Advanced Planning & Design for Cycling

MODULE 2: PLANNING AND FUNDING
SECTION 1: INTRODUCTION

1

Housekeeping

- Cell phones off, please!
- Toilets
- Evacuation procedure
- Food
- 8:45 am start
  - Morning tea 10:10 am
  - Lunch time 12:00 pm
  - Afternoon tea 3:30 pm
- 5:00 pm finish

2

About the Presenters… Axel Wilke

- ME (Civil)
  - Master of Engineering
- ViaStrada (Director)
- 15 years traffic/transportation experience
- Cycling-related projects/publications
  - Design/audit many cycle facilities
  - Develop cycling strategies around NZ
  - Peer reviewer to NZ Supplement
  - Technical advice/articles for CAN
  - Cycling papers at numerous conferences/workshops

3

About the presenters… Megan Fowler

- MET
  - Research project in road safety field
- 4 years at ViaStrada
  - Cycle facility design and safety auditing
  - Signal design, intersection modelling
  - Legal implications of SBFs
  - Various research projects and conference presentations
- Enjoys cycling
  - 15 km daily cycle commute
  - A bit of recreational cycling as well

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Attendees – Who are You?

- Quick round of introductions
  - Name
  - Organisation
  - Work role
  - *Do you cycle regularly/occasionally?*
  - *Have you attended the Fundamentals course (now "Module 1")? If so, when?*

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Course Development

- Course material prepared by ViaStrada & NZTA
- Developed on behalf of NZTA
  - Constantly updated so that it stays current
- Course first run in June 2003

- If you did the Fundamentals course (Module 1):
  - Some material will look familiar
  - We consider it worthy of repetition

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Course Purpose

- Provide traffic engineers, and transport and city planners with tools in:
  - Planning
  - Funding
  - Designing for cycling

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Course Prerequisites

- Cycling "Fundamentals" useful but not imperative for people with relevant professional experience
- Transport planning experience helpful
- Attendees will need further study and experience and don't rely only on advice from this course
- Use sound judgement and seek expert advice as needed
- Get on your bike too!

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Overall Course Structure

Module	Level	Duration	Topic
1	Fundamentals	1 day	Planning & Design for Cycling
2	Advanced	½ day	Planning and Funding • Policy and Legislation • Data Collection and Analysis • Evaluation and Funding • Auditing
3		½ day	Mid-block and Path Design • General midblock issues • Protected cycleways • Cycle Lanes and Parking • Cycle Paths and Shared Paths • Neighbourhood greenways & Traffic Mgmt
4		1 day	Intersection Design • Signals • Roundabouts • Priority and grade separated junctions

Course Structure

- Course book
  - Handouts of slides for note taking
  - Course handbook with references
    - Austroads Guides – cycling synopsis
- Questions
  - Any time (but may be addressed later)

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References are shown in this box

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Module 2 Outline

Section	Topic
1	Introduction to Module 2 •Recommended guides
2	Policy and Legislation • NZTS, GPS, NLTP • Rules relating to cycling
3	Data Collection and Analysis • Data collection methods • Estimating AADTs: CNRPG & SP11 • Injury data
4	Appraisal and Funding • Economic appraisal – EEM • Planning, Programming and Funding – PPFM
5	Auditing

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Recap from Module 1

- Types of cyclist
- 5 main requirements for cycling
- Types of midblock provision for cycling
  - Who's happy where?
  - Hierarchy of treatments
- Evaluating level of service (LOS) for cycling

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Module 2, Section 1

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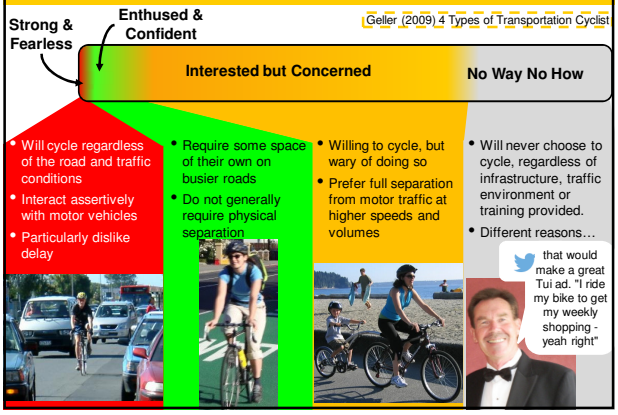
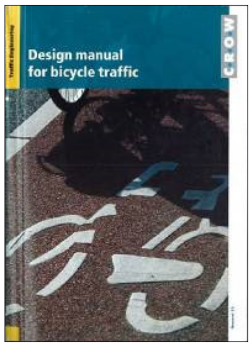
Recap: 4 types of transportation cyclists



Recap: 5 main requirements for cyclists

From Dutch "CROW" Guide:

- (1) Coherence
- (2) Directness
- (3) Attractiveness
- (4) Safety
- (5) Comfort



CROW 2007

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Module 2, Section 1

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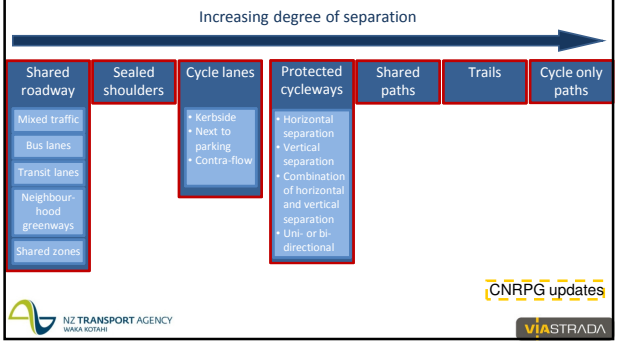
Recap: Midblock provisions for cycling



CNRPG updates

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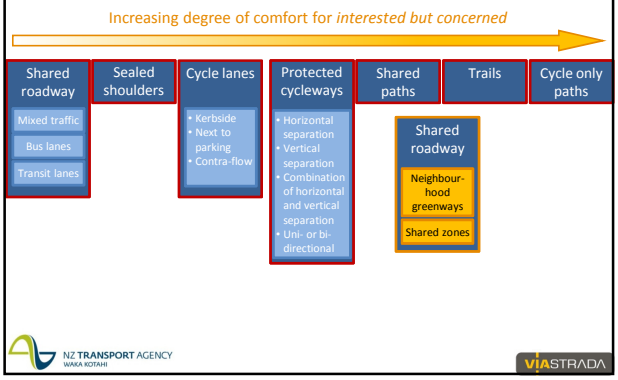
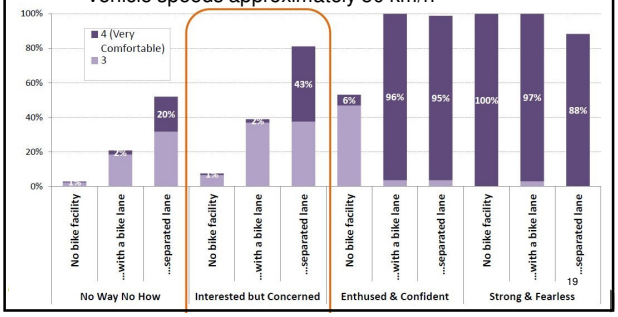
Recap: Midblock - who's happy where?



Recap: Comfort levels

- Dill, building on from Geller research
  - Scenario for major 4 lane road with on-street parking, vehicle speeds approximately 50 km/h



IHT 5-step hierarchy

1. Reduce traffic volumes
2. Reduce traffic speeds
3. Traffic management
4. Reallocation of space
5. Specific cycle facilities

This can be beneficial to all road users, not just cyclists

Recommended Guides

- Austroads guides
  - Old GTEP superseded by new guides (**next 2 slides**)
  - Use in conjunction with NZ Supplement (2008)
- Cycle Network and Route Planning Guide (2004)
  - "CNRPG" LTSA
- MOTSAM (continuously revised)
- CROW (Netherlands, 2007)
- Other overseas guidelines
  - Ireland's National Cycle Manual (NTA 2011)
  - Cycling Infrastructure Design (DfT, UK, 2008)
  - Urban Bikeway Design Guide (NACTO, 2011)

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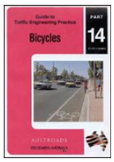
Austroads Guides Update (1)

- GTEP Part 14 is not just copied across to the Guide to Road Design (GRD) Part 6A



- Guidance on providing for cycling is now:
  - GTM: Guide to Traffic Management
  - GRD: Guide to Road Design
  - GRS: Guide to Road Safety
  - GPE: Guide to Project Evaluations

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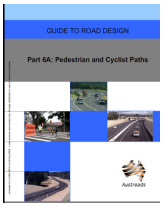
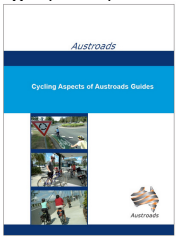
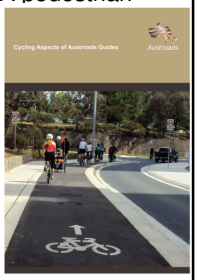
Austroads Guides Update (2)

- Guide to Road Design (GRD) Part 6A pedestrian & cycle paths







- Now AP-G88/14 Cycling Aspects is a one-stop shop

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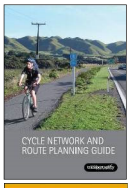
Available design guides

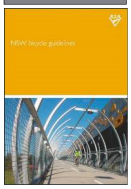
- NZ Supplement to GTEP Part 14
  Transit NZ (2008)
  http://viastrada.co.nz/amended-supplement
- Officially superseded by new Austroads series however content of supplement has not been incorporated

Available design guides Other Aust. / NZ

- Cycle Network and Route Planning Guide (CNRPG) (2004)
  Guide developed by LTSA
  Based on Austroads 14, chapter 2



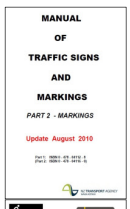
- NSW Bicycle Guidelines (2005)
  Excellent reference document, some concepts adopted for NZ



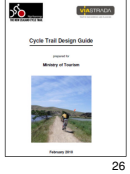
Both available on internet

Available design guides Other New Zealand

- MOTSAM → NZTA's Traffic Control Devices Manual
  Cycling content handout is for study purposes; as MOTSAM and TCD Manual are "controlled" documents please use website in practice!



