Monty

A new agent-based transport model for Aotearoa New Zealand

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Project Monty

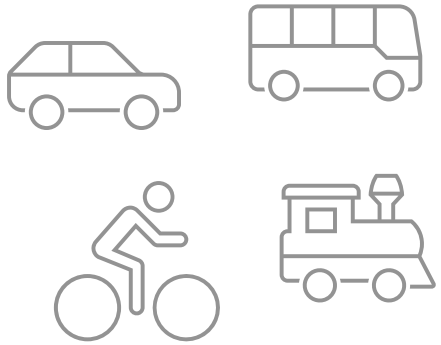
What is Monty?

Monty *predicts* ***people movements*** *in New Zealand, for* ***now and the future****.*

It is a cutting-edge ***transport behaviour model****, initiated by the Ministry of Transport.*

Entire Country

Forecasting



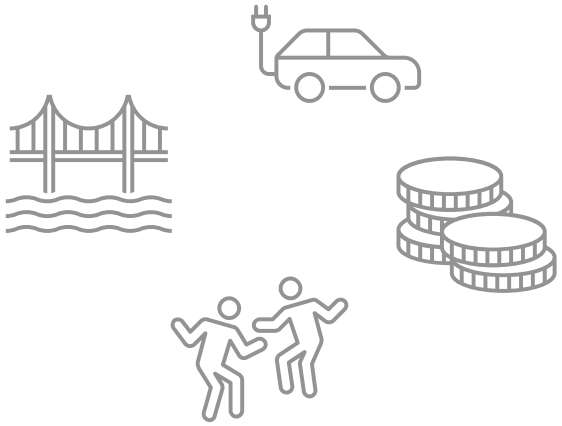
Multimodal

Human-centric

Project Monty

The motivation behind it

Monty *provides a* ***unified, integrated approach*** *for evidence-based* ***policy assessments*** *surrounding road pricing, emissions reduction schemes, land use and future infrastructure planning.*



Country-wide Simulations

New Zealand's existing strategic models cover individual cities, causing:

- Fragmentation in modelling and assumptions across assessments.
- Lack of modelled coverage for less populated areas.
- Lack of understanding surrounding inter-city travel choices.

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Complex Human Behaviour

Emerging policy questions, such as:

- Impact of complex pricing interventions that vary based on time of day?
- What are the equity impacts of specific interventions across demographic groups?
- How are temporal effects like peak spreading going to affect people's behaviour?

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Use Cases

- Road Infrastructure
- Public Transport Infrastructure
- Road Pricing
- Fare Schemes
- Behaviour Change (e.g. WFH)
- Land Use Change
- …

Project Monty

A global network of contributors & skills

Dan Jenkins, Jade Mackay, Mac Townsend, Lucie Jilkova, Shrividya Ravi

Devin Kilminster - Consulting

NZ: Patrick Manser, Liz Halsted, Elizabeth Cheng, George Alexander, Kevin Guo
AU: Michael Byrne, Bruce Johnson, Tri Nguyen, Jack Minster
UK: Gerry Casey, Kasia Kozlowska, Theo Chatziioannou, Michael Fitzmaurice, Fred Shone, Panos Tsoleridis

Transport Planning

Behavioural Science

Co-Design Partnership

High-Performance Modelling Tooling

Stakeholder Management

Cloud Orchestration

Geospatial Big Data Visualisation

Technical Insights

Modelling philosophy

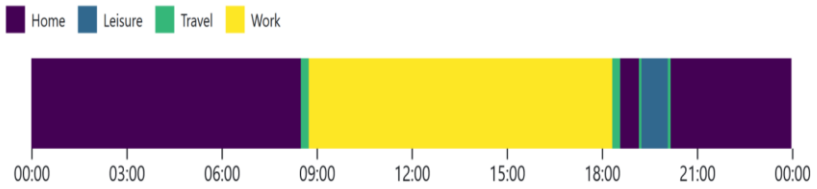
Monty *is methodologically* ***one of the first of its kind****, applying an activity- and agent-based approach. It finds a* ***behavioural response to every change in input assumptions****.*

