

TRANSITIONING TO LOW-CARBON URBAN FORM AND TRANSPORT IN NEW ZEALAND

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Abstract: *There is a growing sense of urgency internationally about cutting greenhouse gas emissions. If New Zealand is to continue to position itself as a truly sustainable nation, it will need to take radical and effective steps to reduce its transport-related carbon dioxide emissions. Even if New Zealand were not to take early action, it is likely that it would come under strong international pressure to stay in step with progressive countries. The government has recently committed, in principle, to cutting domestic transport related emissions by 50 percent by 2040, but it is not yet clear that the measures the government has proposed will get New Zealand to this target. This paper examines the policy opportunities provided by urban form and transport, arguing that these issues have been little explored to date in New Zealand in terms of their potential to reduce carbon emissions, and provide co-benefits such as health gains and cost savings. Ensuring that urban development and transport policies are highly innovative and integrated will be critical to the sustainability transition that New Zealand is now beginning to make, including the transition to low-carbon transport.*

Keywords: *urban form, transport, greenhouse gases, emissions, policy*

INTRODUCTION: THE URGENCY OF CUTTING TRANSPORT EMISSIONS

Like other developed nations, New Zealand is now committed to finding effective ways to reduce rapidly its greenhouse gas emissions. This reflects an increasing awareness on the part of both the community and the government, of the urgency and scale of the climate change problem in a scientific and socio-economic sense. Prime Minister Helen Clark has located climate change action within a broader context of an aspiration to sustainable development:

I believe New Zealand can aim to be the first nation to be truly sustainable - across the four pillars of the economy, society, the environment, and nationhood. I believe we can aspire to be carbon neutral in our economy and way of life.²

The climate change problem is intensifying, as global emissions of greenhouse gases continue to increase. Recent increases are likely to already have taken the planet to dangerous concentration levels. By 2050, greenhouse gas (GHG) emission reductions by New Zealand, and other developed countries, may have to be around 90 percent, requiring significant economic and social adjustment.³

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² Helen Clark, 'Prime Minister's Statement to Parliament (Rt Hon Helen Clark),' (The Beehive, 2007).

³ Ralph Chapman and Jonathan Boston, 'The Nature of the Problem and the Case for Rapid Stabilisation,' in *Towards a New Global Climate Treaty: Looking Beyond 2012*, ed. Jonathan Boston (Wellington: Institute of Policy Studies, 2007).

The 2007 Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)⁴ and similar analyses⁵ imply a need for greenhouse gas emission reductions in developed countries of around 80 to 90 percent by 2050 in order to avoid an unacceptable risk of physical commitment to catastrophic warming of up to 3°C (above pre-industrial levels). This is now becoming recognised at the government level. The British Prime Minister, for example, recently talked of tightening the UK's domestic CO₂ reduction commitment from 60 percent to 80 percent by 2050.⁶

New post-IPCC analysis⁷ reinforces this message and indicates that avoiding catastrophic climate change could require even more rapid reductions in GHG emissions than the IPCC indicates. Global emissions would need to be stabilised within a decade with additional major cuts thereafter. Avoiding catastrophic change also implies significant cuts starting within a decade by developed countries. This is against the background that developing country GHG emissions continue to grow rapidly, with Chinese CO₂ emissions recently overtaking those of the US,⁸ while developing countries continue to argue that developed countries have a historic responsibility to make significant cuts before asking developing countries to do so.⁹

It would be reasonable to assume that New Zealand, as a developed country, will come under intense pressure to cut emissions by around 30 percent by 2020, consistent with the conditional European Union (EU) target, and by as much as 90 percent by 2050.¹⁰ The government's target for the first commitment period under the Kyoto Protocol is to reduce the cumulative emissions 'deficit' (that amount beyond the 'allocated' 1990 level of allowable emissions) from around 45 to 25 million tonnes of carbon dioxide equivalent CO₂e. This would essentially return emissions to 2007 levels by 2012, and is very much a first step.¹¹ The stringency of future targets will have to be reviewed once the government's climate policy framework is in place.