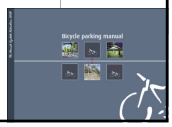
- NZ Cycle Trail Design Guide
  (Ministry of Business Innovation and Employment, 2015)
  Mainly for off-road facilities, but contains new thinking about path/road crossings and rural on-road cycling



http://viastrada.co.nz/trail-design-guide

Available design guides Continental Europe

- Design Manual for Bicycle Traffic
  (CROW, 2007)
  Authoritative guide from The Netherlands - an update of 1993 version:
  http://viastrada.co.nz/order-crow
- Collection of Cycle Concepts
  (Danish Road Directorate, 2012)
- Bicycle Parking Manual
  (Danish Cyclists Federation, 2008)
  Useful dimensions and planning advice



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see separate handout

Available design guides UK

- Cycling Infrastructure Design
  (DfT, UK, 2008)
  Replaces 1996 IHT guide

- National Cycle Network Practical Details
  (Sustrans, 1997)
  UK guide suitable for pathways and inexperienced cyclists

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Module 2, Section 1

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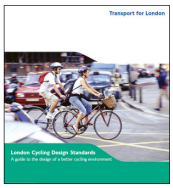
Available design guides UK cont'd

- London Cycling Design Standards
  ("LCDS" TfL 2005)
  - 265 pages; tables, figures & drawings



- Cycling by Design (Transport Scotland 2010)
  - 213 pages; examples, cycle auditing, facilities

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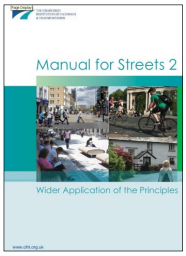
Module 2, Section 1

Available design guides UK cont'd

- Manual for Streets (MfS)
  - MfS 1 (DfT, 2007) Offers general good advice on residential street design, traffic calming
  - MfS 2 (DfT, 2010) A wider application of the principles to all other streets except motorways
  - Based on "place-making" principles



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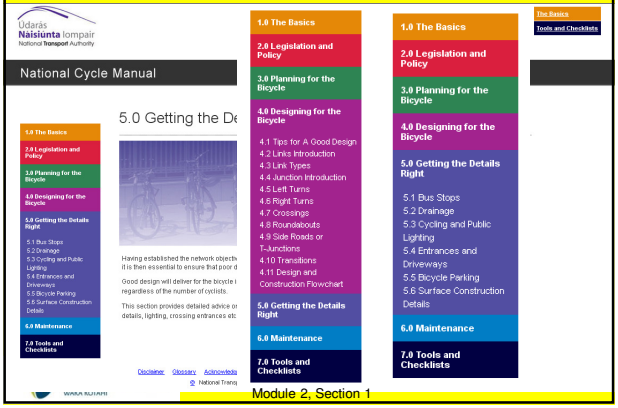
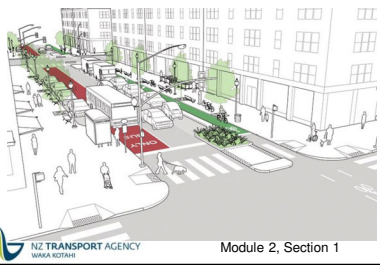
Ireland's National Cycle Manual (NTA 2011)



Module 2, Section 1

Available design guides US

NACTO (National Association of City Transportation Officials) Urban Bikeway Design Guide



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Module 2, Section 1

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Upcoming guidance

- NZ National Cycle Network Design Guidance
  - Online framework
  - Will link relevant existing guidance
  - Including updates to CNRPG, TCD Manuals
  - New guidance to be developed to fill gaps in existing guidance

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VIASTRADA

Summary of Section 1

- Different types of transportation cyclists have different needs and abilities
  - Need to determine the "target audience"
  - Different facilities suit different target audiences in various contexts
- Various sources of guidance
  - Be aware of the local and national context
    - Auckland: new Transport Design Manual (TDM – to replace ATCoP) is on its way…
  - Know which guide to use for your project
  - National Cycle Network Design Guidance online framework will be a useful tool to find the most relevant best practice guidance

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Module 2, Section 1

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Advanced Planning and Design for Cycling

Module 2 Planning and Funding

Section 2
Policy and legislation

Section 2 Outline

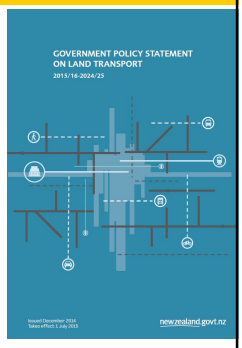
- Government policies and strategies
  - New Zealand Transport Strategy (NZTS) 2008
  - Government Policy Statement (GPS) 2015/16-2024/25
- Transport rules

NZ Transport Strategy

- Specific target to increase walking & cycling
  - 30% of total urban trips by 2040
- National government supports the principles, but...
- Practically speaking the policy is made through the GPS
  - Also other sectors (e.g. travel to school)
- NZTS now largely redundant
  - But never repealed

Government Policy Statement (GPS)

- Sets strategic direction
- Guides land transport investment via NLTP
- NZTA must give effect to the GPS
- No short term targets
- Excludes NZ Cycle Trail funding and Urban Cycleway Fund



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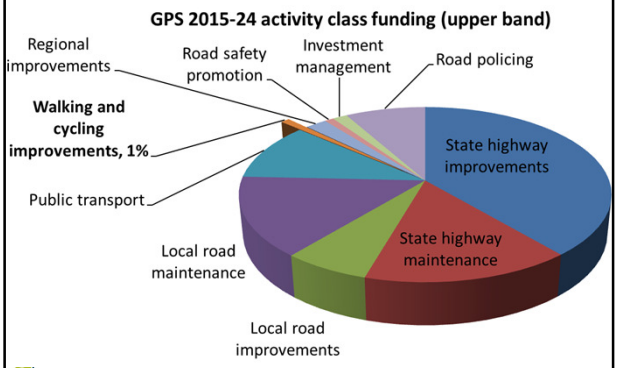
GPS sets priorities for NLTP



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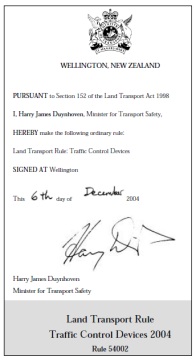
Transport Rules

- Replaced much of *Traffic Regulations Act* 1976
- These are 'ordinary rules'
  - ministerial level
  - simpler than acts
- *Traffic Control Devices Rule*
  - amended 2005, 2006, 2007, 2010, 2011, 2012, 2013
- *Road User Rule* (RUR) 2004
  - amended 2005, 2007, 2009, 2011, 2012, 2013
- *Setting Speed Limits Rule* 2003
  - amended 2005, 2007


WELLINGTON, NEW ZEALAND

PURSUANT to Section 152 of the Land Transport Act 1998

I, Harry James Duynhoven, Minister for Transport Safety,

HEREBY make the following ordinary rule:

Land Transport Rule: Traffic Control Devices

SIGNED AT Wellington

This 6th day of December 2004

Harry James Duynhoven
Minister for Transport Safety

Land Transport Rule
Traffic Control Devices 2004
Rule 54002

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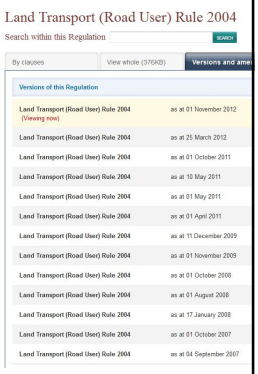
Road User Rule changes

- All rules and amendments are available in HTML or PDF formats from NZTA website
- *Road User Rule* has had several amendments...

http://www.nzta.govt.nz/resources/



2009 Road User Rule changes

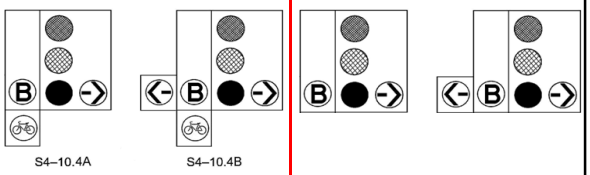
- Special vehicle lanes
  - Other vehicles can use lane for max 50 m for crossing, manoeuvring etc
- Signalling at roundabouts
  - Cyclists no longer required to use hand signals (if unable to do so, e.g. uphill)
- Hook turns
  - Confirms legality and use
- Shared paths
  - Clarifies responsibilities of users

2009 Road User Rule changes (2)

- A user of a shared path
  - (a) must use the shared path in a careful and considerate manner; and
  - (b) must not use the shared path in a manner that constitutes a hazard to other users of the shared path
- Priority signs are enforceable
- Path user must not unduly impede the passage of other path users

2011 Road User Rule changes (1)

- Bus signal changes



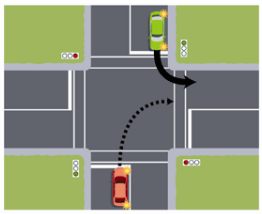
S4–10.4A S4–10.4B

PREVIOUSLY REQUIRED

NOW ACCEPTABLE
B signal now applies to cyclists too
(option to still include cycle aspect)

2011 Road User Rule changes (2)

- Give Way Rule change
  - Reduces demands on left turning drivers
  - Now only have to check for pedestrians and cyclists
  - Increased cycle safety



Vehicle turning right has to give way

2011 Road User Rule changes (3)

- Better for cyclists? Yes!

Left turning motorists don't have to scan mirrors for overtaking vehicles in adjacent lane

Increases time to scan for cyclists

May help with introducing more kerbside cycling facilities, including SBFs

Setting Speed Limits Rule

- Enables road controlling authorities to set speed limits
- Defaults remain 50 (urban) and 100 (open road)
- Flexibility for limits below 50
  - residential areas
  - school zones
  - Safer speed zones
    - Hamilton 40 km/h
    - Queen St 30 km/h
  - activity centres
    - Ponsonby Road, Auckland

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Module 2, Section 2 13

Section 2 summary

- Transport policy set by GPS
  - Since GPS 2009, no short term transport targets
- Recent changes to RUR that affect cycling
  - Give way rule changes should improve cycle safety
- Setting speed limits rule paves the way for lower speed areas

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Module 2, Section 2 14

Advanced Planning and Design for Cycling

Module 2 Planning and Funding

Section 3
Data collection and analysis

SECTION 3 OUTLINE

- Cycle crash data
- Cycle traffic data
- Other data – not specifically related to cyclists
- Estimating AADTs for new facilities
  - SP11 method + exercise

Why do we need cycle data?

- To understand the existing situation
  - Demand for cycling (but don't forget suppressed demand)
  - Comparing cycle volumes with crash rates
- To plan for future improvements
  - Best "bang for your buck"
  - Developing consistent networks
  - Basis for estimating future demand
    - Required for funding applications

Cycle crash data

- Can be useful in cycle facility planning and design
- Often difficult to investigate
- Legal requirement to report injury crashes
  - since 1998
- Under-reporting of at least 54%
  - minor injury under-reporting likely to be much higher - EEM under-reporting factors are:

Fatal	Serious	Minor	Non-injury
1	2	4	20

- St John and ACC records show 92% more crashes than CAS records

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Cycle crash data – useful clues

- Wide variety of crash codes and causes
- Surface problems rarely reported but
  - *'Wandering or wobbling'* may be surface feature avoidance (can be other things too!)
- *'Did not stop at traffic signals'*
  - Signals may not respond to cycles
  - Head start may be less risky than starting with traffic
- *'Wrong way in one-way street'*
  - May be quicker or safer than the legal route

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Use of crash data

- Crash numbers indicate road risk, which is not a true opposite of road safety
  - Myth:

An intersection is safe if there are few crashes

  - Reality:

It may be so dangerous that no cyclists use it

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Crash prediction models

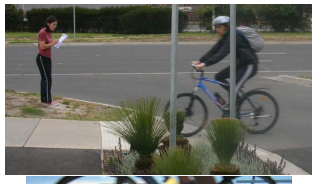
- Can be used in economic evaluation to predict safety benefits (discussed later in this course)
- Example for midblock crash prediction shown below

$$A_{UCMN\ 1} = 3.50 \times 10^{-2} \times Q^{0.19} \times L^{0.54} \times \phi_{FLUSH\ MEDIAN}$$

NZTA Research Report 389

Cycle traffic data collection tools

- Covered in Module 1
- Manual counting
  - Short durations
  - Can capture extra data
- Automatic counters
  - Do not require continual human involvement
  - May be short or long term
  - May require extra processing afterwards



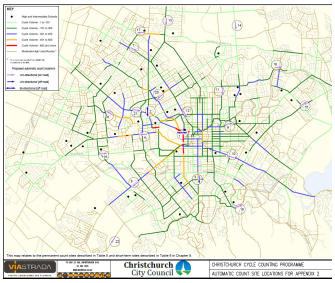
Using counters for encouragement

- Data collection & promotion
- Complete with air inflation
- Cyclist no. 500,000 gets a free bike

http://issuu.com/vekso/docs/cyclist_counters_brochure_eng_single_sided.com

Counting programme

- Number and duration of counts
  - Determine your needs
  - statistical criteria
- Locations - mix of:
  - radial and circulatory
  - on and off-road
  - commuter and school
  - uni and bi-directional



http://viastrada.co.nz/project/2010/CCC-cycle-counting

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Module 2, Section 3

Other useful data

- May also be useful to collect data not directly related to cyclists:
  - Motor vehicle speeds and volumes
    - E.g. to measure traffic calming effects
  - Satisfaction of motorists and pedestrians
    - Effects of new facilities on other road users
  - Economic data
    - E.g. effects on local retails of a new cycle trail or cycle and pedestrian friendly outdoor mall etc.
    - Where shoppers park (to help justify removal of on-street parks to accommodate cycle facilities).

