Does road-space reallocation affect network VKT?

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VIASTRADA
TRANSPORT PLANNING AND DESIGN

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Working with what we have
Resilience for the Future
Whakamahinga ki ngā mea kei a tātou:
He manawaroa mō ngā rā anamata
Transportation Conference 2026

8 – 11 March 2026
Tākina Convention Centre
Te Whanganui-a-Tara Wellington

Te Kāwanatanga o Aotearoa
New Zealand Government

Presentation Outline

- Research Brief
  - What is Road Space Re-allocation (RSR)?
  - Research Objectives
- Results from Project Tasks
  - Systematic **Literature Review** + **Case Studies**
  - Identification of **Success Factors**
  - **Transport Outcomes Framework** Review
  - **Best Practice** for Network VKT Reduction
- Some Recommendations

Background

MfE Emissions Reduction Plan (2022): *Accelerate widespread street changes to support public transport, active travel and placemaking*

- Key national targets for reductions in Vehicle-km Travelled (VKT)
  - Various policy/pricing levers for tackling this
  - What about ***infrastructure*** measures?
- We want better evidence on the effect of implementing **Road Space Re-allocation** on network-wide VKT reduction
  - Current evidence is mixed
  - What factors contribute to success?

What is Road Space Re-allocation (RSR)?

*A **re-purposing** of parts of existing roads*

Can affect different road corridor **elements:**

- Traffic lanes
- Parking lanes
- Cycle lanes
- Bus lanes
- Footpaths

Ways to achieve RSR

Many options for making changes to the road corridor space

Various design / policy tools broadly categorised as:

- **Add** or **Remove** an element
- **Reduce** the size of an element
- **Share** space *(always / different times)*
- **Remove** a **road user group** *(always / different times)*
- **Network-based** changes to access & movement

Measures could be introduced **permanently** or **trialled** (e.g. "tactical urbanism")

Examples of RSR

Various ways of achieving it in practice

Some examples may include:

- **Removal of motor traffic** to make a pedestrian/cycle people-friendly space
- **Removal of on-street parking** to widen a footpath
- **Narrowing of traffic lanes** to add a cycle lane
- On-street parking that **revert to a bus lane** during peak hours

Oxford Tce shared space, Christchurch

Lincoln Road bus / cycle lane, Christchurch

NZTA Research project objectives

Aim: Identify factors for successful measured and sustained reductions in network VKT

NZTA Research Report #724

a. Systematically review and conduct a meta-analysis of **relevant national and international studies** with measured impacts of permanent RSR and the measured level of network VKT reduction

b. Identify the **factors required** for successful and sustained implementation of network VKT reduction from permanent RSR

c. Assess the **impact of permanent RSR** on the five outcomes in the Transport Outcomes Framework (Ministry of Trpt, 2018) →

d. Recommend **best practice** that might be implemented in NZ to support permanent RSR for network VKT reduction

Literature review

Multi-pronged search process, incl. case studies

Focused on finding **evaluation-based** references that either:

- Measured or described the ***impacts*** of an intervention
- Examined the ***contributing factors*** to success or failure of a case study
- Measured or described a ***specific outcome*** of an intervention

Assessed **reliability / validity** of studies in terms of:

- Impacts of intervention on different ***transport users*** (esp. active modes)
- Different ***impacts*** (mode/route choice, traffic count, mean speed, safety, etc) and ***outcomes*** (economic, resilience, environment, etc) of an intervention
- The ***level*** at which the impacts & outcomes of an intervention was measured *(i.e. intervention street, surrounding streets, parallel streets, entire city, etc)*

Literature review

“Rethinking Streets” (USA) – Excellent case studies

Literature review – Evaluation measures

Case studies a key part of the work

30 case studies of interest identified

- 2 featuring multiple locations worldwide investigated
- More focus on recent studies (<10yrs), some older works

Features assessed (qualitatively):

- Relative **effectiveness** in meeting stated project objectives
  (major / minor / no) ✓ ≈ ×
- Overall **reliability** of each study (modes/scope/area assessed)
  (1-5 star rating) ★★★★☆
- **Relevance** of findings to NZ context (based on density / network type)
  (high / medium / low / none) ✓✓✓ ✓✓ ✓ ×

Research database

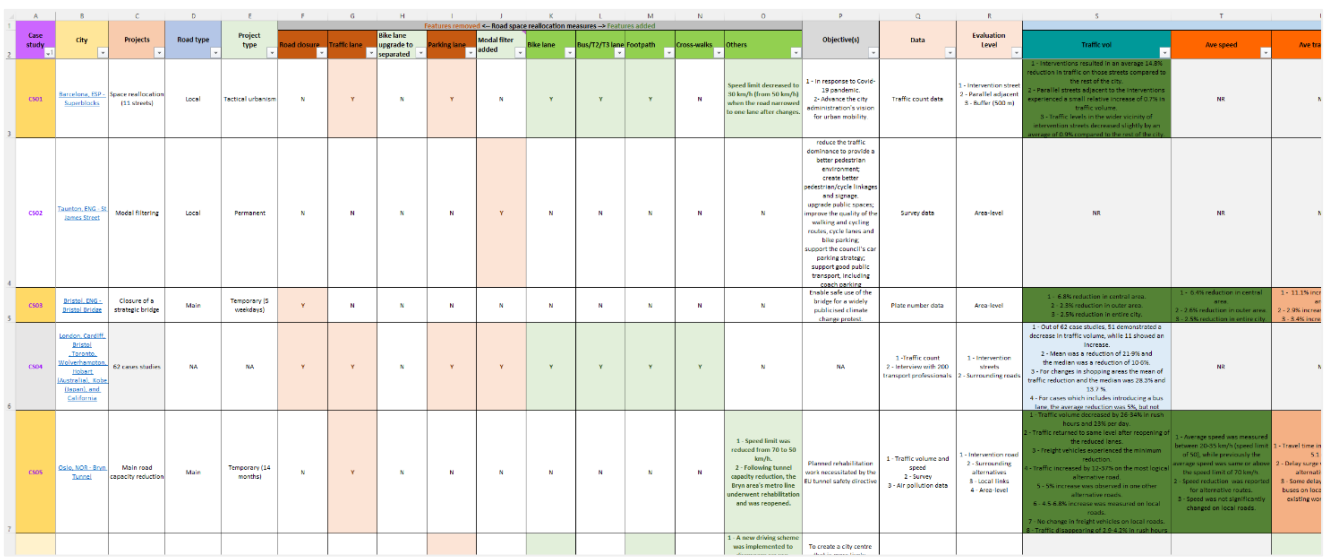
Excel spreadsheet – Repository of all literature and case studies collected

