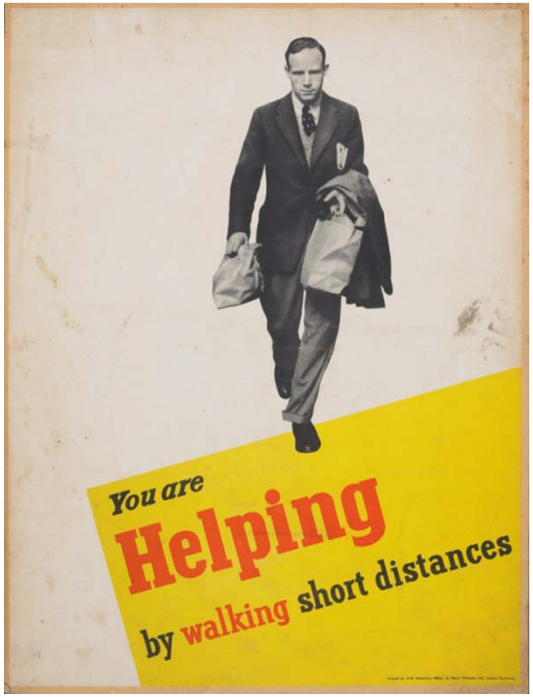
UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON

A public health perspective on transport, health and carbon emissions



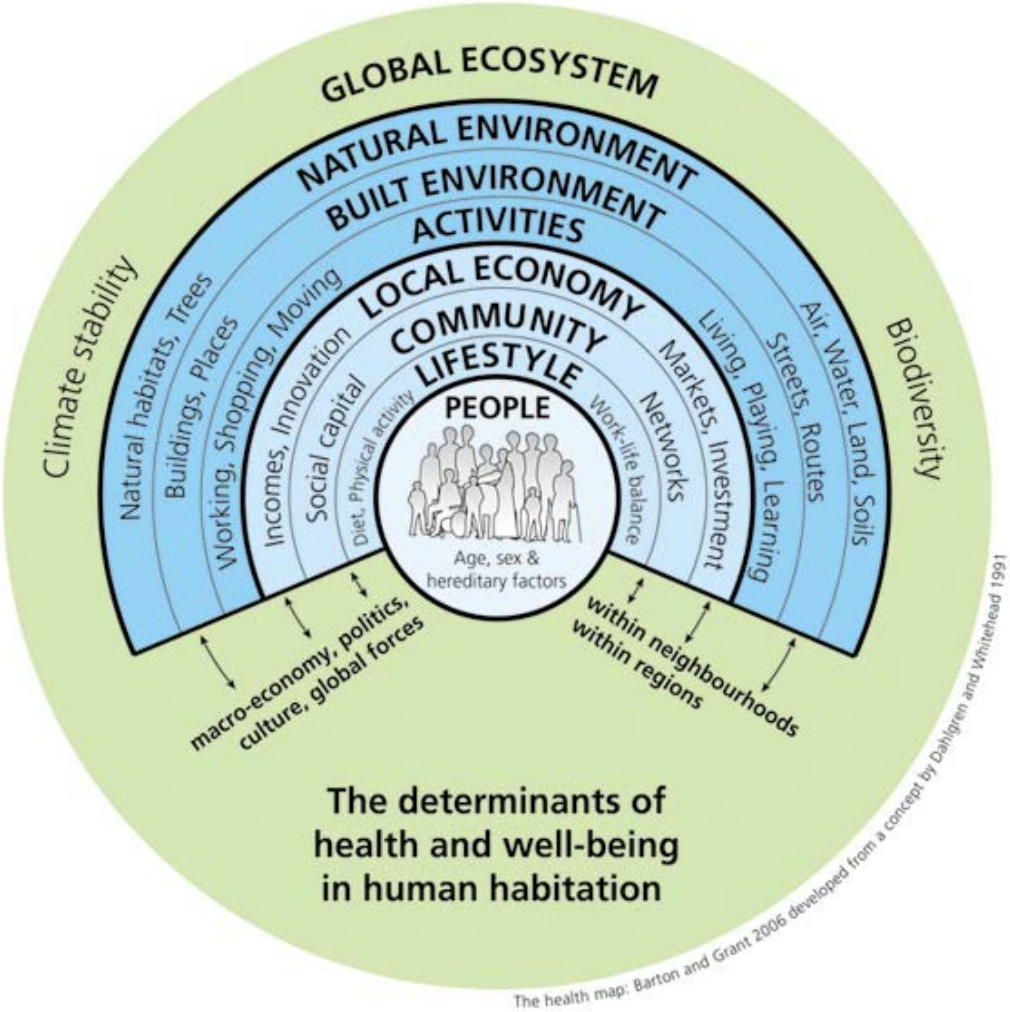
Dr Caroline Shaw
Senior Lecturer
Department of Public Health
University of Otago Wellington

