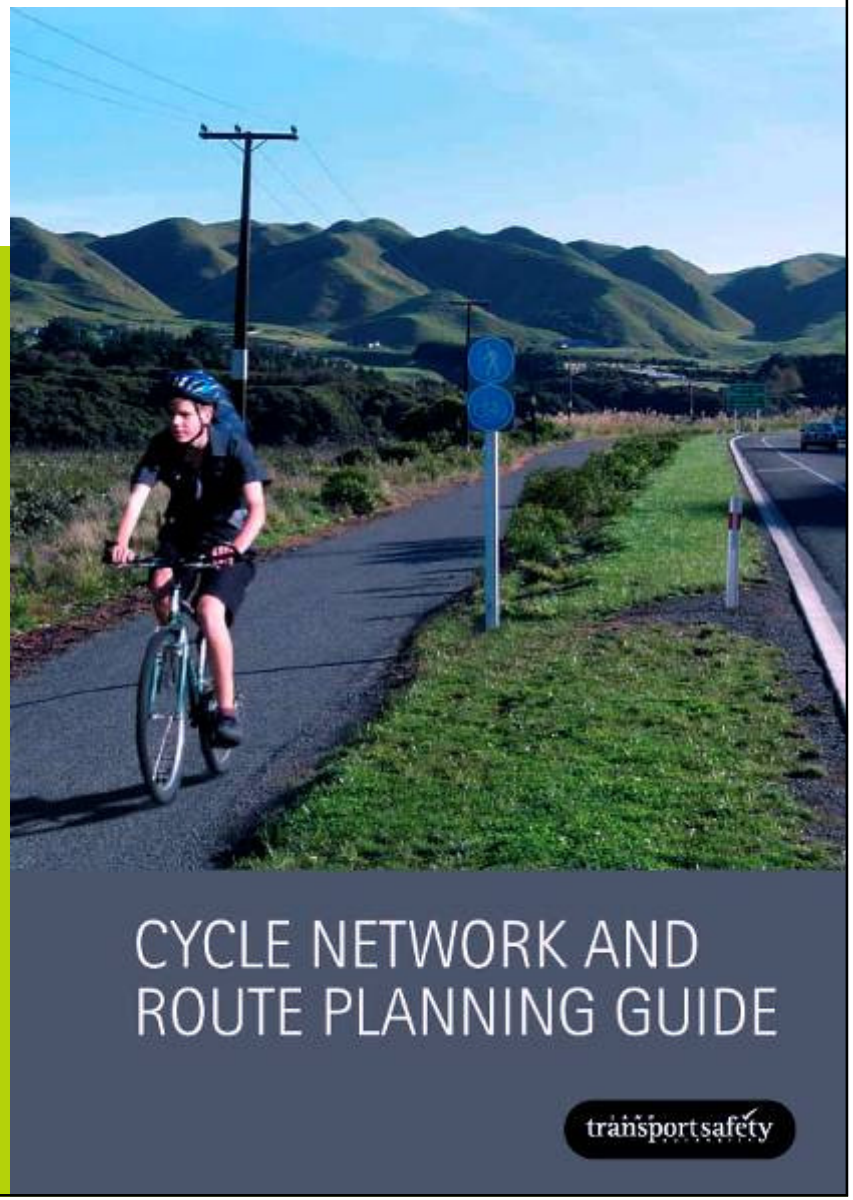
Land Transport NZ
Ikiiki Whenua Aotearoa

Value for Money; Level of Service tools for assessing the cycling environment

Tim Hughes



Land Transport NZ
Ikiiki Whenua Aotearoa

Outline of presentation

What is Level of Service?

