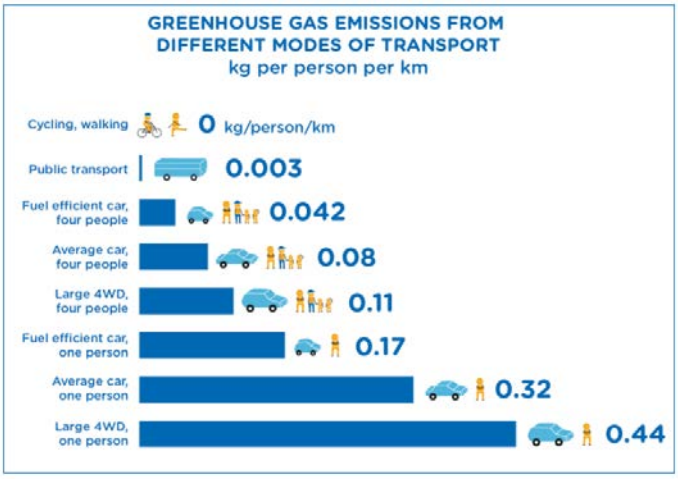
Problem Statement

How do we measure the effect of TfNSW's mode shift based emissions reduction strategies?

SU 18-03

Sustainability

Problem Description

Question	Response
Description of the problem and purpose of the proposed research	The NSW Government's Climate Change Policy Framework includes an aspirational objective to achieve net zero emissions by 2050. As a NSW Government agency, there is a need to explore how Transport for NSW (TfNSW) can measure its progress in contributing to this outcome. The transport sector accounts for a significant share of the state's total energy consumption and carbon emissions. As identified in the Future Transport Strategy 2056, one way that TfNSW can contribute to achieving net zero emissions by 2050 is by encouraging a shift towards lower emission transport modes, that is, moving from single occupant non-renewable fuelled passenger vehicles to public transport and active transport modes or electric vehicles that have fewer greenhouse gas emissions. Figure 1 indicates emissions from different transport modes, and illustrates that mode shift can significantly change the transport sector's emissions profile.  Figure 1: Emissions profiles of different transport modes. Source: *Future Transport Strategy 2056*. *It is acknowledged that emissions may vary and that this representation may not be 100% accurate e.g. source of power is important to consider. At present there is no model that allows TfNSW to readily measure the impact of mode shift from passenger vehicles to active and public transport, or the shift to electric vehicle use and its associated greenhouse gas emissions profile. Such a model will be important in enabling TfNSW to measure the transport sector's contribution towards the NSW Government's aspirational objective of net zero emissions by 2050. TfNSW is interested in research which examines how other jurisdictions around Australia and globally are measuring mode shift and associated reductions in greenhouse gas emissions. Preferably, the research will identify the emerging best practice approach and methodologies in this area, and demonstrate how they could be applied by TfNSW.

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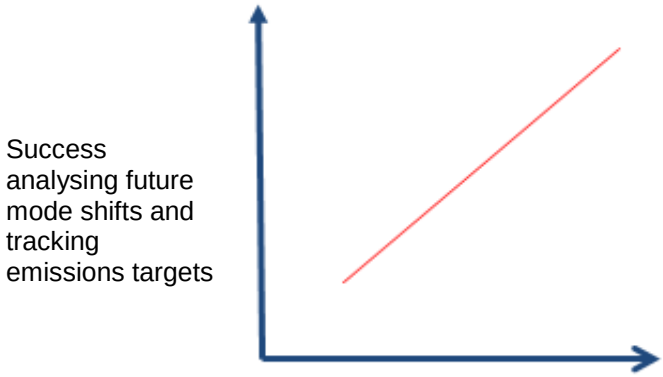
Hypothesis & Variables

Question	Response
For explanatory research, please describe a clear hypothesis with variables for testing **For exploratory research,** please describe how the proposed research will contribute to future explanatory research	There are two steps in this research. The first is to identify whether there has been a mode-shift and what the magnitude of this shift is. The second is to measure the impact of this shift on greenhouse gas emissions profiles. The hypothesis is that examining best practice approaches/models of measuring mode shift impacts on greenhouse gas emissions profiles will better position TfNSW to analyse future mode shifts and track emissions targets. There are a number of different mode share shifts that could be measured. For example: • Mode shift to electric vehicles • Mode shift to public transport (buses) • Mode shift to public transport (rail: light rail, metro, heavy rail) • Mode shift to active transport (cycling) • Mode shift to active transport (walking) • Mode shift to public transport and related shift in walking or cycling (or not) • Mode shift to point to point rideshare services  The next stage of this research would be to use this knowledge to create a tool/model that allows TfNSW to readily measure the impact of mode shift and its associated greenhouse gas emissions profile.

