## Submission on the draft findings of the Productivity Commission report:
# Using Land for Housing

**FIT (Fair Intelligent Transport) Wellington**

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## Introduction

1 FIT Wellington is an umbrella group of concerned Wellingtonians who wish to see a change in the present-day culture where the private motor vehicle dominates other transport modes. We wish to see Wellington and the wider region, designed around the needs of people, not cars.

This submission is primarily concerned with the interactions between land-use and transport policies, and is in four sections:



Three surprises have appeared in research for this submission:

- The sense of space possible at high density (Vauban: 130 persons/hectare)
- The scale of health benefits available from a quality approach

- The benefits of cycle access to quality public transport.
  High-density areas can be larger, with correspondingly lower pressures towards high-rise; and layout for cycling brings important contributions to both quality and public health.

## Transport and the quality of city life

2 Urban transport is going through a paradigm change. The policy battle is won in some cities but in New Zealand the debate has barely started. Two quotations set the tone:

> *We can have a city that is very friendly to cars. Or we can have a city that is very friendly to people. But we cannot have both.* Enrique Penalosa, Mayor of Bogota 1998–2001 responsible for the city's Transmilenio Bus Rapid Transit system

> *The core conflict in the town planning debate of the last century—the battle between car friendliness and urban life in the city—is now drawing to a close. The city of the future will be liveable and allow mobility also.* Stadt Hamburg, 2014

3 Under the present paradigm, developed since the 1950s, too much transport funding goes into motor vehicle capacity and too little into other modes. This is economically inefficient, but the economy also suffers in more subtle ways: there is a dark side to the cartoon. A recent speaking tour by Daniel Sauer, of the Swiss Pedestrian Association showed children's drawings of their route to school. Those who walked produced lively, realistic drawings, while those who were driven produced darker, stylized or abstract images with no clear route: Sauer's comment was '...pretty desperate, I think'. Some related effects are outlined in paragraph 11 and a broad-brush treatment is described in paragraph 14.

Traffic Inducing Traffic

Today's cities are competing for the best people, in all trades and professions, and an important attractor is a 'liveable' city. For example, Wellington offers views, a magnificent harbour and clean air because the traffic fumes seldom stay long. It has a very people-friendly waterfront, close to the densest employment centre, but access to it is marred by traffic. We have allowed that traffic to become self-promoting as 'triple convergence' fills new road capacity but brings little or no economic benefit. The response is intuitive but counterproductive: more capacity, more cost and little more benefit. The supposed beneficiaries suffer unnecessary danger, delays, noise, pollution and mental effects.

There are good examples of another paradigm, such as Vancouver, Zürich, Freiburg and York. The first two took another approach because referenda threw out major new highways, and the second two chose to keep their medieval city centres. These cities have reduced motor traffic, or controlled increases, with no overall economic disadvantage. Many more cities are rethinking their policies, from Adelaide and Bristol to New York.

Some advantages of reducing traffic were noted in the UK half a century ago, in the 1963 Buchanan Report:[1]

> *Traffic and roads are not ends in themselves, they are services only. The end is the environment for living and working.*
>
> 130 *It is often said that streets are for the passage of vehicles only, and although this may be a sound legal view it has obscured the fact that streets perform other functions, some of them vital. They give access to buildings, they provide an outlook from buildings, they provide light and air, they are a setting for architecture, and they are the backbone of the everyday surroundings for many people. It is impossible to maintain that these functions are subordinate to the passage of vehicles.*
>
> Appendix 1 *...every street must have two capacities for traffic—a 'crude capacity' related only to the movement and parking of vehicles, and an 'environmental capacity' in which account is taken of the need to restrain the volume of traffic in order to maintain environmental standards.*

Colin Buchanan also recognized that widening streets makes them more dangerous for pedestrians, and suggested carriageway widths (between kerbs) of as little as 5.5 metres, or four metres one-way. Such practices are established in many parts of Europe. In New Zealand many suburban access roads have carriageways 12 or 14 metres wide, with large-radius kerbs 'for safety'. The result is fast motor traffic because the road feels safe to drivers, but speed and long crossing distances makes them dangerous for walking and cycling. Using wide roads makes them more costly, less safe and leaves less land for building.

