The Density Multiplier: A Response to Mees

Peter Newman and Jeff Kenworthy

Density is about people wanting to be in the same place. It's not hard to see that the more people who want to be in the same place the more that a mass transit system will be needed, so it's not surprising that there will be a relationship between density and transport. Our work over several decades has been about finding thresholds that can help in making these relationships transparent (Kenworthy et al, 1999; Newman and Kenworthy, 1989, 1999, 2006).

Making mass transit functional will also depend on how frequent its service is available. The densest places will not have much transit patronage if services are not provided. Paul Mees' work over several decades has been on making these service level relationships transparent (Mees, 2000, 2009).

It's pretty clear therefore that we shouldn't be fighting over these matters. Nevertheless, we need to say something in public that we have said privately to Paul several times: he is wrong to denigrate the role of density and he is wrong in his analysis that seeks to show this (Mees, 2009; Morton and Mees, 2010). The reality is that density and quality/quantity of services are both essential features of mass transit.

Nevertheless, Mees describes "the density delusion" as being the biggest barrier to improving public transport in Australia. We would like to show that density is a multiplier for any services you provide. In particular, transit use can be multiplied many times by density increases.

The biggest mystery to us remains why Paul continues to want to denigrate density like this as it does create doubt in the mind of policy makers.

Serving doubt

Merchants of Doubt by Naomi Oreskes and Erik Conway (2011) is an analysis of public debate about key topics like smoking and climate change. Certain key approaches are used to underline the scientific basis of the need to intervene and regulate for smoking or carbon emissions. These include:

1. Selecting a small cut of data from a larger sample that supports your case, whilst neglecting the big picture. For example, in the mid-2000's there were 5 years when temperatures went down even though carbon dioxide was going up. However, despite the statistical trend for 2000 years showing global warming closely correlates with carbon emissions there were 'sceptics' who claimed that the five-year trend was proof that no relationship existed.
2. The data used to justify the relationship are challenged for some technical reason that no-one else can really check, thus sowing seeds of doubt about the whole work.
3. Anecdotal stories that 'prove' there is no relationship as claimed. For example, 'my 90 year old grandfather smoked all his life' or 'Bondi Beach hasn't changed in my lifetime, so much for sea-level rising'.

Paul Mees has used these tactics to prove density has no link to transit.

1. Selective data

Mees has made a case for the 'density delusion' based on a selective presentation of data on cities. Instead of presenting all of the cities from our global sample he focuses on the work of Mindali et al (2004) and says:

"In 2004, a team of Israeli researchers re-examined the Australian and US cities in the original *Cities and Automobile Dependence* data-set. Their analysis, replete with a reproduction of the famous hyperbola, found no correlation between density and energy consumption: the US cities had similar densities to the Australian cities, but much higher car and energy use (Mindali et al, 2004; Mees 2009, p.35/6).

This approach appears to deliberately blur the much clearer relationship between density and transport patterns (energy use) when all the cities are included, by simply taking the small sub-set of cities that have a very small range in urban densities. Not even Canadian cities were included. Taking the more comprehensive and more recent 1995/6 data in the Millennium Cities Database (the Mindali paper uses 1980 data) we can explore this finding.

Figure 1 shows the relationship between urban density and car use per person for just the fourteen Australian and US cities in this more recent database.[2] It shows that there is a negative, though only weak relationship (r-squared of 0.22) between density and car use in these fourteen cities, though it is negative in line with our other results and although weak, it is clearly not random.

Figure 2 shows what happens when one adds in the five Canadian cities[3] in the study using the correct urban density figures and not the false ones provided by Mees (see later discussion under Data Questions). Canadian cities have densities that are in fact on average higher than US and Australian cities, though still in the auto city range, but by starting to expand the density range a little in this critical part of the graph where multiplicative effects start to occur (Newman and Kenworthy, 1999, 2006) we start to see that the there is indeed a density multiplier at work. Now there is a r-squared of 0.53 between density and car use.