Available on website: https://www.nzta.govt.nz/resources/research/reports/724

Database features:

- Reference list (79 publications) →
- 30 Case studies (can be filtered)
  - **Location & type** of case study/project
  - RSR features **removed** and **added**
  - **Data** gathered and relative **area** of measurements taken
  - Results of **outputs** measured
  - Assessment of project **effectiveness**
  - Relative **relevance** to NZ cities/towns
  - Any notable **success or failure** factors
  - Scientific **reliability** of each study
  - Any other notes of relevance

Refs	Study	Authors	Year	Study type	Access link URL	Study topic (main)	Case study location(s)	Notes
CS28	Redoubt Road	Auckland Transport	2020	Webpage	https://at.govt.nz/projects-roadworks/dynamic-lanes/redoubt-road-dynamic-lanes	Dynamic lane reallocation	Auckland	Arguably not really the focus of this study as it's focused on motor vehicle lane reallocation only
CS29	Drews Avenue	Whanganui District Council	2022	NZTA Case study	https://www.nzta.govt.nz/assets/Roads-and-Rail/streets-for-people/Innovating-Streets-case-study-Drews-Ave-Arts-Quarter.pdf		Whanganui	
CS30	Manukau/Pah Roads	Auckland Transport	2017	Internal File Note	Internal draft document only	T3 Transit Lane	Auckland	Modelled changes in CO2-e
	Stage 2: Success factors							
SF01	Citizen Responses to Tactical Urbanism Initiatives in Aotearoa New Zealand	Rebecca J. Sargissona; Glenn S. Brown; Christina Hanna; Samuel G. Charlton; Priya Kurian; Patrick Barrett; Taciano L. Milfont	2022	Research paper (empirical data)	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4144180	Success and failure factors in Tactical Urbanism in NZ	Projects under the Innovating Streets for People project	High-level relevancy
SF02	Smarter ways to change: learning from innovative practice in road space reallocation	Helen Rowe	2013	Research paper (empirical data)	https://apo.org.au/sites/default/files/resource-files/2013-11/apo-nid59916.pdf	Success and failure factors in Tactical Urbanism in 5 cities around the world	San Francisco, New York, Bogotá, Copenhagen and Yarraville in Melbourne	
SF03	Pedestrianisation as a step in a societal transformation? An analysis of support and opposition in Brussels.	Geert te Boveldt, Liesbeth De Wilde, Imre Keseru, Cathy Macharis	2022	Research paper (empirical data)	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4271195	Detailed investigation of support and opposition	Brussels, Belgium	
SF04	The politics of bicycle lane implementation: The case of Vancouver's Burrard Street Bridge	Matti Siemiatycki, Matt Smith, and Alan Walks	2016	Research paper (empirical data)	https://www.tandfonline.com/doi/full/10.1080/15568318.2014.890767		Vancouver, Canada	Very interesting study comparing the unsuccessful and successful implementation of a reallocation project
SF05	Local attitudes towards large-scale active transport infrastructure from the Gold Coast, Australia	Madison Bland and Matthew I. Burke	2022	Research paper (empirical data)	https://australasiantransportresearchforum.org.au/wp-content/uploads/2022/05/ATRF2022_Resubmission_95.pdf		Gold Coast, Australia	
SF06	From advocacy to acceptance: Social media discussions of protected bike lane installations	Colin Ferster et.al	2021	Research paper (empirical data)	https://journals.sagepub.com/doi/pdf/10.1177/00420980209382252		Edmonton and Victoria, Canada	Interesting longitudinal analysis on people reactions
SF07	Encountering bikelash: Experiences and lessons from New Zealand communities	Adrian Field et.al	2018	Research paper (empirical data)	https://www.sciencedirect.com/science/article/pii/S2214140518302032		Island Bay, Devonport-Takapuna, South Dunedin	
SF08	Planning for cycling in local government: Insights from national surveys in Australia and New Zealand	Courtney Babb, Sam McLeod, Conor Noone	2022	Research paper (empirical data)	https://www.jtlu.org/index.php/jtlu/article/view/1970		NZ & Aust	Focus on cycling initiatives
SF09	Street space reallocation to fight Covid19 opportunities and challenges for New Zealand	Kirsty Wild et.al	2020	Report for NZTA	https://www.nzta.govt.nz/assets/Roads-and-Rail/innovating-streets/docs/Street-space-reallocation-COVID-19-20201116.pdf		NZ	
SF10	Barriers to the pedestrianization of city centres: perspectives from the Global North and the Global South	Ayush Parajuli and Dorina Pojani	2018	Research paper (empirical data)	https://doi.org/10.1080/13574809.2017.1369875		Brisbane, Aust; Kathmandu, Nepal	