4 Paradigm-change is very real and very difficult to manage. A good paradigm is difficult to question because it tends to define the questions asked. Change comes not so much from new evidence as from changing mindsets, and is seldom clear-cut because both sides use their own paradigm for support: both sides are using circular arguments. The New Zealand Transport Agency (NZTA) claims to have coherent policies supported by local and overseas research but note, for example, the criticism by Pickford (paragraph 5). The NZTA is likely to be seen by future generations as not so much a Galileo or a Copernicus as a medieval scholastic. In that particular paradigm-change—understanding the solar system—most scientists by Isaac Newton's time accepted Galileo, but with no final proof until the nineteenth century. That is the nature of paradigm-change: getting heads around new concepts.

Some gaps in the current paradigm are outlined below but—of course—similar gaps will appear in these arguments when viewed from an NZTA perspective.

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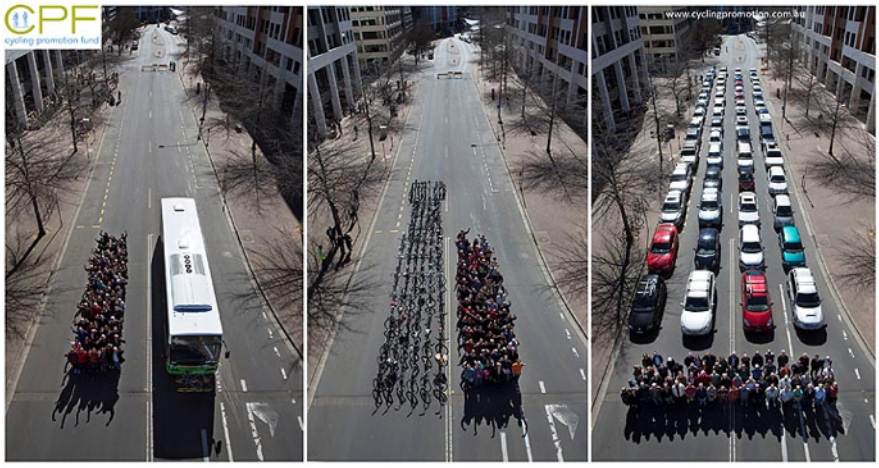
[1] HMSO (1963). *Traffic in Towns.*

## 5 Congestion

Motor vehicles are the principal source of congestion because they need so much more road space than other modes, as well as generous parking space at both origin and destination. The photos show the problem clearly, but do not show that pedestrians are the most space-efficient mode of all.




## 6 Triple convergence

Building urban roads is often counter-productive because of 'triple convergence'. The effect was first noted in London in the 1930s and has often been reported since,[2] sometimes absorbing as much as 50–100% of new capacity.[3] Urban roads quickly fill up, not so much with new traffic as with existing traffic converging from three sources: other routes, other modes and other times of day. The effect has been explained by Downes[4]:

> [Triple convergence] *occurs because traffic flows in any region's overall transportation networks form almost automatically self-adjusting relationships among different routes, times, and modes. For example, a major commuting expressway might be so heavily congested each morning that traffic crawls for at least thirty minutes. If that expressway's capacity were doubled overnight, the next day's traffic would flow rapidly because the same number of drivers would have twice as much road space. But soon word would spread that this particular highway was no longer congested. Drivers who had once used that road before and after the peak hour to avoid congestion would shift back into the peak period. Other drivers who had been using alternative routes would shift onto this more convenient expressway. Even some commuters who had been using the subway or trains would start driving on this road during peak periods. Within a short time, this triple convergence onto the expanded road during peak hours would make the road as congested as it was before its expansion.*

The NZTA Project Evaluation Manual used to give an evaluation procedure for triple convergence but it was optional, seldom used and now seems to have been dropped.

A standard response of such arguments is to point out that freight is essential. This is usually correct but irrelevant: trucks rarely make up more than about 15% of an urban traffic stream, not enough to upset to upset the general pattern. The argument contains an underlying assumption that traffic and traffic growth are fixed, thus giving too much weight to 'gridlock'. In

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[2] The best-known study is probably SACTRA (1994). *Trunk Roads and the Generation of Traffic.* London: Department of Transport, ISBN 9780115516139

[3] Some international estimates are collated at http://www.vtpi.org

[4] Downs, A (1992) *Stuck in Traffic.* Brookings/Institute of Land Policy, also quoted at http://www.brookings.edu/research/papers/2004/01/01transportation-downs

fact gridlock occurs only when an unexpected event upsets the 'almost automatically self-adjusting relationships among different routes, times, and modes'. A recent Wellington example was in 2013, following two large earthquakes. Most office managers sent staff home immediately after the second quake, and the unusual pattern overloaded the network.

