Total Daily Mobility Patterns and Their Policy Implications for Forty-Three Global Cities in 1995 and 2005

Jeff Kenworthy

Introduction

Cities worldwide are grappling with different levels of either automobile dependence or automobile saturation. Cities in the USA, Canada, Australia and other new world cities have developed significantly in the age of the automobile. The automobile and its land consuming infrastructure requirements have shaped a high proportion of their urban fabric. This has led to low density and heavily zoned patterns of development where residents and businesses have become utterly automobile dependent. This means that for a majority of trips, people have little choice as to which mode to use.

In other cities in Asia, Latin America, Africa, Eastern Europe and the former Soviet Union we see a rapid motorization process. The result of this, at least as it meets the eye, is a growing dependence on the automobile. These urban systems seem totally paralysed for much of the day by the volume of traffic trying to squeeze its way through urban forms and road systems that were not designed for it. These cities were designed for a situation where most daily travel needs were met by public transport, walking and cycling, modes which even collectively require far less space than cars to move the same number of people. Essentially, the automobile and the growing number of motorcycles and trucks have been imposed upon "walking city" and "transit city" urban fabrics (Newman and Kenworthy, 1999) and they simply cannot accommodate them.

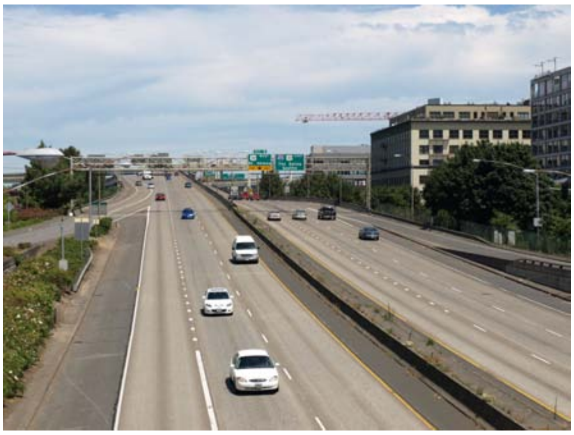

Plate 1: Freeways encourage greater car dependence

It is common to see mobility patterns in cities expressed in terms of the percentage of daily trips by different modes, most usually, private transport, public transport[1] and non-motorised modes (e.g. Buehler, 2010; Pucher and Buehler, 2012). Often these figures represent all types of trips for all purposes, or sometimes only work trips, depending on the source of data and the aims of the survey or analysis. However, it is rare to see a complete analysis of daily mobility expressed as person-kilometres of travel per day by cars, motorcycles, public transport, walking and cycling. Such an analysis is important in order to see on a comparative basis just how different cities are around the world in terms of total daily mobility or movement of people.

This paper presents such an analysis on forty-one cities[2] in the more developed parts of the world (USA, Canada, Australia, Europe as well as selected more wealthy Asian cities), presenting panel data for the years 1995/6 and 2005/6. Importantly, by doing the same analysis for two years, it enables us to see some important trends in this factor. In a supplementary analysis, it also considers two further cities (Taipei, the capital of Taiwan and Sao Paulo, the largest metropolitan area in Brazil). Both these cities are much less wealthy than the cities in the core analysis, but have been included here in order to also gain an insight into what may be happening in at least some examples of lower income, rapidly motorising cities around the world.

Methodology

The data summarized in this paper have been obtained from a number of different sources, which are in turn totally dependent on how data are generated and kept in each city. The data for 1995/6 were collected from 1998 until 2001 as part of the research undertaken for The Millennium Cities Database for Sustainable Transport

1 Public transport in this paper is sometimes, for brevity and table layout purposes, referred to by the American term "transit".
2 Cities refer here for the most part to whole metropolitan regions, not just the core „city".

on 100 cities worldwide (Kenworthy and Laube, 2001). The author has collected the data for 2005/6 during the period from 2008 until 2013 as part of an independent update of this database. The collection of these city data is a long process involving web searches and innumerable contacts around the world and an even greater volume of email correspondence and often telephone calls.