Figure 1: Urban density versus car use for Australian and US cities, 1995/6

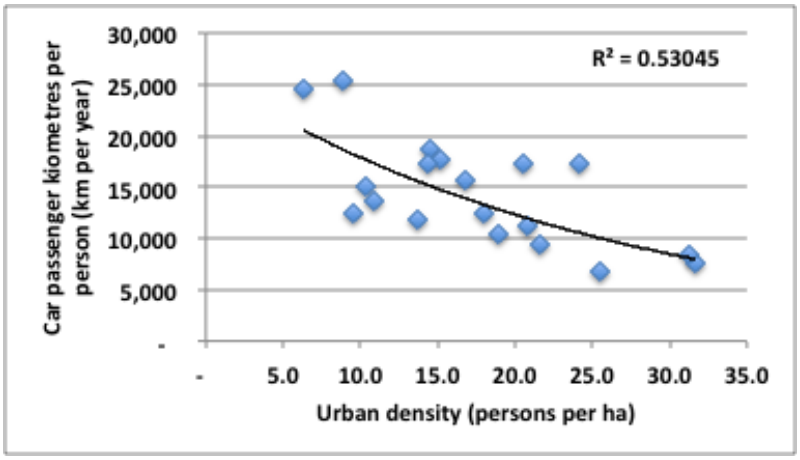
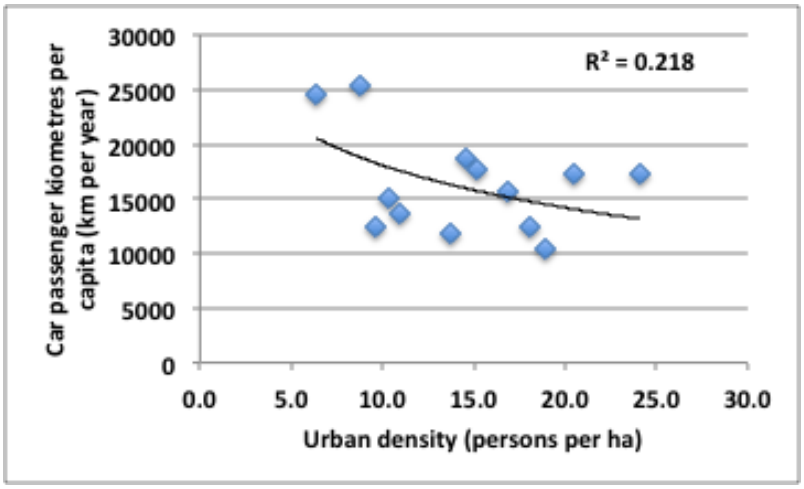


Figure 2: Urban density versus car use for Australian, US and Canadian cities, 1995/6



[2] The cities in the graph are: Brisbane, Melbourne, Perth, Sydney, Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Phoenix, San Diego, San Francisco and Washington

[3] The Canadian cities are Calgary, Montreal, Ottawa, Toronto and Vancouver.

Figure 3: Urban density versus car use for 58 global cities, 1995/6

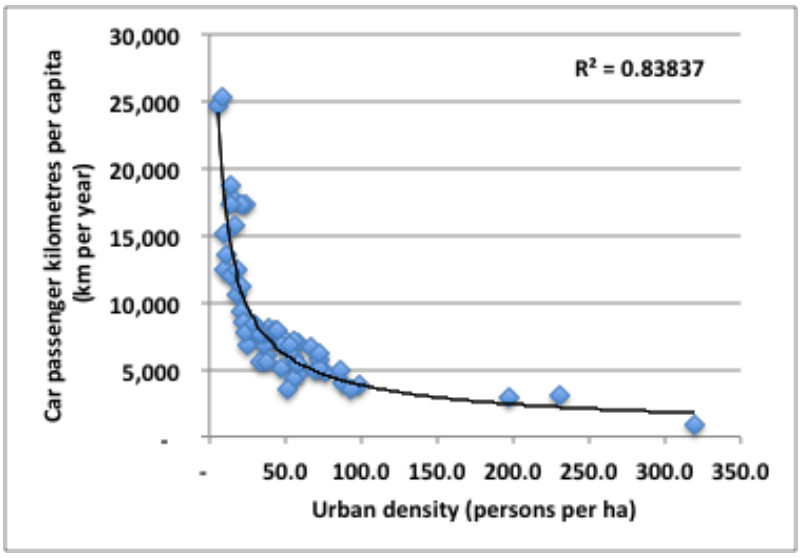


Figure 3 presents then the full set of higher income cities available in the Millennium Database, which brings in mainly European and some Asian cities, in total 58 cities instead of fourteen in the case of Mees' comments about the US and Australian results, which are aimed at invalidating any link with density, and nineteen in the case of adding in the
Canadian cities. The result shows that 84% of the variance in car use across a global sample is explained by urban density.

It is acceptable, naturally, to explore relationships within different regional samples, but not to make the rather reductionist leap that simply attempts to wipe out any density effect whatsoever, by taking only a little slice of the whole picture. Even the modest increases in density evident in the somewhat less auto-dependent Canadian cities, when brought in to the picture (with valid data), has an effect and is worth considering in policy terms.