The proposed New Zealand emissions trading scheme is designed to cut emissions by putting a price on 'carbon'. It will link into the Kyoto Protocol trading framework¹² so that the Kyoto unit price will set the price for New Zealand units. The phase-in arrangements for the scheme remain fluid, but it seems the scheme will have little effect before 2012. Moreover, the Kyoto price itself is now arguably 'too low', because 1997 Kyoto commitments now appear modest in relation to the findings on accelerating climate change emerging in the latest scientific publications, and current developed country aspirations for emission reduction. Therefore the extent of abatement in New Zealand in the Kyoto first commitment period (until 2012) will almost certainly be 'insufficient' if a longer view is taken. Given that we are now past the start of the first commitment period, and given New Zealand's poor record thus far in stemming emissions growth, the pressure to cut emissions rapidly will be all the more intense in the post-2012 period.¹³

⁴ Intergovernmental Panel on Climate Change, 'Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Inter-Governmental Panel on Climate Change,' (Cambridge University Press, 2007).

⁵ N. Höhne, D. Phylipsen, and S. Moltmann, 'Factors Underpinning Future Action, 2007 Update,' (Cologne: Ecofys, 2007).

⁶ Gordon Brown, 'Speech by the Prime Minister the Right Honourable Gordon Brown MP on Climate Change, Hosted by the World Wildlife Fund at the Foreign Press Association,' (London, 2007).

⁷ J. Hansen et al., 'Dangerous Human-Made Interference with Climate: A GISS Model Study,' *Atmos. Chem. Phys.* 7, no. 9 (2007); Timothy Lenton, 'Tipping Points in the Earth System,' in *UEA Modelling Group Research Pages* (UEA, Norwich, 2007).

⁸ J. Vidal and D. Adam, 'China Overtakes Us as World's Biggest CO₂ Emitter,' *Guardian*, 19 June 2007.

⁹ M. Ward and J. Boston, 'Current International Climate Change Policy Architecture,' in J. Boston (ed.) *Towards a New Global Climate Treaty: Looking Beyond 2012*, (Wellington: Institute of Policy Studies, 2007).

¹⁰ Chapman and Boston, 'The Nature of the Problem and the Case for Rapid Stabilisation.'

¹¹ David Parker, 'Emissions Trading Scheme Announcement: Speech Notes, Banquet Hall, Beehive, 20 September,' (Office of Minister responsible for Climate Change issues, 2007).

¹² New Zealand Government, 'The Framework for a New Zealand Emissions Trading Scheme,' (New Zealand Government, 2007).

¹³ Nicholas Stern, *The Economics of Climate Change* (Cambridge: Cambridge University Press, 2007).

CUTTING TRANSPORT EMISSIONS

Energy emissions from transport account for 19 percent of total New Zealand greenhouse emissions and 45 percent of energy emissions.¹⁴ Road transport emissions grew 65 percent between 1990 and 2005.¹⁵ As in most developed countries¹⁶ there is major momentum in transport emissions growth and it will be difficult to change this growth trajectory to a downward one without a mix of strong measures. The government's Energy Strategy of October 2007 includes an in-principle decision to cut domestic transport emissions per capita by half by 2040, relative to 2007 levels.¹⁷ But exactly how this is achieved is yet to be determined. Other measures in the Energy Strategy include better coordination between transport and urban development policies, and a range of other complementary and, it is hoped, synergistic measures.

The New Zealand emissions trading scheme, by itself, is expected to have only a small initial impact in cutting transport emissions, because of the limited responsiveness of transport activity to price increases in the short run – i.e. a low 'short-run price elasticity' of transport demand'.¹⁸ At a carbon price such as NZ\$25 per tonne of CO₂, reductions are projected to be less than one percent, against a business-as-usual growth path (without other measures) of around 35 to 40 percent by 2030.¹⁹ However, these reductions might be bigger if the price elasticity of demand for vehicle fuel use has been underestimated in the government's policy advice, or if the carbon price is significantly higher, or if fuel prices rise significantly. Long-run responses, allowing time for changing behaviour patterns such as car purchase decisions, are likely to be greater. Responses can be assisted by other prices such as 'feebates' – as seen in northern Europe. For example, the 2007/2008 Dutch Budget included an announcement that the purchase tax differential between fuel efficient and inefficient cars will be increased, to reward environmentally friendly car purchase behaviour, while penalising polluting behaviour.²⁰

