MEMORANDUM

TO: Future Development Strategy Hearings Committee

FROM: Drew Bryant (Senior Infrastructure Planning Advisor)

DATE: 31 May 2022

FILE NO: GHG Emissions Modelling Memorandum v3

RE: **Household Transport Emissions Analysis**

Summary

Staff have developed a model to assist Councillors deliberate on the implications of transport related GHG emissions related to different development patterns. To do this, staff have developed the model from first principles that uses a Ministry of Transport pathway as the basis for what transport will be like in the future.

The FDS proposal can potentially reduce household transport emissions by 94% of current emissions by 2050. However, this is not enough to achieve international and national targets of keeping global temperatures increases less than 1.5°C. Development within or close to Richmond/Nelson (including all suburbs) has the least amount of Vehicle Kilometres Travelled (VKT) and will generally contribute the least GHG emissions (intensification scenario). However, this is not enough on its own to meet transport GHG emission targets.

Update

This memo (Version 3) is an update to a memo (Version 2) that was attachment 5 of the staff report included in FDS deliberations agenda. Version 3 has taken into account the following:

- The Ministry for the Environment released the Emissions Reduction Plan (ERP) which provides carbon budgets and actions to meet the budgets through to 2035. The major change is in the uptake of EV's in 2035. Previous advice used was 27% of the national light vehicle fleet would be EV, whereas the ERP advises 30% of the fleet.
- The model has been updated to consider all the sites in the Urban Environment that are recommended in the officer's report (ie some sites proposed in submissions and other changes recommended by officers eg. Removing site T-54 Teapot Valley)

There was a mistake made in the intensification scenario in Version 2 which stated that the scenario needed 3 times the assumed uptake (or 45%) of intensification to achieve all development by intensification only. This has now been revised to 2 times the assumed uptake (or 30%) of intensification to achieve all development by intensification only.

These updates have made minor changes to the charts and graphs published in Version 2. Table 1 below shows the different between the draft FDS proposal in Version 2 and the updated FDS proposal in Version 3 at 2022, 2035 and 2050.

Table 1: Differences in FDS versions

Version	2022	2035	2050
2 (draft FDS proposal)	240,000	132,479	14,985
3 (updated FDS proposal)	240,000	128,016	14,648

The major difference is in 2035. This is likely due to the increase in the update of EV's (from 27% to 30%) in 2035. The intensification scenario and rural development scenario have also adjusted with the overall effect being the FDS proposal is now closer to the intensification scenario in 2035.

Introduction

Nelson City Council (NCC) and Tasman District Council (TDC) are developing a combined Future Development Strategy (FDS). International and national net GHG emission reduction targets for keeping global temperatures increases less than 1.5°C are 50% reduction by 2030 and 100% reduction by 2050. Advice from the Climate Change Commission recommendations to government is that transport will have to meet a higher proportion of net reductions than many other activities. In May 2019, NCC declared a Climate Emergency and prioiritised collective action to climate change mitigation and adaptation. In 2019, TDC adopted the Tasman Climate Action Plan which sets out goals target and actions to mitigate GHG emissions from Council activities and to advocate and encourage others to take action.

The draft FDS proposes using a combination of intensification and greenfield development to cater for the expected growth in the area over the next 30 years. The geographical constraints of the combined region means many greenfield developments are separated from the main NRUA. This includes all suburbs that make up the wider contiguous urban space straddling the boundary of NCC and TDC. The geographic separation means significant travel through rural areas. Development in these new non-NRUA greenfield areas would mean that a greater number of residents will drive long distances for everyday activities such as work or school. This will in turn increase vehicle travel and transport related Greenhouse Gas (GHG) emissions when there is a need to reduce GHG emissions.

This analysis helps to identify the development areas that contribute the greatest to transport GHG emissions and quantify the future transport emissions from the FDS proposal. This analysis only looks at opportunities to change development areas within a commutable distance to Nelson but does include all NCC and TDC in future emissions calculations.

Vehicle Kilometres Travelled

VKT is the combined distance that households travel each day and can be used as a proxy to assist in identifying the development areas that will contribute the most to transport GHG emissions. The greater the VKT, the more transport emissions a development area is likely to produce. Staff have used 2018 travel to work and school census data to determine the travel patterns of different development areas. The results of the analysis are shown in Figure 1 below.