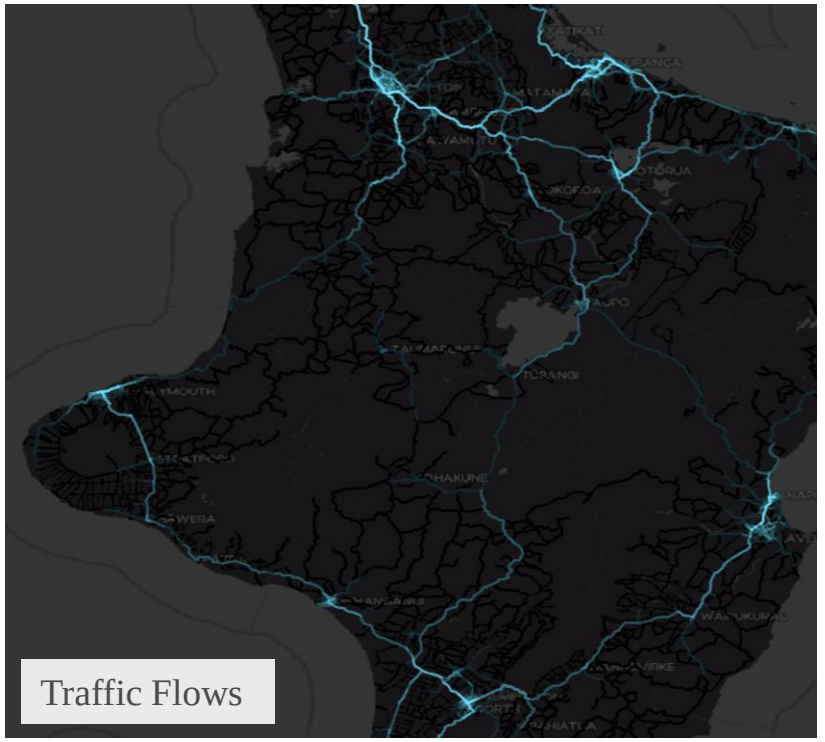
Transport System

Land Use & Demographics

Policy & Technology

Human (Activity) Behaviour

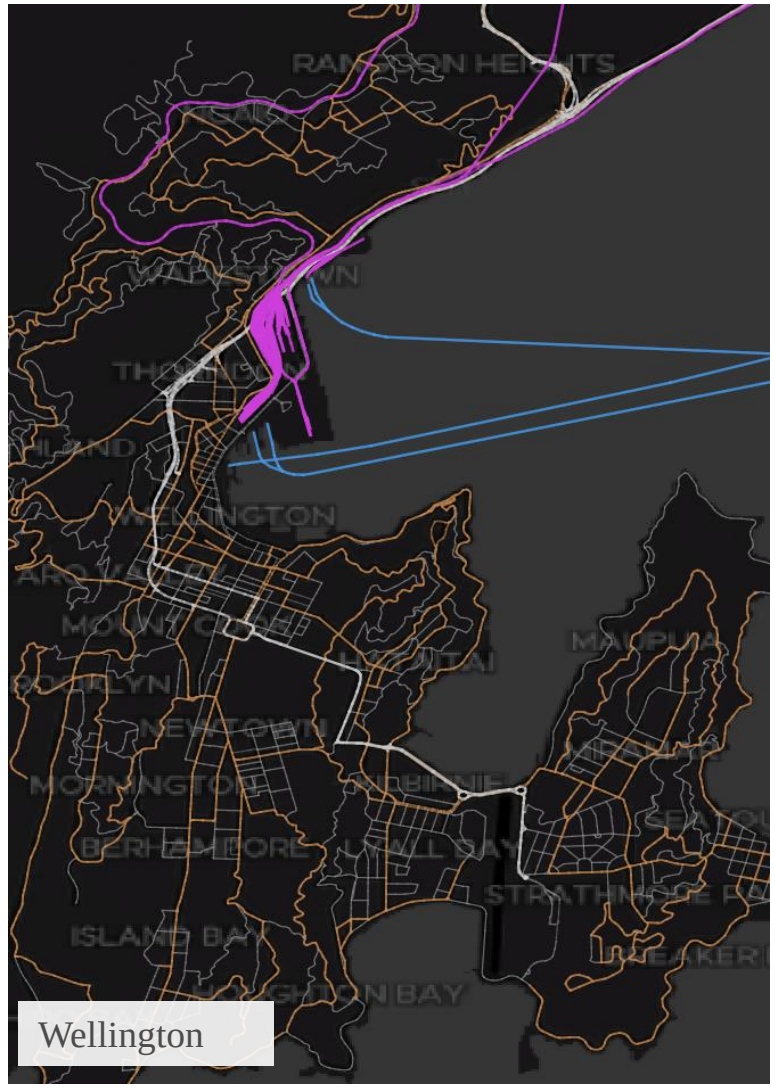




Technical Insights

Multimodal transport network

Monty *generates a* ***multimodal transport network*** *including strategic road infrastructure and detailed public transport representation.*