new zealand centre for
Sustainable Cities
te pokapū rōnaki tāone-nui

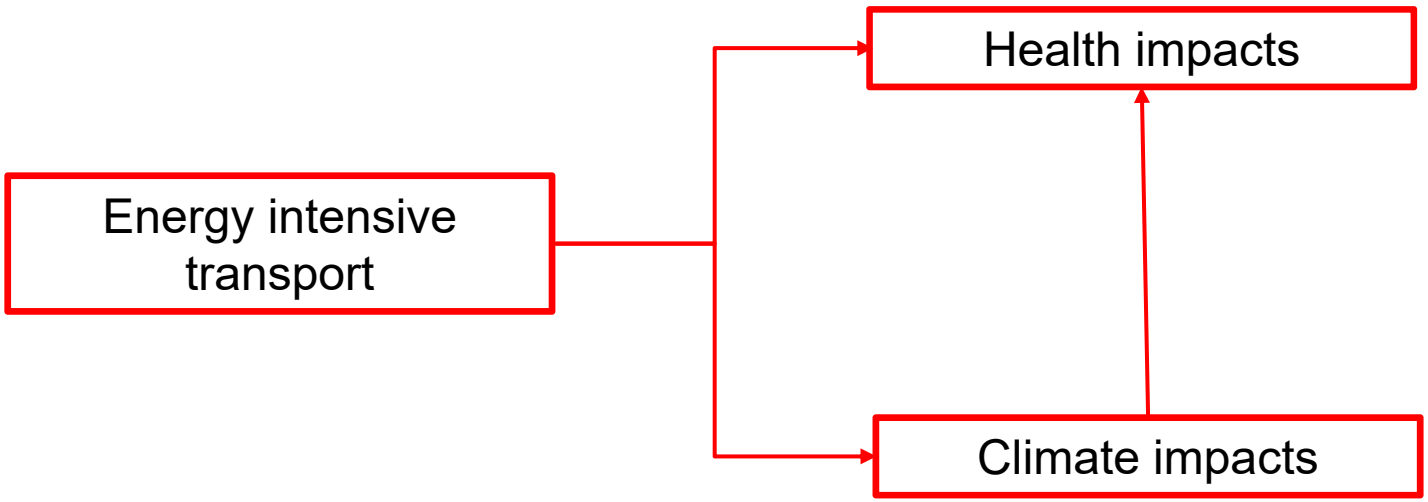
What Determines Health?

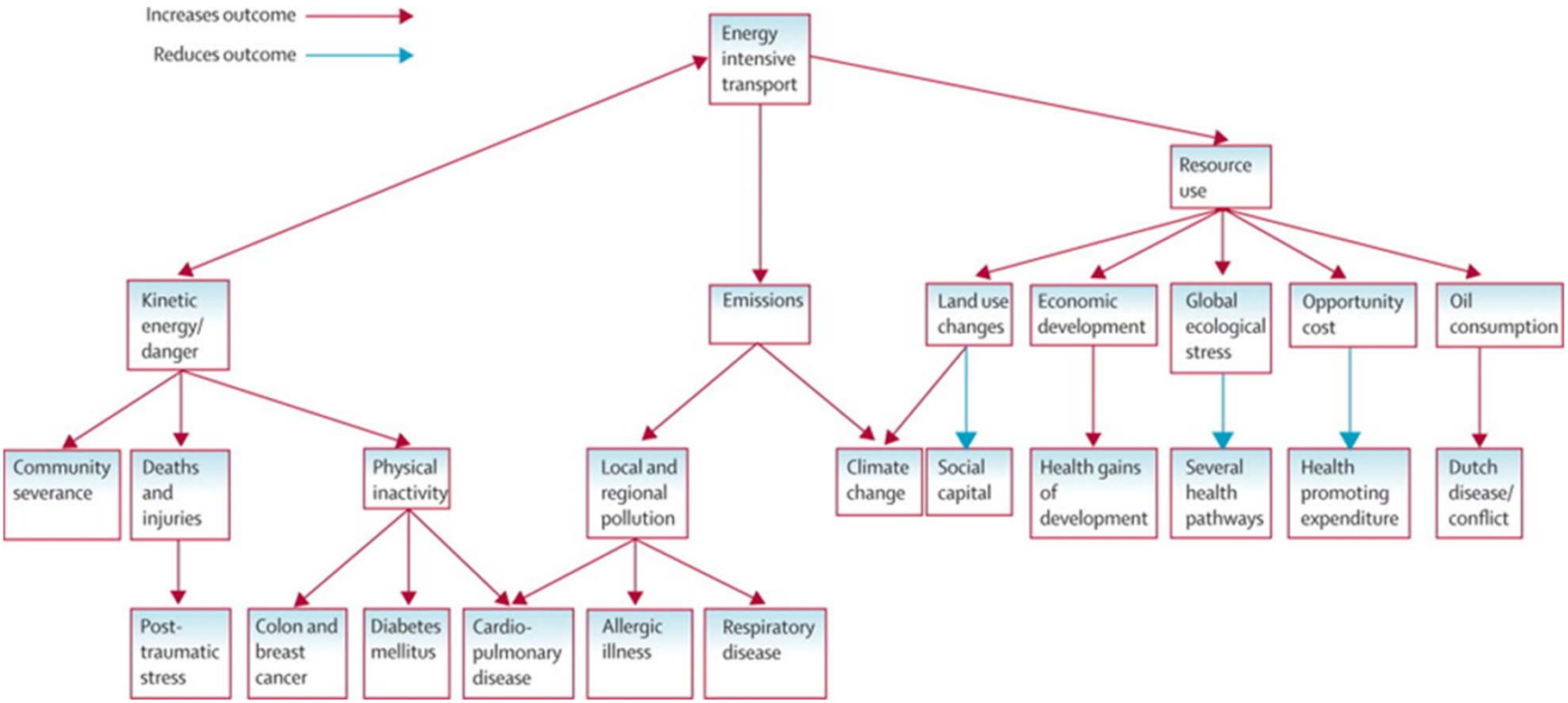
Source: McGinnis et al, 2002

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON



The health map: Barton and Grant 2006 developed from a concept by Dahlgren and Whitehead 1991