When new capacity is opened, triple convergence increases traffic until the level of congestion is much the same as before. The same thing happens, in reverse, when existing capacity is closed. Either way, the level of congestion usually settles down within a few days. Sometimes drivers' collective response is spooked by dire publicity and congestion *falls*, despite the loss of capacity. This happened when APEC met in Auckland in 1999 and the Southern Motorway was closed for motorcades: other roads carried unusually light traffic.

It is often claimed that traffic congestion costs some huge sum and 'something must be done', but some skepticism is justified:

- A consequence of triple convergence is that such estimates mean little because the obvious solution is counterproductive. Effective solutions must manage trips by car, not capacity to make trips by car.
- Estimates are often over-stated because the comparison made is false. A reasonable comparison is the level of congestion that maximises road capacity, not the highest practical speed (at say 3.00 AM) and certainly not the highest permitted speed if all signals are green.
- Effective solutions are available (paragraphs 5, 7, 10 and 12) but driving organizations cry 'subsidy'.
- Drivers have proved reluctant to pay for economically priced toll roads.

## 7 Other evaluation problems

- Metz notes (in the Abstract of his paper):[5]

  *The idea that the main benefit of improvements to transport infrastructure is the saving of travel time has been central to transport economic analysis. There is, however, little empirical evidence to support this proposition. Indeed, in the long run average travel time is conserved, implying that travellers take the benefit of improvements in the form of additional access to more distant destinations made possible by higher speeds. Such a perspective, based on considerations of the value of access, has implications for economic appraisal, modelling and policy.*

- Pickford notes that NZTA highway evaluation methods no longer consider objective benefits directly.[6] The result is that uneconomic roads are approved, their funding wasted.

  *The inconvenient truth is that the current approach to the ranking and selection of state highway projects, including the roads of national significance, under which the role of economic efficiency has been greatly diluted, has resulted in many hundreds of millions of dollars of benefits annually being squandered in pursuit of the empty goals of 'strategic fit' and 'effectiveness'.*

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[5] Metz, David (2007). The Myth of Travel Time Savings. *Transport Reviews,* 28:3, 321—336

[6] Michael Pickford (2013). State Highway Investment in New Zealand: the decline and fall of economic efficiency. *Policy Quarterly,* Aug 2013

- Time savings are the principle benefit considered, evaluated to the second. However real times are variable, and just missing a traffic signal is likely to delay a driver by over a minute. It follows that time savings of less than a minute or two are a lottery, of very little value and should be ignored or heavily discounted. Either would drastically reduce benefit estimates.

## 8 Carbon emissions

The problem of reducing carbon emissions is becoming critically urgent. Private motor vehicles are one of New Zealand's principal carbon emitters but diesel buses have substantially lower emissions—if they are well-filled—and electrified trains, trams, trolleybuses and battery-buses in New Zealand could be almost entirely carbon-free.