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Module 2, Section 3

AADT estimation

Where there are existing facilities / access

- CNRPG scaling method using cycle count data (covered in Fundamentals course Module 1)

For new facilities or corridor without public access

- EEM SP11 method using census data
  - This technique presented in following slides
  - Exercise (15 minutes) then we'll give the answers

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Module 2, Section 3

Estimating demand for new facilities

- A corridor with no existing facilities / access
- Not easy to accurately predict demand due to wide range of cycle facility types
  - On-road vs. off-road
  - Urban vs. rural
  - Shared (with pedestrians) vs. segregated
- May be possible to use existing data
  - From similar facilities (not necessarily same location)
  - From near-by facilities (not necessarily same type)
- EEM SP 11 method

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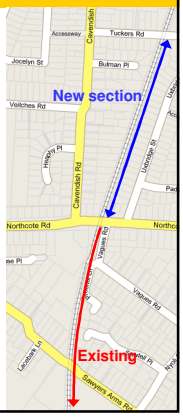
Module 2, Section 3 14

SP11 worked example

- Christchurch railway cycleway northern extension
- Using SP 11 to estimate demand on new section



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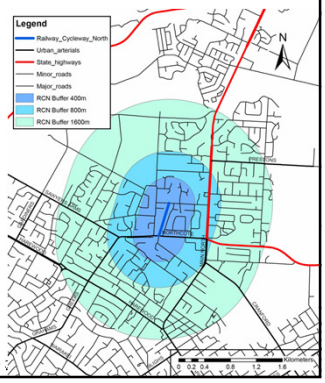
Module 2, Section 3

AADT estimation from census data

- SP 11 method
  - GIS-based
  - Uses Census population and mode share data in 3 buffers around facility
    - 400 m
    - 800 m
    - 1600 m



SP 11

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Module

AADT estimation from census data

- SP 11 method
  - Calculates AADT for new cyclists
  - Then used in B/C calculations

SP11 Walking and cycling facilities, continued

Cycle demand — Worksheet 7

	New and Existing cyclists			
	Buffers (km)	<0.4	0.4 to <0.8	0.8 to ≤ 1.6
1	Area (km²)	2.5174	3.5216	10.0571
2	Density per square kilometre	669.7386192	400.6701499	156.4069165
3	Population in each buffer (3) = (1) × (2)	1686.00	1411.00	1573.00
4	Total population in all buffers (Sum of (3))	4670.00		
5	Commute share (single value for all)	2.7		%
6	Likelihood of new cyclist multiplier	1.04	0.54	0.21
7	Row (7) = (3) × (6)	1753.44	761.94	330.33
8	Sum of row (7)	2845.71		
9	Cyclist rate (9) = ((5) x 0.96) + 0.32	2.91%		
10	Total existing daily cyclists (10) = (4) × (9)	135.99		
11	Total new daily cyclists (11) = (8) × (9)	82.87		

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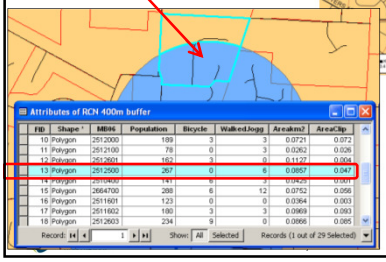
AADT estimation from census data

- GIS meshblocks overlap 400 m buffer
- We only need population in buffer



$Population_{400m}$ = 0.047 / 0.0857 * 267 = 146

18

AADT estimation from census data

- GIS results are for total buffer areas
- SP11 requires population & areas for each buffer
  - Deduct inner area

	Area (km²)			Population			Population Density		
Buffer	**0.4**	**0.8**	**1.6**	**0.4**	**0.8**	**1.6**	**0.4**	**0.8**	**1.6**
From GIS	0.88	3.12	11.62	1993	7481	22674			
Exclusive to buffer	**0.88**	**2.24**	**8.50**	**1993**	**5488**	**15193**	**2264**	**2450**	**1787**

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Modul

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AADT estimation from census data

- Determine regional commuter share from EEM Table A20.1
  - Course notes - Appendix 2
- Christchurch = 6.1%

Territory authority area	2006 % of mode share	Annual growth (2001-2006)
Manawatu District	2.1%	-7%
Palmerston North City	5.4%	-6%
Tararua District	1.5%	-10%
Horowhenua District	2.6%	-9%
Kapiti Coast District	1.7%	-5%
Porirua City	0.6%	-4%
Upper Hutt City	1.7%	-7%
Lower Hutt City	1.5%	-6%
Wellington City	2.5%	0%
Masterton District	3.5%	-8%
Carterton District	1.8%	-9%
South Wairarapa District	1.5%	-12%
Tasman District	5.1%	0%
Nelson City	6.8%	-1%
Marlborough District	4.6%	-5%
Buller District	3.9%	8%
Grey District	2.0%	-13%
Westland District	3.9%	-10%
Kaikoura District	4.5%	-7%
Hurunui District	1.9%	1%
Waimakariri District	4.3%	-4%
Christchurch City	6.1%	-3%
Selwyn District	5.2%	-5%
Ashburton District	3.9%	-5%
Timaru District	3.3%	-7%

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Module 2, Section 3 20

AADT estimation from census data

- We now have enough data to complete the SP11 worksheet
- Each row explains the required calculation

	New and existing cyclists				
	Buffers (km)	<0.4	0.4 to <0.8	0.8 to ≤ 1.6	
1	Area (km²)	0.93	2.24	8.50	
2	Density per square kilometre	2,264	2,450	1,787	
3	Population in each buffer **(3)** = **(1)** × **(2)**	1,993	5,488	15,193	
4	Total population in all buffers (Sum of **(3)**)	22,674			
5	Commute share (single value for all)	6.1			%
6	Likelihood of new cyclist multiplier	1.04	0.54	0.21	
7	Row **(7)** = **(3)** × **(6)**	2,073	2,964	3,190	
8	Sum of row **(7)**	8,227			
9	Cyclist rate **(9)** = (**(5)** × 0.96) + 0.32	6.18			%
10	Total existing daily cyclists **(10)** = **(4)** × **(9)**	1,401			
11	Total new daily cyclists **(11)** = **(8)** × **(9)**	508			

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Module 2, Section 3 21

AADT estimation from census data

- SP 11 method pitfalls
  - Original model:
    - Developed for 2 specific USA cities
    - For on-road, urban cycle facilities
  - Cyclists travelling longer distances are probably more likely to travel further to reach a facility
  - Resident population not the only trip generator
    - E.g. consider facilities in CBD – very low resident population in surrounding buffers, but very high user volumes due to people cycling to work!
- Therefore, use SP 11 with caution and supplement with other data where possible.

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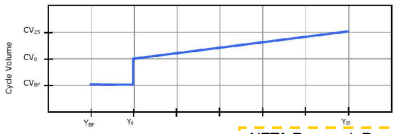
Module 2, Section 3 22

Estimating growth rates for new facilities

- Funding new cycling facilities includes cost benefit ratio analysis, which are dependent on predicted future demand
- Need accurate cycle volumes (AADTs)
  - User numbers likely to increase with infrastructure provision
    - Step increase at implementation
    - Significant annual growth in subsequent years
- NZTA Research Report 340 can be used to predict future demand

Cycle lane example



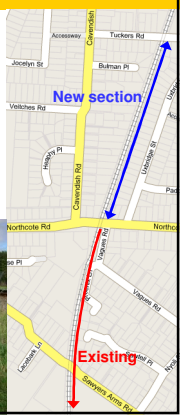
NZTA Research Report 340

Section 3 summary

- Cyclists have a wide range of trip types and requirements
- Cycle data to help understand and provide for the existing situation and plan for the future
- Need to carefully consider cycle crash data
- Various manual and automatic counting devices have different abilities, limitations and applications
- SP11 method uses Census population data rather than cycle counts
  - We'll now do an exercise using it…

Exercise – SP11

- Christchurch railway cycleway northern extension
  - Use SP 11 method to estimate demand on new section
- Data in course book at end of this section
- 15 minutes



Advanced Planning and Design for Cycling - Module 2

Section 3 Exercise 1

Demand Analysis and Estimation SP11 Method

This exercise is based on the planned northern extension to Christchurch's railway cycleway. The existing cycleway caters for a mix of users including pedestrians, commuter cyclists and child cyclists. The location for the area to be considered is shown in Figure 1.

Figure 1: Location of railway cycleway extension

The exercise is to predict the new cyclist demand for the extension according to the method presented in Worksheet 7 of SP 11. The instructions for Worksheet 7 are found in Appendix 1 (but should not necessarily be required for this exercise).

In practice, many of the calculation steps for the first part of the exercise would be performed using GIS (geographic information system) software and the SP 11 spreadsheet. As we don't have computers available in this course and to ensure the understanding of the principles behind the calculations, we will perform a few sample steps.

1 Determine population and areas of edge meshblocks

SP 11 calculations rely on census population data, which are supplied according to meshblocks. Figure 2 shows that census meshblocks do not always coincide perfectly with buffer boundaries. Therefore we need to adjust the data for meshblocks that are only partially included in each buffer. Figure 3 shows the GIS attribute table for the 400 m buffer, with the sample buffer highlighted. Using this information, determine the population for the sample meshblock highlighted in Figure 2 to be used in calculations.