Case study	City	Projects	Road type	Project type	Features removed <- Road space reallocation measures -> Features added: Road closure	Traffic lane	Bike lane upgrade to separated	Parking lane	Modal filter added	Bike lane	Bus/T2/T3 lane	Footpath	Cross-walks	Others	Objective(s)	Data	Evaluation Level	Traffic vol	Ave speed	Ave tra
CS01	Barcelona, ESP - Superblocks	Space reallocation (11 streets)	Local	Tactical urbanism	N	Y	N	Y	N	Y	Y	Y	N	Speed limit decreased to 30 km/h (from 50 km/h) when the road narrowed to one lane after changes.	1 - In response to Covid-19 pandemic 2- Advance the city administration's vision for urban mobility.	Traffic count data	1 - Intervention street 2 - Parallel adjacent 3 - Buffer (500 m)	1 - Interventions resulted in an average 14.8% reduction in traffic on those streets compared to the rest of the city. 2 - Parallel streets adjacent to the interventions experienced a small relative increase of 0.7% in traffic volume. 3 - Traffic levels in the wider vicinity of intervention streets decreased slightly by an average of 0.3% compared to the rest of the city.	NR	
CS02	Taunton, ENG - St James Street	Modal filtering	Local	Permanent	N	N	N	N	Y	N	N	N	N	N	reduce the traffic dominance to provide a better pedestrian environment; create better pedestrian/cycle linkages and signage; upgrade public spaces; improve the quality of the walking and cycling routes, cycle lanes and bike parking; support the council's car parking strategy; support good public transport, including coach parking	Survey data	Area-level	NR	NR	
CS03	Bristol, ENG - Bristol Bridge	Closure of a strategic bridge	Main	Temporary (5 weekdays)	Y	N	N	N	N	N	N	N	N	N	Enable safe use of the bridge for a widely publicised climate change protest	Plate number data	Area-level	1 - 6.8% reduction in central area. 2 - 2.3% reduction in outer area. 3 - 2.5% reduction in entire city.	1 - 6.4% reduction in central area. 2 - 2.6% reduction in outer area. 3 - 2.5% reduction in entire city.	1 - 11.1% inc a 2 - 2.9% inc 3 - 3.4% inc
CS04	London, Cardiff, Bristol, Toronto, Wolverhampton, Hobart (Australia), Kobe (Japan), and California	62 cases studies	NA	NA	Y	Y	N	Y	Y	Y	Y	Y	N	N	NA	1 - Traffic count 2 - Interview with 200 transport professionals	1 - Intervention streets 2 - Surrounding roads	1 - Out of 62 case studies, 51 demonstrated a decrease in traffic volume, while 11 showed an increase. 2 - Mean was a reduction of 21.9% and the median was a reduction of 10.6%. 3 - For changes in shopping areas the mean of traffic reduction and the median was 28.3% and 13.7 %. 4 - For cases which includes introducing a bus lane, the average reduction was 5%, but not	NR	
CS05	Oslo, NOR - Bryn Tunnel	Main road capacity reduction	Main	Temporary (14 months)	N	Y	N	N	N	N	N	N	N	1 - Speed limit was reduced from 70 to 50 km/h. 2 - Following tunnel capacity reduction, the Bryn area's metro line underwent rehabilitation and was reopened.	Planned rehabilitation work necessitated by the EU tunnel safety directive	1 - Traffic volume and speed 2 - Survey 3 - Air pollution data	1 - Intervention road 2 - Surrounding alternatives 3 - Local links 4 - Area level	1 - Traffic volume decreased by 16-34% in rush hours and 23% per day. 2 - Traffic returned to same level after reopening of the reduced lanes. 3 - Freight vehicles experienced the minimum reduction. 4 - Traffic increased by 12-37% on the most logical alternative road. 5 - 5% increase was observed in one other alternative route. 6 - 4.5-6.8% increase was measured on local roads. 7 - No change in freight vehicles on local roads. 8 - Traffic disappearing of 2.0-4.2% in rush hours	1 - Average speed was measured between 20-35 km/h (speed limit of 50), while previously the average speed was same or above the speed limit of 70 km/h. 2 - Speed reduction was reported for alternative routes. 3 - Speed was not significantly changed on local roads.	1 - Travel time in 5.1 2 - Delay surge i alternati 3 - Some delay buses on loca existing wo
														1 - A new driving scheme was implemented to	To create a city centre					

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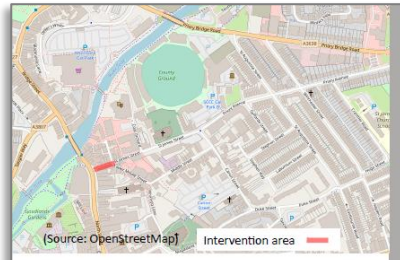
Case study summaries

Simple graphical summaries produced of each case study



TAUNTON, ENGLAND

INTERVENTION
Modal filtering

OBJECTIVES
- Reduce the traffic dominance to provide a better pedestrian environment
- Create better pedestrian/cycle linkages and signage
- Upgrade public spaces
- Improve the quality of the walking and cycling routes, cycle lanes and bike parking
- Support the council's car parking strategy
- Support good public transport, including coach parking

OTHER MEASURES & NOTES
- Small scale project resulted mainly in changing route choices rather than mode shift

INTERVENTION TYPE
Permanent

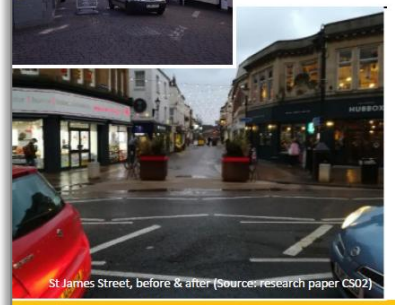
ROAD TYPE
Local

EVALUATION LEVEL
Area

EFFECTIVENESS
No effects

RELIABILITY
★★★★

RELEVANCE TO NZ
Medium


St James Street, before & after (Source: research paper CS02)

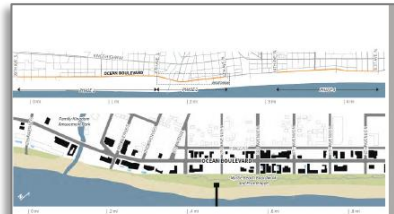
IMPACTS

98% stated they still drive to the same place but taking different route

Mode shift- no significant difference

Trip suspension- no significant difference

CS02


Ocean Boulevard (Source: research paper CS18)