Data: OpenStreetMap, GTFS feeds

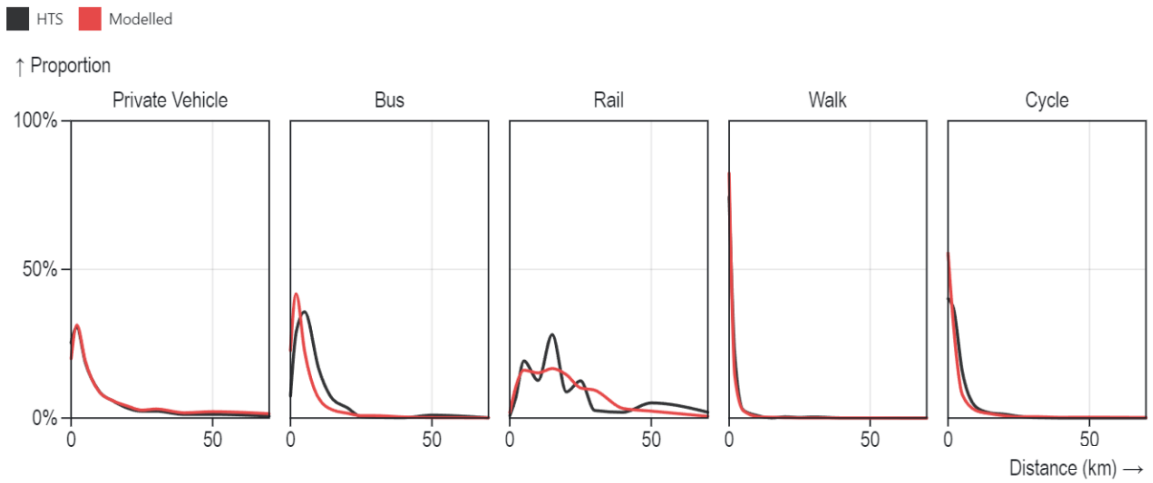
Technical Insights

Mode choice behaviour in New Zealand

Monty statistically measures the ***behavioural response of people*** to changes in their environment across the entire country based on ***surveys and historical data***.

Variable	Car Driver	Car Passenger	Public Transport	Cycle	Walk
ASC	- (ref.)	-2.9382	1.1048	-2.6711	2.0666
ASC shift no car in hh.	-	1.9859	2.6230	2.4631	2.7605
β_{tc} (log.)	-0.6184	-0.6184	-0.6184		
$\beta_{tt,car}$ (linear)	-0.0408	-0.0351			
$\beta_{tt,car}$ (box cox*)	-0.1525	-0.1525			
$\lambda_{pc,car}$	0.4508	0.4508			
$\beta_{ivt,pt}$ (linear)			-0.0162		
$\beta_{accegr,pt}$ (log.)			-1.3901		
$\beta_{tt,active}$ (box cox*)				-0.	
$\lambda_{tt,active}$				0.	

*$(x^\lambda - 1)/\lambda$
All values are statistically significant at the 99% confidence level.