Health impacts
Energy intensive transport
Climate impacts

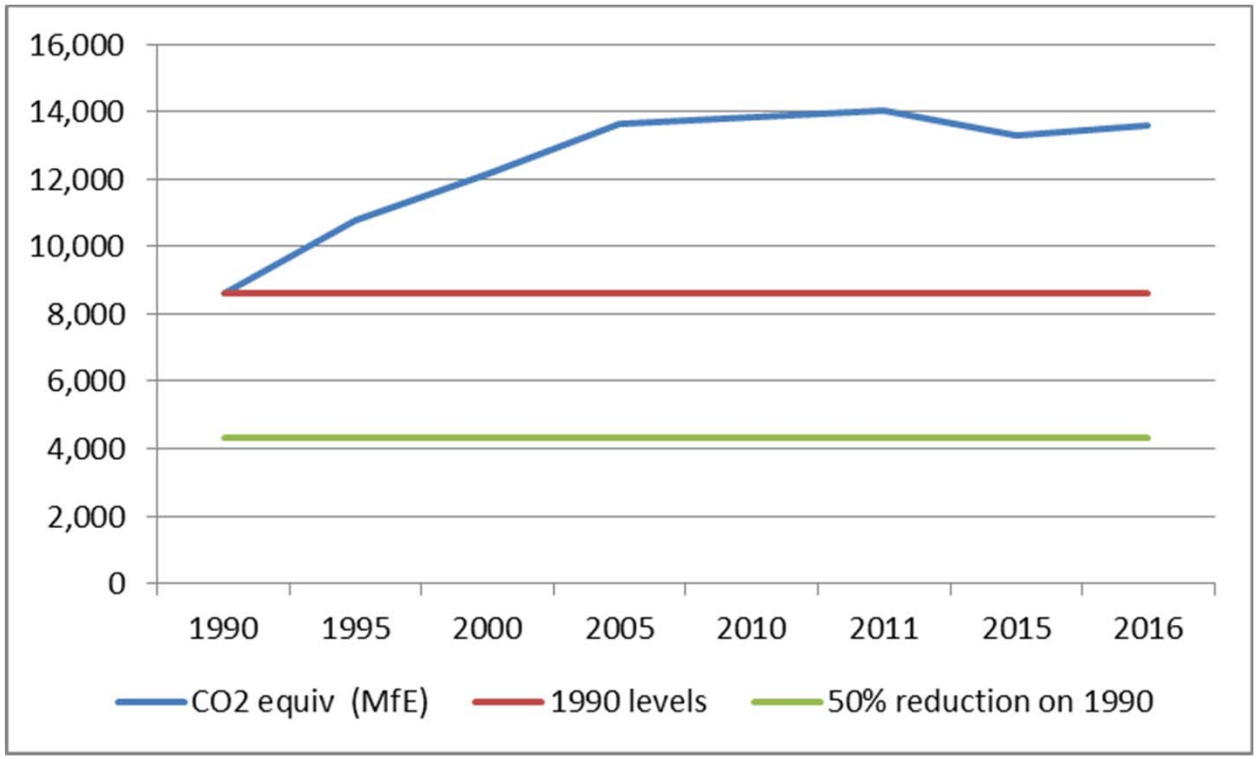


Woodcock et al, 2009


I DON'T BELIEVE IN
GLOBAL WARMING

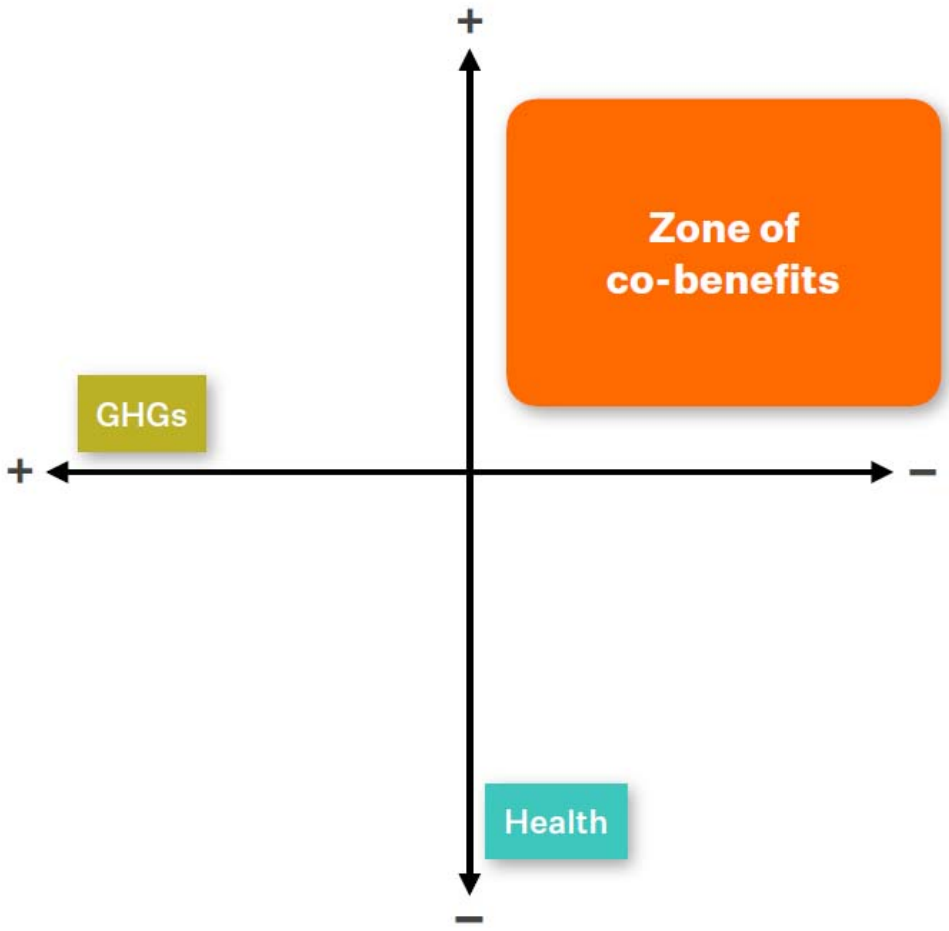
UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON

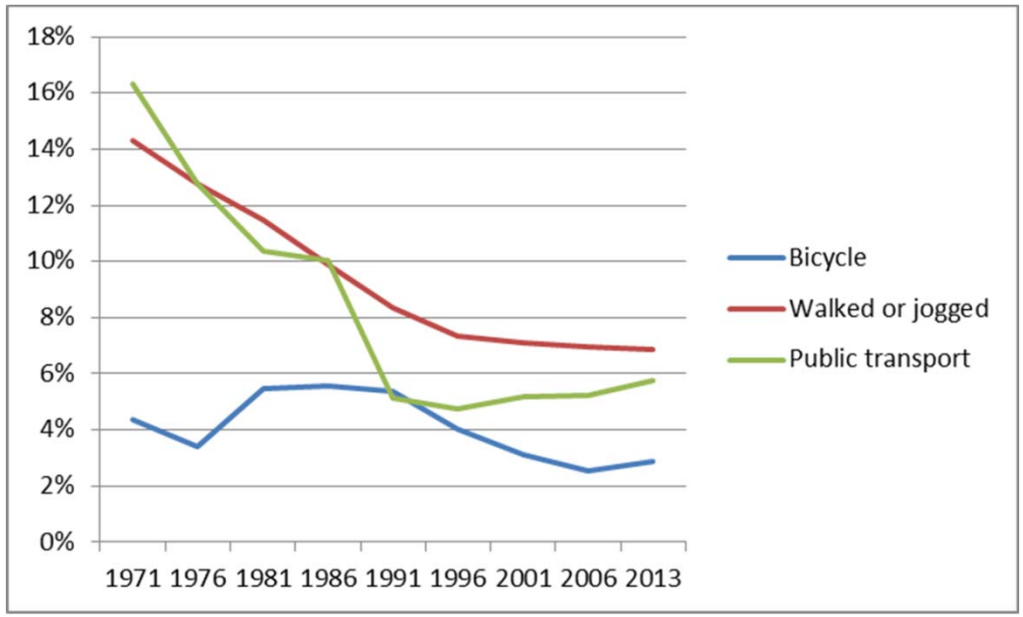
NZ transport emissions



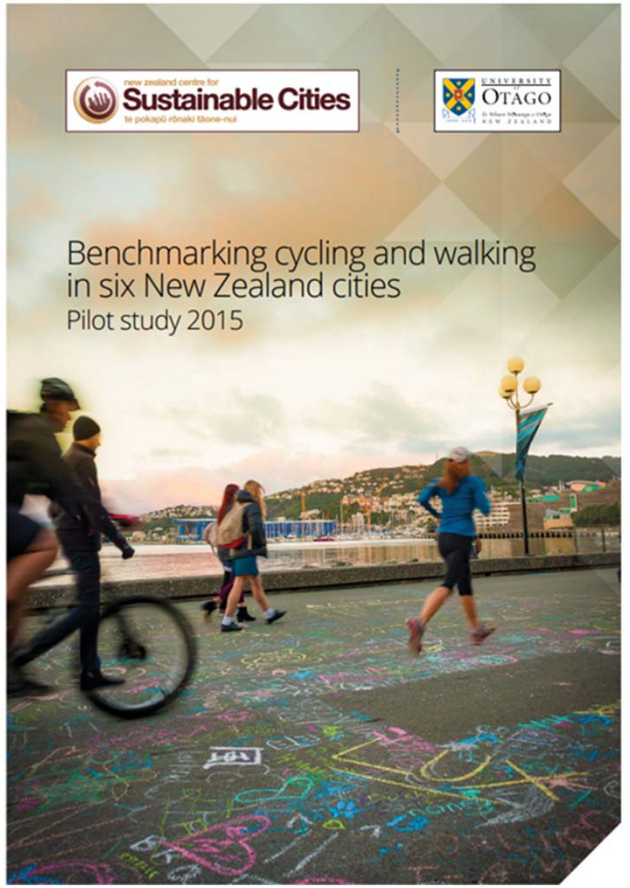
UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON

Policy sweet spot





Source: Census 1971- 2013



UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON

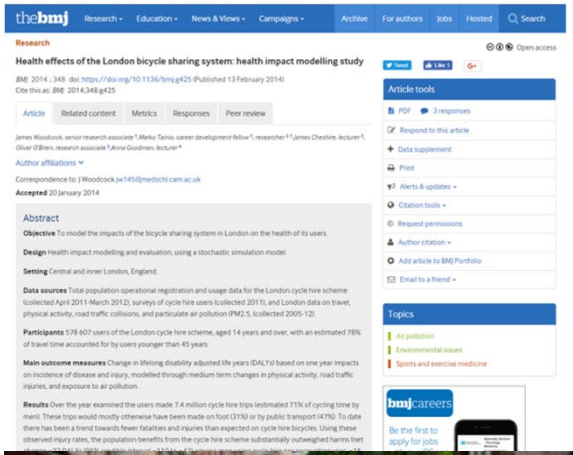
Current travel patterns in NZ cities

	Population	HH with two or more vehicles (%)	Trips walking (annual %)	Trips cycling (annual %)	Trips by public transport (annual %)	CO_2 emissions per capita (tonnes/year)
Auckland	1,493,210	55	16.1	0.5	3.3	1.44
Tauranga	119,830	51	14.1	2.1	1.3	1.59
Hamilton	150,180	49	13.8	1.2	1.9	1.68
Wellington	197,460	36	27.5	1.3	6.2	1.15
Christchurch	356,750	53	18.9	3.1	3.3	1.25
Dunedin	123,540	46	23.5	1.3	1.4	1.24

