Transport Knowledge Hub Environment –Emissions Group

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Meeting date & time Thursday 26 July 2018, 9:00am – Noon
Meeting location NIWA - 41 Market Place Viaduct Harbour

Agenda for this session

Introduction to the day	9:20 – 9:30
Ports of Auckland Update **Rosie Mercer – Ports of Auckland**	9:30 – 9:45
PEMS Research Update **Jayne Metcalfe - EIL**	9:45 – 10:00
Auckland Council Update **Nick Talbot – Auckland Council**	10:00 – 10:15
Auckland Transport Update **Carl Chenery and Viv Heslop – Auckland Transport**	10:15- 10:30
Morning tea	10:30-11:00
TKHE - Emissions Group – Research Questions **Sharon Atkins and Greg Haldane - NZTA**	11:00 - 11:15
Roundtable **All**	11:15 - 12:00

Purpose of the meeting

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- **Knowledge Sharing**
- **Looking to the future**

The knowledge hubs provide a mechanism for members of the transport research community from public and private organisations, as well as academia, to **connect with each other**.

It is a channel for the sector to work together to **identify and prioritise data and research needs** considering the broader framework of the Transport Domain Plan and Research Strategy.

Progress to date with stocktake/research prioritisation

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- July 2017 workshop – Stocktake and overview of existing databases
- Dec 2017 workshop – Panel discussion/need for gap analysis and research action plan
- Feb – June 2018 –Subgroup (Incl. MoT, MoH, MfE, NZTA & reps for CASANZ TSIG and NAQWG) undertake gap analysis and develop research priorities
- June–July 2018 – Consultation on research priorities with wider emissions group

Development of research action plan

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- The **Transport Domain Plan** outlines the main statistical and information priorities (enduring questions) for the transport sector, and provides guidance on how to address them
- The **Transport Research Strategy** 2016-2020 gives clear guidance on the direction for transport research
- The **Triple-4 Framework** provides clear guidance on how best to prioritise effort according to sector needs. Supports evidence-informed intervention decisions.

T10 Safety & Health	The transport system can result in harm to people and their health. This topic covers the risk profiles across transport modes and the factors that contribute to these **risk profiles**. Such information helps to understand how these risks lead to transport related harms, their causes and the mitigation opportunities.
Enduring questions	**EQ10.2** What is the **risk profile of different types of transport**, what factors contribute to this risk and in what quantities and proportions, and how are these things changing, including modally, regionally and temporally? **EQ10.3** What are the **sources and types of health impacts from transport**, what are the harms and benefits of these impacts, who experiences them, and how are these things changing, including modally, regionally and temporally?
High priority initiatives	**R10.1** Develop health and safety risk profiles and exposures that lead to transport-related harm
Medium priority initiatives	**R10.2** Integrate data sources to develop transport harm cost profiles
T11 Environment	The relationship between transport and the environment is critically important. This topic is about understanding the **types of emissions** that come from the operation of the transport system. This information is critical to understanding not only how transport and the environment interact, but also the mix of policy responses required to address related impacts.
Enduring questions	**EQ 11.1** In what ways and to what extent does the transport system impact on the environment and how are these things changing, including spatially, modally and temporally? **EQ 11.2** In what ways and to what extent does the environment impact on the transport system and how is this changing, including spatially, modally, and temporally?
High priority initiatives	**R11.1** Research into transport emissions profiles **R11.2** Develop environmental impact framework for emissions and infrastructure
Recommended initiatives	**R11.3** Conduct strategic environmental horizon scanning **R.11.6** Conduct research into the impact of large ships on local environments while in port

TRIPLE-4 KNOWLEDGE DEVELOPMENT AND PRIORITISATION FRAMEWORK

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Overview		
Purpose	To gather additional information on people's attitudes, preferences and perceptions about transport.	
Problem definition and knowledge development opportunity	People's attitudes, perceptions and preferences greatly influence their transport choices. In order to understand why people make the transport choices they do, it would be useful to have additional information about why they have these attitudes, preferences and perceptions. This type of information would be useful to supplement economic modelling techniques to inform a range of policy, investment and operational decisions. At present, data on people's attitudes, preferences and perceptions is limited largely to a small number of surveys conducted by commercial operators (which are not publicly available), and individual, often qualitative, studies carried out in the academic sector. There is an opportunity to work with the academic sector to develop the skills and knowledge of the public sector in this field.	
Response	Develop research and capability – carry out additional surveys to gather information on people's attitudes, preferences and perceptions of the cost, reliability, security, safety and convenience across different modes of transport.	
Triple-4 assessment		
Knowledge gap in achieving long-term sector outcomes	Effectiveness Efficiency Safety & Responsibility	The proposed research will provide additional measures to better understand user needs and preferences to assist policy and investment planning to ensure the transport system is effective, efficient and safe
Nature of knowledge gap	*Better understanding user preferences will help:*	
	Measuring outcomes	Inform how outcomes might be best assessed
	Delivering outcomes	Identify the type of interventions to influence outcomes
	Balancing outcomes	Identify appropriate balance and trade-off between outcomes
Assessing priorities	Impact	The proposed research will add to current stock of knowledge as such information is currently incomplete H
	Breadth of application	The information will be useful to a range of stakeholders and applications H
	Access to right resources	Some methods are available for testing but the research will require a large sample size to obtain representative results M
	Strategic value	The knowledge can be used to inform the Government Policy Statement on Land Transport Investment and many other strategic policy decisions H

