

# WHO'S GOING GREEN?

## An Executive Summary of Working Paper 16-20

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## SUMMARY HAIKU

Power, flying, meat.  
Producers' emissions are  
improving. Your turn.

## INTRODUCTION

The consumption of any good to satisfy consumer demand involves some element of environmental impact. This paper examines the drivers of greenhouse gas emissions (GHGs) inherent in what New Zealand households consume and how this is changing over time.

It is also an updated version of a paper published in November 2015. It uses newly available input-output data for 2012/2013 and an improved calculation of emissions intensities. These changes allowed the researchers to better dissect the elements of household spending and identify their changing contribution to GHG emissions. The key new contribution is to separate the roles of producers and consumers in changes over time in New Zealand's consumption-based emissions.

## METHODOLOGY

Emissions occur at all stages of production, from the extraction and processing of raw materials to the final distribution of finished products to retail stores. Our methodology estimates emissions embodied in the goods we all consume. This consumption approach tracks products throughout the production process and accounts for emissions that occur at all stages of production. This updated paper modifies the 2006 carbon intensity vector used in the previous version, and calculates a new carbon intensity vector for 2012. This allows us to attribute changes in emissions among changes in emissions intensity (emissions per unit of production), changes in the characteristics of New Zealand households (e.g. total expenditure and family size) and changes in household behaviour.

To calculate household emissions, we use detailed household-level expenditure data from the 2006/07 and 2012/13 waves of the Household Economic Survey produced by Statistics NZ.

## CHANGES IN HOUSEHOLD EMISSIONS OVER TIME

For the average household, emissions fell by around 11 per cent between 2006 and 2012. This represents a fall of around 2.6 t-CO<sub>2</sub>e for a 2 person household with \$80,000 of expenditure. About 90% of this reduction comes from improvements in emissions intensities, with most of the remaining 10% coming from changes in household behaviour.

### Disclaimer

Access to the data used in this study was provided by Statistics New Zealand under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the authors, not Statistics New Zealand.

Food, housing utilities, and transport account for 89 percent of the emissions for the average household. These categories are also emissions intensive, meaning that more emissions result from producing an extra unit of these goods.

**Table 1: Comparison of carbon intensities of selected expenditure categories over time**

	kg-CO <sub>2</sub> -e/\$ 2006	kg-CO <sub>2</sub> -e/\$ 2012	Percentage change between 2006 and 2012
Milk, cheese, and eggs	1.944	1.835	-5.61%
Meat and poultry	3.149	2.843	-9.72%
Fruit	0.348	0.346	-0.57%
Petrol	1.005	1.101	9.55%
Air travel	0.509	0.229	-55.01%
Electricity	0.98	0.723	-26.22%

(in 2012 dollars)

Table 1 displays the carbon intensity for a selection of more specific household consumption categories within these main categories as well as the percentage difference between the two years. Large improvements in carbon intensity were made in milk, cheese, and eggs, meat and poultry, air travel, and electricity. These improvements are generally due to an improvement in the emissions efficiency of industry, measured as emissions produced per dollar of output. For example, emissions in meat fell nearly 10 percent because of how farmers now produce their beef and lamb.

Household energy (electricity, gas, solid fuels) accounts for the bulk of emissions from household utilities. Emissions intensity of electricity fell more than 26 percent between 2006 and 2012, mainly due to the increased share of renewables in total generation. However, total residential electricity consumption also fell from 12,665 GWh to 12,493 GWh between 2006 and 2012. This was probably a result of higher electricity prices, housing insulation and gradual energy efficiency improvement.

Emissions from transport fuels increased around 28 percent as regular petrol became 'dirtier' and households consumed more. In contrast, air travel became more greenhouse gas efficient, due to airplane improvements and better fuel efficiency.