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND

WELLINGTON

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON



UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON

Baseline – current travel

Demographics

Travel patterns (incl VKT/CO_2 emissions)

Transport- related health outcomes ($PM_{2.5}$, PA, Injury)

Scenario – "Wellington"

Demographics

Travel patterns (incl VKT/CO_2 emissions)

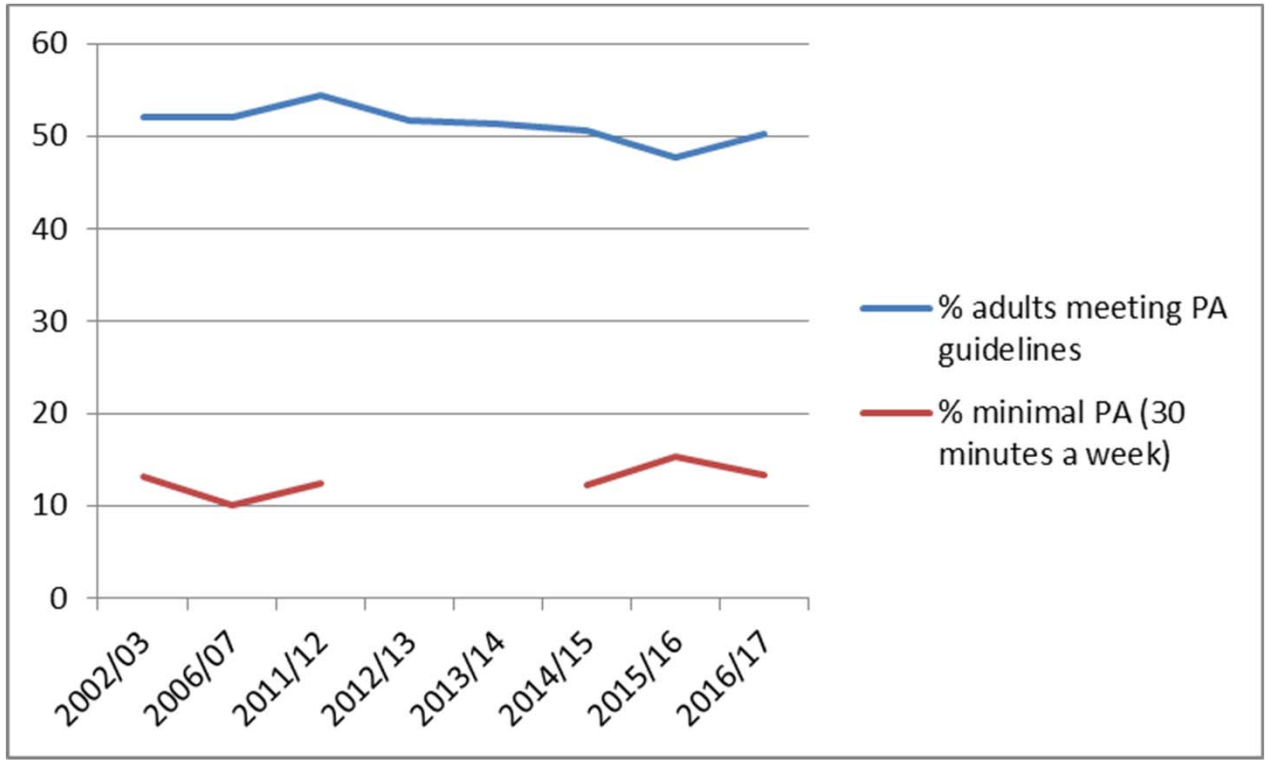
Transport- related health outcomes ($PM_{2.5}$, PA, Injury)

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON

	Premature deaths averted (total)	Deaths averted (Physical activity)	Deaths averted (Injury)	Deaths averted (air pollution)	CO_2 emission reduction
Auckland	57.3	41.2	15.1	1.0	20%
Tauranga	49.7	46.5	1.8	1.3	27%
Hamilton	51.7	47.2	2.9	1.5	32%
Christchurch	31	29.1	1.5	0.4	8%
Dunedin	12.3	12.3	0.4	0.3	7%

What does this research tell us?

- Policies that promote physically active transport will have the most health gain
  - Estimates are conservative



NZ Health Survey

Meeting NZ PA Guidelines (odds ratios)	
AT vs car	PT vs car
1.76 (1.26 - 2.47)	1.15 (0.80 - 1.65)

What does this research tell us?

- Policies that promote physically active transport will have the most health gain
  - Estimates are conservative
- But injury reductions are important too, especially in Auckland
  - Likely to be conservative estimate
  - ITHIM assumes increase in injury from increased cycling and a safety in numbers effect