Cycle Network and Route Planning process

Use of cycling LOS in other tools

- Strategy
- Review
- Prioritising
- Benchmarking

Cycling LOS

- Past research
- Discussion
- Current research project

Bicycling -- Levels of Quality

	A	B	C	D	E	F
	Exemplary	Excellent	Good	Fair	Poor	Hall of Shame
Wide Curb Lanes	Wide curb lanes increase comfort between motorists and bicyclists. Motorists desire to separate themselves 6.0 feet from bicyclists. Wide curb lanes give buses more space, and allow greater turning radii. Low speeds create greater comfort.						
Bike Lanes	Bike lanes define and identify bicycling locations. Widths up to 6.0 feet are most comfortable. Colorization can help. Narrow widths next to parking are least comfortable. Speeds between 25-35 mph are most comfortable.						
Paved Shoulders	Paved shoulders that are smooth and wide are most comfortable. Surfaces should be clean and smooth, with few driveways and other interruptions. Narrow shoulders can help, but are less comfortable.						
Multi-Use Trails	Multi-use trails work well in paralleling high speed roads in access controlled environments. Trails can offer more scenic, quiet, and direct routes of travel. Widths can vary, but must be designed to accommodate many users and user types.						
Crossings	Crossings with low volume streets, where there are frequent gaps, good sight distances, good lighting, and medians or refuge islands are best. In some cases signals are essential or other controls are essential.						

Land Transport NZ
Ikiiki Whenua Aotearoa

Cycle Network Planning Process:

- *Cycle Strategy; vision & objectives* — *Target LOS*
- *Assess cycle demand: (how many? Where?)* — *DEMAND*
- *Identify existing and potential cycle routes* — *LOS*
- *Evaluate options (How good are they?)* — *REVIEW, LOS*
- *Develop Cycle Network plan*
- *Prioritise route development* — *DEMAND, LOS*
- *Implement* — *AUDIT*
- *Monitor* — *Outcome BENCHMARKING*

- *Overall Policy and Process* — *Policy audit BENCHMARKING*

Land Transport NZ
Ikiiki Whenua Aotearoa

Components

Mid-block

- Kerbside cycle lanes
- Cycle lanes next to parking
- Contra-flow cycle lanes
- Wide kerbside lanes
- Sealed shoulders
- Bus lanes
- Transit lanes
- Mixed traffic

Paths

- Exclusive
- Shared
- Separated
- Beside roadway
- Unpaved

Land Transport NZ
Ikiiki Whenua Aotearoa

Components

Intersections

- More important than mid-block
- Greatest challenges and greatest opportunities.
- Least studied and understood