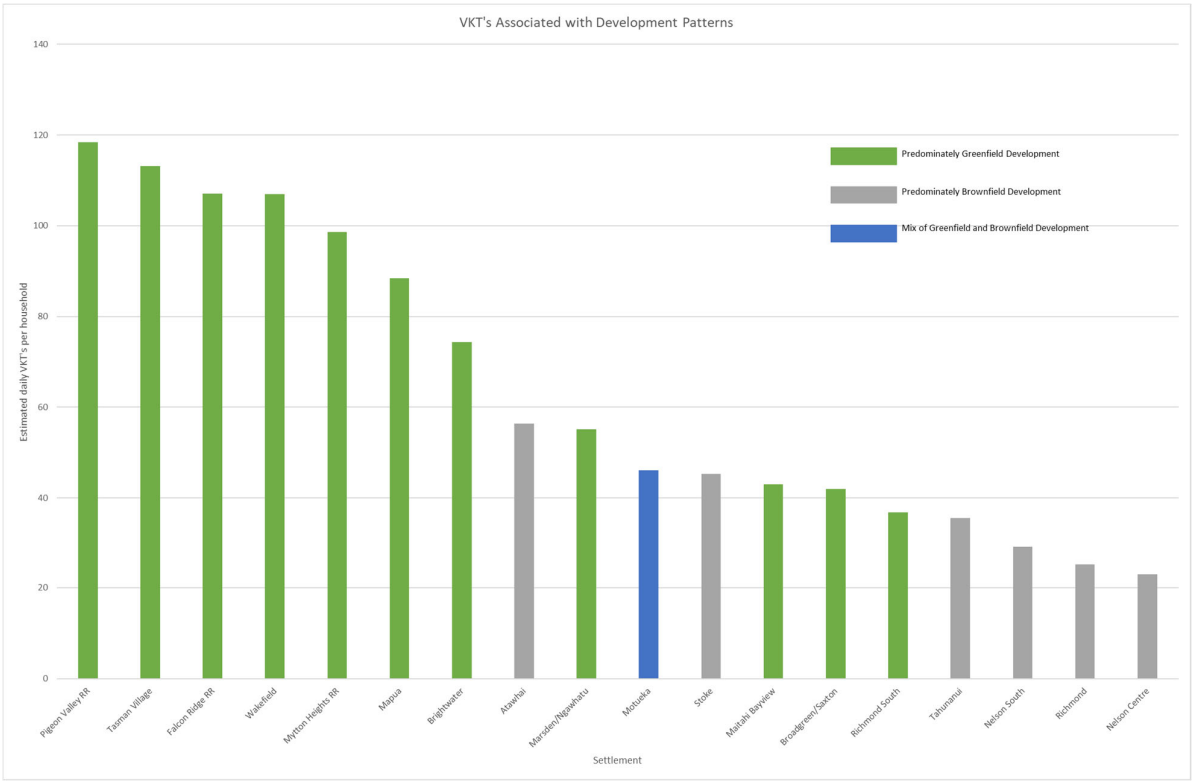

Figure 1: VKT's from Developments per household

Figure 1 shows that rural residential and non-NRUA greenfield development a long way from NRUA produces the most VKT's due to a high proportion of residents travelling to work or school in NRUA. The exception to this is Motueka. Motueka is large enough that it includes a number of workplaces and schools that mean a high proportion of residents stay local. In addition, there is a high number of residents that work just outside of Motueka like Riwaka or Lower Moutere. This shows that developments within (or very close to) NRUA or Motueka will produce the least VKT's and therefore the least GHG emissions.

Transport Emissions

Staff have used the travel patterns from the VKT analysis and combined it with future transport changes and the residential growth from the draft FDS to model transport emissions in 2035 and 2050 as shown as red in Figure 2 below.