Research priorities identified

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1. How well do we understand the current and likely future challenges to reducing air impacts from road transport and do we have the data and tools to address them in the next 10 years (i.e. a **roadmap)**?
2. How well do we capture and **integrate real-time changes** in the fleet and travel behaviour into our emission models to characterise vehicle emissions?
3. How well can we quantify the real **cost** (to human health, the environment and the economy) **of air quality impacts** from road transport?
4. How well do we understand the contributions of **heavy vehicle (bus and truck) emissions** to air quality?
5. How well do we understand how extensively **gross emitting vehicles** (e.g. poor maintenance and tampering) undermine fleet improvements and what can be done to practicably address this?
6. How well do we understand the current and likely future impacts of **non-tailpipe emissions** (e.g. road dust and unsealed roads)?
7. How well does our existing **monitoring** capture the air quality risks from road traffic and how can we improve our monitoring of air quality risks?
8. How well do we understand the influence that **land-use and transport planning** can have on air quality impacts and what role can integrated land-use and transport planning play in improving air quality?
9. How well can we quantify the impact of **ship emissions** on local air quality?

Overview of each research question drafted

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5. Vehicle emissions (Gross emitters)	
Overview	
Purpose	To improve the understanding of the impacts of gross emitting vehicles on air quality
Research question	How well do we understand how extensively gross emitting vehicles (e.g. poor maintenance and tampering) undermine fleet improvements and what can be done to practicably address this?
Problem definition and knowledge development opportunity	The distribution of vehicle emissions in the fleet is highly skewed with a small number of vehicles contributing disproportionately to total emissions. Whilst older vehicles typically emit several times the emission of their newer counterparts (due to older technology), the impact of gross emitters (due to poor maintenance and tampering) can be upwards of orders of magnitude greater. In New Zealand, all vehicles entering the fleet are required to meet minimum emission standards on entry and then, once in service, a vehicle's exhaust emission system or control equipment must not be modified so as to prevent the vehicle being able to a pass a metered test which sets limits for: • Carbon monoxide (CO) and hydrocarbons (HC) for petrol vehicles • Opacity (a proxy for particulate matter) for diesel vehicles. All vehicles must also pass a visible smoke check to be issued with a certificate or warrant of fitness. However compliance associated with this in service requirement is poorly recorded. Worldwide, claims of widespread tampering with vehicle emission control technology have been steadily increasing. VW emissions scandal aside, the next most pressing concern has been the rise in technology being offered aftermarket to bypass the use of exhaust treatments (such as AdBlue) which are integral to ensuring vehicles meet Euro 4/IV and better emission standards for oxides of nitrogen (NO_X). Defeat devices are widely available on the web, especially for use in heavy duty diesel trucks. The difficulty is in knowing exactly how widespread the tampering is and its likely effect on fleet emissions and subsequent health effects. This is a large knowledge gap – limited data on maintenance and no data on the influence/extent of tampering in the NZ fleet (historically and current) to understand the significance of gross emitters and how they are undermining fleet improvements. The ability to identify gross emitters could provide a cost-effective management approach to reducing emissions from the vehicle fleet. Opportunities - Observational methods that can isolate individual vehicles (e.g. RSD, PEMS) can now be combined with data on individual vehicle histories to characterise gross emitters.
Response	• Conduct research to investigate the extent/impact of tampering. Review of available methods. • Undertake new RSD round. • Analyse of RSD database to investigate establish potential influence on fleet emissions. • Investigate characteristics of temporary, deteriorating and persistently gross emitting vehicles.