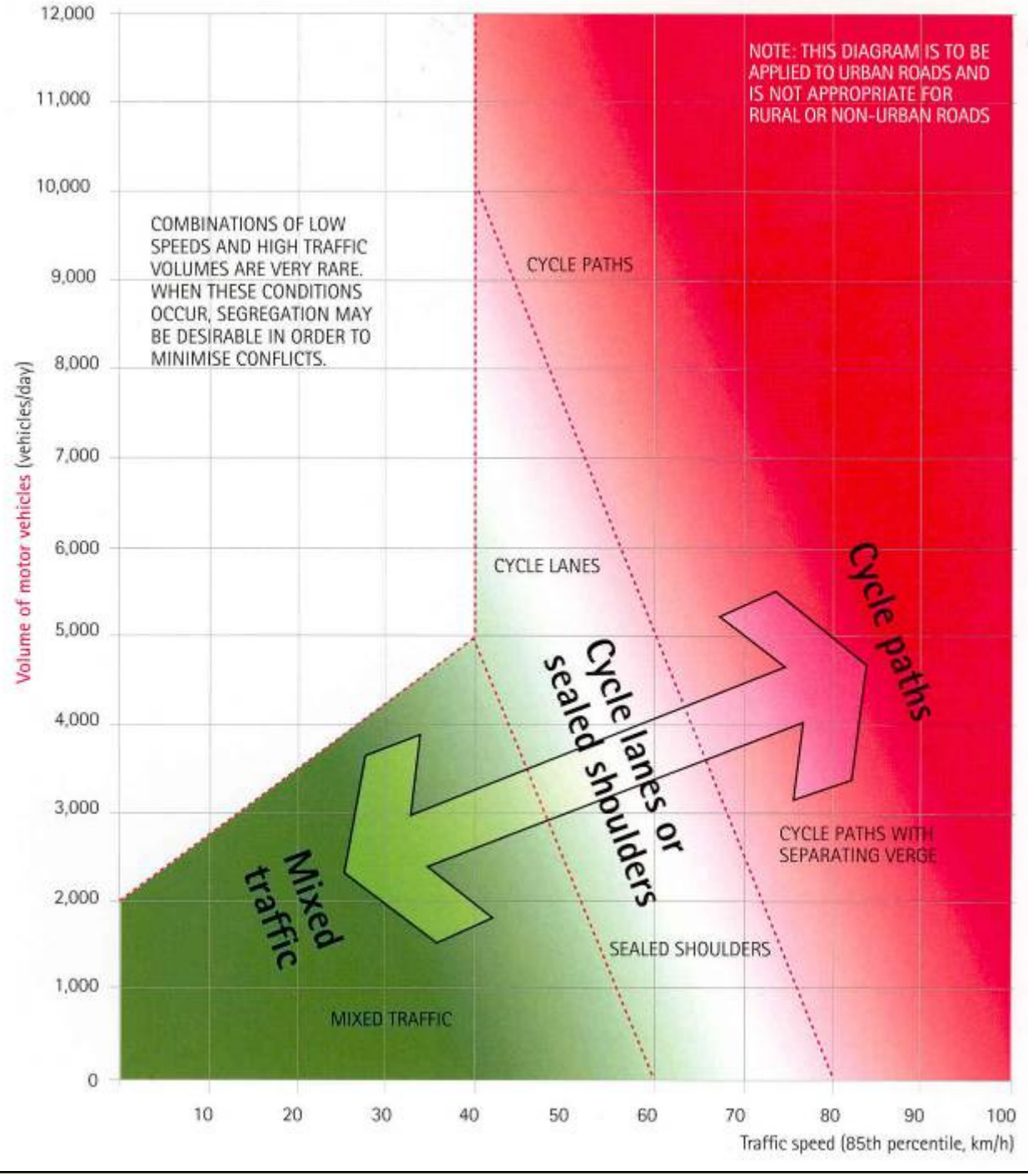
Land Transport NZ
Ikiiki Whenua Aotearoa

Develop & assess route options

- *How friendly is the current provision?*
- *How will cyclists perceive improvements?*
- *Who would use it?*
- *How good does it need to be?*
- *How do my options compare?*
- *Tools for assessing*
  - *cycle friendliness*
  - *bicycle LOS / LOQ*
  - *bikeability / cyclability*

Land Transport NZ
Ikiiki Whenua Aotearoa

Facility selection based on LOS B (moderately satisfied) ? or LOS C (a little satisfied?)



Land Transport NZ
Ikiiki Whenua Aotearoa

Cycle Review

Cycle Review:

- *analyses deficiencies in order to develop and evaluate potential solutions*
- *It is a systematic process to ensure the full range of options are considered*
- *The result is well considered project brief for design of the favoured option*