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Strategic Criteria & Alignment

Question	Response
Alignment with strategic theme	This problem statement is aligned with the TfNSW Strategic Research Theme 'Sustainability'. The transport sector accounts for a significant share of the state's total energy consumption and public infrastructure investment. Mode shift to active and public transport, as well as to electric vehicles, will reduce greenhouse gas emissions intensity. Developing a model that measures mode shift from passenger vehicles to public and active transport and electric vehicles, and their consequent emissions output will enable TfNSW to track the progress of the transport sector's contribution to net zero emissions by 2050.
External driver of change analysis **Outline how the research will better position TfNSW to respond proactively to macro drivers of change**	This Problem Statement is focussed on a number of external drivers of change that present challenges and/or opportunities to TfNSW. **Political** NSW Government's Climate Change Policy Framework states that NSW will take action that is consistent with the level of effort to achieve Australia's commitments to the Paris Agreement. **Economic** There are economic costs associated with transport emissions. For example heavy reliance on fossil fuels for passenger vehicles, which are subject to market conditions, may impact household budgets. Further, studies indicate that improved air quality may lead to reduced public health spending. Consequently, there are also economic benefits in reducing emissions via mode shift. **Social** Mode shift to active and public transport or electric vehicles may require raising awareness and/or behavioural change amongst stakeholders. **Technological** New sources of (digital) data are increasingly available that may allow mode shift emission reduction measurement/modelling to occur, for example, Opal data. **Legal** NSW Government's *Climate Change Policy Framework* outlines that the role of government is to implement emissions savings policies that are consistent with achieving the Commonwealth Government's interim and long-term emissions-saving objectives and are fair, efficient and in the public interest. **Environmental** NSW Government's Climate Change Policy Framework comprises the long-term aspirational objective to achieve net zero emissions by 2050.
Forward looking	This Problem Statement is forward looking in that it will lay the foundations to develop a model that measures mode shift and its impact on emissions, which at this stage is not yet available. This will help track against NSW Government's Climate Change Policy Framework target to achieve net zero net emissions by 2050.
Potential research impact	Provides a model that helps understand the impact of mode shift on emissions reductions.

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Technical Criteria

Question	Response
Innovation **Outline how the proposed research will result in new knowledge**	This research will potentially lead to a new tool/model for TfNSW.
Basis in completed research and/or observed practice	Limited research in this area has been found. However, one paper that sheds some light on the topic is: • Stanley, J., Ellison, R., Loader, C., and Hensher D. (2017) *Getting off the greenhouse gas: Public transport's potential contribution in Australian cities.* Institute of Transport and Logistics Studies, The University of Sydney Business School. See: http://sydney.edu.au/business/__data/assets/pdf_file/0009/326961/ITLS-WP-17-13.pdf
Feasible data requirements	Environmental indicators from Sydney Trains, NSW Trains and the State Transit Authority are currently captured under the Transport Environment and Sustainability Policy Framework's indicators and targets. Since 2013/14 each of these operating agencies has reported annually to the Asset Standards Authority on the following indicators: • Energy consumption measured in GJ • Greenhouse gas emissions tCO_2-e • Energy Intensity of public transport: • kJ/person/km travelled • kJ/passenger seat/km travelled Approximately three weeks' notice will be required to access the above data. **Available data sets** • Transport for NSW Household travel survey data • Opal data • Roads and Maritime Services vehicle registrations • Public transport passenger data

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Level of Collaboration & Resource Requirements

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Level of collaboration **Please select the level of collaboration required to complete the proposed research**	**1. 'Quick-Fire' Research** ☐ Intense bursts of research activity (e.g. under 8 weeks). Intended to make use of 'hackathon'-type environments, where students/researchers work collaboratively and intensely on particular problems involving data interrogation and visualisation.
	2. Undergraduate Final-Year Research ☐ Suitable for final-year undergraduate students (e.g. capstone, Honours) as part of the research requirements for their undergraduate degree (i.e. 1 to 2 semesters).
	3. Higher Degree Research ☒ Project may form whole or part of a postgraduate research degree (i.e. Masters, PhD), and contribute to new knowledge (i.e. 1 to 3 years).
	4. Major Collaborations and Funded Research ☐ Project may form the basis for a significant collaboration agreement between TfNSW and the relevant research institution, including major competitive grant funding (e.g. Australian Research Council funding with TfNSW as an industry partner).
Comments	This project could form all or part of a PhD or Master of Research.
Supporting TfNSW resources	TfNSW will facilitate access to subject matter experts and project support (up to 4 hours per week). TfNSW will help attain required data.

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