Nevertheless, New Zealand's and other countries' experiences and projections suggest that technology-assisted gains in fuel economy over time can be easily swamped by behavioural changes such as increased vehicle kilometres travelled (vkt), and growth in average vehicle engine sizes, so that CO₂ emissions continue to increase over time. If the New Zealand emission trading scheme and other price influences are not likely to be enough to significantly deflect the rising trend of vehicle emissions, transport emissions will have to be explicitly targeted with a strong mix of measures in order to achieve meaningful cuts. The assumption here is not that all sectors of the economy will make the same level of emission cuts (it may be more efficient for other sectors to cut emissions more quickly than transport), but the transport sector should nevertheless be aiming to reduce emissions, rather than continue to follow its rising path.

There is little debate about the government's conclusion that reducing transport emissions requires a mix of measures: price instruments such as the emission trading scheme, alternative renewable fuels, increasing vehicle efficiency, using more efficient modes of transport, or using

¹⁴ New Zealand Government, 'The Framework for a New Zealand Emissions Trading Scheme.'

¹⁵ Ministry for the Environment, *Environment New Zealand 2007* (Wellington: Ministry for the Environment, 2007).

¹⁶ S. Kahn-Ribeiro et al., 'Transport and Its Infrastructure,' in *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds.)] (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, 2007).

¹⁷ New Zealand Government, 'New Zealand Energy Strategy to 2050. Powering Our Future,' (Ministry of Economic Development, 2007).

¹⁸ D. Kennedy and I. Wallis, 'Impacts of Fuel Price Changes on New Zealand Transport,' in *Land Transport New Zealand Research Report 331* (Wellington: Land Transport New Zealand, 2007).

¹⁹ New Zealand Government, 'The Framework for a New Zealand Emissions Trading Scheme,' p. 106

²⁰ VROM [Dutch Ministry for Housing Spatial Planning and the Environment], 'Spatial Planning and the Environment 2008 Budget: Break with the Past,' (2007), <http://international.vrom.nl/pagina.html?id=11025>. (12 May 2008).

given modes more efficiently, with shorter and fewer motorised journeys.²¹ This paper focuses on the contribution, to that mix, of urban form and related travel behaviour approaches and measures. It is worth noting, here, that around 86 percent of New Zealanders live in urban areas.²² Urban form is viewed here as the shape, design and connectedness of urban areas including the configuration of transport systems. It extends to matters of urban design, such as provision for active travel (walking and cycling), which is contentious enough,²³ to questions of sprawl, a matter of caustic ongoing debate.²⁴

New Zealand officials and the government have only come lately to realise the potential of urban form to contribute to reduced energy and emissions, as against looking to other transport-related elements, particularly engine technology and new fuels. Urban form was barely mentioned in the 2002 Transport Strategy.²⁵ For example, the 'Sustainable Transport' discussion document released in December 2007 had a welcomed but minimal section²⁶ on transport planning and land use working together.²⁷ Similarly, the Draft Energy Strategy contained no reference to urban design or land use change in the 'From Vision to Action' chapter, although urban form was explored briefly elsewhere in the chapter.²⁸ However, the final Energy Strategy and New Zealand Energy Efficiency Strategy have more detail.²⁹

For governments and communities wrestling with reducing greenhouse gas emissions through urban planning and policy making, difficult but critical policy questions arise in relation to urban form and the emission reduction options available. They include the following:

- a. Are issues and policy options around urban form and related behavioural matters being explored sufficiently?
- b. What is the best contribution of urban form to CO₂ emission reductions, and how fast can measures act without imposing excessive cost?
- c. What are the co-benefits and uncertainties?
- d. What can we learn from other countries about urban form-related strategies for cutting transport emissions?

The remainder of this article focuses on a subset of these questions: (1) the emission reduction potential of changing urban form as part of decarbonising transport, especially in relation to reducing the need for motorised journeys, and the likely timescale for an effective transition in this domain; (2) the likely significance of the co-benefits of urban redesign in New Zealand. I conclude with some reflections on the range of policy measures which warrant closer examination as part of the transition.

²¹ Ministry of Economic Development, 'New Zealand Energy Strategy to 2050: Powering Our Future,' (Ministry of Economic Development, 2007).

²² Ministry for the Environment, *Environment New Zealand 2007*, p. 40.