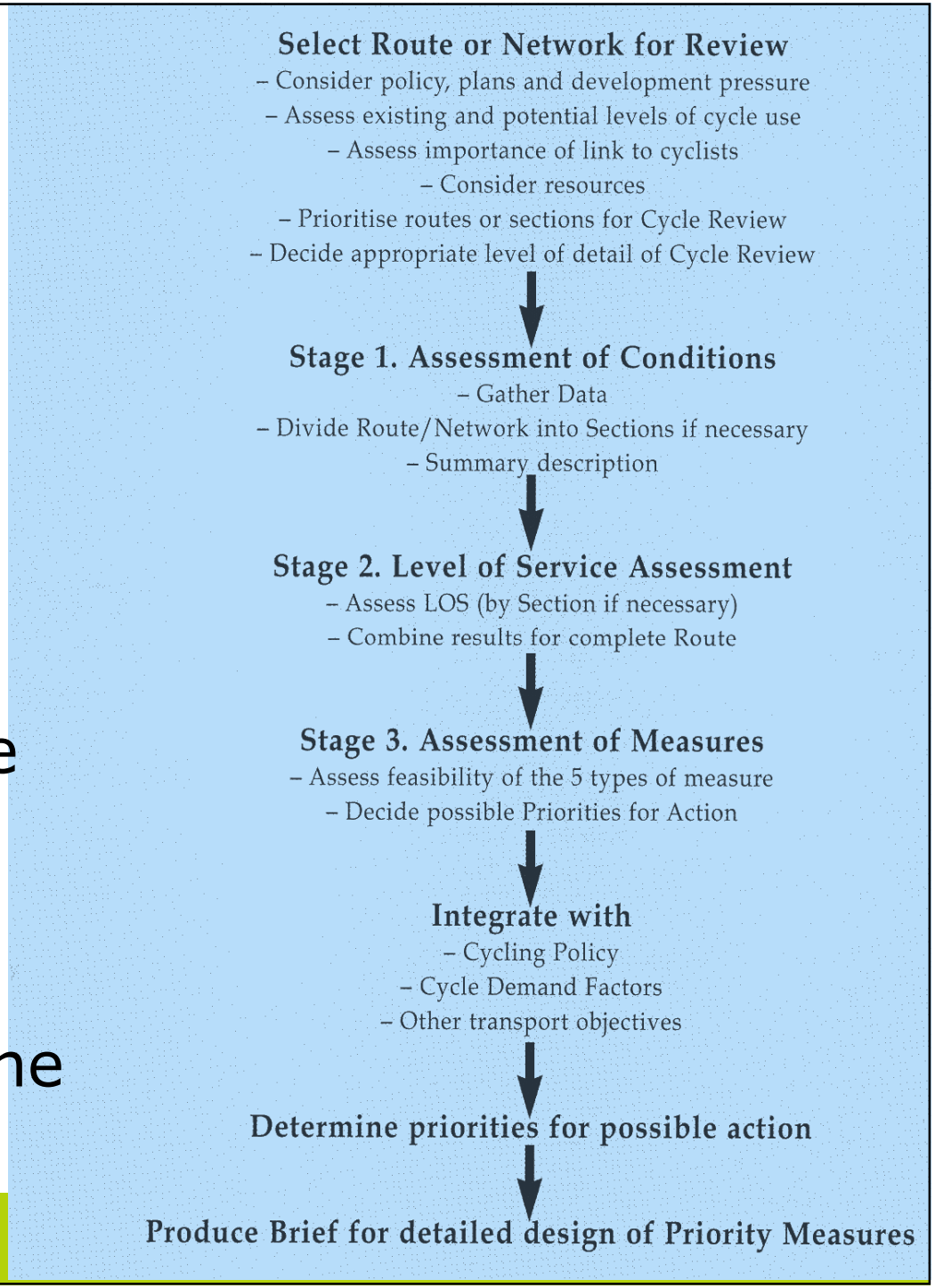
Land Transport NZ
Ikiiki Whenua Aotearoa

Cycle Review

Hierarchy of measures:

- Reduce traffic flows
- Reduce traffic speeds
- Improve junctions
- Redistribute road space
- Paths

- How much better are the options than existing.



Land Transport NZ
Ikiiki Whenua Aotearoa

Prioritising projects

- *Greatest number / demand*
- *Crash records*
- *Remove blocks*
- *Easiest and cheapest*
- *Quality demonstration projects*
- *Area completion*
- *LOS improvement for greatest number*

Land Transport NZ
Ikiiki Whenua Aotearoa

Benchmarking

- *Benchmarking is a process for motivating organisations to measure and improve their performance, by sharing information using common indicators to enable the best performers to become the standard to which the other aspire.*
- *The secret of successful benchmarking programs is to dig behind the figures to understand performance differences and identify what leads to excellent performance*.