MYRTLE BEACH, USA

INTERVENTION
Space reallocation: road diet

OBJECTIVE
- Improve safety

OTHER MEASURES & NOTES
- Traffic lane removed
- Bike lane added, footpath and pedestrian crossings added / improved
- Landscaped medians installed and centre turn lane added
- Evidence of traffic evaporation

INTERVENTION TYPE
Permanent

ROAD TYPE
Main

EVALUATION LEVEL
Intervention road

EFFECTIVENESS
Major effects

RELIABILITY
★★★½

RELEVANCE TO NZ
High

Ocean Boulevard before (Source: Google Street View)

Ocean Boulevard after (Source: City of Myrtle Beach)

IMPACTS

Average daily traffic reduced by 13%

Slower speeds of 15 mp/h though speed limit remained at 25 mp/h

Collisions dropped by 40%

CS18

Cambridge Streets for People
(Source: Waka Kotahi Innovating Streets)

INTERVENTION
Roadway art, kerb buildouts, planters and speed reduction treatments

OBJECTIVE
- Innovating Streets programme

OTHER MEASURES & NOTES
- Traffic and bike lane removal
- Restrictions to mode types
- Bike lane and pedestrian crossings added or improved

CAMBRIDGE, NZ

INTERVENTION TYPE
Permanent

ROAD TYPE
Local

EVALUATION LEVEL
Area

EFFECTIVENESS
Major effects

RELIABILITY
★★★★

RELEVANCE TO NZ
High

Before and after (Source: Waka Kotahi Innovating Streets)

IMPACTS

Traffic decreased by 2%-6% on 3 key roads

Mean speed reduced by 7%-20%

Bike trips increased over 58% and walking increased by 26% on 2 sites

Active modes increase of 141% at peak school trip times

CS24

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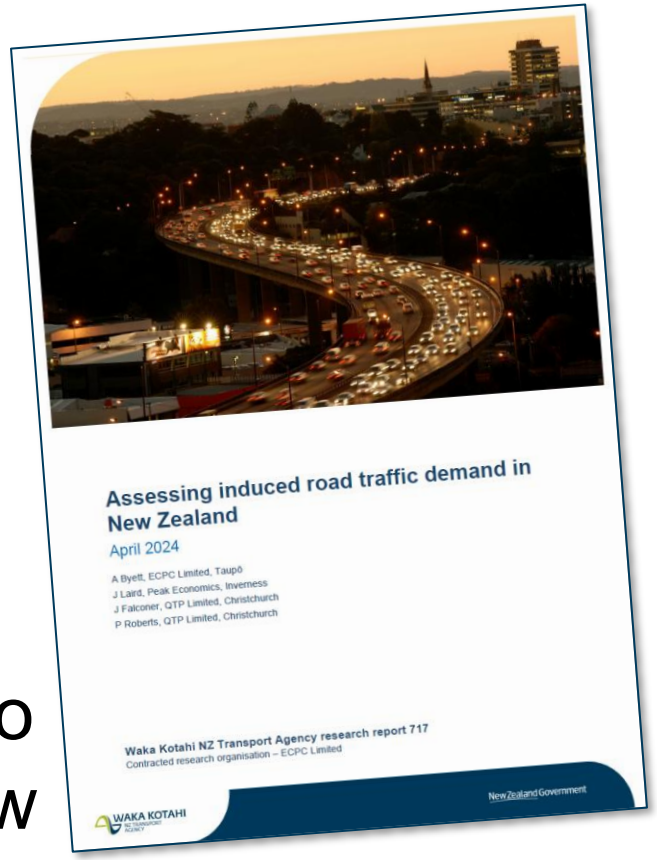
Induced road traffic research

Recent NZTA Research Report #717 (Byett *et al*, 2024)



Other NZTA research completed around the same time as our work looked into induced road traffic

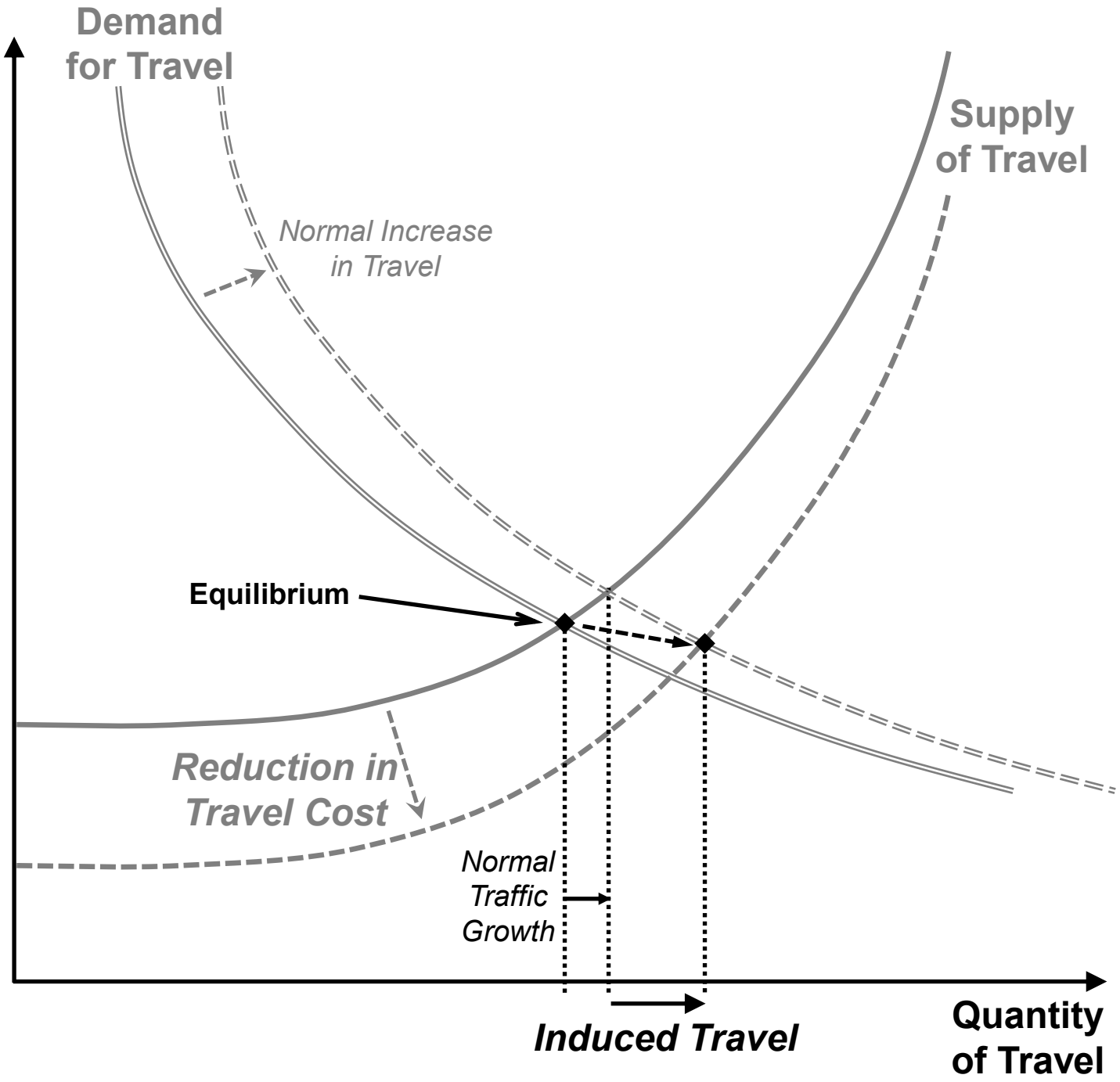
- Focus of this work was on what factors contribute to inducing additional traffic on road networks and how to measure the level of change