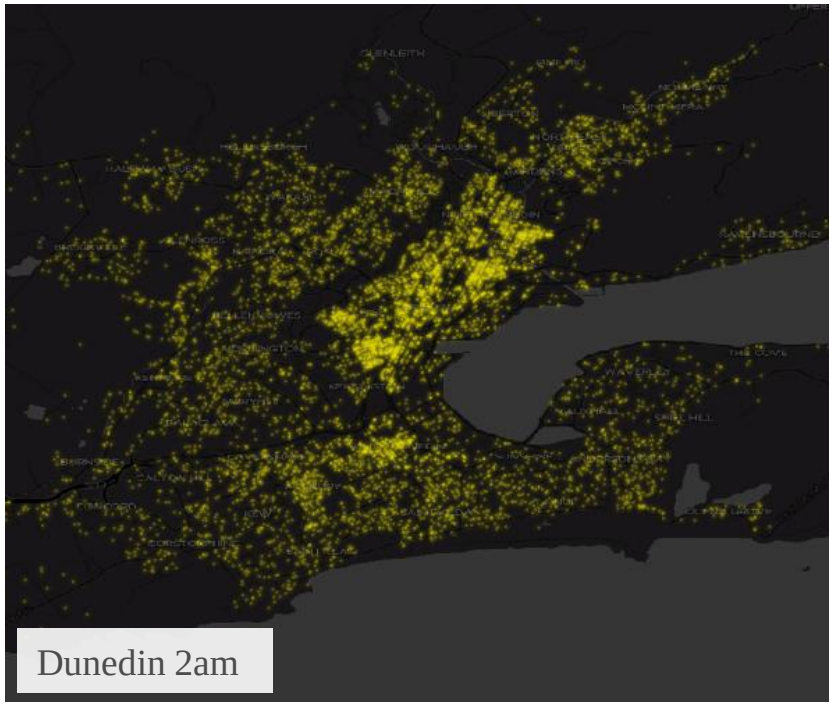


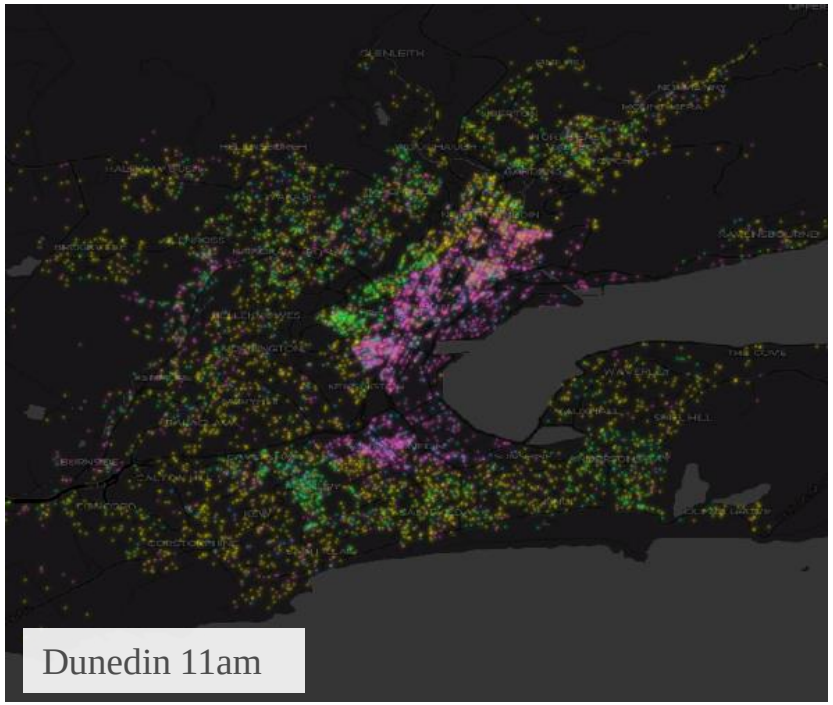
Data: NZ Household Travel Survey, Waka Kotahi Cost Manual

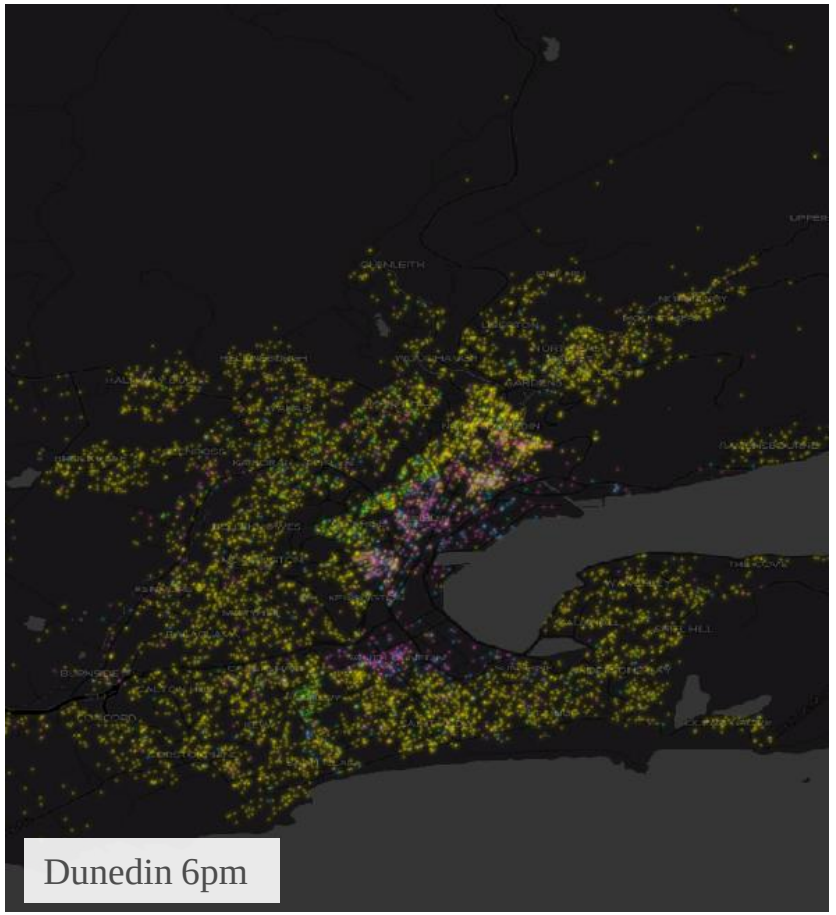
Technical Insights

Modelling individual activity behaviour

Monty *shows in high resolution* ***when, where, and why*** *individual persons perform* ***activity tasks*** *based on land-use information.*







