Final Report

Assessment of greenhouse gas emissions from transport of motor vehicles to New Zealand and distribution within New Zealand via Auckland and alternative North Island ports

Prepared by	Shannon Ball & Anthony Hume Enviro-Mark Solutions Limited
Contact details	Shannon.Ball@enviro-mark.com +64 3 321 9823
Client Contact	Matt Ball Ports of Auckland Limited
Contact details	BallM@poal.co.nz +64 9 348 5262
Report date	June 2017
Report reviewed by	Belinda Mathers, Enviro-Mark Solutions Limited

Inspiring Action for a Better Environment

P O Box 69040 · Lincoln 7640 · New Zealand
Gerald Street · Lincoln 7608 · New Zealand
0800 ENMARK · www.enviro-mark.com

ENVIRO-MARK SOLUTIONS

Contents

Disclaimer

Introduction

This report presents the findings of a study to estimate the greenhouse gas emissions (carbon footprint) from the import of motor vehicles (both new and used) to New Zealand via ports in Auckland, Whangarei and Tauranga. The results of this study highlight key emission sources, assumptions used and limitations of current data sources. Publically available emission factors approved by Enviro-Mark Solutions were used to complete the study.

Purpose of this report

The purpose of this study was to assess the greenhouse gas emissions from the import of new and used motor vehicles to selected delivery ports within three primary scenarios to the North Island of New Zealand and the wider distribution of those vehicles within New Zealand. The first scenario represents estimating emissions from the status quo with vehicle import through Auckland's port operations before wider distribution of vehicles within New Zealand. The second and third scenarios consider potential emissions from switching the import of vehicles from Auckland to ports at Whangarei and Tauranga. In each scenario the main variable is the entry port for vehicles to New Zealand. Other data including the departure port to New Zealand, final destination of distributed vehicles and the number of vehicles imported have been held constant each scenario.

Approach

During the scoping study, four primary tasks were completed:

1. Identification of key import scenarios
2. Identification of key activities and related emission sources (Table 1)
3. Estimation of the greenhouse gas emissions from the importation of vehicles via Auckland, Whangarei or Tauranga (Table 2 and Table 3)
4. Identification of data gaps, assumptions needed and the potential limitations of greenhouse gas measurements

To complete the emissions estimates, a data sheet was provided by the Ports of Auckland for different vehicle types imported through Ports of Auckland. The data covered a period from February 2016 to February 2017. In addition to this, a data sheet containing information about the last port of call for each vessel was provided. This data was used to complete estimates for emissions from the importation of vehicles through the Auckland, Whangarei and Tauranga ports into New Zealand. Assessment of the accuracy of raw data was beyond the scope of the project completed.

Table 1 Summary of activities, emission and data sources used and key emission sources identified

Emission source	Data used	Data Sources
Transport from overseas departure port to NZ port of entry e.g. Auckland	Location of last call port	Vessel data provided by Ports of Auckland (POAL)
	Weight of vehicles from last callport (kg)	Data sheet provided by POAL
	Typical distance from last call port (km)	SeaRates.com
Vehicle transportation to NZ	Weight of light vehicles (kg)	Data sheet provided by POAL

destination	Distance to NZ destination (km) Regional demand for vehicles	Google Maps New Zealand Institute of Economic Research (NZIER)
Heavy vehicles to NZ destination	Number of heavy vehicles Typical distance to NZ destination (km) Regional demand for vehicles	Data sheet provided by POAL Google Maps NZIER
Coastal shipping	Location of port Distance to port (km)	Data sheet provided by POAL SeaRates.com

Estimated emissions

The key findings of the study are provided in Table 2. The following is based on the data provided by the Ports of Auckland supplemented with other data sources that were readily available. Further detail is provided in the spreadsheet issued with this report.

The key findings of the study are provided in Table 2. Freight based emissions for the import of vehicles of through Auckland into New Zealand are estimated at 156,243 tCO_2e, based on emissions from that last call port. Emissions for the import of vehicles through Whangarei are estimated at 177,765 tCO_2e. Emissions for the import of vehicles through Tauranga are estimated at 167,979. Estimated emissions per vehicle are 0.65 tCO_2e, 0.74 tCO_2e and 0.70 tCO_2e for import via Auckland, Whangarei and Tauranga respectively. Table 3 shows the percent contribution of different activities to emissions for the import of vehicles. The estimated emissions for importing vehicles in to New Zealand through Whangarei are 12% higher than estimated emissions from the import of the same number and types of vehicles via Auckland. The estimated emissions for importing vehicles in to New Zealand through Tauranga are also 7% higher than estimated emissions from the import of the same number and types of vehicles via Auckland.