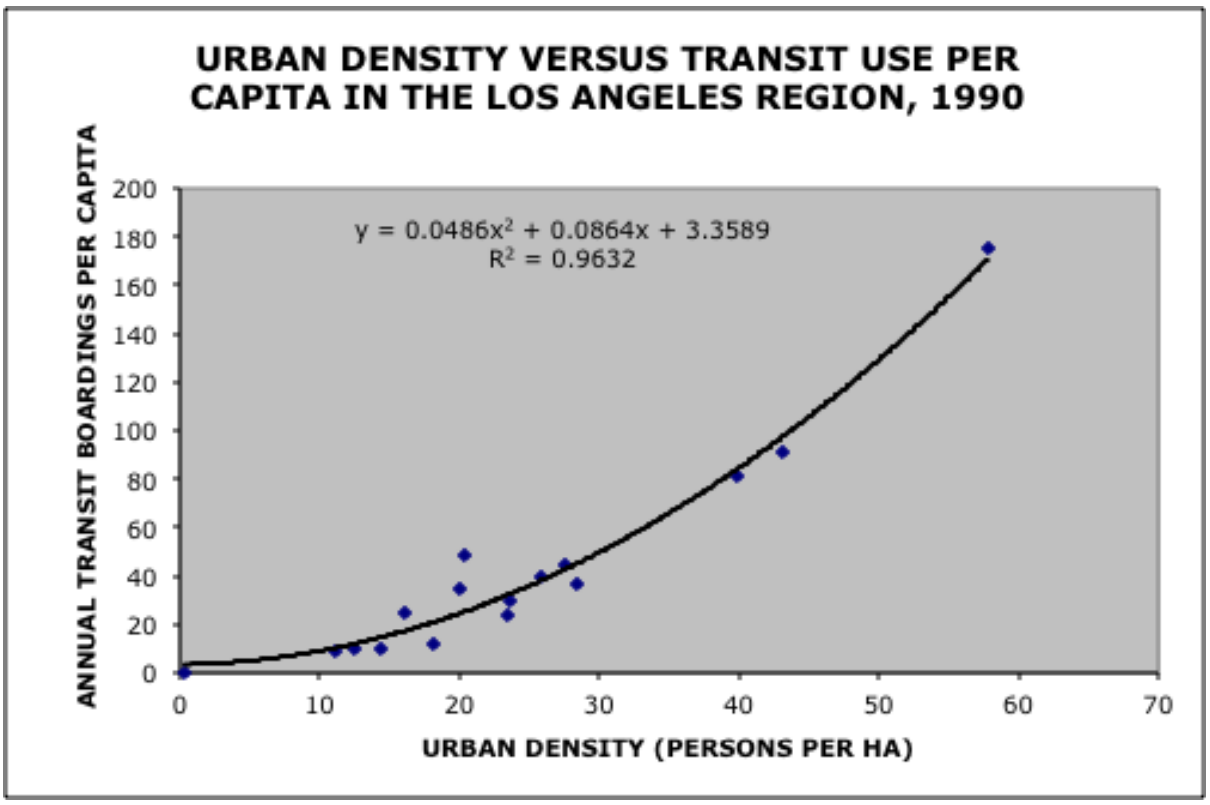
Selective data is very misleading as the relationship between density and transit is not only shown between city comparisons but also within cities. The power of the relationship with density is shown even more dramatically within every city we have ever examined. Los Angeles provides a good example of both the need for density and the need for transit service. Some internal data provided to us nearly 20 years ago by Metro, the main LA transit agency, shows how there is a near perfect relationship within Los Angeles between density and transit use, even in a city not renowned for either its high transit use or high density. The points on the graph are Planning Sectors used by Metro in the 1990s. Los Angeles' urban form of course is not as centralised as European cities, though clearly it has areas that achieve relatively high urban density near the core parts of LA County and these are the areas that very clearly have the highest transit use. West Central Los Angeles reaches 58 persons per ha, likely even higher now, and South Central Los Angeles is 43 persons per ha. Both are equal to typical European city densities (Figure 4).

However, from the Mees 'service perspective' it is also important to note that, notwithstanding Los Angeles reputation as a mega-sprawling low density region, LA County is now the densest urbanised area in the USA with an urban density approaching that of the Copenhagen and Stockholm metropolitan areas and yet it has very mediocre overall transit use per capita, a fraction of the two European cities. This is due at least in part, though not exclusively, to relatively poor transit service infrastructure and service provision, with only a comparatively small but growing and so far very successful rail system. Other factors accounting for its overall low use of transit include the generous provision for automobiles symbolised by the extensive freeways around which the dominant automobile system is built. But it is also true that as the LA rail system and new higher speed bus services are expanded, Los Angeles transit use continues to grow well in

excess of population growth and it recorded the highest per capita transit use growth between 1995 and 2005 of the 10 major US cities in our global cities update (Kenworthy, 2011). Density at the same time is also growing.