Data: Stats NZ, LINZ

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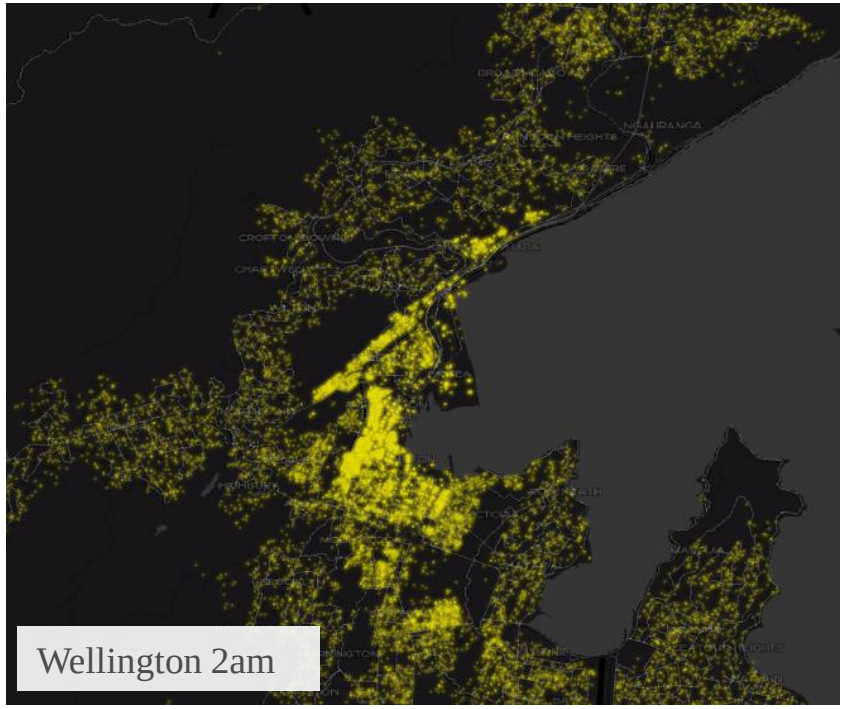
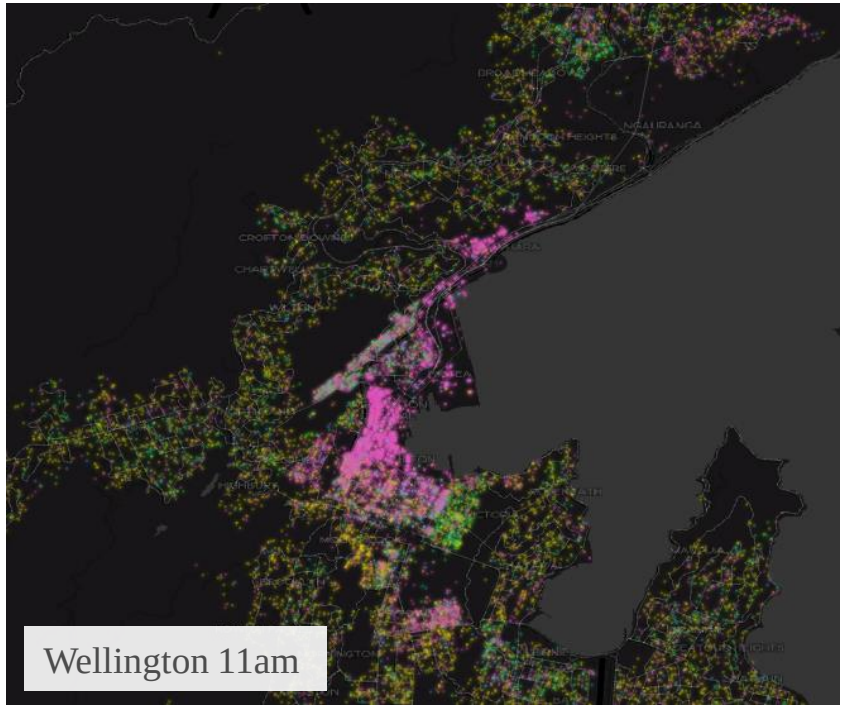
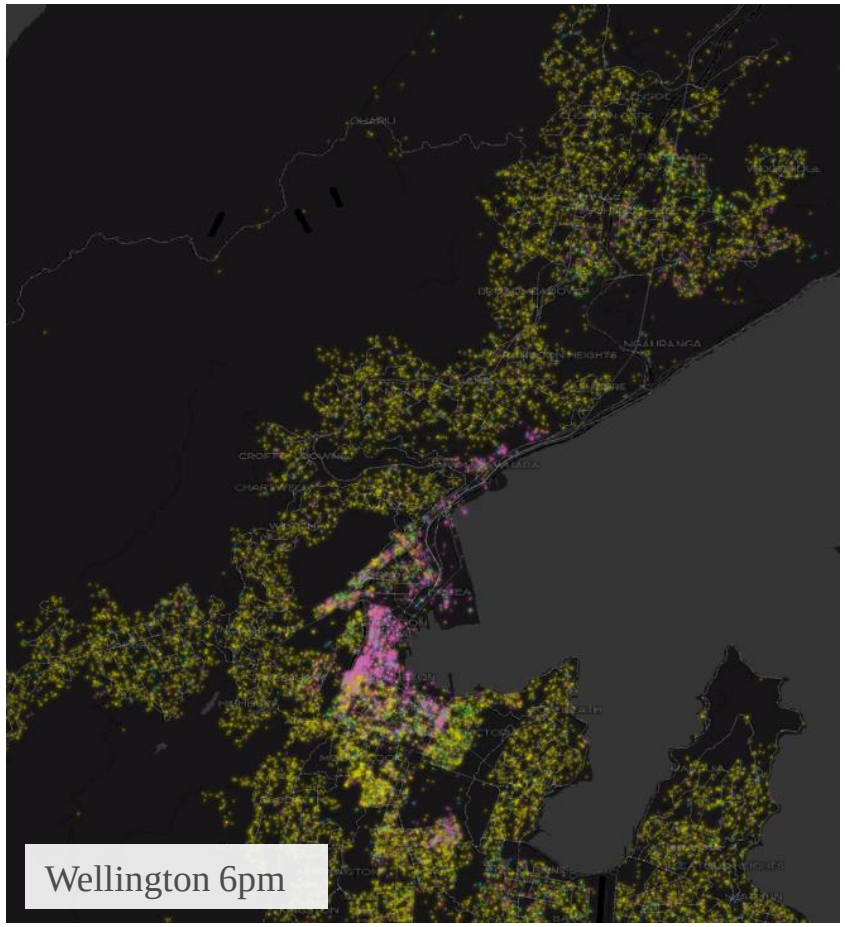