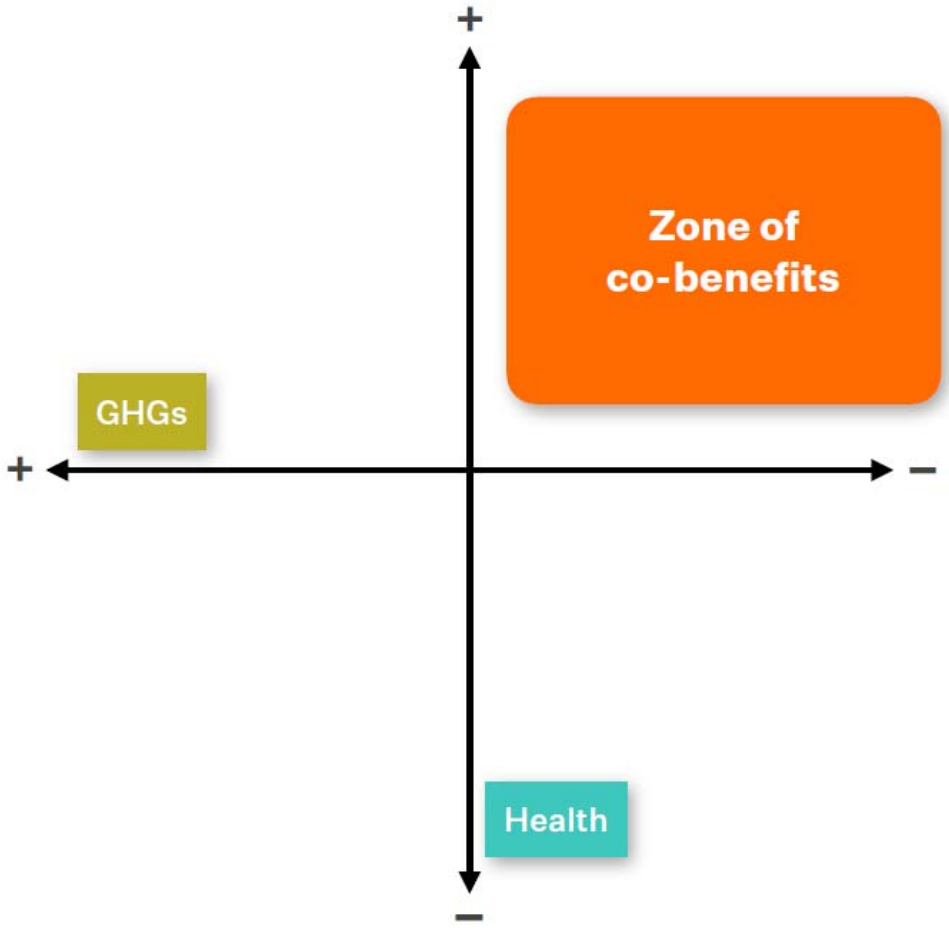

VISION
ZERO
NO MORE TRAFFIC DEATHS

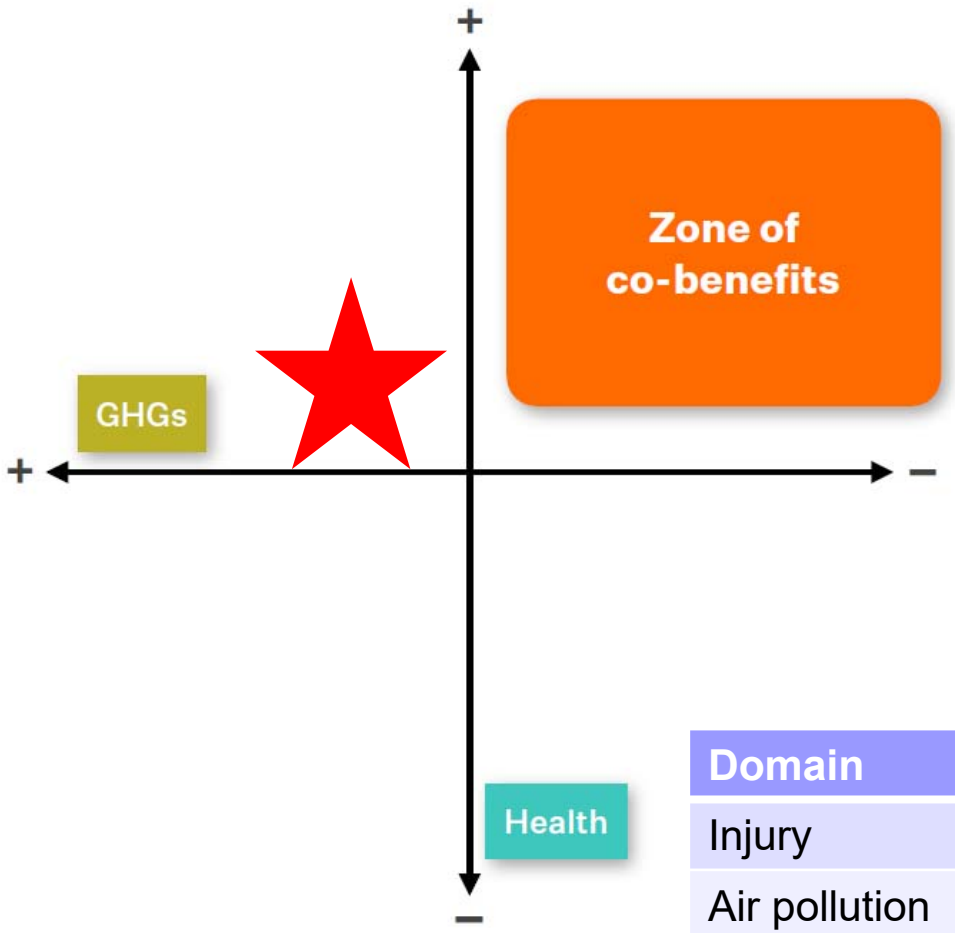
What does this research tell us?

