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Shared transport: Reducing energy demand and enhancing transport options for residents of small towns

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ABSTRACT

New Zealand's greenhouse gas emissions profile is somewhat different from many highly urbanised countries. Just under half of greenhouse gas emissions are associated with agriculture, with much less from transport. However, transport-related greenhouse gas emissions have increased rapidly and at a faster rate than most other sources since 1990. The challenge for New Zealand (and many other countries) is to promote forms of transport which do not contribute to that increase, whilst at the same time ensuring that the residents outside main urban centres have access to employment, education, health, business and other services that may be at some distance. Research into travel by residents of small towns in New Zealand suggests flexible shared transport has considerable potential to enhance the social and economic well-being of the population in small towns and cities. It can enable residents to travel to larger regional centres for necessary services at the same whilst reducing the energy use associated with single occupant vehicles. New digital platforms offer scope for flexible shared transport to overcome the barriers faced by many public transport providers. Therefore, transport policy-makers and planners need to see flexible transport as a key element in a low carbon, socially and economically inclusive transport system, and actively support its expansion.

1. Introduction

New Zealand's greenhouse gas emissions profile differs from other similarly urbanised countries. Four sectors are recognised when addressing greenhouse gas (GHG) emissions: agriculture, energy, industrial processes and product use, and waste. In the most recent inventory of GHG emissions, two sectors (agriculture and energy) contributed nearly 90% of emissions (48% and 39% respectively). Agricultural emissions are made up mostly of methane from ruminant animals (in particular, dairy cattle). The energy sector comprises road transport and electricity production. It is a smaller source of greenhouse gas emissions than in many countries due, in large part, to New Zealand's access to hydroelectric power for household and industrial energy use, and relatively small reliance on thermal electricity generation. However, between 1990 and 2013, emissions from the energy sector increased by 32% (compared with a 14% increase for agriculture).

Most of the increase in energy sector emissions came from road transport which contributed just over 40% of energy emissions compared with 16% produced by public electricity and heat production. Within the energy sector, road transport emissions have increased by nearly 70% since 1990. There was a decline in energy sector emissions between 2009 and 2011, partly linked to the global financial crisis; however, transport emissions have increased again as the economy has recovered [21].

New Zealand's high rate of car ownership (one of the highest rates among members of the Organisation for Economic Co-operation and Development (OECD)) and a relatively old vehicle fleet are key factors in increased road transport emissions. Freight is also transported mostly by road rather than rail or coastal shipping. Despite being highly urbanised country the economy is rural-based and the historical settlement pattern of small towns and cities servicing the rural economy persists. Heavy dependence on emission-intensive vehicles is compounded by a relatively sparse population in many parts of the country and under-development of public transport (urban bus services, long distance passenger bus services and passenger rail). According to Leining [18,p. 11], the World Resource Institute's Climate Analysis Indicators Tool shows that, in 2011, New Zealand's per capita emissions excluding forestry were 16.5 t CO_2 equivalent per person, with a ranking of fifth highest among industrialised (Annex I) countries (after Australia, Luxembourg, USA and Canada). This high per capita rate, even when

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agricultural emissions are excluded, highlights the need for New Zealanders to address transport emissions.

In July 2015, the NZ Government announced that its post-2020 climate change target is to reduce greenhouse gas emissions to 30% below 2005 levels by 2030. New Zealand's small (but growing) population is widely distributed (4.6 million as of March 2015 at a density of 17 people per square kilometre) [24]. The NZ Government sees electric vehicles as the mechanism transforming the transport sector. However, it recognises that this transformation will take longer than the 2021–2030 timeframe covered by the December 2015 Paris Agreement.

In the meantime, until there is much greater uptake of low emission vehicles, a key challenge for New Zealand is to promote forms of transport which reduce transport-related greenhouse gas emissions whilst at the same time ensuring that residents outside main urban centres have access to transport. Recently, there has been considerable emphasis on harnessing the economic, health and environmental benefits of cycling [25]. However, many of the benefits of this form of transport can only be enjoyed by those cycling within urban areas as opposed to between urban areas.