Could some of the lessons gleaned from that research also be applied when considering the ***opposite*** *process?*

- *i.e. how to* ***reduce*** *traffic…*

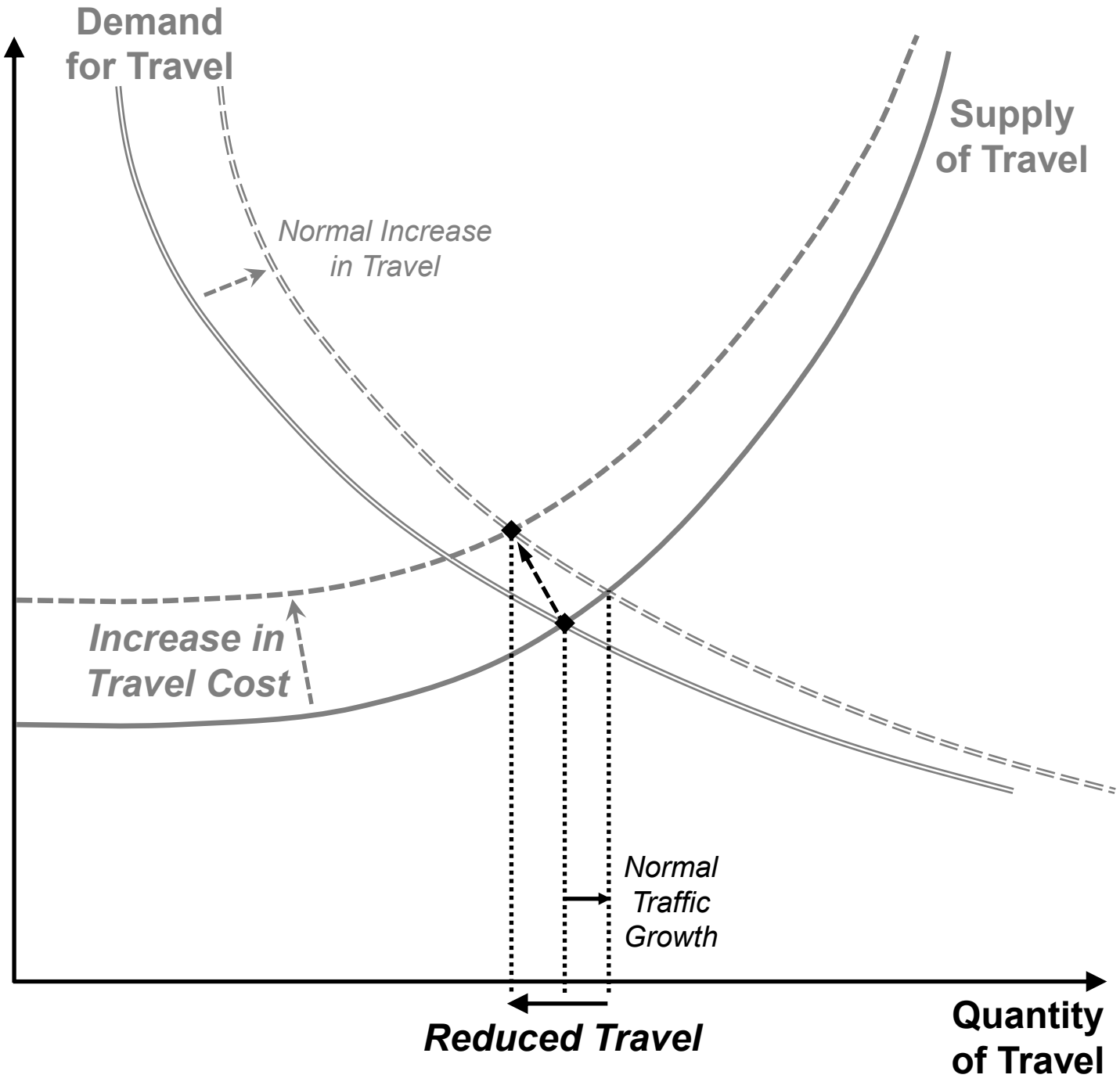
Economic Theory of Induced Traffic

- Normal increases in (say) population can lead to *normal* increases in travel demand
- Reducing cost of travel further leads to additional *induced* travel demand



