestrians, bicycles	Laser speed measurement device	Speed
Piezo-cable	Traffic volume, mass, pedestrians, bicycles	Inductive loops	Traffic volume, parking occupancy, bicycles
AVI (automatic vehicle identification)	Traffic volume, speed, travel time	VISTA (or equivalent) survey	Pedestrians, cyclists, OD, noise, trip generation
Axle detectors	Traffic volume, speed, bicycles	Microphone	Noise
VIPS (video image processors)	Traffic volume, speed, pedestrian, bicycle	Stud	Future development

Sources of Traffic Data - Summary

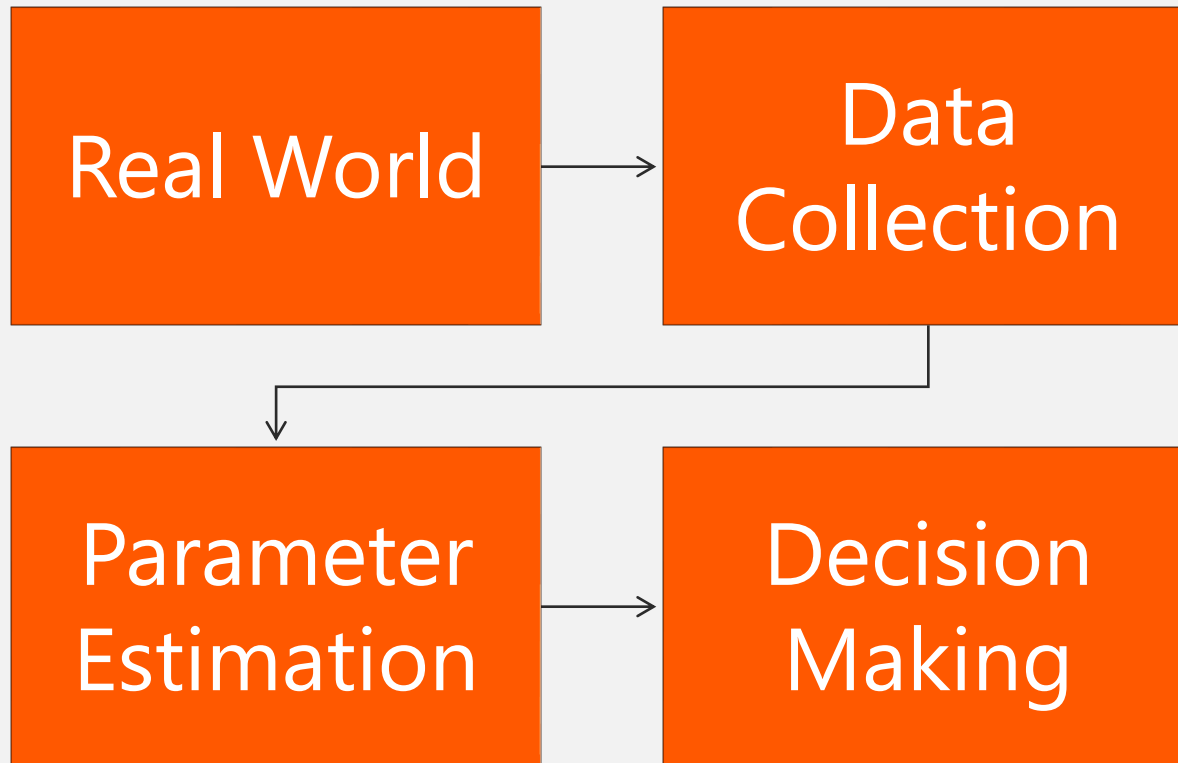| Source	Type of survey data	Source	Type of survey data
TIRTL detectors	Traffic volume, speed	Manual count	Pedestrians, bicycles, parking
Probe	Speed, Travel time, OD	Cordon count	OD, Parking
Bluetooth	Pedestrian, Travel time, OD	Dynamometer	Air pollution
GPS	Travel time, speed, pedestrians, bicycle	Weigh-in-motion (WIM)	Mass
Public Transport Ticketing system	OD	On-board Mass (OBM)	Mass

Future Developments

- Private sector collect data and distribute to public (PPP relationship)

- Complete data coverage including weekends and public holidays (Austroads 2020)

- Vehicle tracking technology is increasing the range of data available

- Data fusion from multiple sources will build the traffic data network

- Customer profiling

- Data will continually be integrated with routing services such as Google, Waze

- Increased number of metrics → temperature, congestion, delays, cost

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Evaluation and Analysis of Traffic Data

Evaluation and Analysis

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┌──────────────┐      ┌──────────────┐
│  Real World  │─────▶│     Data     │
│              │      │  Collection  │
└──────────────┘      └──────────────┘
       ┌─────────────────────┘
       ▼
┌──────────────┐      ┌──────────────┐
│  Parameter   │─────▶│   Decision   │
│  Estimation  │      │    Making    │
└──────────────┘      └──────────────┘
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Source: Ramezani (2018)

Before decision making can occur, data must be analysed

Statistics

- Central tendency (mean, median, mode)

- Variance

- Error

- Bias

Reporting

Guidelines

- Clearly outline purpose and scope

- Cater for the audience

- Use maps and graphs (as figure right)

- Separate data into spatial and temporal classifications

- Record assumptions and adjustments

- Outline the procedures for collection, analysis and reporting

Traffic volume map. Source: Google (2017)

Quiz Questions

Time to Reflect

Q1. What are the three major categories of traffic data collection?

A.   Stationary, mobile, satellite

B.   Spot, moving, range

C.   Point, Linear, Area

Answer C is correct!

Time to Reflect

Q2. What types of data can a TIRTL detector obtain?

A. Travel time and trip generation

B. Traffic volume and speed

C. Pedestrian and cyclist

Answer B is correct!

References

Austroads (2020). Guide to Traffic Management Part 3: Traffic Studies and Analysis Methods, AGTM03-20, Austroads, Sydney, NSW, available at: https://austroads.com.au/publications/traffic-management/agtm03, accessed: 27 April 2020.

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Thank you for participating