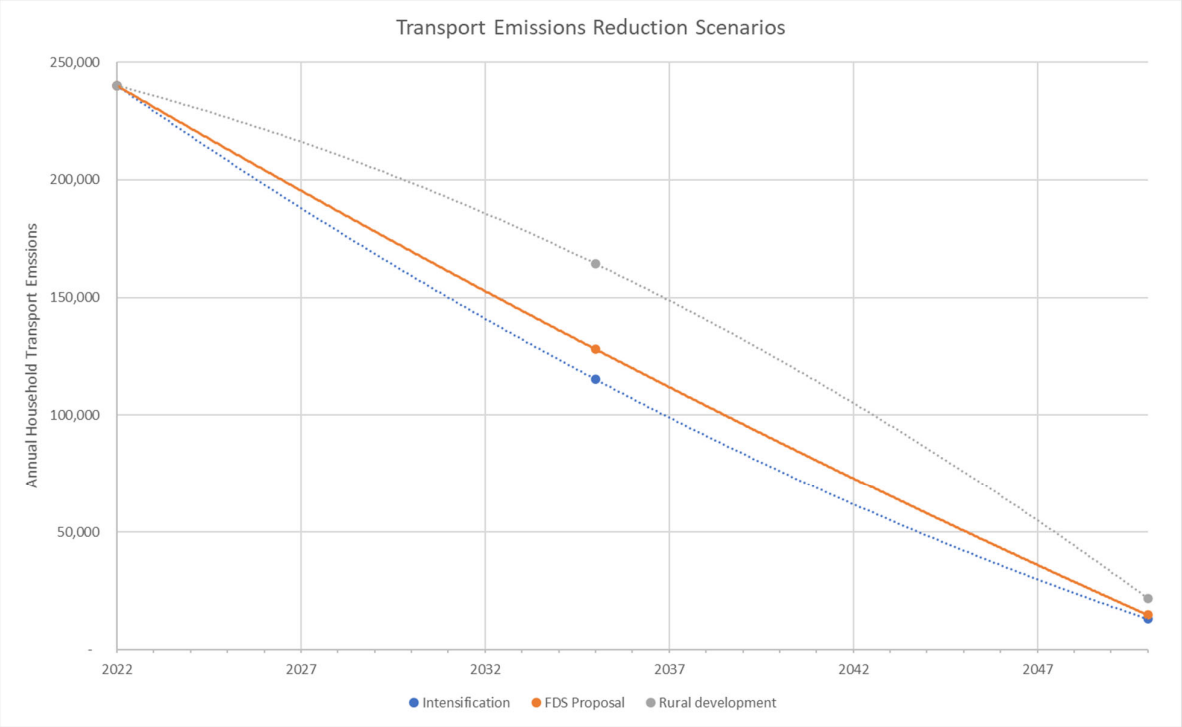

Figure 2: Future Transport Emissions

In order to understand the results, staff also modelled two other scenarios that have significantly different development patterns. The first is 'Intensification' (blue) which looks to extensive intensification in the NRUA with some intensified greenfield development that has low VKT's to make up the required dwelling numbers. The second is a 'rural development' (grey) which will cater for all the new growth expected in the combined regions for the next 30 years. These two scenarios provide context to where the proposed FDS sits. The FDS proposal can reduce household transport emissions by 94% of current emissions by 2050 but only 37% by 2030. The draft FDS emissions reduction trend is constant over the next 28 years compared with the targets which requires faster reductions early on. When compared with the intensification scenario, the draft FDS proposal does not get the same level of early GHG emissions but is still much better than a rural development scenario.

Staff have also compared the modelled GHG emissions against the national and international GHG emission reduction targets are shown in Figure 3 below.