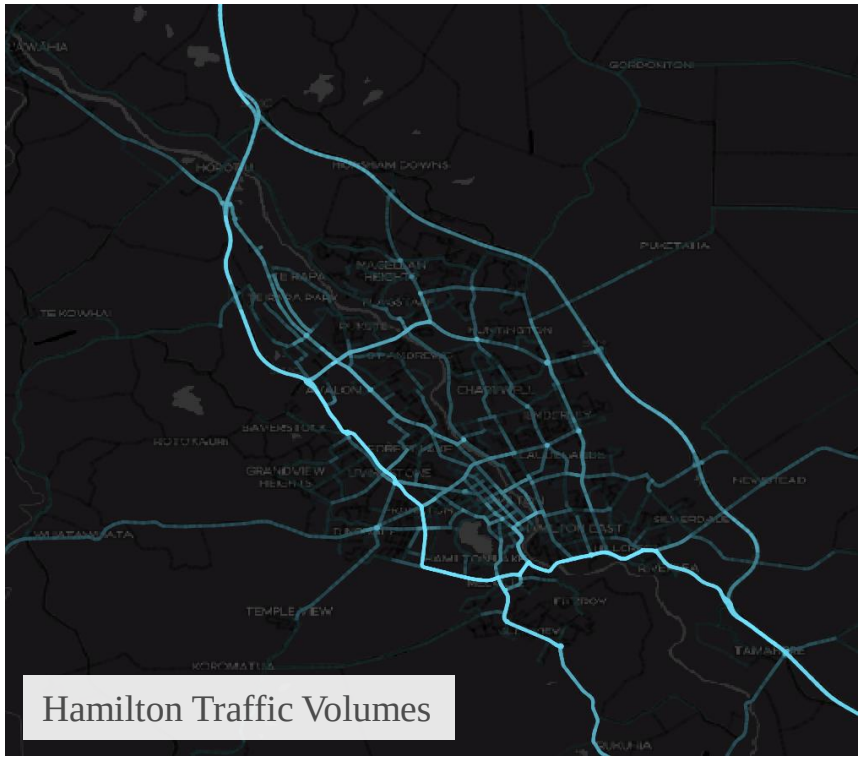


Data: Stats NZ, LINZ

Technical Insights

Traffic simulation outcomes

Monty *predicts* ***vehicle traffic flows*** *for each road segment as well as* ***public transport patronage*** *for any given time during the day.*