²³ Clive Doucet, *Urban Meltdown: Cities, Climate Change and Politics as Usual* (Ottawa: New Society Publishers, 2007).

²⁴ R. Ewing, 'Is Los Angeles-Style Sprawl Desirable?,' *Journal of the American Planning Association* 63, no. 1 (1997).

²⁵ Ministry of Transport, 'New Zealand Transport Strategy,' (Ministry of Transport, 2002).

²⁶ Ministry of Transport, 'New Zealand Transport Strategy,' p 57.

²⁷ Ministry of Transport, 'Sustainable Transport: Update of the New Zealand Transport Strategy. Discussion Paper,' (Ministry of Transport, 2007).

²⁸ Ministry of Economic Development, 'Powering Our Future: Draft New Zealand Energy Strategy to 2050,' (Ministry of Economic Development, 2006).

²⁹ Ministry of Economic Development, 'Powering Our Future: Draft New Zealand Energy Strategy to 2050,' See section 6.1

THE EMISSION REDUCTION POTENTIAL OF RESHAPING URBAN FORM

Prima facie, urban form influences energy use and carbon emissions significantly. For example, Kenworthy found that for 'high-income cities, 82 percent of the variance in car passenger kms per capita and 78 percent of the variance in per capita private passenger transport energy use is explained by urban density'.³⁰ He also concluded that the greatest energy and greenhouse conservation potential is from compact, mixed land use cities, with extensive transit systems operating on a backbone of rail, and that compact land uses combined with attractive environments for walking and cycling will save further energy and CO₂ emissions. Some evidence tends to support this finding³¹ although other evidence is more equivocal.³² However, it is one thing to identify existing patterns and another to convincingly estimate the potential of changing urban form.

International evidence suggests that there is potential for reducing emissions significantly over time by accentuating compact, clustered, urban development supported by transport systems. In the United States a review study examining various large-scale metropolitan planning strategies for reducing travel while maintaining accessibility, concluded that, a combination of land use and transit policies might succeed in reducing vehicle miles travelled in urban areas by about five to seven percent over a period of 30 years, and perhaps nine to ten percent if combined with policies to charge for parking and for use of congested roads.³³ Modelling and simulation analyses of travel at the neighbourhood level suggest that vehicle travel might be reduced 10 to 25 percent by changing the design of subdivision development to more closely resemble the grid street layouts and mixed land uses of pre-World War II communities.

Reid Ewing and colleagues in the United States use the term 'compact development' to mean a higher average 'blended' densities for urban areas, meaning a mix of land uses, strong population and employment centres, interconnecting streets, and the design of structure and spaces at a human scale.³⁴ They suggest that, with compact development, people drive 20 to 40 percent less, at minimal or reduced cost, and with other fiscal and health benefits. A more recent study in California found that 'increasing a community or development's density and accessibility to job centers are the two most significant factors for reducing vehicle miles traveled through design'.³⁵

³⁰ J.R. Kenworthy, 'Transport Energy Use and Greenhouse Gases in Urban Passenger Transport Systems: A Study of 84 Global Cities,' in *Third Conference of the Regional Government Network for Sustainable Development* (Notre Dame University, Fremantle, Western Australia: 2003), p. 24.

³¹ Chanam Lee and Anne Vernez Moudon, 'The 3ds + R: Quantifying Land Use and Urban Form Correlates of Walking,' *Transportation Research Part D: Transport and Environment* Vol. 11, No. 3 (2006); Christopher Leinberger, 'Footloose and Fancy Free: A Field Survey of Walkable Urban Places in the Top 30 U.S. Metropolitan Areas,' in *Metropolitan Policy Program at Brookings* (Washington D.C.: Brookings, 2007); Peter Newman, Mark Bachels, and Ralph Chapman, 'Sustainable Transport for Sustainable Cities: Policy Implications for Managing Development in New Zealand Cities,' *Public Sector* Vol. 28, No. 3 (2005); Peter Newman and Jeff Kenworthy, 'Sustainable Urban Form: The Big Picture,' in *Achieving Sustainable Urban Form*, ed. Kate Williams, Elizabeth Burton, and Mike Jenks (London and New York: E and FN Spon, 2000); M.J. Saunders, S. Krumdieck, and A. Dantas, 'Energy Reliance, Urban Form and the Associated Risk to Urban Activities,' *Road & Transport Research* Vol. 15, No. 1 (2006).