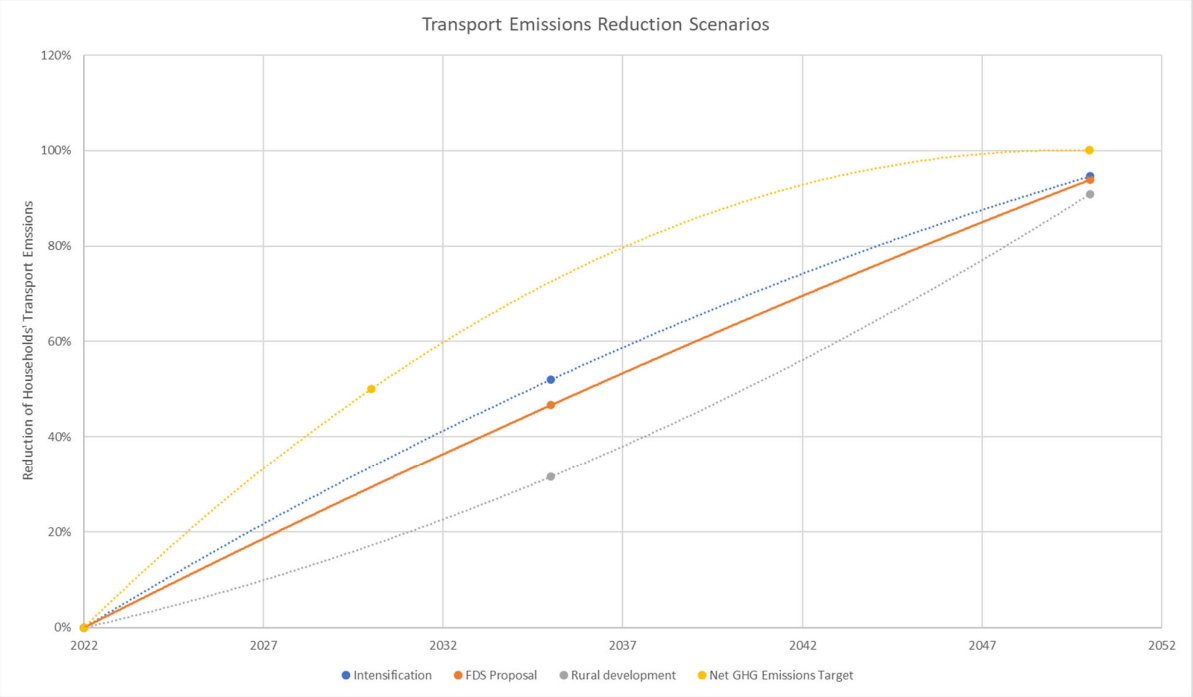

Figure 3: Transport GHG Emissions Reductions

Transport emissions need to be above the GHG emissions target line to be on track to keeping global temperatures increases less than 1.5°C. As it can be seen from Figure 3 the FDS proposal is close to the intensification scenario, but both the proposed FDS and the intensification scenario are significantly under the GHG emissions target. The target requires greater emission reduction within the next eight years than what the FDS allows. To achieve the transport emission targets, emissions will need to be offset by planting around 3.1 million pine trees by 2030.

In addition to modelling the likely transport related GHG emissions, staff are able to test different development scenarios. Staff have developed and tested the following new scenarios in Figure 4;

- Medium population growth instead of high population growth for the FDS proposal.
- Development that is deliberately staged to target earlier settlement areas that have lower VKT's up to 2035 and allowing full development of the proposed FDS up to 2050.