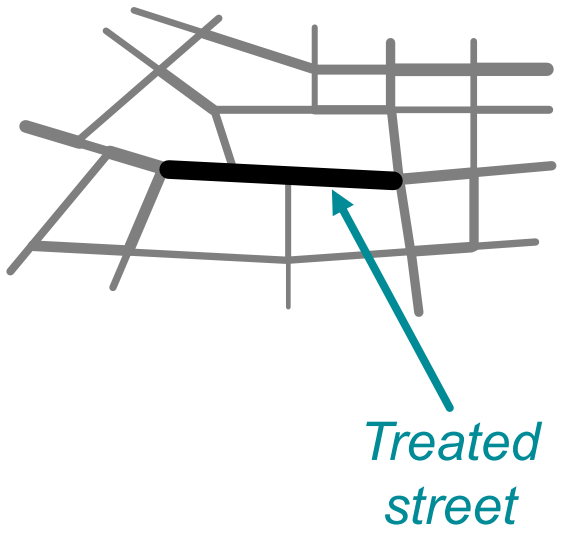
Economic Theory of Reduced Traffic

- RSR measures can increase relative cost of travel ➔ *reduced* travel
- If normal increases in travel demand occur at the same time, it might *understate* the actual reduction due to RSR

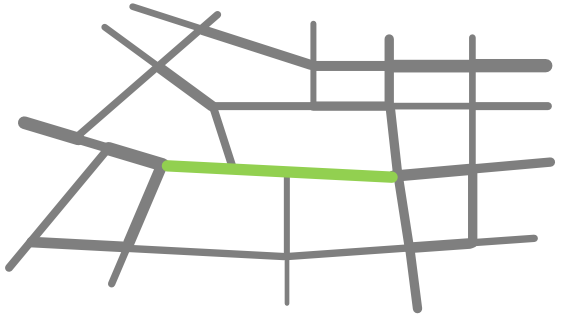


Measuring network-wide VKT reduction

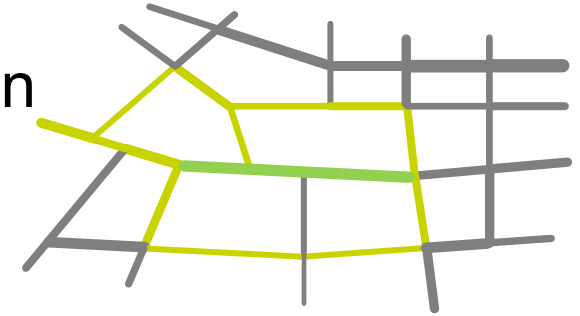
How do we know if traffic has "disappeared" or just shifted?



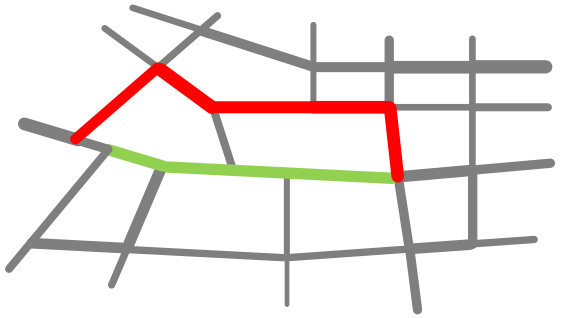
- Do you get a reduction effect just on ***one*** street?



- Is there an overall reduction in VKT ***across*** a network?



- Has traffic just ***shifted*** to somewhere else?

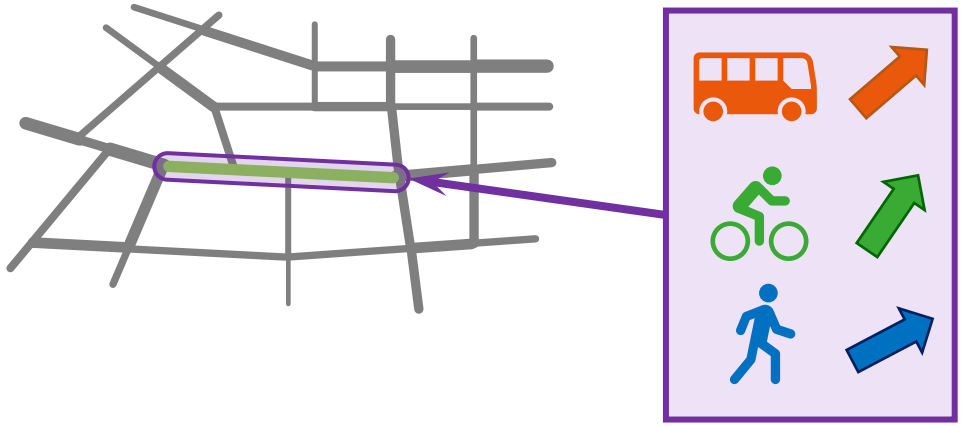


Often difficult to measure this

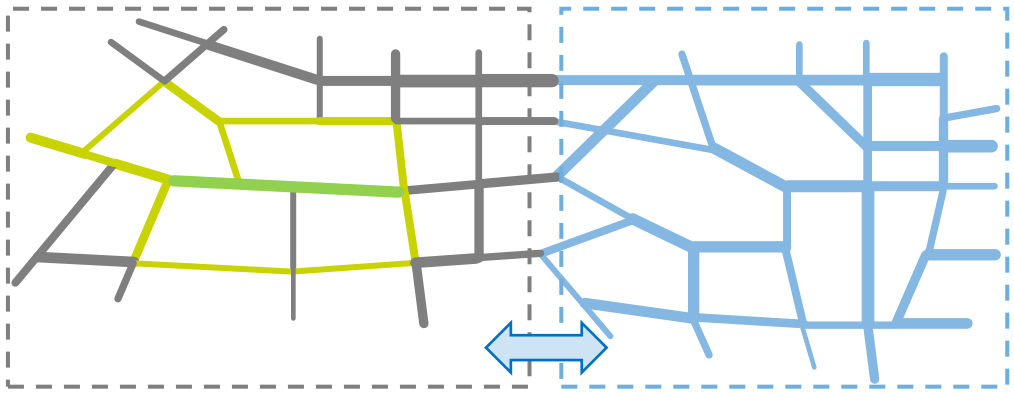
Ways to measure network VKT reduction

Need to use other metrics to compare against

- Look at relative changes in ***other*** travel modes (e.g. walk, bike, public trpt)
  - Check they haven't shifted from other streets