³² M. Buxton and J. Scheurer, 'Density and Outer Urban Development in Melbourne,' *Urban Policy and Research* Vol 25, No. 1 (2007); Kahn-Ribeiro et al., 'Transport and Its Infrastructure'.

³³ David Greene and Andreas Schafer, 'Reducing Greenhouse Gas Emissions from U.S. Transportation,' (Washington, D.C.: Pew Centre on Global Climate Change, 2003).

³⁴ R. Ewing et al., 'Growing Cooler. The Evidence on Urban Development and Climate Change,' (Washington, D.C.: Urban Land Institute, 2007), p. 4.

³⁵ Gina Barkalow et al., 'The Role of Land Use in Meeting California's Energy and Climate Change Goals. Draft Staff Paper', (California Energy Commission 2007).

Australian evidence also suggests that more compact urban forms produce significantly less energy and emissions intensive household travel behaviour.³⁶ They conclude that, while the urban form influence is greatest in relation to travel behaviour, it is also significant in reducing household energy and emissions attributable to vehicles themselves, road infrastructure, dwellings, and household appliance use. Other authors suggest there are land use efficiency advantages, from ensuring new suburban developments are compact, even if emissions gains are less clear.³⁷

However, there is huge inertia in the shape and functioning of cities, and many social and political barriers to rapid change.³⁸ How quickly could reshaping cities contribute to transport related CO₂ emission reductions? Ewing et al.'s estimate of CO₂ savings, with 30 percent cuts in vkt for new compact developments, and 60 percent of development shifted to compact form, suggest reductions of around seven to ten percent below current trends nationally, by 2050. This is broadly consistent with Greene and Schafer's qualified conclusion, based on their review of various studies, that although there are significant barriers to change, improved regional accessibility (reducing distances to regional centres) might work with pricing policies to cut travel (and, implicitly, emissions) around ten percent over a period of decades. Clearly, this would be a substantial contribution if it could be achieved.

A similar sized contribution however, could be possible in New Zealand, given similar urban development and vehicle use patterns, and trends already emerging to shift urban form to more compact patterns. The potential may be somewhat smaller in New Zealand given that public transport use is already higher than in most parts of the USA, and car ownership marginally lower – though increasing sharply in recent years.³⁹ Moreover, the potential for shifting transport modes depends on a number of economic, social and cultural variables⁴⁰ and responsiveness to different strategies, such as personalised transport planning, will vary. More work is needed to refine estimates of potential CO₂ savings from reshaping New Zealand cities, and combining urban planning strategies with behaviour change measures. The very fact, however, that transport patterns changed so much over the last few decades⁴¹ suggests that it is not impossible to make further major changes in transport habits and behaviour over the next generation, as long as the incentives are clear and strong.

Assuming urban reshaping, even if effective over time, would not generate a significant cut in transport related emissions within the next decade or so, is it worth pursuing? Two arguments suggest that it is important. First, given the signs of an emerging climate crisis, all feasible measures to mitigate carbon emissions need to be initiated as soon as possible, even if results are medium to long term. An analogue is changes to the building code, which will take decades to have full effect. Moreover, increasingly, scientists point to the need for aggressive and continuing emission reductions if longer-term climate damage is to be minimised.⁴² Second, the co-benefits of reshaping cities so that they are more compact and better connected mean that policies to promote this reshaping are desirable even disregarding CO₂ reduction benefits.

³⁶ Alan Perkins and Stephen Hamnett, 'The Significance of Urban Form in Creating More Greenhouse-Friendly Cities', (paper presented at the 8th International Conference of the Asian Planning Schools Association, 2005).

³⁷ Buxton and Scheurer, 'Density and Outer Urban Development in Melbourne.'

³⁸ Nicholas Low, 'The (Wedge) Politics of Climate Change,' *Urban Policy and Research* 25, No. 1 (2007).

³⁹ Kahn-Ribeiro et al., 'Transport and Its Infrastructure', p. 332.