Again, both density and transit service levels are important in determining a city's use of transit.

Figure 4: The relationship between urban density and transit use within Los Angeles in 1990.



This strong relationship between density and transit (as well as car use) does not mean there are not other factors at play, but we find the same picture in every city (Newman and Kenworthy, 2006). The extent of the density correlation will be impacted by other factors such as the level of services and other behaviour factors, as pointed out by Ker (2011), but in no city have we found that density did not play an important role in determining the transit patronage. In Melbourne and Sydney detailed regression analysis of their transport greenhouse gas emissions by local government area showed that density explained 56% and 71% of the variance and transit access/services explained 61% and 58% of the variance; in other words both were significant and interrelated (Newman, 2006).

Density is not a delusion; it is a real factor in shaping the overall orientation and performance of the transport system in every city on the planet. If we could find one city that did not show some kind of positive relationship between density and transport, even a plateau, then we would begin to wonder about the significance of density. But we do not.

2. Data questions

Mees has suggested that the Global Cities Database that is used in all our work is suspect as the European density data are too high and hence must be only for the 'central city' thus making comparisons with Australian, US and Canadian cities inappropriate. This is highly mischievous as all our publications presenting the Database

show that the European cities are large city areas like the Greater London Area which although still not the full conurbation of London, covers 7.5 million people today and is hardly a 'central city'. Furthermore, this assertion is another example of Mees rather selective use of data to make a point that is not valid. For example, the Ile de France is what we use to represent Paris and always have (so do the French), not the Ville de Paris, which would correspond a little more to Mees assertion of "central cities", but not even then, because the real central city of Paris is only Arrondissements I to X of the Ville de Paris, which we use when we present data on the CBDs of cities. So yes we do have some limited European "central city" data in terms of jobs and parking, but this is clearly defined in our work and refers to the Central Business District of all our cities (as mostly defined by the cities themselves).

A majority of the European cities are similar. Copenhagen, Helsinki, Berlin, Hamburg, The Ruhr, Athens, Oslo, Madrid, Stockholm, Bern, Zurich, Geneva, Glasgow, Rome, Lyon, Manchester and many more of the European cities in the Millennium Cities Database are legitimate and meaningful representations of those urban regions. In fact, very often the definition chosen and also its name is taken from the authorities' own definitions of their urban regions (e.g, Greater Manchester).

More importantly the transport data are used only to coincide with the area of the city that density is collected. Thus comparisons across the world are possible. Indeed every city in the world has issues that must be decided on where to draw the boundaries and these are always discussed in detail before decisions are made on what to include. European cities do present more issues than many others in this regard because of the heavily urbanised nature of the continent with its innumerable, small, medium and large urban settlements, often blending into each other. Sometimes the nature of the region is so multi-centred and complex with such a large number of cities contained in it, (e.g. the Rhein-Main Region of which Frankfurt is the main city), that even the authorities have a number of ways of defining it. Where the issue arises of how to define a "city" the decision is made on the best balance between the functional urban region and the availability of data.

It is appropriate at this point to also point out that some European cities have been analysed internally by other researchers and have come up with identical graphs to the ones we have developed both between and within cities (Figure 5). For example, the Paris region was studied by INRETS (Institut national de recherché sur les transports et leur securite) and they showed near perfect correlations between density and transport energy use, carbon monoxide and hydrocarbon emissions from transport. Not shown in this paper are a further three graphs on page 57 of their report which shows the same near perfect negative correlations between density and transport NO_x and CO_2, and also a strong correlation with particulate emissions.

The key point is our European cities data are valid and meaningful and present nothing whatsoever that would suggest that density factors are "delusional" or that we are misrepresenting European cities. In addition, analyses by independent research organisations, such as for the Paris region, confirm the importance of density, not only for transport energy use, but also for transport emissions.

Therefore the criticism that some of the European cities as defined by us sit in a larger urban region and that larger area is lower density does nothing to undermine the data at all. The transit usage figures we use are calculated for whatever areas we define and the urban densities for those areas are

based on land use inventories and are genuine urban densities, so the two parameters are matched. All that would happen if we were able to more widely define some European cities is that the density would decline and so would the per capita transit use because those extra more far-flung areas are simply more car-dependent, as they are in every city in the world.

Mees claims that Canadian cities are much lower in density than we have them and more like American and Australian cities, yet their transit usage is much higher, thus negating the density factor and proving the service factor. This is simply not true. Goldberg and Mercer (1986) wrote an entire book about the clear differences between US and Canadian cities and two of the factors highlighted were the higher densities of Canadian cities and their higher transit use compared to their US cousins.