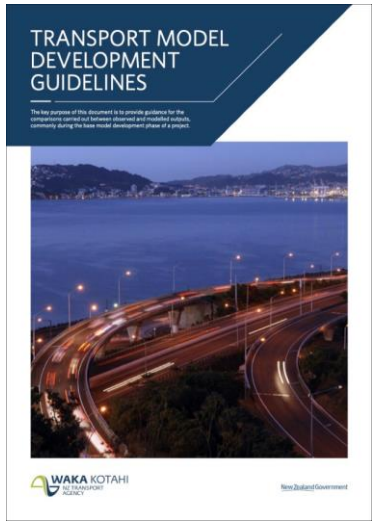
Hamilton Traffic Volumes

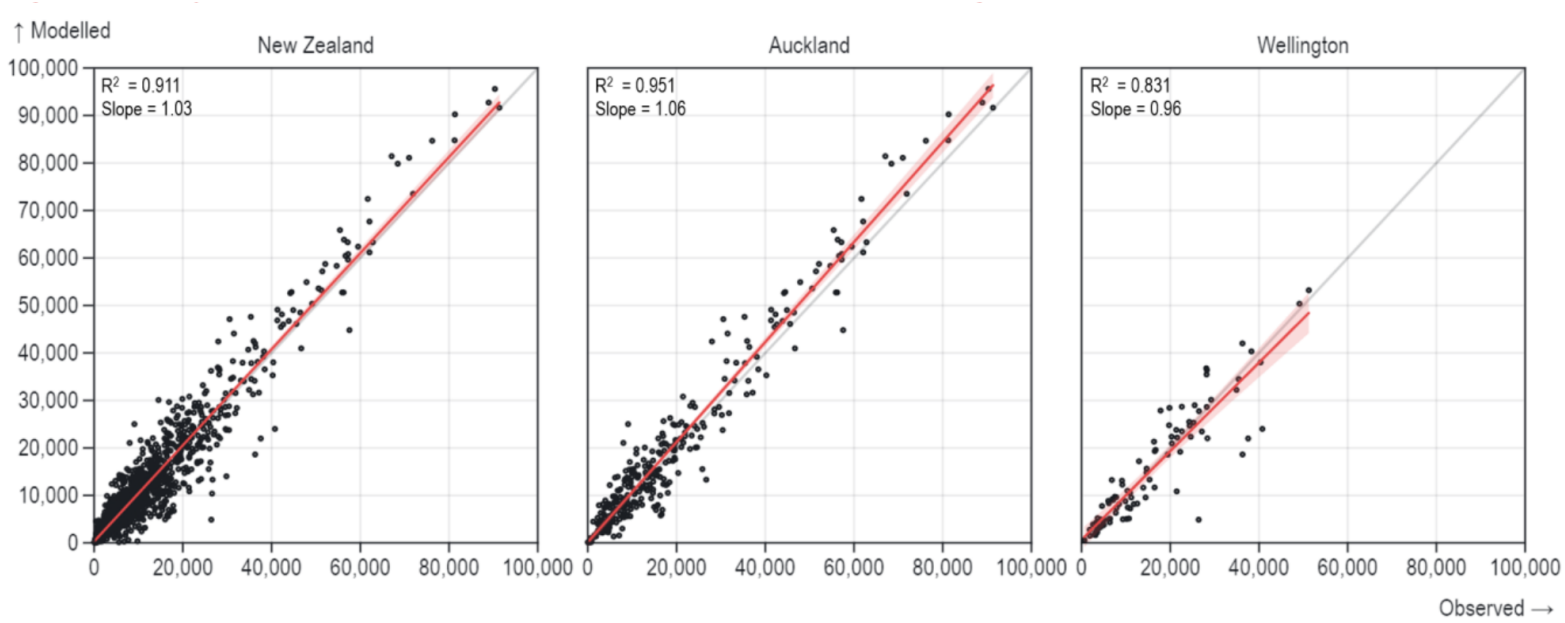
Auckland Bus Patronage

Technical Insights

Validation statistics

Monty *validates the simulation outcomes with available* ***count data*** *from various* ***sources****, for both road traffic volumes and public transport patronage.*