Shared transport options such as carpooling and more recent innovations such as Uber and Lyft and microtransit are more generally associated with, and established in, large urban areas where there is higher population density. Yet, the need for shared transport is arguably even greater in smaller towns and rural areas where public transport services are limited or non-existent. We argue that in countries like New Zealand, and also within more densely populated countries where there are regions with smaller, less dense populations, shared transport should be recognised by policy makers as an essential element in the transport system. It can offer the opportunity to maintain and improve people's access and mobility not just in cities but between small towns and the larger urban areas to which residents of small towns often need to travel for employment and services. For many residents outside of larger urban centres, private transport is often not an option (for example, in the case of people on low incomes who cannot afford to own and run a car, or those too young to drive, and for those who have medical conditions that mean they are not licensed to drive). Following a brief literature review, we present findings of survey and focus group research and provide analysis of 2013 Census data on demographic changes since 2001 that highlight a growing need for alternatives to private transport for residents of small towns. Finally, we highlight some examples of shared transport that have been successfully implemented to address inequalities in access to mobility and transport and discuss how these initiatives might be promoted by transport planners and policy-makers to increase mobility while also reducing energy demand and social exclusion.

2. Addressing transport disadvantage and forced car ownership: the shared transport alternative

Transport is important for the economic well-being of individuals, households and communities through its use by business and industry for movement of people and goods to markets and also for individuals and households to access employment and goods and services. In addition, it also contributes to social well-being. Importantly, a lack of accessible transport may contribute to social exclusion, 'the inability to participate in economic, social and cultural life' [5,p. 15]. In New Zealand, members of the community who have the lowest levels of accessibility are referred to as the 'transport disadvantaged'. Section 4 of New Zealand's Public Transport Management Act 2008 defines the transport disadvantaged as

> people whom the regional council has reasonable grounds to believe are the least able to get to basic community activities and services (for example, work, education, health care, welfare, and food shopping)

The elderly, women, youth, disabled and low income people are recognised as being the most 'transport disadvantaged' [3,12]. This focus on individuals or groups of individuals has the effect of suggesting that those who use shared or public transport have some personal deficit (related to income, education, physical health, age). However, it has also been recognised in transport policy documents that people who live in rural areas (along with people with disabilities and the elderly) are also among those recognised as experiencing transport disadvantage (Ministry of Transport, 2008b, p. 7).

While the focus is still on people, it is clear that *place* can be the source of transport disadvantage. Hurni (2005) argues that transport disadvantage is a characteristic of areas that are at a distance from transport networks and/or where there are few public transport options. Inaccessibility to public transport means greater reliance on private vehicles and dependence on family and friends for travel. This reliance on private vehicles has been described by Banister [1] as 'forced car ownership'. It occurs when 'there are no alternatives. In rural [small towns] areas, there is clear evidence of "forced" car ownership, since cars are owned at lower-income levels and are seen to be one of the items of household expenditure that cannot be foregone' ([1,p. 7]). Forced car ownership has a severe impact on a range of people and makes them transport disadvantaged [7].

Lack of access to transport through low income, disability and age, and transport disadvantage resulting from minimal public transport services, cause further disadvantage and social exclusion [4,29] ultimately leading to 'transport poverty' [6,14]. In areas that are not served, or poorly served, by public transport social exclusion is exacerbated through restricted access to opportunities and/or through forced car ownership (which reduces the amount of income available for meeting other needs).

Alternatives to forced car ownership and transport poverty such as car and van pooling, have existed for some time although largely as a result of initiatives by employers or workers. In addition, health shuttles have been established (again not primarily led by government but as a result of community initiative) to assist residents or rural areas or small towns to access health and medical services in larger centres. In some cases, there is limited public funding (for example, district health board or local government) but the services are largely developed by community groups. In response to demand from an ageing population new businesses are emerging to provide older people who no longer drive with a personal driving service.[1] However, this tends to be for individuals and does not constitute shared transport in the sense of a mode of transport that is simultaneously used by a number of travellers.

We consider shared transport to include conventional 'public' transport which can be important for small towns and rural areas as commercial long-distance passenger services may pass through towns albeit on schedules not necessarily tailored towards the needs of residents of those towns who see transport for work or other utility purposes, but determined by the needs of tourists and visitors. However, and more importantly, it includes a range of demand-responsive transport (DRT) initiatives characterised by

[1] For example, Driving Miss Daisy is a personal driving and companion service operated by a private company. It was initially established in Alberta, Canada and then spread to other parts of Canada. A New Zealand business was established in Hawkes Bay in 2008 and quickly spread throughout the country with over 50 franchises. The franchise was launched in the United Kingdom in 2012. See http://drivingmissdaisyuk.co.uk In Australia Dial-An-Angel is a nation-wide private company that provides transportation in the Angel's car or as a companion in a regular taxi. See http://dialanangel.com/care/aged-care.

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