- Policies that promote physically active transport will have the most health gain
  - Estimates are conservative
- But injury reductions are important too, especially in Auckland
  - Likely to be conservative estimate
  - ITHIM assumes increase in injury from increased cycling and a safety in numbers effect
- Emission reductions are surprisingly large
  - Driven by PT

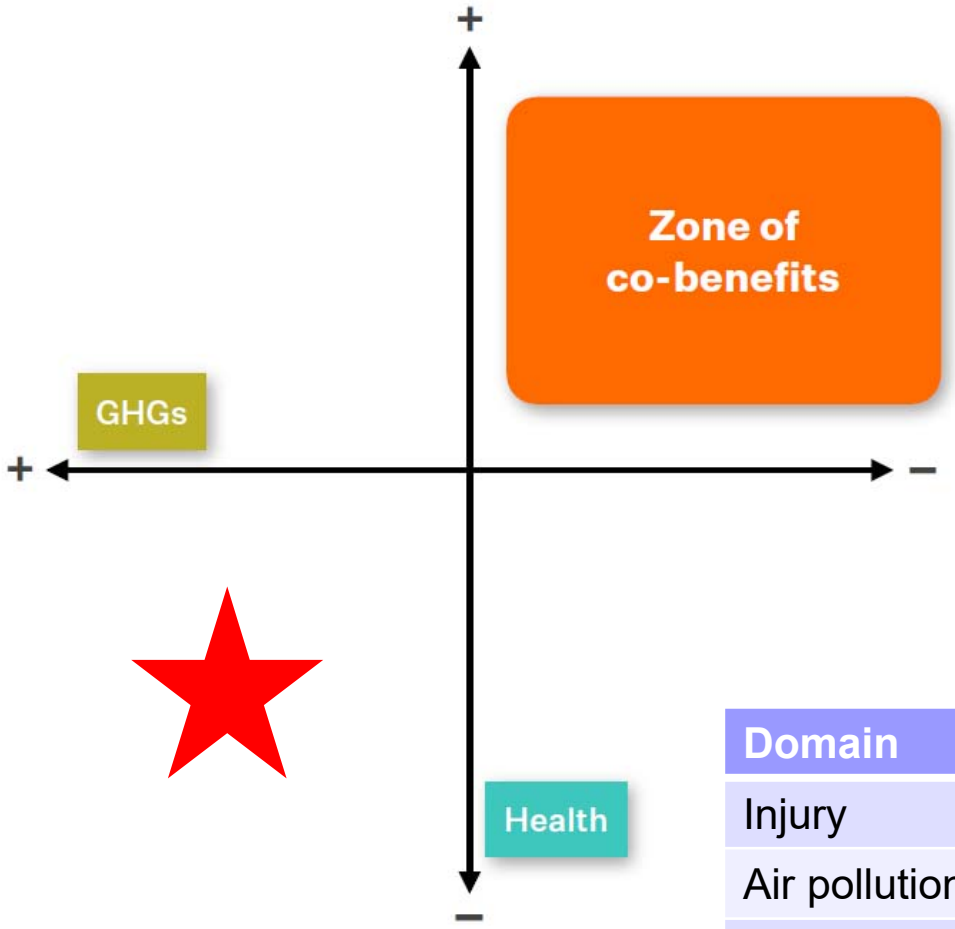
What doesn't this research tell us?

- The specific policies that would be most effective to achieve the change in mode of the 'Wellington' scenario
  - Complex trade offs in some policies that aim to reduce emissions

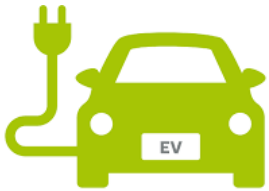

+
Zone of co-benefits
GHGs
+
−
Health
−

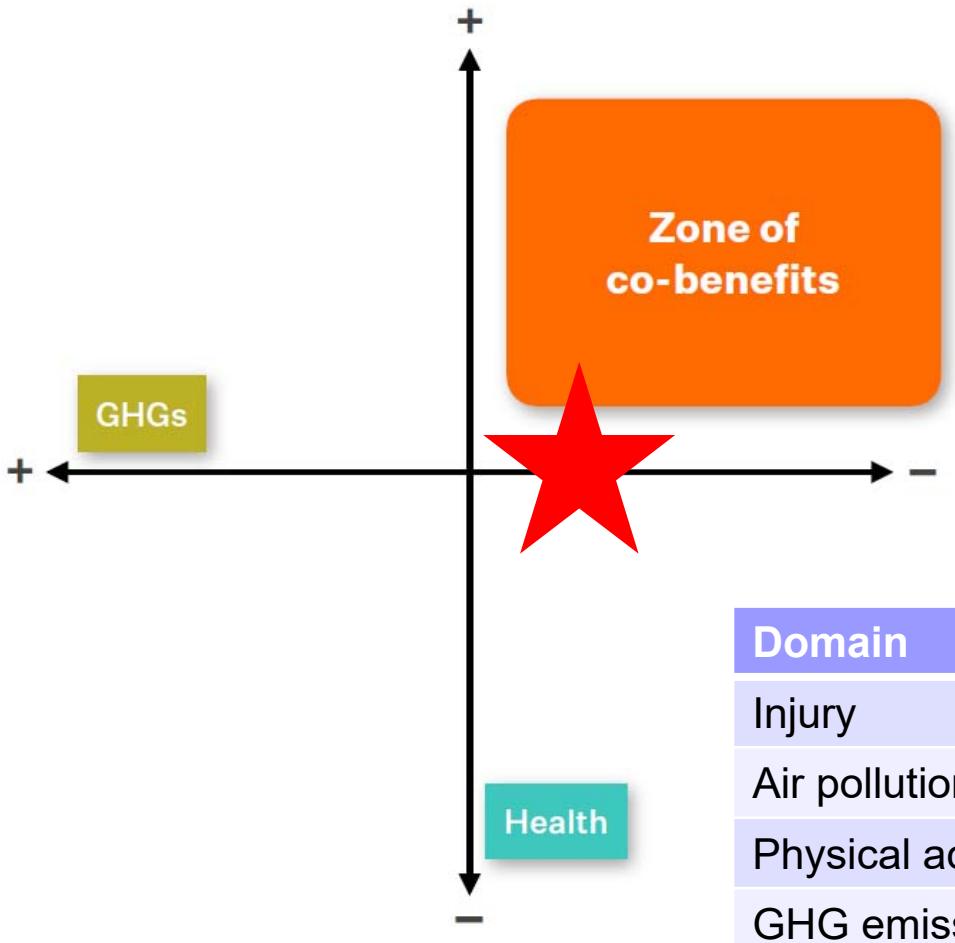


Domain	Impact
Injury	✓
Air pollution	Worse
Physical activity	✓ (?)
GHG emissions	Increase



Domain	Impact
Injury	-
Air pollution	Made it worse
Physical activity	-
GHG emissions	Neutral or made worse





Domain	Impact
Injury	-
Air pollution	✓
Physical activity	-
GHG emissions	Improve (depending on electricity source)

What doesn't this research tell us?