⁴⁰ Jillian Anable and Birgitta Gatersleben, 'All Work and No Play? The Role of Instrumental and Affective Factors in Work and Leisure Journeys by Different Travel Modes,' *Transportation Research Part A: Policy and Practice* Vol. 39, No. 2-3 (2005).

⁴¹ Chris Harris, 'Lost City: Forgotten Plans for an Alternative Auckland,' (2007), Christopher Harris, 'Slow Train Coming: The New Zealand State Changes Its Mind About Auckland Transit, 1949-56,' *Urban Policy and Research* Vol. 23, No. 1 (2005).

⁴² Timothy Lenton, 'Tipping Points in the Earth System,' in *UEA Modelling Group Research Pages* (UEA Norwich, 2007).

CO-BENEFITS OF RESHAPING CITIES

Key co-benefits (that is, benefits alongside greenhouse gas reduction benefits) include improving health through promoting physical activity; enhancing social capital, especially cooperative community networking; enhancing peri-urban amenity; retaining other land uses through preserving farmland, open space and forests ('greenery'); protecting air and water quality; reducing the incremental cost of infrastructure; providing planning opportunities to minimise vulnerability to future climate change; and lowering transportation costs. Two co-benefits, health benefits and cost savings, are briefly discussed here.

The rapid increase in obesity and physical inactivity-related diseases such as diabetes is now widely seen as an emerging public health crisis, with major future cost implications. Given this, measures to design cities to increase active travel (walking and cycling) and reduce car use can be important in terms of health improvement.⁴³ There is now considerable evidence, especially from the US, on this matter. Frank and colleagues, for example, point out that 'each additional 30 minutes in a car is associated with a 3% increase in the odds of being obese, while each additional kilometer walked per day is associated with a 4.8% reduction in these odds'.⁴⁴ Others note that there is a sizeable literature that demonstrates 'consistent associations of neighborhood environmental variables with walking and cycling for transport' so that neighbourhood design which facilitates walkability and health can clearly yield benefits.⁴⁵

In terms of transport costs, there will be clear savings derived from a lower-carbon and less energy intensive land use pattern and transport system in future as oil prices rise, even if the exact timing of price increases remains uncertain. That oil (and gas) prices are likely to rise in real terms in coming decades is now widely accepted, including by organisations such as the International Energy Agency, employees of which now voice concerns about the stability of the global energy system.⁴⁶

Even at lower fuel prices than currently prevail, more compact urban form can provide savings for lower income households. A study by the Brookings Institution showed that living in more compact parts of urban settlements in the US is associated with lower combined transport and housing costs.⁴⁷ For example, they found that in one major US metropolitan area, only denser inner neighbourhoods are affordable to low-income families at less than 50 percent of area median income:

Proximity to better transit service in the central cities, access to more jobs, and the availability of some lower priced housing improves the overall cost of living for

⁴³ H. Badland and G. Schofield, 'Perceptions of Replacing Car Journeys with Non-Motorized Travel: Exploring Relationships in a Cross-Sectional Adult Population Sample,' *Preventive Medicine* Vol. 43 (2006). See also: J F Sallis et al., 'Active Transportation and Physical Activity: Opportunities for Collaboration on Transportation and Public Health Research,' *Transportation Research Part A* Vol. 38 (2004).

⁴⁴ L Frank, M A Andresen, and T L Schmid, 'Obesity Relationships with Community Design, Physical Activity, and Time Spent in Cars,' *American J of Preventive Medicine* Vol. 27, No. 2 (2004).

⁴⁵ Howard Frumkin, Lawrence Frank, and Richard Jackson, *Urban Sprawl and Public Health: Designing, Planning, Building for Healthy Communities* (Island Press, 2004). See also: John Pucher and Lewis Dijkstra, 'Promoting Safe Walking and Cycling to Improve Public Health: Lessons from the Netherlands and Germany,' *American Journal of Public Health* Vol. 93, No. 9 (2003).

⁴⁶ Robert L. Hirsch, 'The Inevitable Peaking of World Oil Production,' *Atlantic Council Bulletin* XVI, no. 3 (2005). See J. Mouawad, 'Cuts Urged in China's and India's Energy Growth,' *New York Times*, 7 November 2007. Also see: A. Scheidner, 'Fatih Birol Interview: 'Leave Oil before It Leaves Us',' *Energy Bulletin* 2 May (2008).