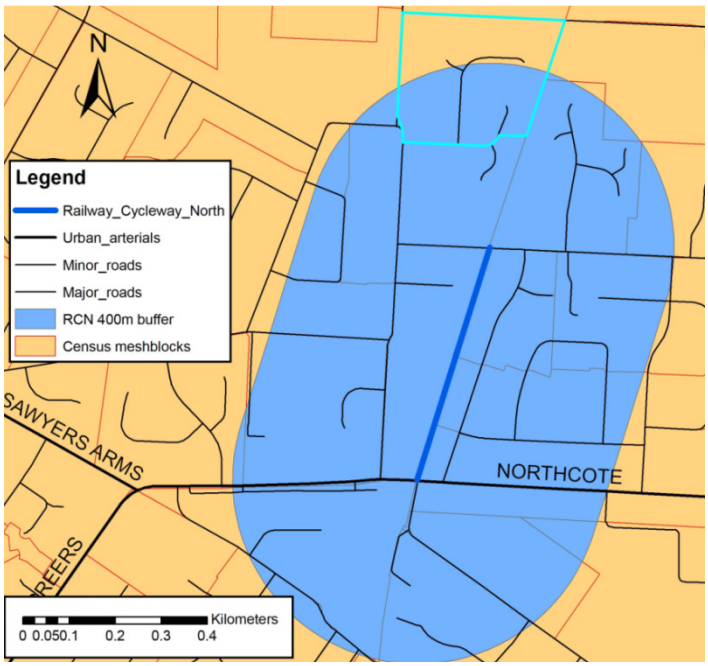


Figure 2: Sample meshblock for railway cycleway

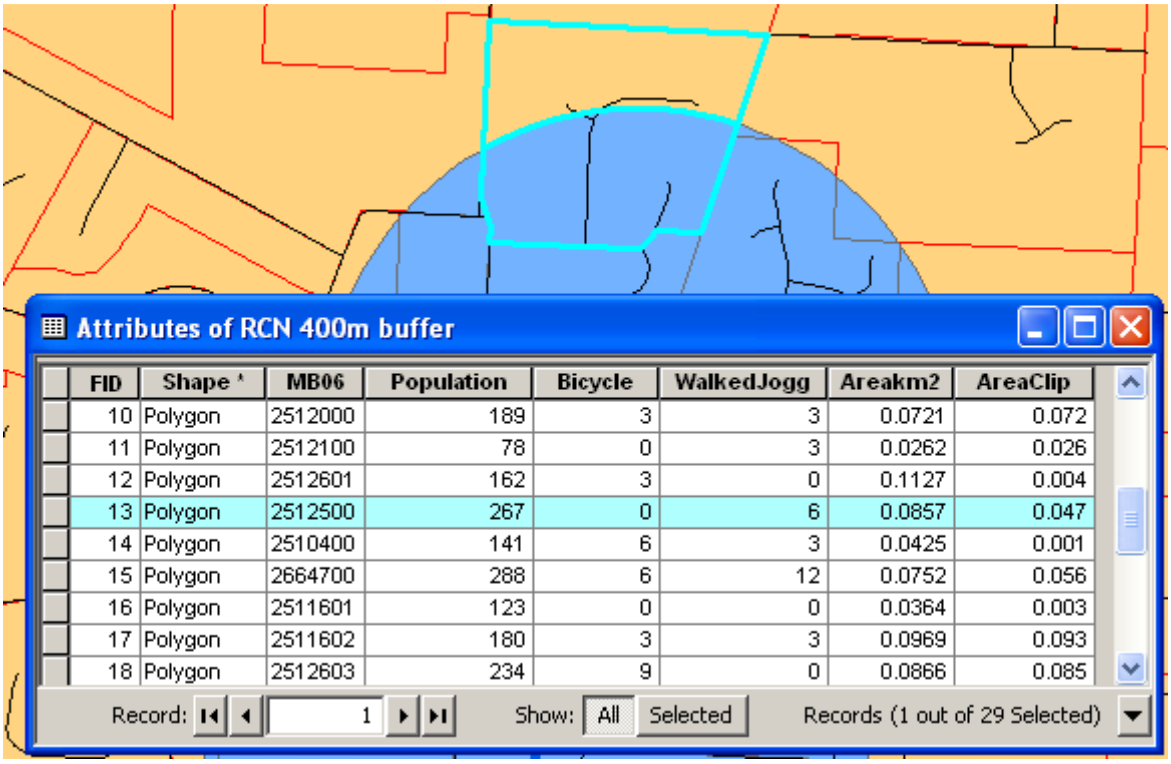


Figure 3: Attributes table for sample meshblock

Answer: population of highlighted meshblock inside buffer =

2 Calculate population densities

SP 11 requires population densities and areas. Using the information provided and derived in Table 1, fill in the first two rows of Table 2.

Note that the area and population information provided in Table 1 have already been processed to give only the portion of the meshblock that coincides with the buffer oval. However, remember that SP 11 requires the values exclusive to each buffer, and the outer two buffers are "doughnut" shaped rather than full ovals (e.g. the 800 m buffer input should not include population or area already included in the 400 m buffer input).

Table 1: Summary of GIS output for census data

	Area (km^2)			Population			Population Density		
Buffer	**0.4**	**0.8**	**1.6**	**0.4**	**0.8**	**1.6**	**0.4**	**0.8**	**1.6**
From GIS	0.93	2.85	9.73	2444	6492	20724	X	X	X
Exclusive to buffer									

3 Determine commute share

This value is found in table 8.4 of the Economic Evaluation Manual, reproduced in Appendix 2 and must be entered into row 5 of the SP 11 demand estimation worksheet.

4 Complete SP 11 worksheet

You now have enough information to complete the SP 11 worksheet for demand estimation (Table 2). Each row explains the required calculation.

Table 2: SP 11 demand estimation worksheet

	New and existing cyclists				
	Buffers (km)	<0.4	0.4 to <0.8	0.8 to ≤ 1.6	
1	Area (km^2)				
2	Density per square kilometre				
3	Population in each buffer **(3)** = **(1)** × **(2)**				
4	Total population in all buffers (Sum of **(3)**)				
5	Commute share (single value for all)				%
6	Likelihood of new cyclist multiplier	1.04	0.54	0.21	
7	Row **(7)** = **(3)** x **(6)**				
8	Sum of row **(7)**				
9	Cyclist rate **(9)** = (**(5)** x 0.96) + 0.32				%
10	Total existing daily cyclists **(10)** = **(4)** × **(9)**				
11	Total new daily cyclists **(11)** = **(8)** x **(9)**				

Appendix 1 SP 11 Worksheet 7 Explanation

Explanation for worksheet 7 **Cycle demand**

This worksheet is used to calculate cycle demand for a new cycle facility. The new commuters section of the worksheet calculates the total new daily cyclist commuters. The new other section calculates the total daily new other cyclists. Finally the overall new cyclists is devised.

1. Calculate the area within each buffer distance that is connected to the route. The buffer distances are defined at 0.4, 0.8 and 1.6 km. The buffer represents the distance to the cycling facility.
2. Enter the population density per square kilometre for each of the buffer zones.
3. The population per buffer is calculated by multiplying the area of each buffer **(1)** by the density per square kilometre **(2)**.
4. Calculate the total population, for all buffers by calculating the sum of row **(3)**
5. Enter the cycle commute mode share. This value is the same for all buffers. Cyclist commute mode share values can be found in section 8.16.
6. Row **(6)** contains the likelihood of a new cyclist multiplier for each buffer. This adjusts for the higher likelihood for the populations living closer to the facility, to use the facility.
7. Multiply the population of residents per buffer **(3)** by the likelihood multiplier **(6)**.
8. Calculate the sum of row **(7)**.
9. Calculate the cyclist rate by multiplying the cyclist commute share **(5)** by 0.96, then add on 0.32.
10. Calculate the total number of existing daily cyclists by multiplying the sum in row **(4)** by the cyclist rate **(9)**.
11. Calculate the total number of new daily cyclists by multiplying the sum in row **(8)** by the cyclist rate **(9)**.

Appendix 2 Mode Share Values for NZ TLAs

(From Table 8.4 of EEM2)

Territory authority area	2006 % of mode share	Annual growth (2001-2006)	Territory authority area	2006 % of mode share	Annual growth (2001-2006)
Far North District	0.7%	-11%	Manawatu District	2.1%	-7%
Whangarei District	1.4%	-4%	Palmerston North City	5.4%	-6%
Kaipara District	1.0%	-9%	Tararua District	1.5%	-10%
Rodney District	0.5%	-5%	Horowhenua District	2.6%	-9%
North Shore City	0.8%	-3%	Kapiti Coast District	1.7%	-5%
Waitakere City	0.9%	-4%	Porirua City	0.6%	-4%
Auckland City	1.5%	-1%	Upper Hutt City	1.7%	-7%
Manukau City	0.6%	-7%	Lower Hutt City	1.5%	-6%
Papakura District	0.8%	-7%	Wellington City	2.5%	0%
Franklin District	0.5%	-9%	Masterton District	3.5%	-8%
Thames-Coromandel District	3.0%	-2%	Carterton District	1.8%	-9%
Hauraki District	1.5%	-11%	South Wairarapa District	1.5%	-12%
Waikato District	1.1%	-7%	Tasman District	5.1%	0%
Matamata-Piako District	1.8%	-8%	Nelson City	6.8%	-1%
Hamilton City	3.2%	-8%	Marlborough District	4.6%	-5%
Waipa District	1.3%	-8%	Buller District	3.9%	8%
Otorohanga District	0.9%	-12%	Grey District	2.0%	-13%
South Waikato District	2.4%	-10%	Westland District	3.9%	-10%
Waitomo District	0.8%	-13%	Kaikoura District	4.5%	-7%
Taupo District	1.7%	-7%	Hurunui District	1.9%	1%
Western Bay of Plenty District	0.9%	-6%	Waimakariri District	1.9%	-4%
Tauranga City	2.5%	-6%	Christchurch City	6.1%	-3%
Rotorua District	2.2%	-6%	Selwyn District	2.7%	-5%
Whakatane District	2.9%	-7%	Ashburton District	3.9%	-5%
Kawerau District	3.4%	-10%	Timaru District	3.3%	-7%
Opotiki District	1.5%	-6%	Mackenzie District	3.7%	-7%
Gisborne District	3.4%	-4%	Waimate District	2.2%	-8%
Wairoa District	2.3%	-2%	Chatham Islands Territory	1.1%	-
Hastings District	3.3%	-6%	Waitaki District	2.4%	-4%
Napier City	3.7%	-2%	Central Otago District	3.4%	-6%
Central Hawke's Bay District	0.9%	-8%	Queenstown-Lakes District	2.3%	-5%
New Plymouth District	2.5%	-4%	Dunedin City	1.8%	-9%
Stratford District	1.0%	-9%	Clutha District	1.1%	-9%
South Taranaki District	3.0%	-7%	Southland District	1.5%	-6%
Ruapehu District	2.4%	-11%	Gore District	1.9%	-7%
Wanganui District	3.9%	-8%	Invercargill City	2.2%	-10%
Rangitikei District	1.9%	-9%			

Advanced Planning and Design for Cycling

Module 2 Planning and Funding

Section 4
Evaluation and Funding

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VIASTRADA

Section 4 Outline

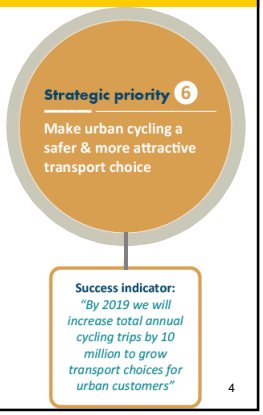
- Current context
- Business Case Approach
  - Process
  - Investment Logic Mapping
  - Strategic Assessment factors
- Economic Evaluation Manual (EEM)
  - Simplified Procedures (SP11)
  - Full Procedures
  - Example

Why NZTA is interested in cycling

- Greater safety risk compared to other modes
- Perceptions of being unsafe, unattractive and inconvenient
- Benefits not fully understood by stakeholders
- Needs of cyclists not fully understood

Changing gear in cycling

- Cycling is one of the Transport Agency's six priorities for 2015-19
- Directly connects with and supports NZTA priorities around predictable journeys and safer speeds



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4

What success will look like

- Safer more attractive network for cycling
  - Better transport choices
  - Major network development in main urban centres
  - Lower rate of fatalities and injuries from crashes involving cyclists
- More people choose to bike more often
- Road users show mutual respect
- Collaborative and effective delivery of cycling initiatives

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How we are going to do it?