- The specific policies that would be most effective to achieve the change in mode of the 'Wellington' scenario
  - Complex trade offs
- Most cost-effective policies

What doesn't this research tell us?

- The specific policies that would be most effective to achieve the change in mode of the 'Wellington' scenario
  - Complex trade offs
- Most cost-effective policies
- Healthcare cost savings of scenarios

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
SAPERE AUDE

WELLINGTON

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON

Co authors

- Ed Randal (UOW)
- Michael Keall (UOW)
- Alistair Woodward (UA)

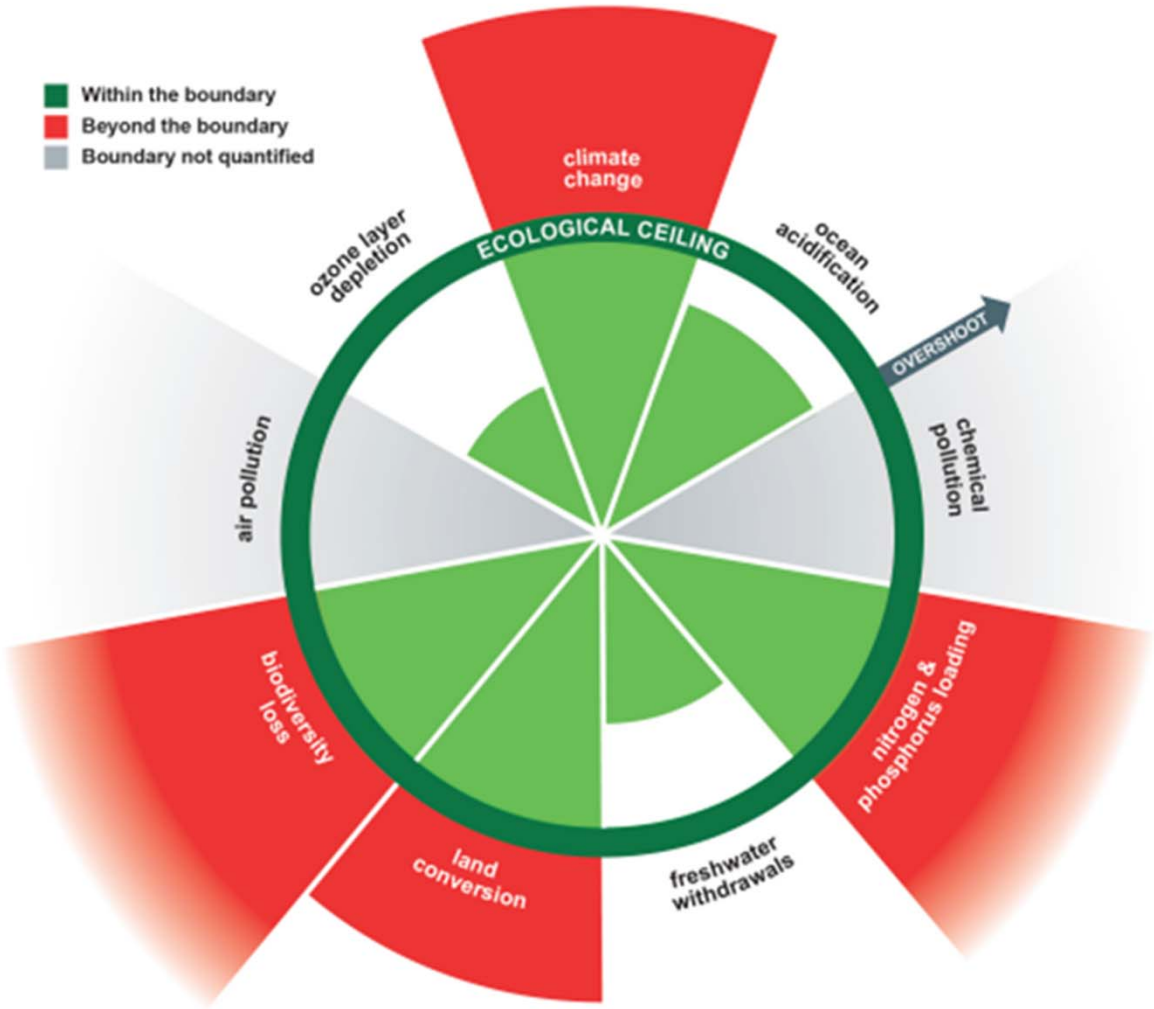

UNIVERSITY
of
OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
SAPERE AUDE

WELLINGTON

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON

A doughnut for the Anthropocene



UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
WELLINGTON

Model issues

- Uncertainty not dealt with
  - Not so relevant in this scenario but very relevant in 'future modelling'
- Data limitations
  - Due to sparse $PM_{2.5}$ model used airshed and vehicle emissions model from the USA
  - Also domain specific PA from the USA as we don't know where NZer obtain their PA from
  - Unable to disaggregate travel by road type and speed – injury reductions probably conservative