La Beca

Improving Pedestrian Amenity in City Centres

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CBD Environments





CBD Planning



"As things stood now, a downtown shopper needed a four-leaf clover, a voodoo charm, and a St. Christopher's medal to make it in one piece from one curbstone to the other" - Henry Barnes



Research locations

Three cities involved:

- Auckland
- Wellington
- Christchurch







Research components

- Focus on Central Business Districts (CBD) / City Centre environments
- Literature review / international practice
- 14 intersections, 12noon to 1:30pm
- 811 pedestrian interviews
- 1,465 wait time pedestrian observations
- Deterministic: aaSidra
- Micro-simulation modelling: S-Paramics, Aimsun
- Stakeholder steering group



Findings: Observations

 Recommended wait time: 25-30 seconds (International literature)

Average Delay – Auckland – 53 seconds

- Average Delay Wellington 45 seconds
- Average Delay Christchurch 25 seconds
- Combined Average 41 seconds (1,465 observations)



Complexities of ped research

- Identifying pedestrian delay
- Identifying 'average' walk speeds
- Modelling pedestrian behaviour / model limitations





Findings – Literature

- Link between delay and frustration
- Link between delay and ignoring / avoiding signals
- Therefore: link between delay and road safety

 (but non-linear & difficult to quantify)

>90% of pedestrians surveyed stated that they would cross on a red or flashing red

Compliance risk

~= delay vs. perception of safety

(including volume & gap intervals)



Pedestrian Priority

- Most pedestrian trips are short duration (less than 10 minutes)
- Therefore crossing delays are a primary feature of pedestrian trips
- Each minute of delay > +10% total time
- VOT "low" in NZ but VOT of delay = very high



Micro simulation models

Intersections:

- Lake Road, Takapuna, Auckland (Aimsun)
- Albert / Customs / Fanshawe Street, Auckland (Aimsun)
- Taranaki / Courtney / Manners / Dixon, Wellington (Paramics)









Micro simulation models (con...)

- Adjacent intersection (Aimsun)
 Vincent Street / Mayoral Drive, Auckland
- Pedestrian corridors (S-Paramics):
 - Hereford Street, Christchurch
 - Manchester Street, Christchurch
 - (Green Wave)



Per person delay

- Sum of Total vehicle delay for each approach
 / Sum of vehicles x occupancy (e.g. 1.3)
- Sum of Total ped delay for each approach
 / Sum of pedestrians
- Combine to determine 'per person' delay

 Compare model scenarios using 'per person' delay (i.e. multi-modal efficiency of signals)



Per person delay - Findings

- Average pedestrian delay higher for 100% of intersection surveyed
- Example: Jervois / Queens Warf
 - Average vehicle occupant delay: 4 seconds
 - Average pedestrian delay: 40 seconds
- Can test scenarios
- Can work 'backwards' to allocate fair distribution



Findings – Per person optimisation

- Intersections optimised to include pedestrians as well as cars - perceived value of time
- Significant improvement to pedestrian delay
- Optimisation also reduced car delay at most locations (spare capacity in offpeak)

City	Location	Delay reduction from optimisation	Optimisation + other measures
North Shore City	Lake Road / The Strand	26%	40%
Auckland City	Albert / Custom Street	31%	38%
Wellington City	<u>Jervois</u> Street / Queens Warf	45%	32%
Wellington City	<u>Taranaki</u> / Courtney Place	30%	N/A



How do we improve?

Funding Policy

- Optimisation / intervention: can't happen without funding
- Value of Time: Does this result in fair distribution of road space?
- Benefit Cost Ratios (BCRs) widely used but pedestrians Value for Time (VoT) in NZ is very low

Engineering practices

- If pedestrian data is not collected their effective value of time = zero (The Invisible Mode)
- Therefore, more pedestrian data is needed to provide road users with appropriate outcomes

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• To count for something: Pedestrians must counted!

Operational changes

Intersection operations - designed for peak loading and vehicle efficiency

- Potential for spare capacity during off-peak
- Separate off-peak phasing and shorter cycle lengths to make use of spare capacity
- Optimisation can improve pedestrian & vehicle delay
- Other options inc Barnes dance, etc
- Some intersections may be poorly optimised due to 'slave status' with other signals (SCATS)
 - Therefore "divorce" when vehicle volume low



Other Lessons learned

- Can use 'per person' delay to improve efficiency of intersections
- Can reverse engineer 'per person' to allocate time more fairly
- If creating a pedestrian green-wave better to underestimate speed then overestimate
- Trade off of safety vs delay
- Running Barnes Dance twice in a cycle can reduce delays for pedestrians (e.g. 1x in vehicle peak 2x for offpeak).
- In highly pedestrianised areas, prioritising vehicles can decrease efficiency of intersections



Questions?



