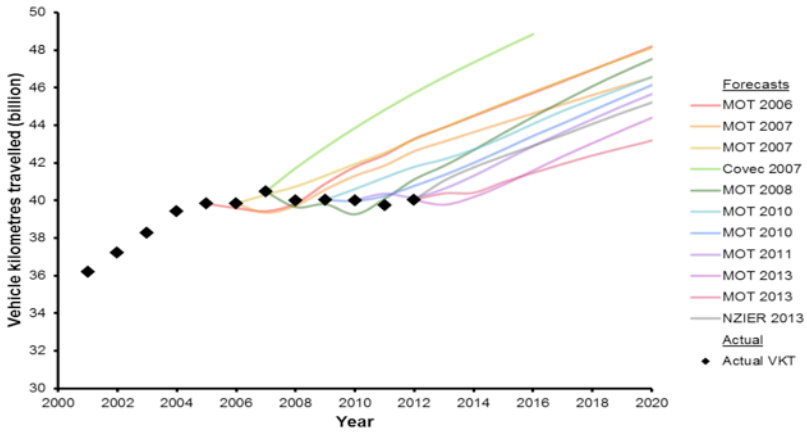
## 9 Oil scarcity and price

Despite relative low oil prices at present, the world is uncomfortably close to permanent oil scarcity. 'Conventional' (easy) oil peaked in 2005 and has not recovered, despite massive investment. Producing it is now generally dearer, and production is declining at around 6% a year, world-wide. All substitution and growth now comes from 'unconventional oil' (hard). Steve Kopits, Managing Director of oil evaluation company Douglas-Westwood/New York, made a very gloomy presentation (February 2014, http://energypolicy.columbia.edu/events-calendar/global-oil-market-forecasting-main-approaches-key-drivers) and has said elsewhere:

> *Peak oil does not occur when we run out of oil. Peak oil occurs when the marginal consumer is no longer willing to pay the cost of extracting and processing the marginal barrel of oil.*

Oil price and scarcity are among the stresses facing New Zealand transport since conventional oil peaked in 2005, illustrated by the Ministry of Transport[7] (at right).

Figure 2: Historic New Zealand light vehicle traffic forecasts vs actual growth




[7] Ministry of Transport, New Zealand (2014) *Strategic Policy Programme*

## 10 External and misallocated costs

Transport, and particularly road transport, has massive but ignored external costs: generally around a half of internal costs.[8] The first investigation in New Zealand was in 2005 by the Ministry of Transport.[9] It was dismissed by the industry and never followed up, although the results were reasonably consistent with overseas studies.

The Ministry also noted good reasons for intervention in the transport market. For example:

> [2.3.2.3] *A major issue which arises in New Zealand, as elsewhere, is the co-existence of one sector (roads) where pricing is set using FAC/PAYGO and investment rules are based on social cost-benefit considerations, and another sector (rail) where the rules are commercially based. A similar issue may arise within the roads sector if some roads are provided on a commercial basis (e.g. toll roads) but 'compete' with publicly-provided roads. Broadly there are two problems which arise: the first is that pricing policies differ across the sectors and this affects mode and route choices.*

There are also misallocation issues with public transport. An example is the dramatic differences between bus routes in Auckland and Wellington: most get stuck in peak-hour traffic and some even get stuck in inter-peak traffic, but the Bus Rapid Transit system to the North Shore is mostly free-flowing. Intervention in the market—by providing exclusive lanes for buses—has attracted many more passengers and reduced road congestion. Rail in Auckland is showing even more dramatic effects of investment, with passenger traffic at the Britomart interchange growing at an average 14% over a decade. Now electrification has brought rail patronage growth of some 22% in twelve months.[10]

Public transport by rail is exempt from road congestion and has some effect on road traffic speeds, first noticed in London when it was found that rail and road commuters had generally the same travel times.[11] More recently it has been realized that light rail, bus rapid transit and even bus lanes can have similar effects if given adequate priority.[12] In effect, these modes set a maximum level of congestion by attracting car drivers passengers to less-congested modes.

## 11 Social factors

Some of the external costs of road use are social factors relevant to suburban density:

- Road safety, especially in residential streets. For example, the sketches (next page) show the effect of increasing vehicle speed on driver's field of vision.[13] Her or his brain runs out of processing power and focusses on the area of greatest personal importance. A common result is accepting a speed which is dangerous for other road users.
- Traffic noise.

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[8] http://www.vtpi.org/tca/tca00.pdf

[9] Ministry of Transport, New Zealand (2005) *Surface Transport Costs and Charges Study,* by Booz Allen & Hamilton

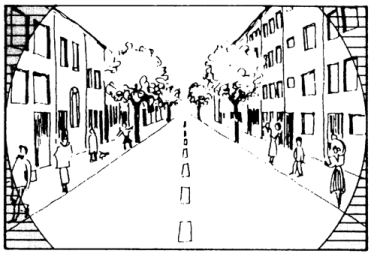
[10] www.transportblog.co.nz 22 July 2015