- Use a similar nearby ***control site*** to compare relative changes
  - Helps address other external changes also happening, e.g. population growth

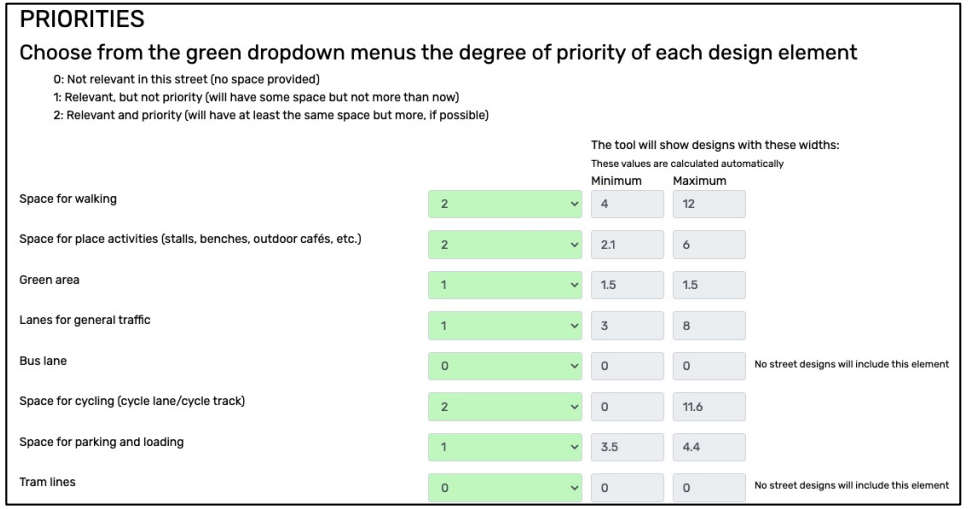


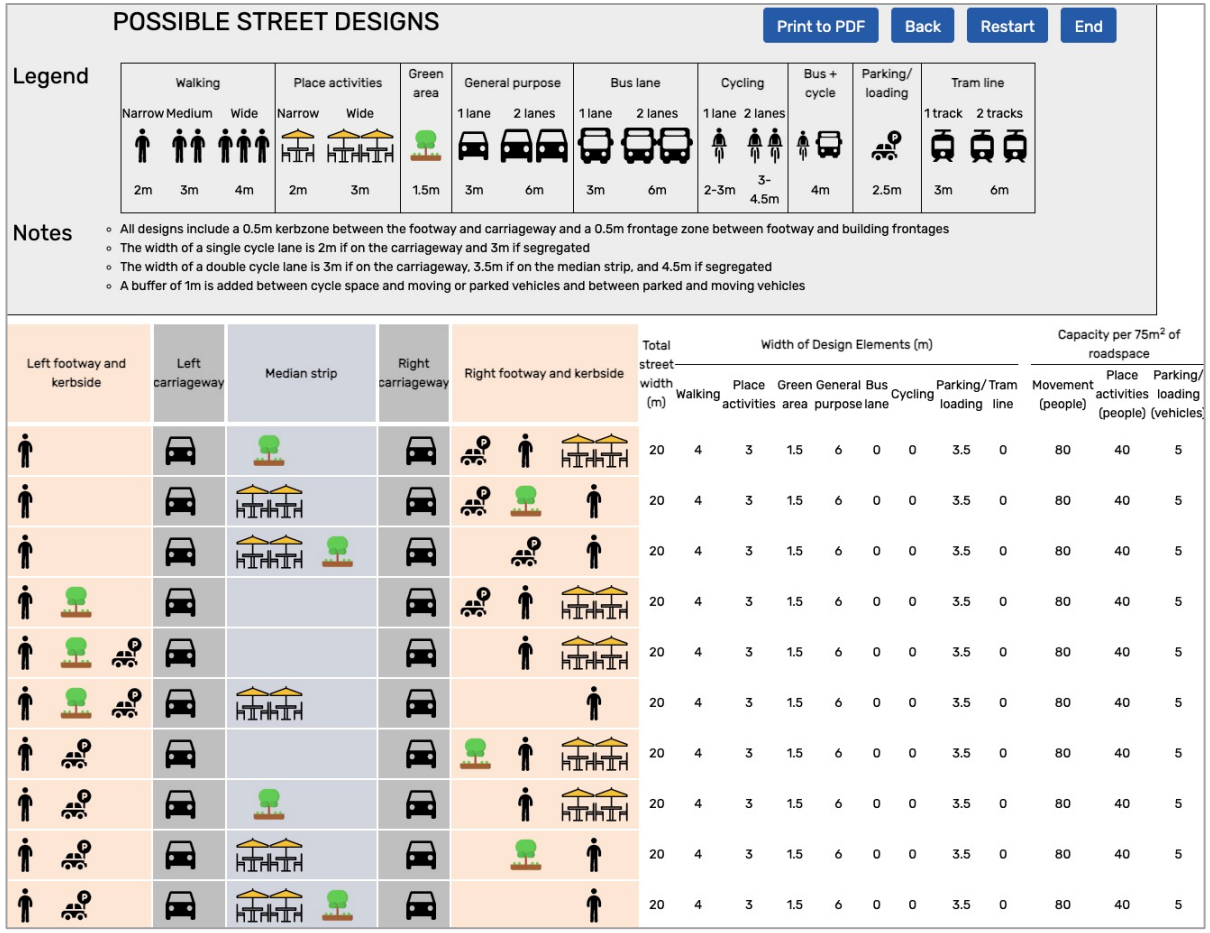
Need more RSR studies that do this

Potential toolset to assess VKT reduction?