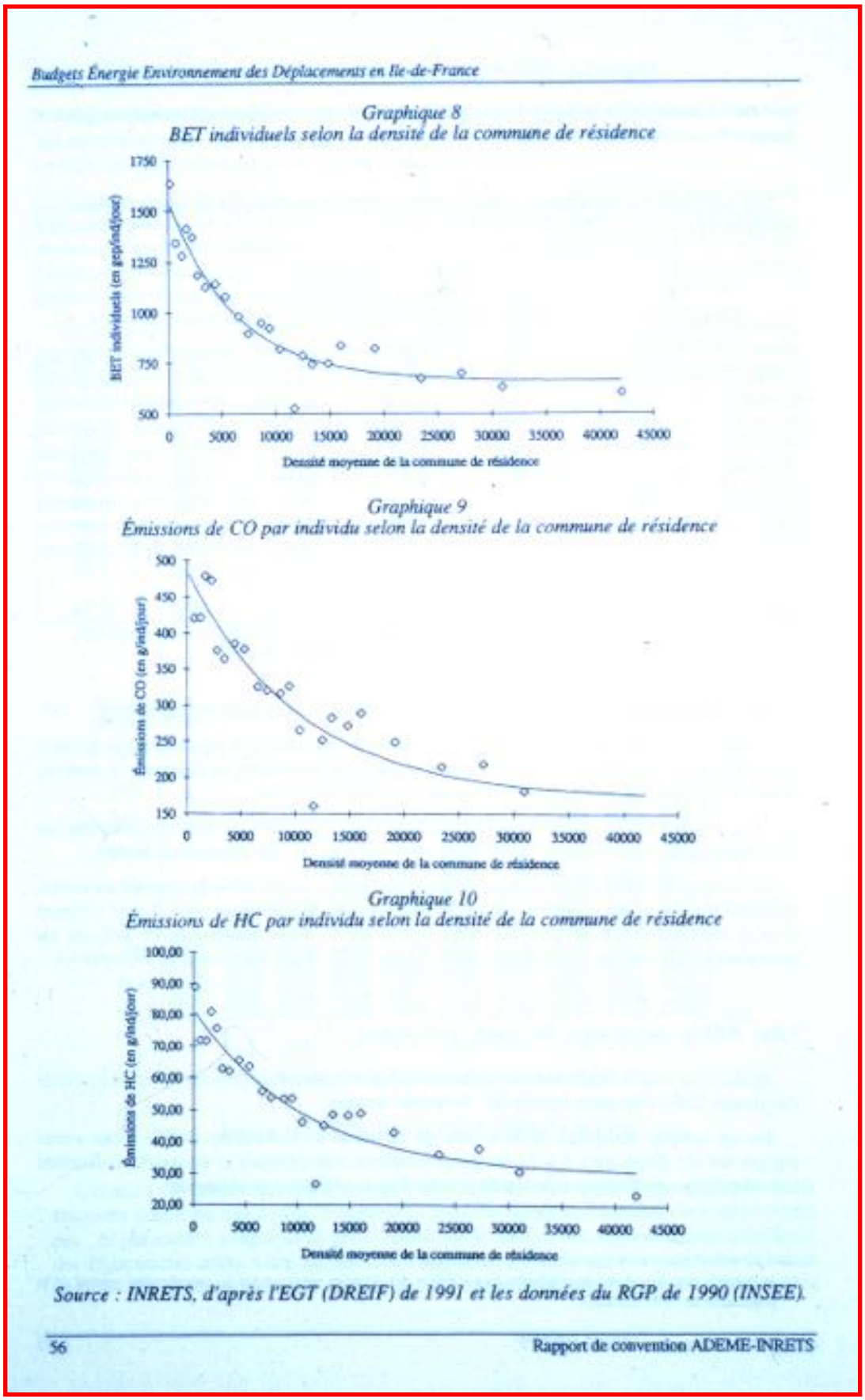
It is not surprising then to find that the low urban densities quoted by Mees for Canadian cities are not in line with all other sources. The average urban density for 2006 for the five Canadian cities we have incorporated (Toronto, Montreal, Vancouver, Ottawa and Calgary) is 25.8 persons per ha, while in Mees data they average 19.1 per ha. The only metro area where we basically agree for 2006 is Toronto (the GTA) at 26.9 per ha in our data with Mees actually a little higher at 27.2 per ha, which is interesting in that he claims the following about our higher Canadian urban densities:

"The reason for this appears to be that Kenworthy's Canadian figures were 'net' or 'residential' figures that excluded non-residential land mixed in with residential land. This can be seen clearly from their map of Toronto (Kenworthy et al, 1999, p. 375), which shows parks, cemeteries and Toronto and York Universities as 'non-urban' land." (Mees, 2009, p.37).