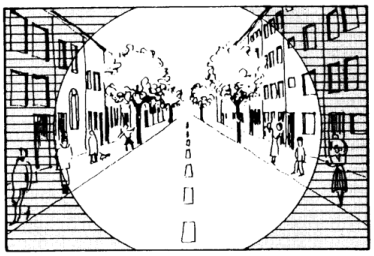
[11] Mogridge, MJH (1997). The self-defeating nature of urban road capacity policy. *Transport Policy* 4 (1) pp 5-23

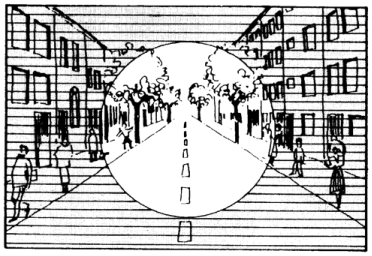
[12] Wood, K (2007). The Paradox of Congestion. *IPENZ Transp Gp Confce*

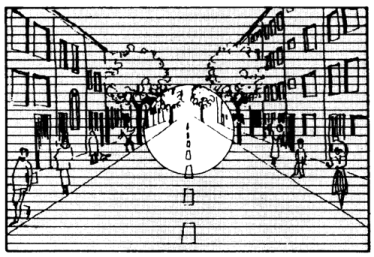
[13] Hass-Klau et al (1992). *Civilized streets, a guide to traffic calming.* Brighton, UK: Environmental & Transport Planning

- Effects on mental health such as reported by Sauer (paragraph 3). Another effect is heavily reduced social contact with neighbours as traffic increases.
- Health effects of pollution, including the newly-recognized health effects of tiny particulate emissions ($PM_{2.5}$) from diesel engines.


24 km/hr


32 km/hr


40 km/hr


48 km/hr

12 There are barriers to funding alternatives to motor vehicles, despite obvious advantages under the new paradigm. Funding for Auckland's badly needed City Rail Loop is being deferred by central government, and there is no clear funding for Auckland's light rail proposals.

Wellington also has problems:

- Necessary public transport projects, of regional importance but entirely within the Wellington City Council area, are being deferred in favour of lower value projects elsewhere. The City Council wants quality public transport but is out-voted by other local authority mayors.
- Light rail is probably the best option in central Wellington but has been rejected in favour of substandard Bus Rapid Transit. How it happened is murky, the reasoning implausible. Might there have been an NZTA or central government instruction that light rail would not be funded?

**Density done well, and living with density**

13 The Commissions Recommendation 5.4 (setting building heights using benefit:cost ratio) is a useful exercise but needs to be moderated by other measures: otherwise the result will tend to be brutalist soviet-era tower-blocks. This might work in the centre of a large brownfield development but will generally need more care. On the other hand, as noted by the Commission, it is ludicrous that outer suburbs should have greater density than inner suburbs. It makes sense that Auckland's inner suburbs should see substantially greater density, and much the same will be true in other cities.

The secret is 'density done well': density repackaged and made acceptable. The phrase seems to have been coined by Brent Todarian, a former Planning Director in Vancouver, who made a recent speaking tour in New Zealand. This summary is extracted and edited from an article by Todarian[14].

> *It is an understatement to say that density is a controversial subject. One big reason is that often density is done rather poorly in many cities. Density tends to be seen as something developers want, but the public values of density are compelling:*

[14] http://spacing.ca/national/2013/04/10/toderian-density-done-well/

- *Facilitating more affordable housing choices*
- *Curbing the negative impacts of sprawl*
- *Mitigating climate change*
- *Dramatically decreasing energy costs*
- *Increasing energy independence*
- *Making walking, cycling and public transport more inviting*
- *Improving public health, diversity, creativity, safety and vibrancy.*

*Not to mention making municipal services and infrastructure much more efficient per-capita, an issue that can literally bankrupt sprawl-based cities. Study after study has shown all of these things—and more—are improved with greater density, if you do it well.*

*Greater density should not be a mathematical exercise, or the product of a one-dimensional read of 'highest-and-best-use.' Density done well should be a design-based approach to responsible city leadership, flowing from a city's vision and values. Density done well is just as much about artfully adding to the inner city beyond the downtown, and building smarter suburbs that are more mixed, compact, walkable, and transit friendly. Density is not just a downtown thing, but even gentle forms of density can be especially controversial in the suburbs. So what does density done well look like?*

a) Align land-use with getting around

*For decades, many cities have separated thinking about land-use and transport, and the car-capacity 'tail' has tended to wag the land-use 'dog'. This has always been a recipe for failure, resulting in car-dependent cities. And if you try to do high densities planned around the car it also fails—miserably.*