- Unprecedented funding - $400m over next 3 years
- Comprehensive UCP
  - complemented by integration with other improvements, and M&O
- Updates to national design guidelines
- Cycling rules change
- Behaviour change
- Collaborative approach with the sector

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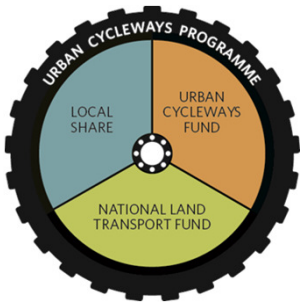
Funding for cycling projects



- UCF already allocated
- NLTP, RLTP and LTPs "locked in" for 3 years at a time
- May be other ways of funding cycling projects through existing allocations

Urban **C**ycleways **F**und
National **L**and **T**ransport **P**lan
Regional **L**and **T**ransport **P**lan
Long **T**erm **P**lan

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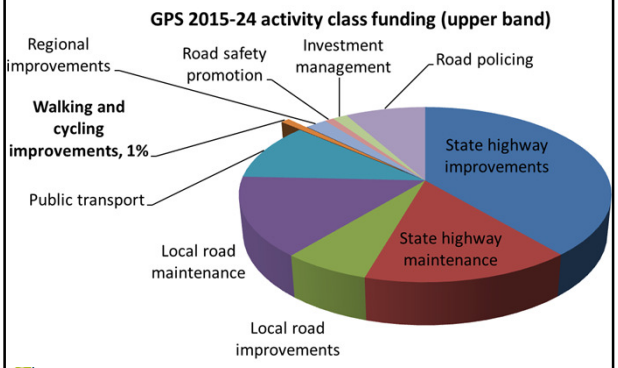
7

NLTF – funding per activity class



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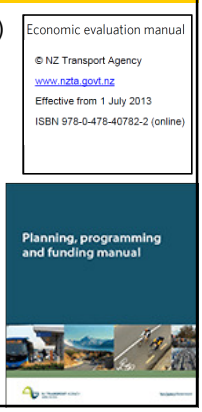
8

Overview – major NZTA resources

- Economic Evaluation Manual (EEM)
  - supersedes the former Project Evaluation Manual (PEM)
  - Current version from Nov 2013
  - Output is a **Benefit-Cost Ratio** (BCR) used in 1 of 3 main criteria in Strategic Assessment
- Planning & Investment Knowledge Base
  - Has replaced Planning, Programming and Funding Manual 2009 (PPFM)
  - Has replaced Planning Policy Manual (PPM)



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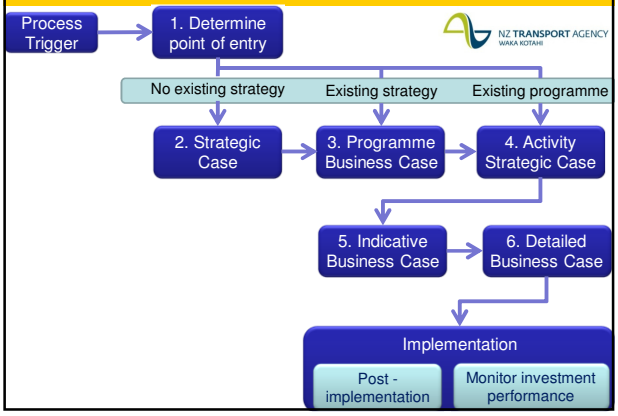
Module 2, Section 4

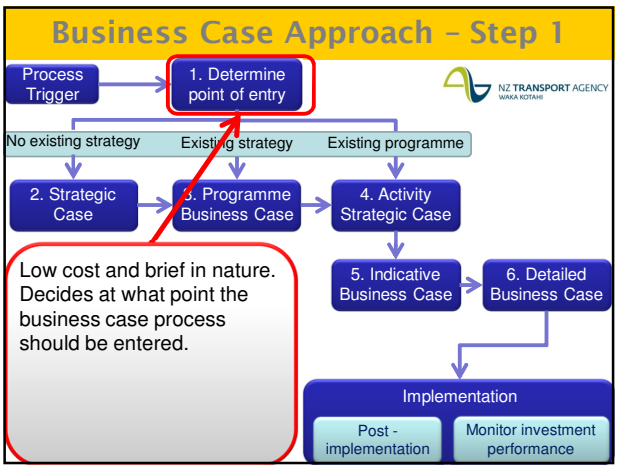
What is the Business Case Approach?

- A structured way of working together, step-by-step, to build up an investment story.
- Principles-based approach:
  - More thinking - less writing
  - Aligned to other processes
  - Quality analysis
  - Fit for purpose effort
  - No surprises

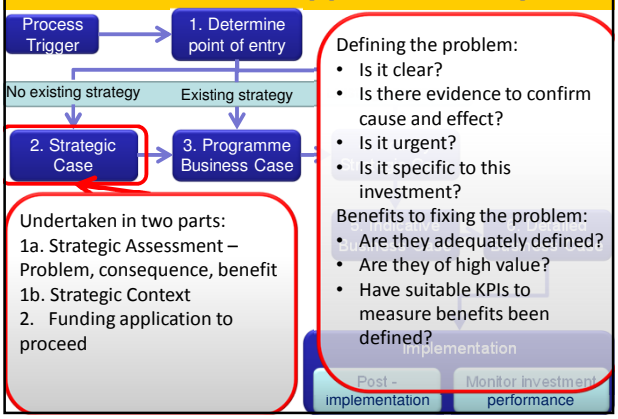
Business Case Approach - overview



Business Case Approach – Step 1



Business Case Approach – Step 2



Investment Logic Mapping

- Strategic Assessment tool
- A tool that unites stakeholders early
  - Identifies the problem, consequences and the benefits to be gained.
  - Establishes a common understanding and agreed outcomes
  - Develops a "story" for investment – from strategy to shovel
- Low cost and low effort
  - time-limited workshops
- Led by strategy (not study)

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14

ILM process - informed discussions

To solve a problem, currently we tend to do this:

What is the problem? → What is the preferred solution? → What benefits would be delivered?

Investment Logic Mapping process:

What is the problem and are the consequences significant? → What benefits need to be delivered? → What is the preferred strategic response? → What is the preferred solution?

Large, complex investments and small investments all follow the same process

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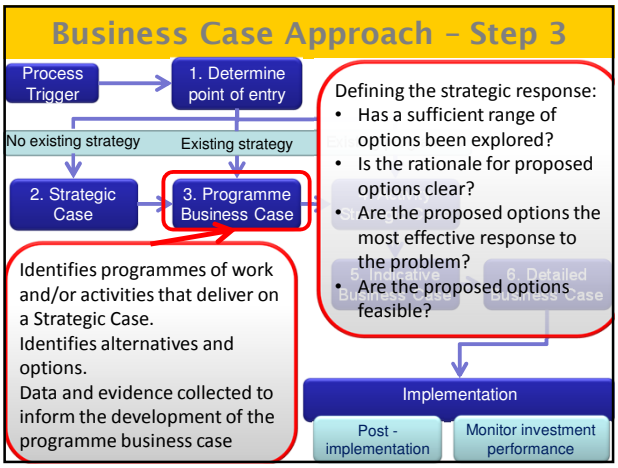
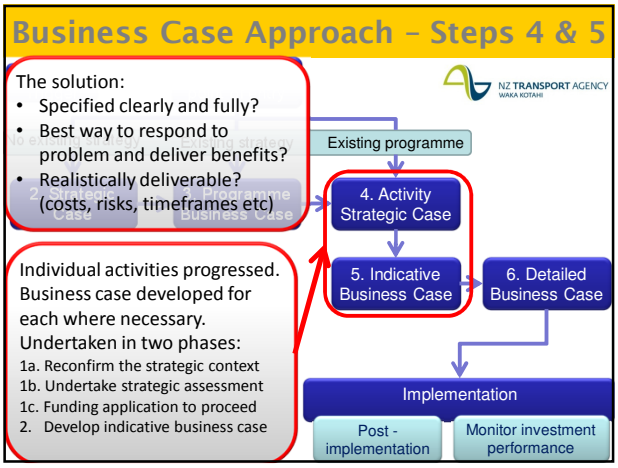

Business Case Approach – Step 3
Process Trigger
1. Determine point of entry
No existing strategy
Existing strategy
2. Strategic Case
3. Programme Business Case
Identifies programmes of work and/or activities that deliver on a Strategic Case.
Identifies alternatives and options.
Data and evidence collected to inform the development of the programme business case
Defining the strategic response:
• Has a sufficient range of options been explored?
• Is the rationale for proposed options clear?
• Are the proposed options the most effective response to the problem?
• Are the proposed options feasible?
Implementation
Post - implementation
Monitor investment performance


Business Case Approach – Steps 4 & 5
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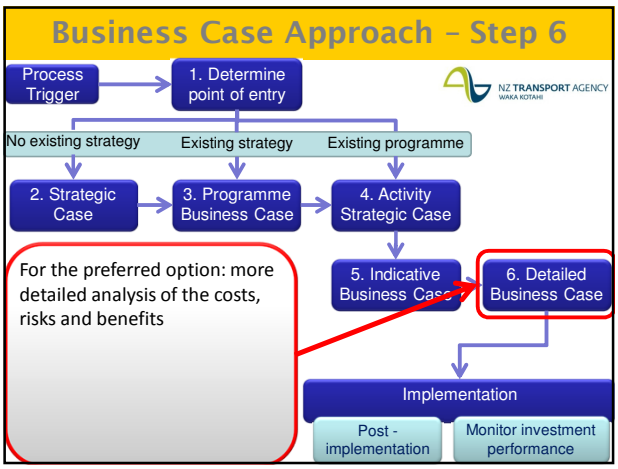
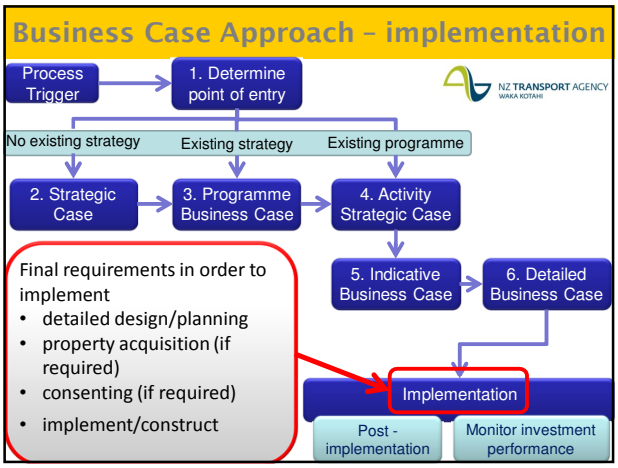
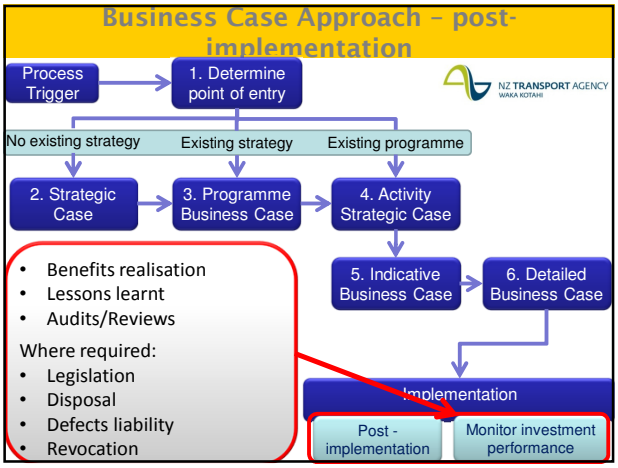
The solution:
• Specified clearly and fully?
• Best way to respond to problem and deliver benefits?
• Realistically deliverable? (costs, risks, timeframes etc)
Existing programme
4. Activity Strategic Case
5. Indicative Business Case
6. Detailed Business Case
Individual activities progressed. Business case developed for each where necessary.
Undertaken in two phases:
1a. Reconfirm the strategic context
1b. Undertake strategic assessment
1c. Funding application to proceed
2. Develop indicative business case
Implementation
Post - implementation
Monitor investment performance


Business Case Approach – Step 6
Process Trigger
1. Determine point of entry
NZ TRANSPORT AGENCY
WAKA KOTAHI
No existing strategy
Existing strategy
Existing programme
2. Strategic Case
3. Programme Business Case
4. Activity Strategic Case
5. Indicative Business Case
6. Detailed Business Case
For the preferred option: more detailed analysis of the costs, risks and benefits
Implementation
Post - implementation
Monitor investment performance





Assessment factors

Strategic Fit Qualitative - High, Medium, Low

- How an identified problem, issue or opportunity aligns with the Agency's strategic investment direction – the national significance

Effectiveness Qualitative - High, Medium, Low

- The contribution the proposed solution makes to achieving the strategic direction, the purpose of the LTMA, and how a solution is optimised, integrated and enduring.