This is not the case, we always include all urban land and our definition of urban density given in Kenworthy et al (1999) in Table 2.4 clearly explains this. The data in Kenworthy et al (1999) for Toronto were all consistently for The Municipality of Metropolitan Toronto, as it was called then, and we specifically noted on page 32 of the above book that the better definition would have been the Greater Toronto Area. In the next data we collected for Toronto for 1996 in Kenworthy and Laube (2001) we used the much larger GTA. The less generously defined Toronto area in Kenworthy et al, (1999) is why the urban density in 1991 is higher, not because of what Mees says. But again, the density and other parameters in our study were tailored to whatever area we used, so any statistical regressions remain valid.

But even more importantly, Mees' Canadian cities densities are all universally less than those of other studies. For example, Bunting, Filion and Priston (2002) report for 1996 in Montreal a figure of 32.9 per ha, Mees reports 19.8 per ha. An independent and careful recent study comparing the reported densities of Canadian cities and exploiting Google Earth to calculate their own densities using our urban land definition put the Montreal region in 2001 at 30.3 per ha (Townsend and McGurk, 2010), while Sorensen and Hess, (2007) showed 28.8 per ha in 2001. The land use data we were given suggest that the Montreal region corresponding to our transport data is 25.6 per ha in 2006. So all other studies place Montreal over the last 15 years years at between 26 and 33 per ha, while Mees has it at 20 per ha. Bunting et al (2002) report densities for our five cities that average 26.9 persons per ha in 1996, while in 1996 our average figure for the same five cities is 26.2 per ha, or almost the same.

Figure 5: Density, transport and emissions relationships in the Paris region.



But there are some further rather glaring problems with Mees' density data on Canadian cities, which become clear in the reality testing of individual cities. For example, in 1992 Kenworthy sat with a senior planner in the offices of the City of Calgary for two days and using extremely detailed data for each small community they assembled the urbanised land area of the whole City of Calgary (which is the functional urban region because Calgary has a history of simply growing its territory by annexing communities as it expands). This planner knew his city inside out and had access to the best data available. The final figure for 1991 was 20.8 per ha. Revisiting the data for 1996, the density had held at 20.8 per ha and in 2006 this had slipped slightly to 20.5 per ha. Mees' reported figure for Calgary in 2006 of 14.0 persons per ha is simply wrong. Calgary may be one of the most auto-oriented cities in Canada, but like other Canadian cities, and just like Goldberg and Mercer (1986) report, Calgary maintains an urban density that helps to give it a relatively healthy transit use of 132 boardings per capita compared to Sydney in 2006 (the densest Australian city) with 19.5 persons per ha and 136 boardings per capita (Mees says Sydney's density is 20.4 per ha, so not a huge difference there). Also interesting is the fact that at about the same density and about the same transit use, Sydney in 2006 provided 78 vehicle kilometres per person of transit service while Calgary provided 52 km per person, apparently not a great reward for significantly more service.

Another interesting one is Vancouver (the Greater Vancouver Regional District (GVRD) or Metro Vancouver today). Mees says the density of Vancouver in 2006 is 17.2 per ha. Our 2006 data show 25.2 per ha, up from 21.6 per ha in 1996. Given the scale and extent of densification in the Vancouver region, especially in the City of Vancouver, such an increase in density is entirely plausible. These densities have been worked out from land use data supplied by the authorities there and according to the definition of what is urban land. What do other studies report? Bunting et al (2002) show 24.4 per ha for 1996, up from 19.7 per ha in 1971 (a 1971 figure that was still over 2 persons per ha more than Mees shows in 2006). Sorensen and Hess (2007) show 23.5 per ha in 2001 and the Google Earth based study mentioned above reports 22.2 per ha. So we have a range of independent studies placing the Vancouver density over the last 15 years at 22 to 25 per ha, while Mees claims 17 per ha.

Edmonton, one of the less studied Canadian cities, is reported by Mees with a density of 10.1 per ha. We were given land use data for 1991, which indicated 29.9 per ha, Bunting et al (2002) show 22.2 per ha in 1996. It is highly unlikely that Edmonton is as low as 10 persons per ha, less than Phoenix, Arizona and about the same as Houston, Texas. Before serious reporting of such a figure occurs, we believe some basic common sense needs to be applied.