⁴⁷ Center for Transit Oriented Development and Center for Neighborhood Technology, 'The Affordability Index: A New Tool for Measuring the True Affordability of a Housing Choice,' in *Urban Markets Initiative* (Washington, D.C.: The Brookings Institution, 2006).

these households. For middle-income families, reduced transportation costs in these same communities also have a positive effect on the family pocketbook.

The corollary is that more compact urban form with good public transport provision can generally lower combined housing and transport costs, which is significant for many lower income or middle income households. When oil prices rise these advantages are reinforced.

AN OUTLINE OF SOME POSSIBLE POLICY OPTIONS

Proposing a detailed policy programme to promote more compact, more mixed-use and better connected urban development is beyond the scope of this paper. However, a mix of measures that warrant consideration, on the basis of their potential to contribute over time to reducing emissions, includes the following.

First, it will be important to ensure that the three-yearly government policy statement on transport, soon to be developed for the first time to indicate transport investment priorities and give direction to regional land transport committees, goes beyond the required short-term (three to six year) focus⁴⁸, and instead aims to achieve major CO₂ reductions over the medium to longer term (10 to 50 years). The government policy statement can help to fill the policy vacuum identified by commentators.⁴⁹ It can also be an extension and broadening of the approach taken by Land Transport New Zealand in submitting on policy statements, plans, policies, and so forth, that provide an opportunity to shape a more sustainable land use and transport system.⁵⁰

Second, the development of a national policy statement on urban development, under the Resource Management Act 1991, could be valuable in reshaping cities. The government has stated that it will investigate the role for greater national guidance on quality urban design, but this is a modest commitment.⁵¹ How much a national policy statement is likely to deliver will be influenced by the permissive nature of the Resource Management Act itself, which is focused on limiting adverse environmental effects rather than supporting goal-oriented planning as such.⁵² It will also be influenced by the political appetite for regulation which, though currently more favourable to shaping urban form than in the past,⁵³ is still relatively laissez faire⁵⁴ compared to European jurisdictions, for example.

Third, greater strategic investment by central government and regional authorities in high quality rail and bus systems is critical to support clusters of compact housing and employment, and (car) travel demand management.⁵⁵ The government's 2007 budget commitment of \$900 million of additional government investment in public transport in the period 2006 to 2010, in particular on rail infrastructure improvements in Auckland and Wellington, as well as national rail

⁴⁸ Cabinet Economic Development Committee, 'Edc (07) 148, Implementing Next Steps in the Land Transport Sector Review: Government Policy Statement' (Cabinet Office, 2007). See also: Ministry of Transport, 'Sustainable Transport: Update of the New Zealand Transport Strategy. Discussion Paper.'

⁴⁹ A. Memon and M. Douglass, 'Integrating Transportation and Land Use Planning: A 'Think Piece', (2007). http://www.transit.govt.nz/content_files/planning/iap/Think-piece-Ali-Memon-and-Malcolm-Douglass.pdf (12 May 2008) p. 10

⁵⁰ Land Transport New Zealand, *Participation in Land Use and Transport Planning Processes* (Wellington: Land Transport New Zealand, 2006).

⁵¹ New Zealand Government, 'New Zealand Energy Strategy to 2050. Powering Our Future'.

⁵² David Young, *Values as Law: The History and Efficacy of the Resource Management Act* (Wellington: Institute of Policy Studies, 2001).

⁵³ Greater Wellington Regional Council, 'Draft Regional Policy Statement for the Wellington Region 2008', (Greater Wellington Regional Council, 2008).

⁵⁴ N. Smith, 'Simplifying and Streamlining the Resource Management Act,' in *National Party Conference, 4 August* (Langham Hotel, Auckland: National Party, 2007).

⁵⁵ Greater Wellington Regional Council, 'Wellington Regional Land Transport Strategy 2007-2016 (Adopted July 2007)', (Greater Wellington, 2007).

improvements⁵⁶ is a significant first step. But this is still limited in comparison to roading investment over the same period: for example, state highway investment in 2007 is still running at more than double public transport investment.⁵⁷

Fourth, changes to national transport, environmental/planning and local government legislation are likely to be needed to give higher priority to CO₂ reductions. This means changes to the Land Transport Management Act 2003, the Resource Management Act 1991, and the Local Government Act 2002. Changes could include reducing the barriers to, and indeed requiring specific steps toward, more integrated urban design and transport planning.