Feedback received (1)

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- Align priorities with GPS on land transport strategic priorities.
- Need to ensure GHG emissions included as well as harmful.
- Are Q1 & 2 really research questions?
- Suggest removing the word 'well' from the questions and then shrink down. E.g. 'What is the impact of shipping emissions on local air quality? Is this important?'
- Do they cover the big picture – where the priorities are if we look towards the future (mega) trends from an international perspective. I.e. what are the trends in transport and does this mean our focus will change?
- Another gap? –Emissions and fuel efficiency of off-road diesel vehicles. EECA estimates that off-road diesel consumption accounts for approximately 20% of diesel combustion at a national level (on-road transport accounts for 66%). We have virtually no information about where these off-road vehicles are, or what they are. Emissions from these vehicles are unregulated and will become more significant as emissions from on-road vehicles continue to decrease.

Feedback received (2)

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- Under Q2 'Integration of real time changes in transport emissions':
  - Replace 'real time' with timely
  - suggest new bullet point under 'response' – The costs and benefits of developing a micro-simulation emissions model (as opposed to an average speed emission model).
- Non-tailpipe emissions (Q6) should be split to cover unsealed road dust and brake and tyre wear separately
- Prioritisation feedback provided to date generally puts:
  - Health Impact assessment (Q3), AQ monitoring (Q7) as HIGH
  - Land use and transport planning (Q8) generally HIGH and comments regarding how we influence planning
  - Shipping (Q9) ranked lowest priority

Initial Prioritisation from feedback

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Triple 4 Prioritisation	1.Emissions Road map	2.Integration of real-time changes in transport emissions	3.Environmental and health impact assessment	4.Vehicle emissions (heavy vehicles)	5.Vehicle emissions (gross emitters)	6.Vehicle emissions (non-tail pipe) a. Brake and tyre b. Road dust (unsealed roads)	7.Air quality monitoring	8.Land use planning and transport	9.Shipping emissions
Impact			H	H	M/H	M	H	H	M
Breadth of application			H	M/H	M	M	H	H	M
Access to right resources			H	M	M	M	H	L/M	M
Strategic value			H	H	M/H	M	H	H	M
Research proposed			**HAPINZ update**	**First stage: Real world emission monitoring (RSD/tunnel)**	**First stage: New RSD round; Analysis of RSD database.**	**First stage: Literature review on research/model /tools/ methods available to estimate impact in NZ**	**Low cost sensor trials. Prioritisation/ Optimisation of existing monitoring network.**	**First stage: Literature review/gap analysis**	**First stage: Literature review/gap analysis**
Is funding already allocated?			**Yes, but could expand scope through extra funding**	**No**	**No**	**No**	**Yes, for above.**	**Possibly monitoring gap analysis. No to rest.**	**No**
Comments	Roadmap covers all the research questions (overarching) . Not a research question. **High Priority** Action for the group.	Should broaden to include GHG & harmful emissions. Not a research question. More improving BAU practices- will be taken forward through that mechanism.	**High priority.** But note funding/programme in progress. Opportunity to include considerations raised. Linked to other research question 7 – AQ monitoring/ exposure modelling.	**High priority. Costs of programme (monitoring/modelling) high, so will need to stage.**	**High priority. Use RSD to characterise gross emitters.**	**Medium priority for non-tail pipe, but will increase in future as exhaust emissions impact reduce. Separate road dust aspect as different issues/response. Research undertaken/mitigation underway.**	**High priority.** Linked to health impact assessment (question 3).	**High priority, but response not clearly defined. How to traction through planning process?** Monitoring aspect linked to question 7 can be taken forward.	**Medium priority, as localised impacts and lower contribution to transport emissions compared with road transport. But will increase in future.**

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Thoughts?

Which question do you think will deliver the best outcomes for air quality & why

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Next steps?

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- Welcome further feedback!
- Aug-Sep 2018 – Finalise research questions in the Triple-4 framework and submit to TKH for endorsement.
- Take forward research projects where there is budget (e.g. Low costs sensor trials, monitoring network prioritisation, VEPM updates, HAPINZ update)
- Scope out other 'priority' research proposals e.g. RSD next round/database analysis
- Action for TKHE-EG subgroup – start to frame up Question 1 'roadmap'