Land Transport NZ
Ikiiki Whenua Aotearoa

Benchmarking

Peer Review

- CTC UK regional project
  - Team up ten local bodies
  - Spend a day in each

Policy and Process

- Bypad
- Velo.info self assessment on web
- English regions bicycle bell ratings

Outcomes

- Dutch cycle balance

Land Transport NZ
Ikiiki Whenua Aotearoa

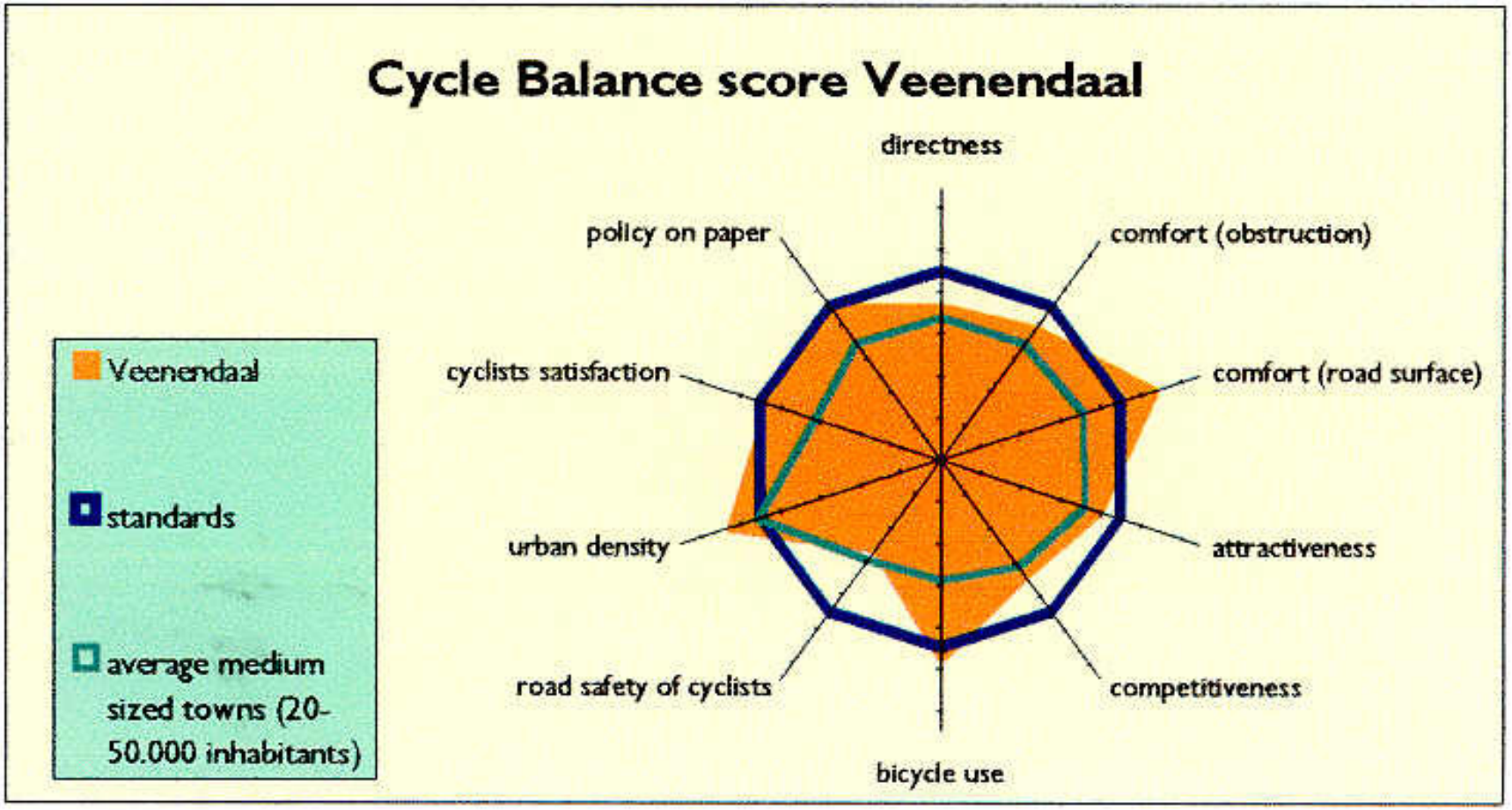
Dutch cycle balance

- Initiated by Dutch Dept for Transport
- Carried out by Dutch Cycle Union
- Instrumented bike and surveys to give objective repeatable measures.
- Measures speed, stops, comfort, noise, video.
- 14 randomly selected routes are ridden.
- Car does same trip leaving at same time.
- Surveys user satisfaction.
- Crash statistics.
- 125 Dutch towns on web site
- Now commencing in Belgium


laat
de fiets schitter
in Europa
Fietsersbond
mortfiets

Land Transport NZ
Ikiiki Whenua Aotearoa

Dutch Cycle Balance



Land Transport NZ
Ikiiki Whenua Aotearoa

Cyclist Level of Service

***Cyclist LOS or Bikeability ratings*:**

- measure or predict cycle friendliness.
- can be applied to existing situations and design proposals for components of the network.
- Can be applied to wider network
- Can be measured by user surveys.
- Can be predicted by formula.

Cyclist Level of Service

Land Transport NZ
Ikiiki Whenua Aotearoa

Methods available:

- Bikeability toolkit – deficiency checklist
- Bicycle Path – US HCM, theoretical delay based
- Bicycle compatibility index – video based
- Florida multi-modal LOS – real time rides
- Cycle Review LOS – expert judgement
- UK Transport Research Laboratory –real time
- Florida – video / real time validation
- Denmark – video based
- Current NZ research project

Land Transport NZ
Ikiiki Whenua Aotearoa

Bicycle Path LOS

- Hein Botma (1995) – US HCM 2000
  - Theoretical delay to cyclist due to interaction with other users.