Benefit / Cost Appraisal Quantitative: 1-2.9, 3-4.9, 5+

- Formerly "efficiency"
- How well the proposed solution maximises the value of what is produced from the resources used

NZ TRANSPORT AGENCY www.pikb.co.nz/assessment-framework/ 21

Strategic fit – walking and cycling

- Walking & cycling projects have a **Low** strategic fit by default
  - Need to prove otherwise
- **Medium** rating:
  - Part of secondary corridor / network in a main urban area, for utility cycling, including associated facilities; OR
  - Link to complete / complement strategic network in a main urban area; OR
  - Corridor / site with a medium W&C crash risk
  - Link to a substantial employment centre outside main urban area, with high demand; OR
  - Link to complete connections to NZ Cycle Trail

NZ TRANSPORT AGENCY WAKA KOTAHI 22

Strategic fit – walking and cycling

- **High** rating:
  - Part of primary corridor / network in a main urban area, for utility cycling, including associated facilities; OR
  - Corridor / site with a high W&C crash risk

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Business case - assessment profile

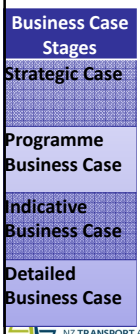
- Developed progressively through the process

Business Case Stages	Strategic Fit Assessment	Effectiveness Assessment	Efficiency Assessment
Strategic Case	Indicative	Indicative (conditional where appropriate)	Not applicable
Programme Business Case	Confirmed	Indicative (conditional where appropriate)	Indicative (conditional where appropriate)
Indicative Business Case	Reconfirmed (continued alignment)	Confirmed	Indicative (conditional where appropriate)
Detailed Business Case	Re-confirmed (continued alignment)	Re-confirmed (continued alignment)	Confirmed

NZ TRANSPORT AGENCY WAKA KOTAHI 24

Business case - assessment profile

- Looking at it in terms of assessment criteria:



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Using the Business Case for cycling

- Western Rail Trail – Hamilton
  - Previously, weak reasoning for route choice ("it's flat…")
  - ILM with stakeholders – developed a compelling 'why'
- Wellington Cycle Programme
  - Strategic Case applied from the start
  - Short report (≈10 pages), with some evidence
    - Business Case requires more thinking than writing
- Hastings – following on from Model Communities
  - Able to enter process at pre-implementation stage, as significant planning already done
    - Highlights that Business Case is about providing the right information at the right stage, not reinventing the wheel.

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Business Case Approach - resources

- Training resources
- Online:
  - Planning and Investment Knowledge Base
    https://www.pikb.co.nz/
  - Highways information portal
    http://hip.nzta.govt.nz/
  - Investment management Standard (Vic State)
    http://www.dtf.vic.gov.au/Investment-Planning-and-Evaluation/Understanding-investment-planning-and-review/What-is-the-investment-management-standard
- Local 'champions'

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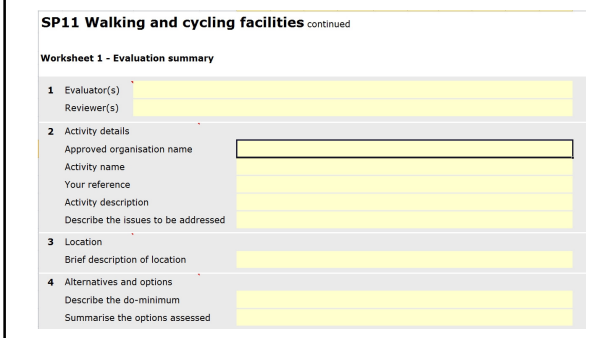
Economic Evaluation Manual (EEM)



SP11 Walking and cycling facilities continued

Worksheet 1 - Evaluation summary

1	Evaluator(s)	
	Reviewer(s)	
2	Activity details	
	Approved organisation name	
	Activity name	
	Your reference	
	Activity description	
	Describe the issues to be addressed	
3	Location	
	Brief description of location	
4	Alternatives and options	
	Describe the do-minimum	
	Summarise the options assessed	

NZ TRANSPORT AGENCY WAKA KOTAHI

NZTA, 2009 28

EEM simplified procedures

- SP 11 benefit / cost assessment
- For projects / packages up to $5M
- Consolidated benefit of $1.45 / km / cyclist
- Main components:
  - Costs: construction and maintenance
  - Demand estimation (Module 2 Section 3)
  - Travel time
  - Health benefits $1.30 per km per cyclist
  - Crash savings:
    - "Safety benefit in absence of specific accident analysis category"
    - Safety benefit from improvement at hazardous sites

NZ TRANSPORT AGENCY WAKA KOTAHI EEM Section 8.7 (2010 version) 29

EEM full procedures

- Benefit / Cost assessment
- For projects / packages above $5M
- Can use for projects under $5M
  - May be able to derive more benefits under congested conditions or where parking spaces not needed
- Uses same components as SP 11
- Plus additional components:
  - National strategic factors
  - Other non-monetised effects

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 4 30

EEM full procedures benefits

- Travel-time (TT) benefits
  - Cyclist "short cuts" may provide TT savings
  - Bike route improvements may reduce delays
  - Motorist reliability/congestion improvements
  - If switching from bus in congested area, travel time savings
  - If switching from train or in uncongested area, may not have travel time savings
- Health benefits…

EEM Chapter 8 (2010 version)

Health benefits of cycling projects

- Cycling – moderate intensity physical activity:
  - Reduces risk of cardiovascular diseases
    - E.g. coronary heart disease, stroke
  - Protective effect against some cancers
    - E.g. heart, lung, breast cancer
  - Reduces risk of type 2 diabetes
  - Combats obesity

NZTA research report 359

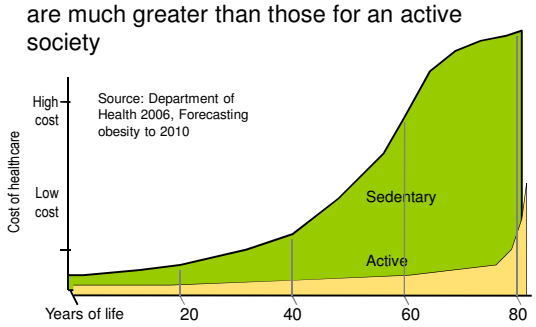
Health benefits of cycling projects

- Cycling – moderate intensity physical activity:
  - Preventative and therapeutic effects for mental illnesses
    - E.g. depression, anxiety, stress, phobias, panic disorders, schizophrenia
  - Car-borne commuters found to experience higher stress levels than users of other modes
  - If people switch to cycling from car use, carbon dioxide emissions reduce

NZTA research report 359

Health benefits of cycling projects

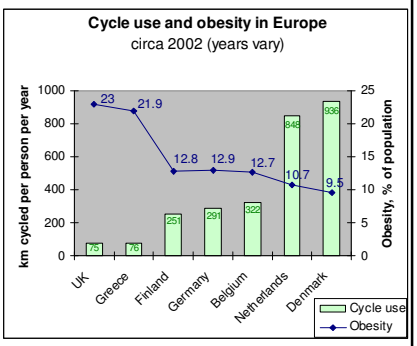
- The cumulative costs for a sedentary society are much greater than those for an active society



NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 4 Darnton, P. (2009) 34

Health benefits of cycling projects

- Countries with low levels of cycling have high obesity
- 70% of women get less than the recommended level of physical activity



NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 4 Darnton, P. (2009) 35

EEM Benefits example

NZ TRANSPORT AGENCY WAKA KOTAHI 36

EEM example – cyclist benefits

- EEM values:

- Time savings – commuting **$7.80 per hour**
- Mode change benefit **25c / km**
  - Cost savings (car 30c / km - bike 5c / km)
- Health: physical activity benefits **$1.30 per km**
- Parking: Auckland CBD **$11.41 per day**
- Safety; cyclist more at risk – but see following slide

Hughes, T. (2009)

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 4 37

EEM example – benefits to others

- Safety: safety in numbers **5c/km**
  safer for everyone else
- Congestion relief (Auckland) **$1.41 / car km**
- Environment: **10c per km** (???)
- Network resilience and reliability: **priceless**
- Parking freed up for others not considered here
- Accessibility more research needed*

** theoretical research in progress on "active friendly variable" of active transport accessible neighbourhood land values suggests a per property benefit of +$50,000*

Hughes, T. (2009), Genter, J. A. 2009

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 4 38

EEM example – scenario

- Best case – congested inner city Auckland
- A 5 km long missing link in the regional cycling network is proposed
- Safe and attractive cycle route linking the CBD to nearby areas, avoiding or remedying hazardous spots
- Links to cycle networks further out
- Average trip length is 5 km; **round trip 10 km**
- Supported by other travel behaviour change initiatives at CBD workplaces etc

Hughes, T. (2009)

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 4 39

EEM example – benefits per day

- Benefits / person cycling 10 km instead of driving:
- User benefits
  - Time savings ($7.80 per hour) **none**
  - Mode change cost savings (25c / km) **$ 2.50 (???)**
  - Health ($1.30 per km) **$13.00**
  - Parking - Auckland CBD ($11.41 per day) **$11.41 (???)**
- Benefits to others
  - Congestion relief: Auckland ($1.41 / 2) **$ 7.05**
    Only allowed to count ½ congestion relief due to estimated induced traffic demand
  - Environment (10c per km) **$ 1.00**
- Total benefits per person per day $35

Hughes, T. (2009)

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 4 40

EEM example – present value

- For projects lasting 40 years
  - $35 per person per day
  - In a working year 250 days = $8,700
  - Present value over 40 years = $134,800
- Previous PT users:
  - No congestion and parking benefits
  - But they save fares and time,
  - Approx $20 / person /day:
  - Present value = $77,000

Hughes, T. (2009)

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 4 41

EEM example – conservative

- Where networks are not congested and parking is cheap or free:
  - Using 3 km each way average cyclist trips, $10 / day
  - $2,500 per year
  - **Present Value = $38,700**

Hughes, T. (2009)

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 4 42

Section 4 summary

- Cycling one of NZTA's 6 priorities for 2015-19
  - Unprecedented funding
- Business Case approach
  - New tool – structured process
  - Bringing stakeholders along from the start
- EEM
  - Simplified Procedure 11 is a fast way to do economic analysis for cycle projects
  - If you require additional benefits to achieve a fundable BCR, consider using full procedures
  - Health benefits are a very strong rationale for advancing cycling projects and programmes

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 4 43

Advanced Planning and Design for Cycling

Module 2

Section 5
Auditing

Section 6 outline

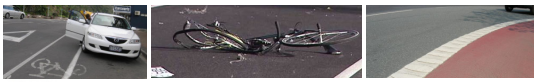
- Overview and definitions
- Road safety audits
  - NZTA Safety Audit
  - Austroads Safety Audit
- Cycle and NMU audits
  - general principles
  - Austroads cycle audit
  - NZTA Non-Motorised User (NMU) Audit Procedures
- LOS evaluations
  - Austroads
  - CLOSAT