Roundtable: NZTA

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Guidelines/ Specifications/ Reports	• NO2 monitoring network data for 2017 available https://www.nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Air-and-climate/Monitoring/Transport-Agency-network/Network-Sites-Monitoring-data-2007-2017-Basic-28June2018.xlsx • TRAMS data upload – completed for 2017 data. https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/tools/transport-related-air-quality-monitoring-system/ • NZTA NO_2 monitoring network, currently working with geospatial team to provide interactive tool/map of data on NZTA open data portal. Purpose: improved accessibility/usability of data. • Finalisation of Guide to assessing air quality impacts from state highway projects July 2018. https://www.nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Air-and-climate/Air-pollution/14-265-Air-quality-assessment-guide-Jul-2018.pdf • Updates to the Air Quality Screening Tool (https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/tools/air-quality-screening-model/) underway: to include VEPM 5.3, updated algorithms and additional pollutants $PM_{2.5}$ and CO_2. Should be completed in next couple of months. • Transport Related Air Emissions Inventory Stocktake (TRAINS) 2018 report is on website: https://www.nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Air-and-climate/Research-and-information/TRAINS-Final-report-14June18.pdf • Stocktake of Transport Related Air Pollution (TRAP) Research (2010) is on website https://www.nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Air-and-climate/Research-and-information/Research-reports/Report-NZTA-TRAP-Research-Plan-v2-19Aug10.pdf
Special Projects/ Initiative	• National Vehicle Emissions Mapping tool. Geospatial mapping of vehicle emissions from state highways and local roads. Link to story map on website https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/technical-disciplines/air-quality-climate/planning-and-assessment/vehicle-emissions-mapping-tool/ Further development of tool underway and enabling wider access to maps. • Dust risk mapping for unsealed roads, methodology development underway. Purpose: to develop maps of TLA areas displaying dust risk categories.
Research	• Current: Testing New Zealand vehicles to measure real world fuel use and exhaust emissions (PEMS research) • Proposed: Low cost sensor trial (NO2,PM2.5), Waterview tunnel • Proposed: Review/optimisation of national ambient air quality monitoring network

Roundtable: NIWA

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Guidelines/ **Specifications/** **Reports**	• Nitrogen dioxide monitoring in Hamilton. Prepared for Waikato Regional Council. NIWA Report 2018109AK.
Special Projects/ **Initiative**	• Webinar/video series being planned to support upcoming release of NO_2 models
Research	• Recent: NO_2 sampling campaigns completed in North Shore and transect of SH1 in Bombay Hills • Jaizhen Chen. Vehicle emission prediction using remote sensing data and machine learning techniques. Submitted to University of Auckland for MSc, February 2018. • Current: Analysis of seasonal patterns in NZTA NO_2 data and implications for commissioning sub-annual sampling campaigns • Upcoming: Release of national NO_2 model; synthesis of roadside NO_2 gradients
Conferences	"Patterns of monthly variation in urban ambient nitrogen dioxide observed in a national monitoring network, plus implications for exposure assessment" And "Variations in roadside gradients of nitrogen dioxide observed in a range of urban and rural settings" To be presented at ISES-ISEE 2018 conference in Ottawa, 23-27 Aug

Roundtable: GNS Science (Perry Davy)

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Reports	• Davy PK, Ancelet T, Trompetter WJ, Markwitz A. 2017. Source apportionment and trend analysis of air particulate matter in the Auckland region GNS Science consultancy report; 2014/194. http://knowledgeauckland.org.nz/assets/publications/TR2017-001-Source-apportionment-trend-analysis-air-particulate-Auckland-GNS-July-2017.pdf Includes spatially resolved concentrations and trends in motor vehicle contributions, shipping emissions and the impact of road dust on $PM_{2.5}$ and PM_{10} concentrations and composition at both roadside and residential air quality monitoring sites over an 8-year dataset. The effect of motor vehicle engine improvements and the impact of changes in Fuel Specification Regulations is also assessed. This is due to be updated to include 12 years of data (2006-2018).
Special Projects/ Initiative	• Black carbon in New Zealand - includes contribution to ambient air BC in PM due to emissions from the transport sector (motor vehicles, shipping) and the trends over a 20-year BC dataset. Black carbon is a combustion-derived atmospheric aerosol that has important implications for human health and the Earth's climate. Exposure to ambient concentrations of black carbon (BC) has been associated with significant negative impacts on human health, including increased hospital admissions and mortality due to cardiovascular diseases. Black carbon also plays a unique role in the Earth's climate system. While most aerosols in the atmosphere scatter incoming solar radiation, resulting in a net cooling effect on the atmosphere, BC absorbs significantly more light than it reflects, resulting in a net warming effect. Light absorbing particles radiate long-wave energy that heats the surrounding air. This results in a positive (warming) forcing (Jacobson, 2001). The magnitude of BC's warming has recently been estimated to trail only the greenhouse gas carbon dioxide (Bond et al., 2013).
Research	• Heavy metals in particulate matter associated with transport emissions (motor vehicles, road dust, shipping emissions) • Impact of motor vehicle associated PM on indoor air quality at schools