- Hummer (2005) developed further- same basis but requires survey counting user interactions by a floating cyclist.
  - Cannot be applied at design stage
  - Only counts delay
  - Not comparable with on-road methods.

Land Transport NZ
Ikiiki Whenua Aotearoa

Bicycle Compatibility Index

- David Harkey (1998)– University North Carolina
- Users rated mid-block sections by watching videos.
- Developed simple prediction equations

Land Transport NZ
Ikiiki Whenua Aotearoa

Florida multi-modal LOS.

- First real time perception surveys –(1997)
- Takes into account surface condition, HV proximity etc –better than video.
- Used volunteers for a Saturday event.
- Surveyed mid-block links.
- 2nd survey of straight through traffic light intersections (2003)
- Each participant wore a numbered jerkin.
- Used many video recorders to record traffic conditions at each site experienced by each participant.
- Developed prediction equations

Florida multi-modal LOS.

Land Transport NZ
Ikiiki Whenua Aotearoa

- Experienced cyclists rate more harshly
  - They are more aware of potential hazards

Key factors:

- Bike lane or shoulder
- Proximity to traffic
- Traffic:
  - Volume
  - Speed
  - Heavy Vehicles
- Pavement condition
- On-street parking

Land Transport NZ
Ikiiki Whenua Aotearoa

Cycle Review LOS

- Cycle Review LOS (Davies 1998).
  - Comprehensive – includes paths and intersections
  - criticised as difficult and based on expert opinion
  - Not validated by surveys
- Developed survey form
- Produced additive prediction equations

Land Transport NZ
Ikiiki Whenua Aotearoa

UK – Transport Research Laboratory

- TRL staff with varying experience rode a 9 km route on very narrow roads near the laboratory
- Each rode the same instrumented bike
- The passing distances were recorded by a side facing video recorder.
- Bicycle computer mounted on the bike
- Users rated 12 items on a ten point scale