*Vancouver illustrates a different and better way. Starting with the refusal of freeways in the city in the late 1960's, Vancouver continues to design a multi-modal city that prioritizes walking, biking and transit. If uses and activities are mixed and compact, with everything proximate and walkable, the 'power of nearness' makes every method of getting around work better. There is freedom of choice and it even works better for drivers.*

b) Insist on a consistently high urban design standard

*Cities that 'take what they can get' in urban design and architectural quality, usually get what they ask for. Success needs high and clear design expectations, to maximize and protect value in both the public and private interest, something smart developers understand and appreciate.*

*In short, great design makes density work. High design quality emphasizes making places people love, and includes connecting to and embracing assets like* [Wellington's] *waterfront for public use and public life.*

*'Height dogma' doesn't work: building height is a challenge for better design. Every scale of building, tall, medium or small, should be designed creatively and beautifully, with the right scale in the right places.*

*Perhaps most important is a focus on how the buildings meet the street, and making the experience at eye-level and walking pace constantly visually inviting. No blank walls along the sidewalk!*

c) Amenities make density enjoyable

*If you plan for too many people without the amenities that make high density living enjoyable, it often fails. Amenities support public life, and the denser it gets, the more such amenities are needed. Design for parks, recreational and people places; childcare playgrounds and schools; and cultural, civic and heritage offerings. Density also brings the population for market-driven amenities like the coffee shop, pub, grocery store and farmers market. These amenities make density livable, lovable and successful for all, children not excepted.*

*Density is never easy, and poorly done density deserves to be criticized. However if any city-region takes its economic resiliency, livability and sustainability seriously, density done well is a must.*

Todarian's slides[15] are worth a look, including the slide alongside paragraph 3 above and:

*We could never to that in our city!*

*The key problem of sprawl is auto-dependency*

*Cities need a lot more multimodal thinking and Density Done Well.*

14 Todarian's approach is supported by a very different approach, from a public health perspective, by Active Cities.[16] It is supported by a wide range of organizations. The case is summarized on page 3 of the reference:

This is About Making our Cities More Competitive

*A city's ability to compete depends on an active population. The research is clear on this. Integrating physical activity into the places we work, live, learn, travel and play is the only way to ensure we learn enough to thrive.*

*Physical inactivity is bankrupting economies at the national level, but it is felt most acutely by the world's cities—often through negative impacts on the health of people,economies and the environment. This is bad news for cities and their citizens. The good news is there's a solution.*

*Our bodies are designed to move. Our cities should be too.*

*Higher levels of physical activity are associated with positive outcomes for most of the things that matter to city leaders. When people move more, crime, pollution and traffic go down. Productivity, school performance, property values, health and wellbeing improve drastically.*

*Cities that make physical activity a priority, convert existing spaces into active spaces, and design environments for people to be active will create a legacy of physical activity. These active cities will be better off by almost every possible measure.*

*Our purpose here is to provide a blueprint for creating active cities, whatever their size and wherever in the world they may be.*

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[15] http://ecan.govt.nz/publications/General/cat-forum-141014-toderian.pdf

[16] http://www.designedtomove.org A detailed report, *Active Cities* can be downloaded from the site. It is tagged *A guide for city leaders.*

Some of the most widely-implemented solutions are:

- Bike sharing
- Motor-free streets
- Fitness in public parks
- Marked bike lanes and visible land divisions
- Open street events
- Integrating walking and cycling with public transport
- Pocket parks and playgrounds.