Introduction

- There are many different ways of evaluating provision for cycling
  - This section gives a brief description of a few audit guides and checklists
- Auditing is necessary because…
  - Helps ensure designs will meet the objectives
    - Does the design provide the right LOS for the target audience?
  - Designing for an *interested but concerned* target audience is a relatively new field
    - Best practice is still being identified and developed
    - Not everyone really knows what they're doing

Types of audits

- Road Safety Audit (RSA)
  - *a formal, independent review of a road design focussed **on safety***
  - a procedure for auditing the safety of projects through their development process. It must be applied to new roading, renewal of roading facilities, and walking or cycling facilities NZTA, 2013
- Cycle audit
  - an audit of a project or existing road from the perspective of bicyclists
  - based on range of criteria ***including*** safety



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Road Safety Audits

- There are many online and published resources
- We briefly mention 2 of these:
  - NZTA's *Road Safety Audit Procedures for Projects:* Guidelines - interim release (May 2013)
  - Austroads Guide to Road Safety (GRS 6)
- In addition, there is a Cycle Road Safety Audit method available from the Federal Highway Administration (FHWA, 2012)

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 5 5

RSA objectives and benefits

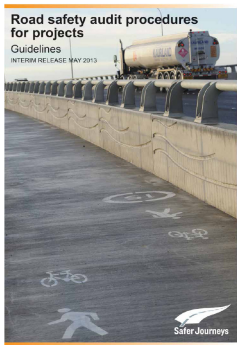
- Objectives
  - identify potential safety concerns for all road users and others affected by project
  - ensure that measures to mitigate concerns are considered fully
- Benefits
  - minimise risk and severity of crashes
  - minimise need for remedial works
  - improve awareness of safe design practices

NZTA, 2013

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 5 6

NZTA safety audit procedures

- NZTA's *Road Safety Audit Procedures for Projects:* interim release May 2013 for general road audits
  - Broad consideration of cycling related issues under 'Special Road Users'
    - e.g. "have cycle lanes been considered?"
  - You need to assess designs according to the design principles in this course



NZTA 2013

Austroads road safety audit

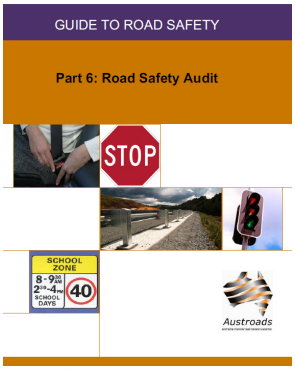
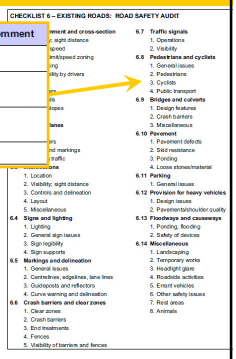


Table of Contents

"Safe Road System"
Intro to Safety Audits
Legal Issues
Audit Process
Road Design Audits
Other Audits • Road works • Land use • Specialist road users ← • Existing roads ←
Case Studies
Safety Principles
Tools
Checklists ←

Austroads road safety audit

Issue	Yes	No	Comment
6.8.3 Cyclists			
Is the pavement width adequate for the number of cyclists using the route?			
Is the bicycle route continuous? (i.e. free of squeeze points or gaps)			
Are drainage pit grates bicycle safe?			



- GRS 6 checklists
  - by project stage
  - **all** include consideration of cyclists
- Checklist 6 – Existing Roads
  - 13 pages, 3 rows for cyclists
  - complete RSA, not a cycle audit...

Cycle and NMU* audits

NMU = Non-Motorised User

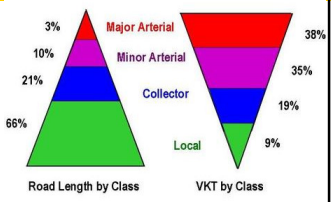
- Available guidance
  - Austroads GRD 6A Appendix C
  - NZTA NMU Review Procedures
  - FHWA Bicycle Road Safety Audit Guidelines & Prompt Lists
  - Bikeability (USA and Australian tools)
  - Community Street Review

Cycle audits – general

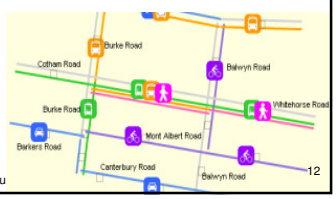
- May be for:
  - concept plans,
  - design plans,
  - construction drawings, or
  - existing roads/paths
- Consider all principles described in standards, guidelines and these course modules
- May need a custom audit methodology

Principles of cycle audits

1. Hierarchies
   - network hierarchy



   - road user hierarchy
     - Which mode is prioritised where?



Principles of cycle audits

2. Has road (path) user interaction been considered?
   - pedestrians
   - motorists
   - heavy vehicles

3. User demographics
   - trip type, skills and ages
     (recall section 3)

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Module 2, Section 5
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Principles of cycle audits

4. Is the choice of facility appropriate?
   - midblock – degree of separation, crossing provisions, etc
   - intersection – ASBs, ASLs, hook turns, cycle phases

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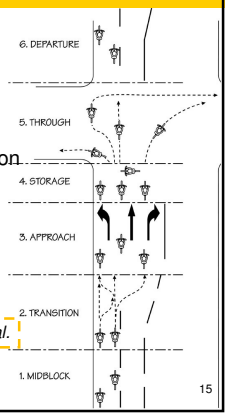
Principles of cycle audits

5. Is the choice of intersection control appropriate?
   - have all cycle movements been catered for?
   - are the six elements of intersection design present? (traffic signals)



Cumming *et al.*

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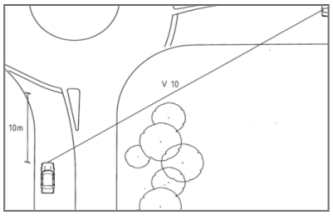
Principles of cycle audits

6. Are appropriate sight distances provided?
   - at midblock crossings
   - between cyclists and conflicting motor vehicle movements at intersections
   - too much sight distance can be dangerous at roundabouts



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Principles of cycle audits

7. Do motor vehicle volumes allow cyclists to:
   - cross at a mid block crossing?
   - cross the road at a priority intersection?
   - transition between lanes on approaches to intersections?

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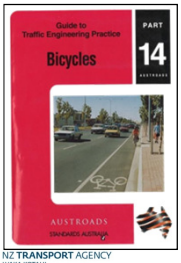
Austroads cycle audits

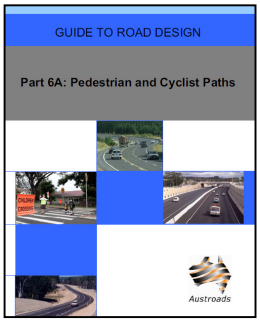
old GTEP PART 14 App A

- Example of bicycle safety audit checklist (4 pages)
- Detailed list of considerations
- Covers roads and paths



GRD 6A Appendix C

- Described in following slides



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Austroads GRD 6A

Appendix C Checklists

- Detailed information, not a "checkbox" table

Section	Description
C.1	Introduction
C.2	General Requirements for Roads and Paths
C.3	Alignment and Cross-section
C.4	Signs, Delineation and Lighting
C.5	Riding Surface
C.6	Vegetation, Maintenance and Construction
C.7	Traffic Signals
C.8	Physical Objects
C.9	Paths
C.10	Roads

Austroads GRD 6A Appendix C – summary

Austroads GRD 6A

Appendix C Commentary (1)

Number	Commentary
1	Separated versus shared paths
2	Cycle design vehicle
3	Footpaths
4	Bicycle paths
5	Shared paths
6	Segregated paths
7	Street furniture
8	Level changes
9	Surface materials
10	Gradients
11	Path factors
12	Construction specifications

Austroads GRD 6A Appendix C – summary

Austroads GRD 6A commentary (2)

- Appendix C, Commentary 5 includes summary of the "Ker Report"* on shared path conflicts
- Covered in more detail in Module 3, Section 4, Paths

Ker *et al.* 2006 – AP-R287/06

* Note that other Austroads publications spell "Ker" incorrectly

FWHA Bicycle RSA Guidelines

- Has very good guidelines & prompts

A.4.2: Does debris accumulate in the area used (or intended for use) by cyclists?

Dirt, litter, glass, etc. may accumulate where cyclists travel. This debris may puncture tires or cause a loss of control, especially on a downgrade or curve. Consideration should also be given to the material adjacent to a facility used by cyclists, as these should be free of lose materials that can move onto a path.

The photo to the left shows a gravel driveway that has partially covered the bikeable shoulder. Loose gravel can cause a cyclist to lose stability and fall. Surface conditions that may present existing or future issues to cyclists should be considered.

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 5 FWHA 2012 22

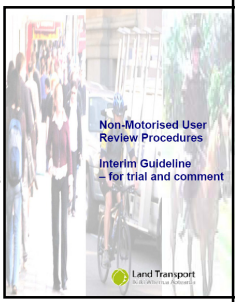
Bikeability checklists

- Bikeability (U.S.A.)
  - hosted on www.pedbikeinfo.org/
  - partners: NHTSA / USDOT
  - non technical, useful for those frequent calls planners get from schools looking for a project ☺
- Bikeability (Australia)
  - hosted on www.travelsmart.gov.au
  - prepared by Bicycle Federation of Australia (BFA)
  - checklist is far more comprehensive, suitable for professional use
- Cycling England "Bikeability" cycle skills training is not a bikeability checklist

NZ TRANSPORT AGENCY WAKA KOTAHI Module 2, Section 5 23

NMU reviews

- Non-motorised user (NMU) reviews consider the needs of:
  - Cyclists
    - of varied ages and abilities
  - Pedestrians
    - walkers
    - runners
    - wheelchair / motorised scooter users
    - skateboarders / roller skaters
    - vision impaired
- LTNZ Non-Motorised User Review Procedures (2006)



LTNZ (2006)

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NMU review objectives

- Why do an NMU?
  - Recognise variations in NMU skills and behaviours
  - Aim for a design which encourages consistent behaviours
- Encourages design team to improve LOS for NMUs
- Recognises current and future needs of NMUs
- Prevents conditions for NMUs being worsened
  - Happens more often if it is not a walking & cycling project

LTNZ (2006)

NMU review components

- Two main parts
  - Context Report (as early as possible)
  - Audits (at each project stage)
- Different audit checklist for each stage:
  - Preliminary Design
  - Detailed Design
  - Construction Stage
  - Post Construction

Level of Service evaluations

- LOS
  - Traditionally a measure used for motor vehicle traffic, based on travel time / delay
  - Remember, directness (which includes travel time) is only one of the 5 requirements for cycling
- The concept of LOS now is being broadened to encompass various route requirements
  - E.g. Austroads LOS metrics – a variety of "LOS needs" for different modes…
- Can be a useful part in evaluating planned or existing provision for cycling

LOS for different modes

reducing performance

Level of Service					
A	No route delay. Always runs to timetable.	Opportunities to cross within 50m. Minimal crossing delay.	High degree of separation. Minimal delay.	No delay. No variability.	No delay. No variability.
B					
C	Stop at every set of signals. Within 5 min of timetable.	Crossing within 200m. Average crossing delay is 45 sec.	On-road bicycle lane.	Stop at every set of signals.	Stop at every set of signals.
D					
E	Takes at least 3 signal cycles to clear intersection.	Crossing within 400m Average crossing delay is 90 sec.	Bicycles share traffic lanes.	Takes at least 3 signal cycles to clear intersection.	Takes at least 3 signal cycles to clear intersection.
F					