Table 2 Summary of headline estimated emissions

Emission source		Tonnes carbon dioxide equivalent (tCO_2e)
Estimated emissions based on import through	Auckland	156,243
	Whangarei	177,765
	Tauranga	167,979
Emissions per vehicle delivered	via Auckland	0.65
	via Whangarei	0.74
	via Tauranga	0.70
Difference between Auckland and Whangarei		21,522 (12%)
Difference between Auckland and Tauranga		11,737 (7%)

Sea freight (from the last port of call) contributes the highest proportion of greenhouse gases the import of vehicles for both Auckland and Tauranga. Emissions from sea freight to New Zealand are lowered if vehicles are imported via Whangarei rather than Auckland. Similarly emissions for coastal shipping or sea freight of vehicles to the Pacific Islands are marginally lower from Whangarei and Tauranga than from Auckland. Focussing in on shipping emissions including coastal shipping, a switch of the import of vehicles to Whangarei would reduce estimated shipping emissions by 2% for the period measured. Estimated shipping emissions increase by 8% if import of vehicles is completed using the Tauranga port. Table 4 shows the percent change in

estimated emissions for shipping and road transport of imported vehicles if they enter New Zealand via Whangarei or Tauranga rather than Auckland.

The regional distribution of vehicles imported to New Zealand is described in Appendix 1. Most vehicles imported are destined for use in the Auckland region. Vehicle distribution around New Zealand provides the greatest impact on the variation of emissions between the different ports. This variation in emissions is due to the increased road distances required for the distribution of vehicles to major cities from Whangarei and Tauranga rather than Auckland. The increased distances for distribution of vehicles increase the emissions from the import of vehicles to New Zealand through Whangarei and Tauranga. Focussing on road emissions, a switch of the import of vehicles to Whangarei and Tauranga would increase estimated road emissions by 24% and 6% respectively for the period measured.

Table 3 Comparison of contributors to estimated emissions from the import of vehicles to New Zealand via Auckland, Whangarei and Tauranga

Emission source	Auckland		Whangarei		Tauranga	
	tCO_2e	Percent	tCO_2e	Percent	tCO_2e	Percent
Sea freight to NZ port	78,641	50	76718	43	85,485	51
Coastal shipping or sea freight to Pacific Islands from NZ port	1,325	1	1,309	0.7	1,190	0.7
Road freight of vehicles <3.5t within NZ	60343	39	78903	44	64321	38
Road freight of vehicles >3.5t within NZ	15934	10	20834	12	16984	10
Total	156,243		177,765		167,979	

Note: Rounding of percentages may mean totals add up to slightly more than 100%.

Table 4 Estimated percent change in emissions from shipping and road transport of Imported vehicles through Whangarei and Tauranga

Transport mode	Port	Estimated emissions tCO_2e	Percent change in estimated emissions
Shipping (including coasting shipping)	Auckland	79,966	n/a
	Whangarei	78,027	-2
	Tauranga	86,675	8
Road (all vehicles)	Auckland	76,277	n/a
	Whangarei	99,738	24
	Tauranga	81,305	6

The influence on estimated emissions from extra road movements for the inspection and registration of vehicles were also considered for a potential a switch of imports to Tauranga. Based on POAL advice, at the current time the inspection and registration centres for imported vehicles tend to be focussed in the Auckland region. Increased road movements for the inspection and registration of vehicles from Tauranga increase estimated emissions by 18% and road emissions by 27% compared to estimated emissions for the Auckland scenario.