Land Transport NZ
Ikiiki Whenua Aotearoa

UK – Transport Research Laboratory

Most important rating factors contributing to overall satisfaction in order:

- Overall pleasure (non-safety)
- Overall safety
- Bumpiness

- Gender and experience appeared to affect but did not significantly improve model

Land Transport NZ
Ikiiki Whenua Aotearoa

UK – Transport Research Laboratory

Significant variables for mlr model:

- Vehicle speeds
- Lane widths
- Frequency of side turnings
- Gradient
- Explains 30% of individual cyclist ratings

Land Transport NZ
Ikiiki Whenua Aotearoa

Danish Research

- Intended to use real time data
- Switched to video data to include dangerous conditions.
- Mid-block links only
- Used a wide range of conditions
- Statistically rigorous design

Land Transport NZ
Ikiiki Whenua Aotearoa

Danish Research

Most important:

- Width - space available for cycling
- Degree of separation from motor traffic and pedestrians

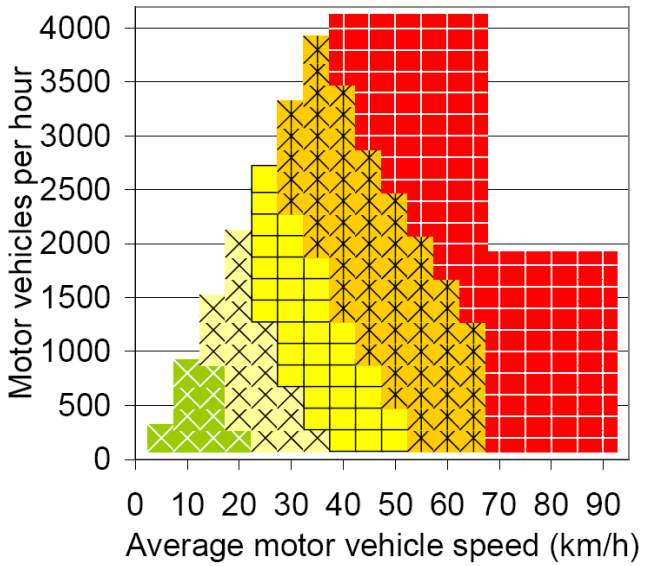
Important

- Traffic volume, speed, parking and bus stops all decrease ratings.

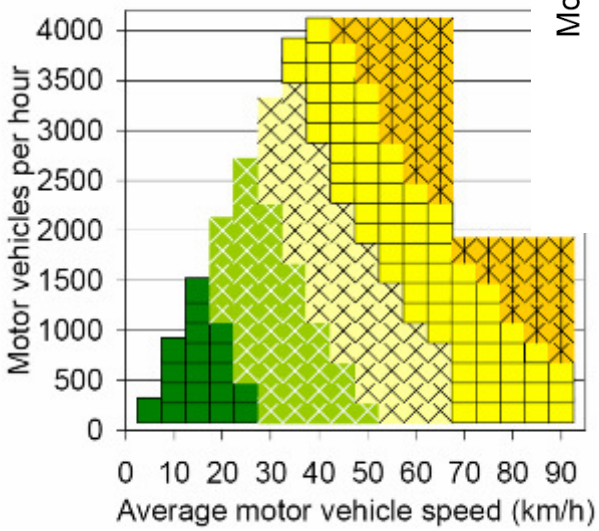
Land Transport NZ
Ikiiki Whenua Aotearoa