Active Cities give quotes from cities that have taken an active city approach:

> *Once Bristol made it easier to walk and cycle than to drive, everyone did.*
>
> *Streets are now safer by design. We are putting every tool we have— engineering, enforcement and education—to use in reaching Vision Zero. This is about more than numbers. Vision Zero means parents can more safely cross the streets with their children, and seniors can walk their neighborhoods more easily. We're approaching this second year of work with proof these methods work and expanding them to even more neighborhoods.* Mayor Bill de Blasio, New York
>
> *For Adelaide to continue to be seen as one of the most livable cities in the world, it is essential that we continue to work towards an integrated transport system that considers the needs of all city users. We believe that the ability for residents, businesses, students, workers and recreational visitors to have access to a range of transport options will help to ensure that the city is a thriving hub of activity and creativity well into the future.*
> Mayor Martin Haese, Adelaide

15 These multiple approaches require a fairly high level of central planning. Height dogma (paragraph 13b) would be a disaster, but setting rules and then waiting for a market response might be nearly as bad: developers might scramble to build the most profitable bits. Regardless of maximum height, some buildings should be lower, for scale, appearance and to control down-draughts. Some buildings might be single storey, or there might be (say) a maximum 20% of site coverage as high-rise; and often blending heights to match existing limits.

Given the value of bicycle access to public transport (paragraph 18), higher-density zoning might be limited to medium-rise, as used in Vauban (paragraph 21). A reasonable limit might be 6–8 floors, which I understand is now practical using relatively cheap timber construction. Other necessary variables will be appearance; variety; trees; affordability; open space; traffic and parking management; children's safety and recreation; and so on.

Another range of variables must be within higher-density buildings: floor area and number of bedrooms in each living unit; more and less affordable. This kind of variation at Vauban seems to be often within a single block, and adjacent blocks rarely look the same: the only obvious exception is the student area, reusing the 1930s barracks buildings.

Under these conditions it is inevitable that some buildings and zones will be more profitable for developers than others, and some will be unprofitable. Planning and consenting will need to

ensure that everything is built. Another dogma that might have to go is one building, one floor-plan. It should be a simple enough matter to design a floor plan with two or three unit sizes, with other options available by using stairs to double unit floor-area.

16 Two more necessary components are integrating with existing buildings and over time. We know that reducing minimum lot size and relying on the market does little to achieve the density sought, so what else is possible? Some of the questions needing answers will be:

- Where will greater density be most effective? Railway stations and bus interchanges will be part of the answer.
- What will be the target population density? Probably not a one-size-fits-all approach.
- What will be the scale of intervention? Probably tens to thousands, perhaps tens of thousands.
- How can scale be optimized? Site-specific might be a good approach.
- Which existing buildings must be retained (heritage, amenity, community, infrastructure or too costly to move)?
- What compulsory powers will be needed?
- How will roading be adapted or rebuilt?
- How to protect retained buildings from overshadowing by new buildings, and what level of protection is reasonable?
- How to encourage creative solutions?
- How to guard against compromise redevelopment which the next generation must do again?
- How to get results reasonably quickly?
- How to help existing residents forced out? Should they be offered deals to move back into the finished complex?

17 Todarian's emphasis on quality, supported by both Active Cities (paragraphs 13 & 14) and the example of Vauban, highlights a dilemma in New Zealand. The government wants to control Auckland housing costs, and residential density must clearly be part of the solution. However, increasing density in the obvious places—well-established inner-city suburbs—is always unpopular, and will become even more unpopular if rushed: doing it well takes time. Partial solutions to the dilemma might include:

- Initially rely on brownfield and greenfield areas, where possible.
- Consider compulsory purchase in suitable areas.
- Consider all scales of project.
- Introduce a 'density done well' approach as soon as possible.
- Consider a Vauban-like demonstration project on a brownfield site with good communications to the city centre.

## Transport supporting density

18 Figure 2.6 of the draft report is a useful aid to visualizing greater density in a generalized city, but might be a trap when considering specific areas. 'Transport' can be treated as homogenous in the one case but not in the other, and the authors of Auckland's Unitary Plan might have fallen into the trap. A new map of the Auckland isthmus[17] shows very limited areas within a one-kilometre walk of a suburban railway station, and thus suitable for residential growth. Adequate growth within such limited areas will need high densities, high-rise 'walls' at the perimeter and will provoke very high indignation from existing residents.

Todarian notes that car-based density fails miserably (paragraph 13a) and two illustrations in this submission suggest why: the road areas needed for the same number of people in cars, on cycles or in a bus (opposite paragraph 5) and the aerial photo at right. It is of a railway station in the Netherlands with space for some 800 cycles (on two levels) needing less space than 20 cars. Cars are too inefficient in too many ways, and especially inefficient users of costly land.