Assumptions and Limitations

The following assumptions were made as part of the scoping study:

- On the datasheet, all vehicles which have Auckland as the 'Final Discharge Port' or don't have any Port listed (i.e. blank) are assumed to be distributed via Auckland around New Zealand via road. All other vehicles listed are assumed to be coastal shipped to the listed destination.
- Estimated emissions for sea freight of vehicles was limited to the single journeys from the last port of call by the vessel to the port of entry for New Zealand e.g., Auckland. The emissions from the point of loading of vehicles to the final port of call before departing for NZ is not included in the analysis. When emissions from the port of origin are assessed, the difference between options is less significant (e.g. using direct routing of the vehicles from ports of origin to New Zealand results in a difference of 3% between Auckland and Tauranga compared to a 7% difference using last port of call).
- Where information, assumptions and data was provided by POAL, a high level sense check was undertaken but no detailed assessment was undertaken.
- Shipping backhaul was not considered in this study.
- A large car carrier suitable for ocean movements was assumed to be used for coastal shipping and transport to the Pacific Islands when the final port destination for vehicles was not Auckland
- NZIER vehicle demand data was used to aid the estimation of emissions for road distribution in New Zealand as described below in Appendix 1.
- NZIER vehicle demand data was applied to both light and heavy vehicles as regional heavy vehicle demand data is not available
- All vehicles entering via Whangarei or Tauranga would have the same destination as if they were imported into Auckland.
- All vehicles imported are assumed to be transported to their destination via car transporters.
- Road car transporters were assumed to be average laden for road freight of vehicles within New Zealand. All journeys were assumed to be one-way due to a lack of reliable data on backloading of vehicles.
- Vehicles that were transported by sea freight were assumed to be the same for Auckland, Whangarei and Tauranga. A large sized ocean car carrier was assumed to be used.
- Emissions from the transport of vehicles for inspection and registration were based on maintaining the current inspection network for imported vehicles without modification for the import of vehicles through ports other than Auckland. This assumption was sourced from NZIER research provided to the Ports of Auckland.
- Emissions from the transport of vehicles using ferries between the North and South Islands of New Zealand were excluded. This will not affect the difference in emissions between ports, as all Ports would be using this route.
- From the data sheet provided we were unable to accurately determine the proportion of new and used cars.
- Emissions from the uploading and down-loading of vehicles at the respective ports were not included.
- Some of the overseas ports listed in the data spreadsheet were not identified by the SeaRates calculator and were diverted to the closest port. These include:
    - Nuku Alofa was calculated from Apia port

- Papeete was calculated from Pago Pago port
- Saipan was calculated from Shimizu port

- The current study does not provide a full life cycle study but is limited to consideration of greenhouse emissions from transport of vehicles to and within mostly New Zealand. For example, environmental and social issues arising from traffic congestion or additional maintenance on road networks were not considered.
- No results are provided for other environmental impacts e.g., air pollution as a result of this scoping study.
- This assessment only includes the emissions from CO_2, CH_4, N_2O greenhouse gases.

Uncertainties

- For this project publically available emission factors were used from the Department for Environment Food & Rural Affairs (UK) database. Emission factors have inherent uncertainty because they are developed based on averaged data rather than company specific information (e.g. due to data collection methods or the uncertainty in the equipment used for measurement). A quantitative uncertainty calculation is not included in our software or assessment methods used to complete this project.
- Emissions from road transport are calculated based on average emission factors across New Zealand as opposed to the actual emissions per km on specific types of roads. It is likely that emissions on open roads would be different to those for urban motorways due to the influence of congestion on different road networks, but this impact cannot be determined. For example, congestion may mean emissions for transport of vehicles from Tauranga to non-Auckland destinations may be lower than estimated and from Whangarei to destinations south of Auckland may be higher.
- Transport distances are measured using Searates.com and Google Maps websites to ensure a common source for these types of data. In most cases the distances provided will be typical distances between different locations. Where typical distances are used uncertainty may mean the differences between one destination and another may actually be insignificant or underestimated. Also, direct observation of transport distances or vehicles journeys may be vary greatly to those listed in general references depending on carrier management and customer servicing plans.
- A consideration of total shipping routes is likely to increase the influence of emissions from shipping on the estimated emissions and reduce the significance of differences in emissions for the different ports listed.

Appendix 1 Vehicle distribution via road data

City	Demand share (%) of vehicles for distribution
Whangarei	4%
Auckland	46%
Tauranga	7%
New Plymouth	2%
Wellington	12%
Christchurch & Timaru	15%
Dunedin	4%
Invercargill	2%
Napier	4%
Nelson	5%

Note: Rounding of percentages may mean totals add up to slightly more than 100%. Source NZIER.