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Austroads LOS metrics

- Austroads LOS metrics for network operations planning
  - For various modes
  - Multiple LOS needs
    - With associated LOS measures
    - And service measure values required to achieve rating levels A-F

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Austroads LOS metrics

- LOS needs for cycling
  - Subdivided into LOS measures

LOS Need	LOS Measures
Mobility	• Travel speed • Congestion (of cycling Infrastructure • Gradient
Safety	• Risk of cycle-to-cycle / pedestrian crash • Risk of crash caused by surface unevenness or slippage • Risk of crash with stationary hazards • Risk of cycle-to-motor vehicle crash at mid-blocks • Risk of cycle-to-motor vehicle crash at intersections and/or driveways
Access	• Access to and ability to park close to destination • Suitability
Information	• Traveller information available, including signposting
Amenity	• Aesthetics • Comfort and convenience • Security • Pavement ride quality

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RADA

Austroads LOS metrics

- Descriptions of LOS ratings for measure
  - E.g. Risk of cycle-motor vehicle crash at mid-block:

Rating	Service measure value
A	• Exclusive bicycle facility in a low-risk environment
B	• Exclusive bicycle facility in a low to medium risk road environment or no bicycle facility in a low risk road environment
C	• Exclusive bicycle facility in a medium to high risk road environment or no bicycle facility in a low to medium risk road environment
D	• Exclusive bicycle facility in a medium to high risk road environment or no bicycle facility in a medium risk road environment
E	• Bicycle only lane (not Copenhagen style facility where the bicycle facility is behind a kerb) in a high risk road environment or no bicycle facility in a medium to high risk road environment
F	• No bicycle facility in a high risk road environment

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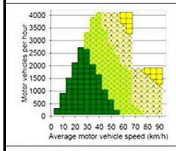
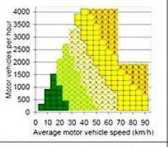
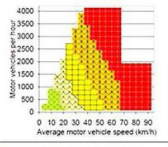
Austroads LOS metrics

- Based on Danish research Jensen (2007)

Table A 6: LOS rating for cyclists based on type of facility, motor vehicle volumes and motor vehicle speeds

Copenhagen style facility	Bicycle lane or sealed shoulder facility	No exclusive bicycle facility	Legend
			
For example 2.2 m cycle track located behind a kerb.	For example a 1.5 m bicycle lane on urban roads or a 1 m sealed shoulder on rural road.	For example bicycles share 3.75 m kerb side lane with vehicles.	

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Austroads LOS metrics

- Results in LOS rating for each measure
  - Example shows comparison for site with / without proposed signalisation
  - Can have +/- increment for each LOS rating

Table 5.6: LOS for cyclists: Stevenson Street/Denmark St intersection signalisation

Road user	LOS needs	LOS measure	W/out or With	LOS rating N/A	F	E	D	C	B	A
Cyclist	Mobility	Travel speed	W/out							
			With							
		Congestion	W/out							
			With							
		Grades	W/out							
			With							
	Safety	Risk of cycle-to-cycle/pedestrian crash	W/out							
			With							
		Risk of crash caused by surface unevenness or slippage	W/out							
			With							
		Risk to crash with stationary hazards	W/out							
			With							
		Risk of cycle-to-motor vehicle crash at mid-blocks	W/out							
			With							
		Risk of cycle-to-motor vehicle crash at intersections and/or driveways	W/out							
			With							
	Access	Access to and ability to park close to destination	W/out							
			With							
		Restrictions	W/out							
			With							
	Information	Traveller information available, including signposting	W/out							
			With							
	Amenity	Aesthetics	W/out							
			With							
		Comfort and convenience features	W/out							
			With							
		Security	W/out							
			With							
		Pavement ride quality	W/out							
			With							

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Austroads LOS metrics

Table 5.6: LOS for cyclists: Stevenson Street/Denmark St intersection signalisation

Road user	LOS needs	LOS measure	W/out or With	LOS rating						
				N/A	F	E	D	C	B	A
Cyclist	Mobility	Travel speed	W/out							
			With							
		Congestion	W/out							
			With							
		Grades	W/out							
			With							
		Risk of cycle-to-cycle/pedestrian crash	W/out							
			With							
		Risk of crash caused by surface unevenness or	W/out							
			With							
		Security	W/out							
			With							
		Pavement ride quality	W/out							
			With							

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Cycling LOS Assessment Tool

- CLOSAT
- Bicycle Network and VicRoads (Victoria, Australia)
- A series of variables with scores to give an overall LOS
  - Professional judgement used to define scores
  - i.e. not validated by surveying actual users
- Midblock and intersections
  - Can be applied to identify weakest link over a route

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Cycling LOS Assessment Tool

Class	Subset	Facility	Value	Score
On Road Bike Lanes	Midblock	Nothing	0	
		Wide kerbside lane (marked)	1	
	One direction	1.0m paint	3	
		1.2m paint	5	
		1.5m paint	8	
		1.8m paint	9	
		2.0m paint	10	
		Separated by profiled line	3	
		Separated by parking	4	
		Bus Lane =<10, <20, 20+ buses/hr	11, 6, 2	
		Speed: 50kph, 40kph, 30kph	1, 3, 4	
		Speed: 70kph, 80kph, 90+kph	-3, -10, -15	
		Sidestreets without green	-2	
		Parking, no 0.5m chevron or reversing zone	-3	
		<.5m lat.clearance to obstruction	-2	
		Uneven surface	-3	

Cyclist LOS

A	3.0+ metre off road path, grade separated, minimal delay	D	1.5m lane outside Parking
B	2.0m kerb side + Parking + hard Separation	E	Bus Lane, medium frequency
C	1.7 to 2.0m bike lane outside Parking with Vibraline	F	WKL marking or nothing. Shared lane with traffic

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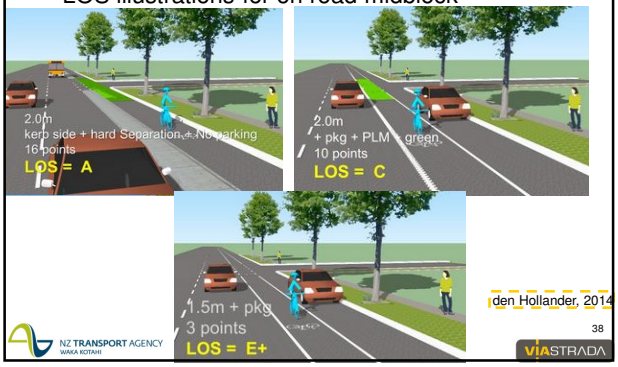
Cycling LOS Assessment Tool

- LOS illustrations for on road midblock



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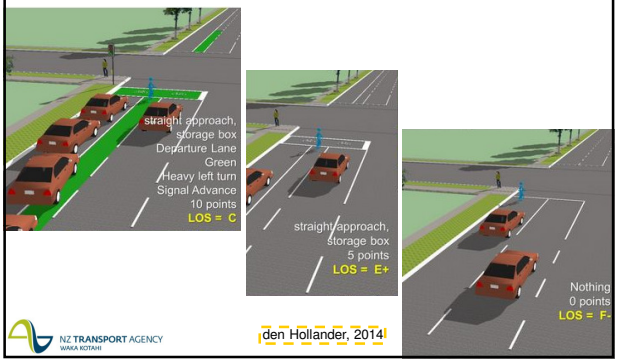
Cycling LOS Assessment Tool

- LOS for on road intersections



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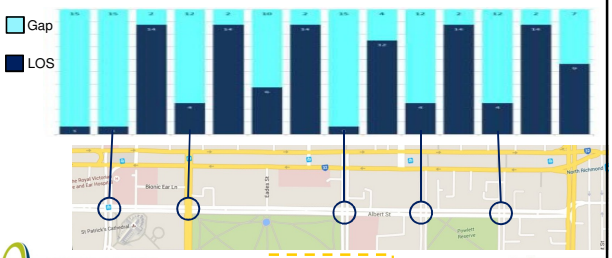
Cycling LOS Assessment Tool

- Application example – Albert St, East Melbourne
  - Used to identify weakest link(s) over a route
  - Intersections have the worst LOS



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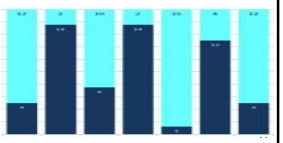
Austroads LOS vs CLOSAT

- Austroads
  - Fine-detail of a particular facility
  - Doesn't give an overall LOS for a component
  - Similar process developed for other modes
- CLOSAT
  - Overview of various components of a route
  - LOS for each component
  - For cycling only

LOS measure	W/out or With	LOS rating						
		N/A	F	E	D	C	B	A
Travel speed	W/out							
	With							
Congestion	W/out							
	With							
Grades	W/out							
	With							



Section 5 summary

- Auditing is an important part of providing for cycling
  - Check the concept design is right (first stage)
  - Identify deficiencies and plan for improvements
  - Inform asset management and models
- Road safety audits (RSAs)
  - NZTA requirement, procedures are well developed
- Cycle audits
  - Use the seven principles of cycle audits
  - Ensure consistent, comprehensive audit
- LOS for cycling
  - Structured methods available to identify weakest links in a route or weakest aspects in a facility

Module 2, Section 5 42

Advanced Planning and Design for Cycling

MODULE 2: PLANNING & FUNDING

Section 6
Module 2 wrap-up

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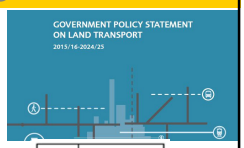
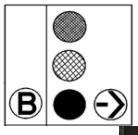
2.2 Policy and legislation

- GPS 2015/16
  - Sets strategic direction
  - Walking & Cycling very small component, but can be funded through other activity classes
  - Does not include NZ Cycle Trail or Urban Cycleway funding
- Road User Rule changes
  - hook turns, use of shared paths
  - Bus signals, give way
- Setting speed limits rule changes
  - RCAs can set low speed zones





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Module 2, Section 6

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2.3 Data collection and analysis

- Data types
  - Crash data
  - Volume data
  - Non-cyclist data
- Counting techniques
  - Equipment
  - Programmes
- Demand estimation
  - SP11 method
  - estimating growth rates

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2.4 Appraisal and Funding

- Business Case Approach
  - Structured process
  - Bringing stakeholders along from the start
  - Includes Investment Logic Mapping process
    - Informed discussions to develop "investment story"
  - Includes 3 factor framework for assessment
    - Strategic fit, effectiveness, benefit/cost appraisal (efficiency)
- Economic Evaluation Manual (EEM)
  - Simplified Procedures for walking and cycling (SP11)
  - Full Procedures may be useful for projects < $1M if additional benefits needed
  - output is a Benefit-Cost Ratio (BCR)
    - To be used in Business Case

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Module 2, Section 6 4

2.5 Auditing

- Road safety audits (RSAs)
  - for all users
  - generally new or renewal projects
  - limited to safety
- Cycle audits and reviews
  - audits of new or renewal projects
  - reviews of existing roads
  - include safety amongst other criteria
- LOS for cycling
  - Austroads – different measures for different needs of a particular facility
  - CLOSAT – LOS of route segments

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The End

- See most of you after lunch!
- Not attending Module 3?
  - *please fill out a course evaluation*

Module	Level	Duration	Topic
1	Fundamentals	1 day	Planning and Design for Cycling
2	Advanced	½ day	Planning and Funding • Data Collection Techniques • Network Design • Economic Analysis Procedures
3		½ day	Mid-block and Path Design • Cycle Lanes and Parking • Cycleways and Shared Paths • Traffic Management
4		1 day	Intersection Design

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Module 2, Section 6 6