A simple solution to this area-and-access dilemma is bicycles, which could increase the area available for higher-density zoning ten or twenty-fold (nominally 3.1 or 4.5 kilometres radius). Another attractive option in Auckland would be higher-density zones linked to the proposed light rail routes on the isthmus.

19 All this suggests two levels of transport objective: within the higher-density zone, and from there to the nearest public transport centre if necessary.

Suggested transport objectives within a higher-density zone are:

- Motor traffic controlled to ensure safe cycling and walking, with drivers generally prevented from taking a short-cut through the zone.
- A maximum speed of 30 km/hr, passively enforced, and 5 km/hr on shared space (5 km/hr is unenforceable but this doesn't seem to matter in practice).
- Roads narrowed to control speeds, make space for cycles as needed and make crossing easier for pedestrians. Minor roads can be laid out as shared space.
- Roadside parking laid out so that the road remains narrow (and slow) when the parking is unoccupied. A good solution is cobbled parking bays, defined by rows of raised cobbles.
- Reduced minimum parking requirements. A new minimum might be as low as one space for every two or three apartments, with anything more in a separate parking building.

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[17] http://transportblog.co.nz, 'Catchies' 28/07/2015

- Residents could be encouraged to minimize car use. Possible methods include parking rights purchased separately from properties, loading and unloading rights for all, and car-sharing vehicles readily available.

Vauban suggests another useful objective: existing roads narrowed or realigned to release space for other purposes.

The second objective—access to pubic transport beyond the higher-density zone—will be needed if a higher-density zone relies on cycle access to public transport outside the zone. The quality cycling infrastructure provided within Vauban has been extended three kilometres into the city centre, and the same can be done in New Zealand. However, given the current low level of city cycling in New Zealand, cycle access to public transport would have to be wider, better quality and safer than is usual today, and if necessary grade-separated in places.

20 The need for quality access in a higher-density zone means that internal roads should be for access only. Any nearby arterial roads should be on the edge of the zone, perhaps with access to buildings from within the zone. Where this is impractical (Wellington proposals for Adelaide Road might be an example) the road could be limited-access, with grade-separated crossings for pedestrians and cyclists, and perhaps also residents' motor vehicle access. Creative alternatives might include road-frontage buildings for commercial use—at least on the ground floor—with vehicle access on one side and pedestrian access on the other.

## Vauban

21 Quartier Vauban is a brownfield development three kilometres outside Freiburg, Germany, on the site of an old military garrison.[18] In this context it is of interest because it demonstrates many ideas worked together in a single high-quality environment. It might be seen as mainly an ideas-bank but possibly also a model for a demonstration project in New Zealand. The gross land area—including roads and open space—is about 38 hectares, the population 5500, giving an overall density of some 130 persons per hectare, or something over double the density of Wellington's Mount Victoria. Buildings are generally three to five storeys, as apartments and houses, with reasonable private and generous communal space. It has proved very popular and buying into the area is relatively costly. See also the photos below.[19]

Features include:

- A wide variety of building heights and styles, as houses; apartments large and small; and student accommodation. There is also a small commercial area, with some 600 jobs. Some residents have access to private open space and all have access to generous open space.
- High density justifies communal facilities: play, sports and park areas, local shops and cafes at six locations, and a farmers' market.
- Car parking is generally separate from living and communal areas. There are two parking buildings for residents and a third for general use. A fourth is open space, planned to meet regulations but may never be needed. Cars and vans may be loaded or unloaded outside each property, but not parked.

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[18] There is a well-illustrated summary document at http://webarchive.nationalarchives.gov.uk/20110118095356/http:/www.cabe.org.uk/files/udss2008-carstensperling.pdf

[19] photos from www.vauban.de

- Even the main street, Vaubanallee, is very quiet (photo below). The grassed central reservation is for light rail. Most other streets are predominantly for walking and cycling (photos on next page, witn more available at ).
- There is easy access to central Freiburg, by either cycle or light rail (on different routes).

The proportion of cars in Vauban has fallen as development progressed, and 2013 was some 170 cars per thousand persons, compared with over 700 in New Zealand. There are also some 20 car-sharing vehicles parked within the area.

Cycle parking and a low-use shared path

The main street for 5500 people, Vaubanallee, with light rail in the grassed central reservation. Cyclists use a parallel street.

Cycling and walking, plus vehicle access for servicing, loading and unloading