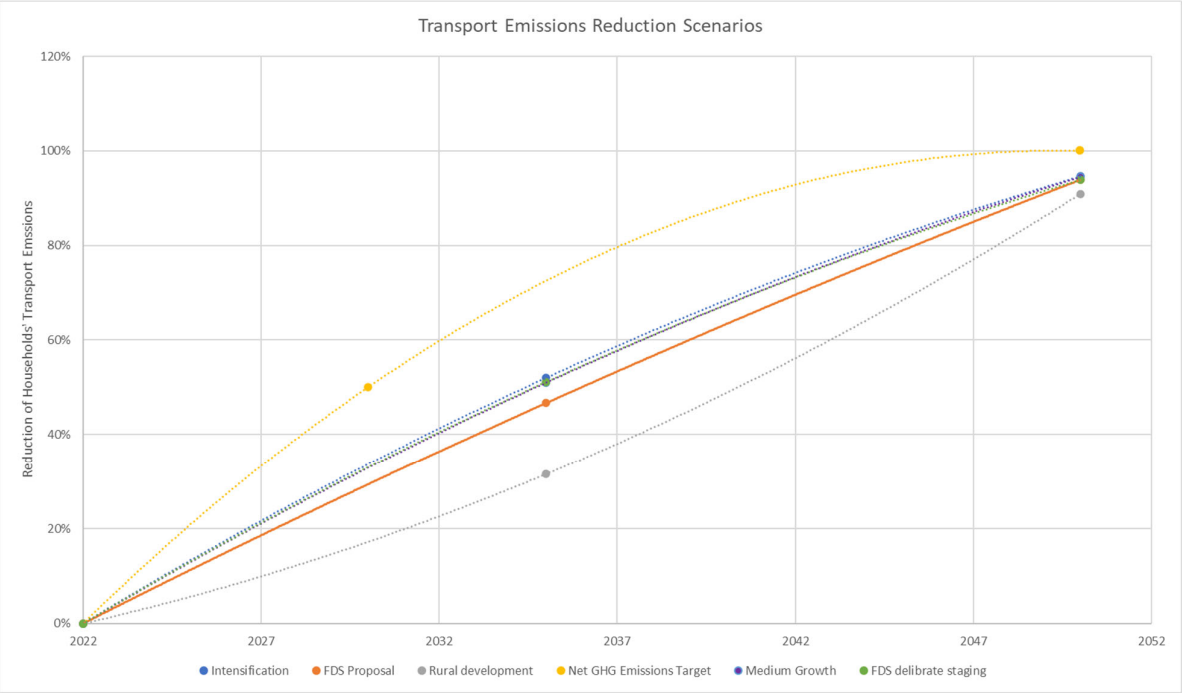

Figure 4: Scenario testing

Figure 4 shows that the reducing the rate of growth to medium (purple) and deliberately staging the development (green) gets close to the intensification scenario. Note, these two scenarios are on top of each other, making it hard to differentiate. If the growth doesn't happen as fast as the high growth assumptions, it will make transport emissions better. The benefit of staging the development to lower VKT settlements first takes advantage of lower VKT while EV uptake is low (2035) and then allows the higher VKT settlements as EV uptake improves.

Assumptions

Staff have produced this analysis to assist Councillors in assessing FDS options. This type of analysis is relatively new to New Zealand and staff have had to develop this from first principles rather than utilising a tested methodology.

This modelling is based on a future scenario and therefore staff have made a number of assumptions as to what will happen. Staff have endeavoured to use other research or Government advice to provide some consensus and alignment. Staff acknowledge the challenge of over reliance on the accuracy of future predictions. Staff recommend the trends and patterns relative to other development areas and scenarios rather than figures.

Staff have used the Emissions Reduction Plan from Ministry for the Environment for a data point in 2035 and Hikina te Kohupara, Transport Emissions: Pathways to Net Zero by 2050 by Ministry of Transport (Pathway 4) from as the basis for future transport scenarios[1].

The main assumptions from mixing Emissions Rection Plan and Hikina te Kohupara are shown in Table 2 below.

[1] https://www.transport.govt.nz//assets/Uploads/Discussion/Transport-EmissionsHikinateKohuparaDiscussionDoc.pdf

Table 2: Future transport changes

Timing	LV change in VKT	Uptake of EV	Increase in PT	Proportion of Electric PT	Biofuel LV (blend)	Biofuel PT (blend)	Proportion of electric MV	Proportion of MV & HV Biofuel (blend)
2021/22	0%	2%	100%	0%	0%	0%	0%	0%
2035	-39%	30%	436%	97%	10%	16%	4%	16%
2050	-57%	94%	487%	100%	10%	100%	25%	100%

Other key assumptions include:

- Growth of existing settlements or suburbs will mean a greater proportion of residents will stay within the settlement for work;
- Any new townships will have travel patterns similar to neighbouring towns;
- Residential development areas outside of commutable distances to Nelson (Takaka, Murchison, St Arnaud, Collingwood, etc.) will continue to have the same travel patterns as those seen in the 2018 census data.

The intensification scenario focusses on all intensification areas in the NRUA. The scenario assumes 30% update of intensification over the next 30 years which is two times higher than the 15% used in the draft FDS. Even at 30% intensification, the NRUA does not provide enough dwellings to match the draft FDS and therefore the intensification scenario includes some greenfield development in Richmond South and Saxton.

The rural development scenario focuses on all growth over the next 30 years being through development within TDC around 25km from Richmond. The 'rural development' would be on the public transport routes.

Conclusions

The FDS proposal can reduce household transport emissions by 94% of current emissions by 2050 but only 37% by 2030. This is not enough reduction to support transport emissions contribution to achieve international and national targets of keeping global temperatures increases less than 1.5°C without carbon offsetting. Development within the NRUA has the least amount of VKT's and will generally contribute the least GHG emissions (intensification scenario) but is also not enough on its own to meet transport GHG emission targets. There are some opportunities for reduction in GHG emissions if the population growth is less than forecast or if development is staged to prioritise low VKT settlement patterns early on, but they also don't achieve the target without carbon offsetting.