Mid-block model

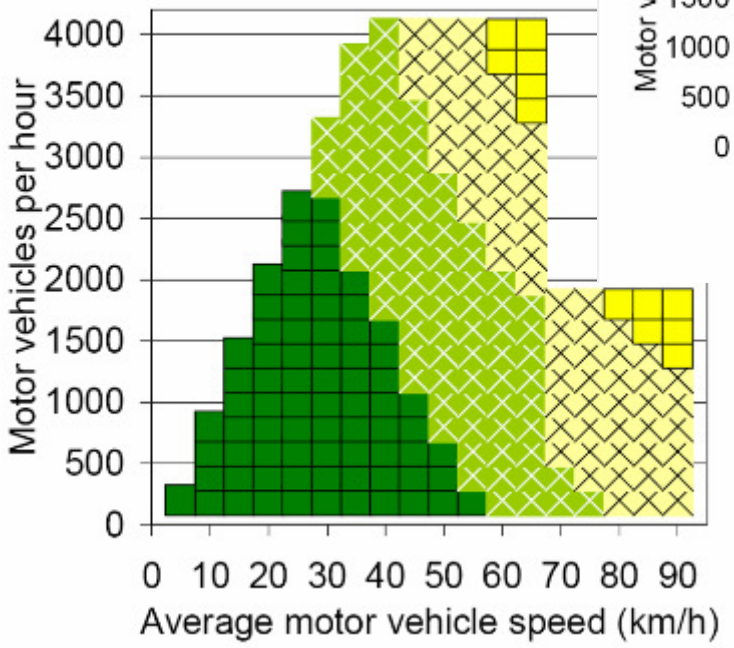
3.75 m driving lane



1.5 m bicycle lane on urban roa
1 m paved shoulder on rural roa



2.2 m bicycle trac



A	very satisfied
B	moderately satisfied
C	a little satisfied
D	a little dissatisfied
E	moderately dissatisfied
F	very dissatisfied

Land Transport NZ
Ikiiki Whenua Aotearoa

NZ Cycle for Science

- Cycling environment perceptions research
  - Performed by MWH NZ under contract

Ultimate Goal

- "… to research cyclist perceptions of the cycling environment with a view to providing a tool for rating how well provision for cyclists meets their needs".

Land Transport NZ
Ikiiki Whenua Aotearoa

Cycle for Science

- Cycling environment perceptions research
  - Commenced in May 2004
  - Similar to projects in UK, USA & Denmark.
  - "Cycle for Science" 1st ride 26 June 2004
  - 3 more Christchurch routes completed
  - Additional Survey in Nelson completed.
  - 108 sites in data base.
  - On road: mid-block, straight through intersections, right turns, paths

Land Transport NZ
Ikiiki Whenua Aotearoa

Cycle for Science – initial results

	Effect of variables
Cycling advocate	lower
Technical background	lower
Riding Ability	lower
Frequency	lower
Age	young and old higher
Gender	female higher
Off-road Path width	higher
Parking Occupancy	lower
Cycle lane width	higher
Short term parking	lower
% Heavy Vehicles	lower
On street parking provision	lower
Effective width	higher
AADT & 15 min Vol	lower

Land Transport NZ
Ikiiki Whenua Aotearoa

Conclusions

- Cycling LOS tools are useful in many phases of cycle strategy, planning, options development, prioritisation and monitoring
- A variety of cycling LOS tools are available
- Comprehensive methods suffer from a lack of user perceptions validation
- Validated cycling LOS tools only cover a narrow range of situations and may not be applicable to NZ conditions
- Previous validation attempts have revealed that the relationships are complex and simple methods insufficient.
- Data collection needs to overcome co-correlation due to site selection- more orthogonal design

Research method

- Check with overseas researchers for any research updates: Florida and Demark - **done**
- Identify deficiencies with NZ data - **done**
- develop site selection criteria - **done**
- find sites with required characteristics.
- Develop analysis technique that will separate user and site variation – **part done**.
- Trial the intercept survey method on some existing sites and compare results with CfS - **deferred**
- Scope a bike instrument system - if feasible build and trial – **built - under trial**.
- Collect more data until adequate
- Check fit of past models and develop new model forms for each of the facility types – starting with mid-block links


GIANT