***MORE**: **M**ulti-modal **O**ptimisation of **R**oadspace in **E**urope*
- https://www.roadspace.eu/

- Funded by 21 EU participants
  - Website with project outputs
  - Analyses & Recommendations
  - Comprehensive Handbook
- Four web tools for street design:
  - Option generation tool
  - Stakeholder engagement tool
  - Simulation tool
  - Appraisal tool





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Trends observed in evidence review

Key findings – Benefits of RSR

- ***Strong*** evidence of
  - Intervention **reducing congestion**
  - Increased **active mode share / shift**
  - Improvement in **safety**

REDUCED CONGESTION

ACTIVE MODE SHARE / SHIFT

IMPROVED SAFETY

- ***Moderate*** evidence of
  - Network-wide **congestion reduction**
  - Mean **speed reduction**
  - Improvement to **health**

NETWORK CONGESTION REDUCTION

SPEED REDUCTION

IMPROVED HEALTH

Trends observed in evidence review

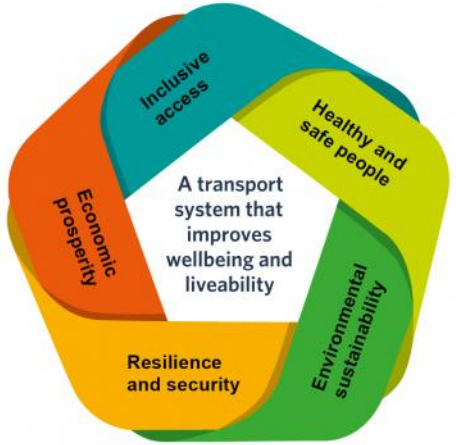
Key findings – Benefits of RSR cont'd

- Could ***not*** be ascertained:
  - Average **travel time** impacts
  - **Route choice** effects
  - **Emission impacts** (not enough evidence)

More studies needed!

Transport Outcomes impacts

From Road Space Reallocation (RSR) Treatments

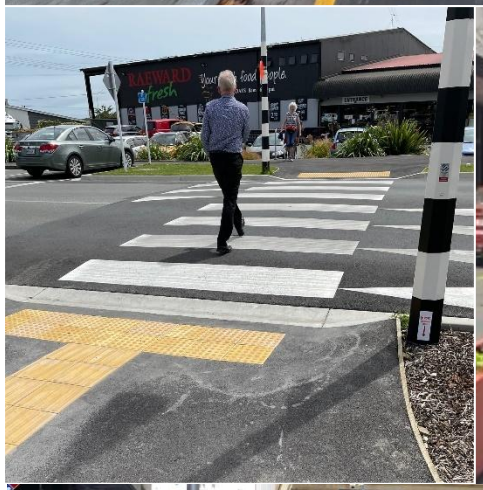


- Healthy and Safe People
  - Generally ***positive*** impacts by all RSR treatments, esp Active Modes
- Environmental sustainability
  - Only ***some*** measurable effects – Active Modes better than PT measures
- Resilience and security
  - Relatively ***little*** impact – but some advantages of Active Modes
- Economic prosperity
  - ***Not a lot*** of relevance – potentially some adverse effects on general traffic?
- Inclusive access
  - Some ***targeted*** positive effects on mode choice by all RSR treatments

Network VKT Reduction

Critical RSR success factors - infrastructure

- Most effective **physical treatments**
  - **More than one** street implemented
  - Additional of **Walking / Cycling** facilities
  - **Pedestrian crossing** improvements
  - **Street landscaping**
  - **Mode removal** (i.e. cars)
  - **Traffic lane removal (**over parking removal)



Network VKT Reduction

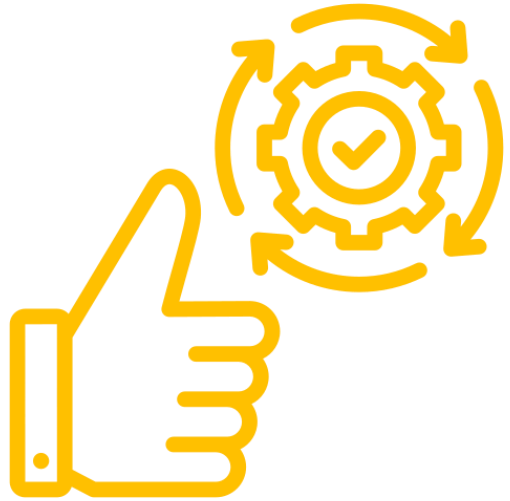
Critical RSR success factors - other

- **Non-infrastructure** key success factors →

Adapted from MorrisonLow (2016)

Network VKT Reduction

Best practice for implementing RSR



- **Trust** in the evidence from elsewhere
  - But identify/account for ***local differences***
- **Multiple streets** as part a project
  - Network-wide VKT reduction requires **network-wide** measures
- Robust **non-infrastructure** processes
  - Comms: Ensure politicians/public/media are informed all the way
  - Spend a little more on good **engagement** & **data**
- Have a **‘control’ site** to measure impacts
  - Is there mode shift / trip diversion / trip suppression?

Recommended future research

More to explore in this space!

- Further **build up** the collection of RSR case studies
  - More examples (in NZ & overseas) to improve the value of the database
- Future RSR projects in NZ should attempt to capture a **wide range** of transport metrics before & after implementation
  - Short-term & long-term changes
  - Cover a reasonably large network around the treated site
  - Measure a similar control site
- **Revisit** some case studies with only short-term results captured
  - Assess ***long-term*** changes in travel patterns
- Investigate further the transferability/applicability of **MORE** to NZ

Thank you!

Any Questions?

Working with what we have

Resilience for the Future

Whakamahinga ki ngā mea kei a tātou:
He manawaroa mō ngā rā anamata

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