These measures above have been ordered from quickest to slowest. Legislative changes are assumed to take time, but conversely, the government policy statement already under preparation could start to reshape land transport investment priorities soon. Whether there is currently sufficient understanding within the government and the transport sector of the urgency of significant steps towards decarbonisation is another matter. None of these measures alone will have much overall impact on transport emissions, and it is easy to be naïve about the potential of better policy integration, facing as it does the constraints of power and advantage.⁵⁸ But taken together, a number of the measures identified could have a significant impact over time, especially in the context of rising oil prices, the government's electric vehicle initiative, and some change in transport habits.

In addition, other innovative mechanisms used or being considered in other countries might be explored in New Zealand. These could include measures such as sprawl 'impact fees'⁵⁹ which might provide useful financial incentives for denser and more mixed urban land use. Specific statutory traffic reduction targets for cities, as suggested in the UK⁶⁰ are a potentially useful medium-term measure, if experience of them in the UK is gauged a success. Customised mobility initiatives, as the Dutch are exploring, might be also considered.⁶¹ Given the importance of having a variety of mutually reinforcing policy measures acting together, as the Energy Strategy outlines,⁶² the pricing of key roads or urban road networks would be a valuable additional policy instrument,⁶³ even if it is one which is politically difficult to progress at present. It remains an option for improving resource allocation in the surface transport sector generally, in part through reducing congestion, while at the same time reducing carbon emissions.

CONCLUSION

While the direction and intent of the Government's recently released energy and climate change (emissions trading) strategies are commendable, many of the transport- and urban form-related measures in these strategies remain to be fully explored and developed. While the likelihood of oil price increases means CO₂ emissions growth could slow and begin to decline, there are large question marks over prospects for transitioning to markedly lower-carbon transport and urban

⁵⁶ New Zealand Government, 'The Framework for a New Zealand Emissions Trading Scheme,' p. 82

⁵⁷ Annette King, 'Address to the 2007 Rooding New Zealand Conference,' (The Beehive, 2007), (12 May 2008).

⁵⁸ Memon and Douglass, 'Integrating Transportation and Land Use Planning: A 'Think Piece'.', Susan Owens and R. Cowell, *Land and Limits: Interpreting Sustainability in the Planning Process* (London and New York: Routledge, 2002).

⁵⁹ M. Pratt et al., 'Economic Interventions to Promote Physical Activity: Application of the Sloth Model,' *American Journal of Preventive Medicine* Vol. 27, No. 3 (2004).

⁶⁰ Royal Commission on Environmental Pollution, 'The Urban Environment,' (London: Royal Commission on Environmental Pollution, 2007), p. 90.

⁶¹ Rene Kemp and Jan Rotmans, 'Managing the Transition to Sustainable Mobility,' in *System Innovation and the Transition to Sustainability: Theory, Evidence and Policy*, ed. B. Elzen, F.W. Geels, and K. Green (Cheltenham: Edward Elgar Publishing Ltd., 2004).

⁶² New Zealand Government, 'New Zealand Energy Strategy to 2050. Powering Our Future.'

⁶³ Ministry of Transport, 'Sustainable Transport: Update of the New Zealand Transport Strategy. Discussion Paper.' p. 53.

development in New Zealand. Moreover, because cities and the behaviours of city residents are complex and because behaviours are resistant to change, there is no easy way to reliably project the trajectory of transport-generated urban CO₂ emissions in New Zealand and to ensure significant emission reductions take place.

In principle, there is considerable potential for New Zealand cities to be substantially decarbonised over a period of decades, in much the same way that a car culture and private vehicle-dependent urban form emerged gradually after World War Two. To the extent that transport behaviours are culturally engrained, decarbonisation will be slower. Changes will require a coordinated and integrated mix of measures, including planning and price instruments, supported by a process of raising public awareness of the need for change, and the advantages, in terms of access, health and other outcomes, of living in more compact and better designed cities. Given the co-benefits of increased active travel, and the urgency of the climate problem facing the planet, New Zealand has every reason to accelerate the transition to low-carbon urban form and transport.