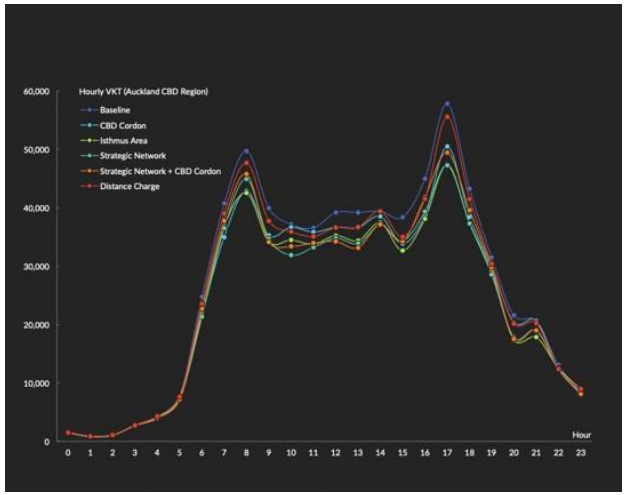


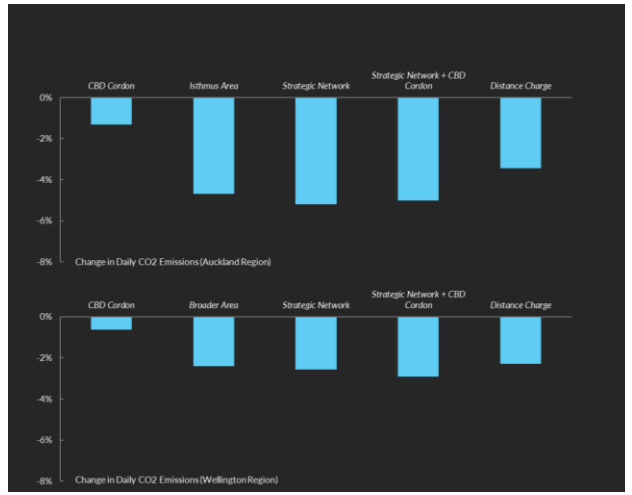
Data: Waka Kotahi TMS traffic counts

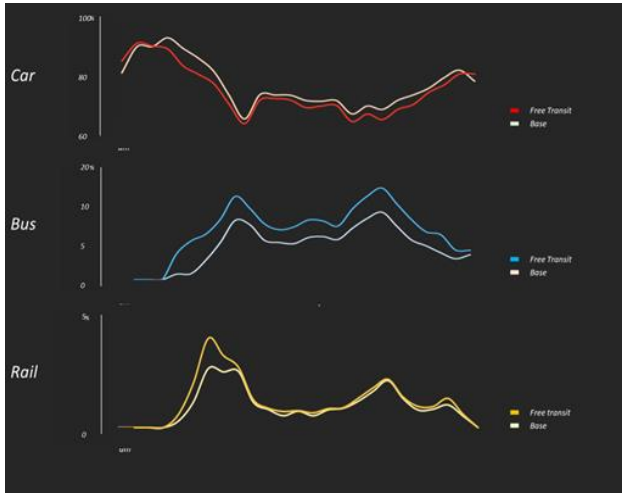
First Applications

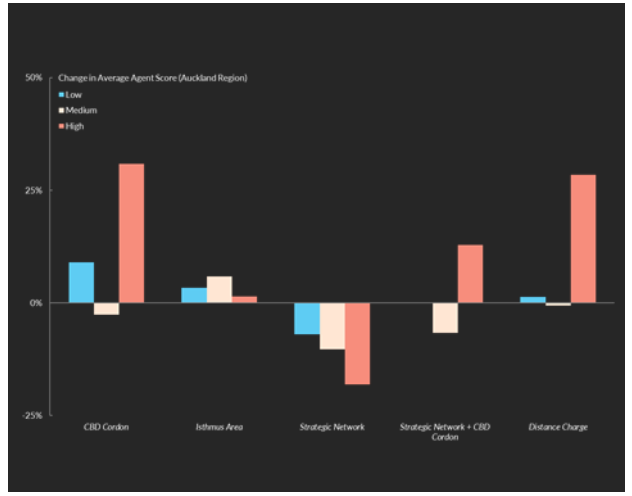
Showing the capabilities of Monty

Monty has been applied for various interventions:
*This includes **road pricing** studies, **road closure** modelling (flood response), or **city-shaping infrastructure** predictions.*









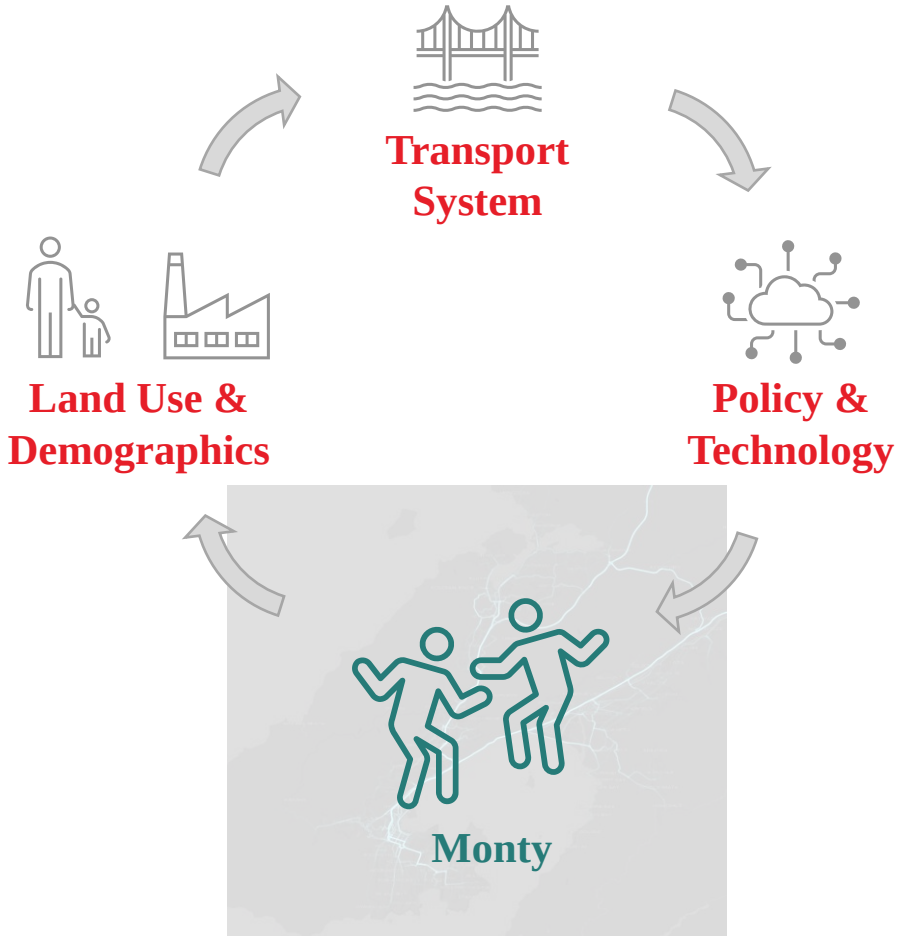
Comprehensive outcome analysis:

- Vehicle kilometres travelled
- CO_2 Emissions
- Mode shifts
- Impact on individual people

Monty's vision

Work on the future of New Zealand, together!

*An **integrated, transparent planning approach** with different partners improving the future for New Zealanders.*



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