It might seem like this is not worth highlighting, but in the lower density range of urban regions from around 7 to 30 per ha, the difference between 17 and 25 per ha, 14 and 21 per ha, or 10 and 22 per ha can be very significant. It generally means the difference between a city with a reasonable amount of higher density areas or sub-centres and one that is generally more sprawling and lacking in many less auto-oriented residential opportunities.

Finally, in order to summarise, if we simply take the average urban density for the five Canadian cities we have analysed from the various studies including our own, we find they report:

26.2 per ha for 1996 (Kenworthy and Laube, 2001),

25.8 per ha for 2006 (Kenworthy, 2011)
26.9 per ha for 1996 (Bunting et al, 2002),
26.3 per ha for 2001 (Townsend and McGurk, 2010)
26.4 per ha for 2001 (Sorensen and Hess, 2007; only 3 of the 5 cities),
19.1 per ha for 2006 (Mees, 2009)

Townsend and McGurk (2010) after analysing this, offer the following explanation:

"The reason for Mees' low figures for most of the Canadian cities seems to be because they were "gross census tract densities". Mees points out that the minimum density of a census tract to be considered "urban" is 4 persons/ha. However, minimum threshold is not one of the criteria Statistics Canada uses to define the parts making up Census Metropolitan Areas, which include rural areas (classified as "rural fringe") which have less than 10,000 inhabitants and less than 4 persons/ha, but are included for other reasons. Mees appears to have used gross census tract density rather than a measure of density which takes into consideration the quantity of land considered urbanized. In order to verify this proposition, the calculation of gross census tract densities was calculated using the 2001 data organized for this study. In most cases, the densities dropped to levels that were very close to Mees' 2006 figures." (Townsend and McGurk, 2010, p.10)

In summary, we go to great lengths to ensure that what we are measuring in cities for density is genuine urban density and it takes a lot of effort to assemble the needed data, talk to the suppliers of the data in each city and to do everything possible to ensure it reflects the true urbanised land area from which to calculate density. It is not easy work.

It is pretty strong terminology to suggest that the work of others is contributing to a delusion and by implication misleading public policy. Far from our density analyses being "delusional", we find they are consistent and highly supportable and attempts to wipe them away, as there have been over the years, does little for the cause of better public policy.

3. Anecdotal Evidence

The stories that Mees uses to clinch his case are all very anecdotal. He finds a small town on the edge of Zurich or an outer suburb in Toronto and compares it with some hapless inner Melbourne suburb where services are poor. And surprise, surprise they are similar or better in fact in the low density area than the poor Melbourne example. Based on the Mees approach he could conceivably also look at the three graphs from Paris in Figure 5 and highlight the commune that appears at about the 12,000 mark on their density axis, which has much lower energy and emissions than all the others, even though it is of a modest density for the Paris region. An anecdotal story could then be created along the lines of "well look at such and such commune and how low its transport energy use is" which could give the impression that density doesn't matter in Paris either, even though there is otherwise a near perfect fit with density. This clearly would not be particularly helpful in a public policy sense.

Anecdotal stories like this indeed cannot be the basis of public policy, they commonly illustrate a broader case and that will include the need for transit service and density increases. The impression from Paul is that you can build transit anywhere, add a high level of services and all will be well. It may in some places, but its much more likely to work in denser areas.

In short many cities run Rolls Royce transit systems in dense enough environments for the systems to achieve high utilisation rates. They "value-add" to their basic density advantage, but they could not do it to

anywhere near the same effect if they didn't have that significant overall density of 40 plus per ha, with many areas well above that. Their low density little villages, hamlets and suburban enclaves with the good transit service are firmly embedded and embraced within a highly coordinated, high frequency transit system only made possible and viable by very large areas of higher density into which their own more modest transit services are linked. They feed off the main system that is strongly facilitated and supported by density. They are not isolated little exurbs swimming at the edges of sprawling megalopolises. You will not find such well performing systems on the edges of Phoenix or Houston or LA no matter how much effort may be put into providing for them. The best you will get is a grossly underutilised demand responsive minibus to act as a safety net for the desperate. Density does matter a lot in such places.

Density Multiplier

The value of providing better services without waiting for density increases is incontrovertible. 'If you service it they will come'. Perth's electric rail system, developed over the period from 1988 up to now, clearly shows the capacity of rail modes to provide superior faster services which people will flock to even from low density areas provided the stations are fed properly with access modes. Use of Perth's rail system has exploded from 7 million passengers a year in 1992 to nearly 60 million in 2010. But the value in increasing services whilst also increasing density is a far more powerful case. The evidence is available and the argument can be understood by anyone - the more people who have the chance to access a transit service, the more chance you have of them using the service. There is a scale and density factor that operates to enhance and multiply whatever operational advantage can be provided.