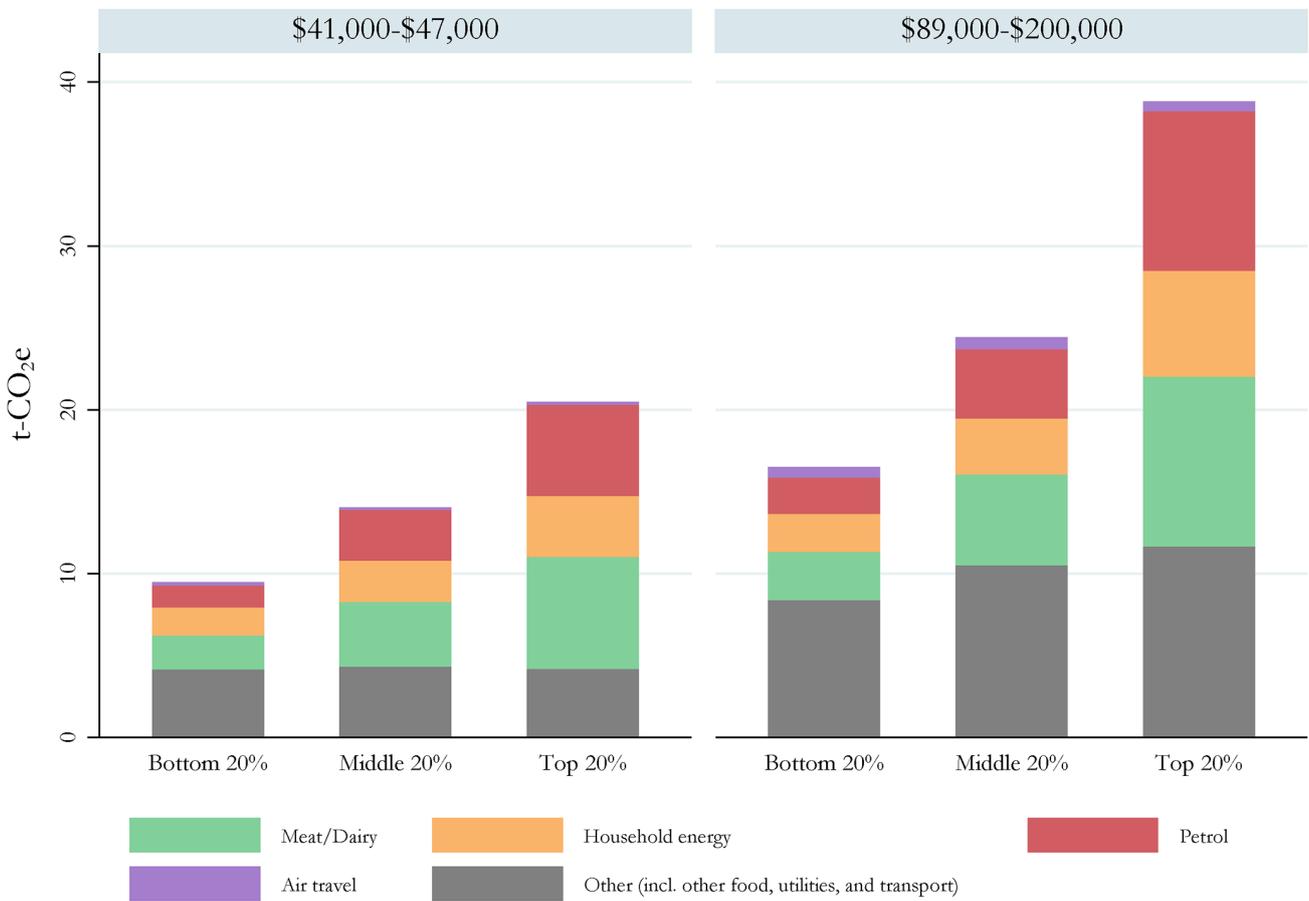
## COMPOSITION OF AVERAGE HOUSEHOLD EMISSIONS

Our results suggest that a household's emissions increase by 6.5 percent when expenditure not related to housing increases by 10 percent. As households get wealthier, they tend to spend more money on services, which are less emissions-intensive. This is why a 10 per cent increase in expenditure generates a less than 10 per cent increase in emissions.

Household expenditure, size, and composition explain nearly 70% of the variation in emissions across households. Contrary to our results in Allan et al, we find some evidence for economies of scale in household size.



**Figure 1: Comparing emissions from the top, middle, and bottom 20% of emitting households for two expenditure levels**



The relative importance of the different categories changes with a household’s income. Food emissions make up roughly 40% of emissions for all expenditure deciles. Utilities contribute about 30% of emissions for poorer households. This decreases to just over 20% for the wealthiest households. The importance of transport emissions increases as households become wealthier, with the share rising from about 20% to about 25%. Wealthier households also do more international travel.

There is a lot of variation across otherwise similar households. Households have some control over their emissions and can influence them by choosing different goods and services. The graph above looks at the variation in household emissions for two person households with the same level of expenditure.

It is not just the level of expenditure that is important in determining emissions; the choices households make about what goods to consume also have large impacts. Within both deciles, total emissions from the highest emitting households are more than twice that of the lowest emitting households. Important sources of the difference between households within each decile are diet and transport behaviour. On the sixth (tenth) expenditure decile, emissions from meat and dairy are 228% (251%) higher in the most emitting households than the lowest emitting households, while emissions from petrol and diesel are 314% (377%) higher.



Emissions tend to increase with the age of the household head. Young children are less emissions intensive than adults. For a household with two adults and one child, adding an extra adult increases emissions by 14%, while adding an extra child increases emissions by 7.8%.

Emissions tend to decrease with education. This is driven by differences in diet between more educated and less educated households, but this is partially offset by higher emissions from air travel for more educated households.

## CONCLUSION

After controlling for household characteristics, an average household's emissions were 11 per cent lower in 2012 than in 2006. This represents a reduction of about 2.6 tonnes of carbon dioxide equivalent (t-co<sub>2</sub>eq) for a two person household with \$80,000 of expenditure. About 90 percent of the reduction in emissions is due to improvements in production efficiency and reductions in emissions factors. Of the remaining 10 percent, about two-thirds is from a change in household behaviour. Much of this reduction can be attributed to changes in households, with the remainder due to improvements in production efficiency.

Our other main conclusions remain the same as in Allan et al. (2015). We find that on average households have not made a large systematic shift in their climate-change related consumption behaviour. The majority of the change in emissions we observe is due to reductions in the emissions intensity of products.

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