It is true that public transport usage differences between whole cities are less strongly correlated with density than is car use. Our own analyses show this in the wealthy cities with an r-squared of 0.58 between transit boardings and urban density and 0.82 with car use. This is a big difference and its even more with non-motorised modes (only 0.47 r-squared with density). There are lots of qualitative, topographical infrastructure, mixed use and other factors that determine non-motorised mode use, but you are not going to get very high NMM use in any low density, zoned environments, whichever way you look at it.

With public transport you are sometimes going to have poorly serviced/poor transit infrastructure cities of similar density to those with much better or even exceptional infrastructure and service, so they will have quite divergent transit use. Zurich and Bern are good cases where their usage sits way off the density graph relative to their medium but significant densities because they provide such high levels of service, much of it on rail, the services are so well-timed and integrated, the vehicles are superb, clean and well maintained, they all operate with green waves and have a preponderance of reserved routes with a good speed advantage over cars, the ticketing system encourages committed users with annual passes, the passenger information is second to none and so on. This added "quality" factor that the Swiss are so good at, on top of the density advantage, is so pronounced compared to many other European cities of similar density, that Zurich and Bern "outperform" their density and become outliers on the graph.

Density is called an 'urban sustainability multiplier' by Rees (2003). The evidence that density can improve urban functioning, including public transport, recycling, the provision of green infrastructure (like trigeneration), and the walkability of an

area, is the basis of this claim. Other urban economists like Glaeser (2011) make the same case for a range of other urban services – scale and density matter. This is now called agglomeration economies and the evidence is mounting that cities that do not take density seriously are going to suffer in every area of sustainability. For us, the vulnerability to oil continues to be a major motivation behind our work. To blithely remove the density factor is not something we could easily accept and cities will do this at their own peril.

Getting density increases to happen is not easy in many cities, especially it seems in the Eastern Suburbs of Melbourne where Mees suggests density has become such a barrier to good public policy. However, it is no excuse for trying to denigrate the value of density and call it a 'delusion'. In fact density increases are beginning to happen across the world's cities and they are one of the factors why car use is now in decline (as set out in Newman and Kenworthy, 2011). Indeed Melbourne's density has gone up faster than any other Australian city so the populism of Mees to say it is not needed if its so unpopular, is misplaced. Furthermore, most cities in the world today are diverse enough to warrant and sustain many different housing and urban environment preferences and these are not all anti-density. Many are pro-density based on living in a more lively, convenient and interesting community where short distances with attractive, hospitable public spaces are common and where walking and cycling access to more diverse and frequent transit services are possible.

Conclusion

The promulgation by Mees of the idea that density's influence on transit and transport generally in cities is propagating delusions in public policy is totally rejected. The suggestions that the data we have used over many years to specify cities in terms of density is wrong or inadequate is also rejected. Indeed the findings suggest that in the case of the Canadian cities, it is Mees own supposed urban density data that are in error and are not supported by any other work.

The reductionism, that makes complex issues like transit viability become a fight between service levels and density, does the cause of sustainable transport little good. The way of changing a city to be more sustainable will obviously require both. Such changes are never without pain politically. However, to back off and say that difficult things aren't needed is to prevent the kind of changes that in the long term we must make. The polycentric city of the future will need carefully planned and implemented centres with real density increases. These will be linked together across the city by high levels of transit service, thus providing the framework for the low density suburbs to have the necessary public transport base for their future viability and resilience. Density and services together form an indivisible partnership to help make this kind of city.

Neither we nor Paul Mees want to see the continuation of unsustainable, auto-based patterns of development and transport. The basic policy thrust of both his and our work has been to help to create cities that are better places to live, and which are more equitable, less environmentally destructive and more economically viable. Together we want to prevent policies that lead cities down a dangerous path for the future. Paul is an outspoken opponent of road infrastructure increases, he wants better transit services, he supports investment in better transit and non-motorised infrastructure and naturally increases in walking and cycling. We want these things too. It is therefore not without some genuine pain and regret to be found in conflict with someone who we fundamentally see as more of a colleague than a detractor, but nonetheless having to defend our own

work. We believe that there is a genuine basis for harmonising the issue of density with that of transit service and quality factors so that work can continue on addressing the big picture...making cities more liveable, sustainable, fairer and resilient places.

Author details:
Jeff Kenworthy
Email: j.kenworthy@curtin.edu.au
Peter Newman
Email: p.newman@curtin.edu.au

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townsend@alcor.concordia.ca
tmcgurk1817@gmail.com