Car travel

The number of Vehicle Kilometres of Travel (or VKT) from which person kilometres travelled in cars and on motorcycles are ultimately derived, have been sourced either from surveys or from traffic models. For example, in the Australian cities, the long-running Australian Survey of Motor Vehicle Use has been used. This survey first appeared in rudimentary form in 1963 followed by a larger survey in 1971. Since that time the survey has been done on a triennial or biennial basis depending on the period.

VKT data for cities are also sourced from traffic models, which mostly exist in each city, but which vary in their comprehensiveness (e.g. some are more geared to peak periods).[3] In these models the city is divided into hundreds if not thousands of Origin-Destination or O-D zones, or what are also often termed TAZs or Traffic Analysis Zones. These models provide output of annual vehicle kilometres of travel or VKT (all trip purposes, all times of the day) because they have a database of all trips by mode between all O-D zones built into their operation and a representative road network along which the trips are made. They can usually also distinguish between VKT for passenger travel and VKT for commercial and freight purposes, driven by trucks and vans of various sizes.

However, the data in this paper are Person Kilometres Travelled or PKT and to obtain this requires a measure of the 24 hour per day, 7 days a week average car occupancy. Most cities can provide this from a variety of sources such as screen line surveys, but also from the number of "car as driver" and "car as passenger" trips for all trip purposes, which when combined naturally yield average car occupancy. It is even possible to get very good estimates of average car occupancy from the police records of all traffic accidents reported to them in any one year within each city. This is because traffic accidents occur every day of the week and at all hours and the police record the number of occupants in each vehicle at the time of the accident. An average of these data is therefore a reasonable statistically significant measure of average car occupancy.

Motorcycle travel

Motorcycle VKT and PKT are harder to source since traffic engineers and transport planners in cities where motorcycles are relatively limited are not very concerned about monitoring or understanding their usage patterns. The need to take account of motorcycles is, however, becoming more important as their usage grows for a variety of reasons (cheapness, ease of movement through congested streets etc) and of course motorcycles are very important in some cities such as Taipei, as will be shown later in the paper.

Often it is possible to obtain an average annual kilometres driven per motorcycle, which can then be combined with motorcycle registration numbers to calculate VKT. Average motorcycle occupancy in the more wealthy cities in this study is usually close to unity (i.e. only the driver), and only varies from about 1.05 to 1.09 in most cases (such data can also be averaged from traffic accident record data of numbers of riders on the motorcycles involved). In cities where motorcycles form a very important part of the mobility culture such as in Ho Chi Minh City, Taipei, most Indian cities, Jakarta and so on, average occupancies can rise to quite high levels in excess of 1.5. Whole families can sometimes be seen in such cities on one motorcycle. In these cities, dedicated efforts are often made to have accurate data on all aspects of motorcycle ownership and use.

3 These traffic models are the typical 4-Step Gravity models used in conventional urban transportation planning and which derive their main baseline input data from Household Travel Surveys. Over the years these models have been known under a variety of commercial names such as Tranplan, UTPS, EMME 2 and so on. Such models, when properly calibrated against actual traffic counts, are very good for specifying base year actual data for cities, but are very poor when used for future planning (see Kenworthy, 2012 for a detailed critique).

Public transport

Public transport passenger kilometres are collected carefully for every public transport mode in every city, no matter how small or insignificant is the mode (e.g. it includes small funicular railways in some cities, ferry boats services involving just two boats etc). The data are collected from every operator in the city from their statistical records. Passenger (person) kilometres are generally derived from operators through the number of boardings multiplied by an average distance that each boarding travels on every mode (each mode separately). This average distance is either derived from surveys conducted by the operator or increasingly from the intelligence gathered through computerized smart ticketing systems. Boardings multiplied by this average travel distance equals person kilometres. This item can take years to assemble for some cities, especially in places such as Hong Kong where every public transport mode is available (regular buses, minibuses, trams, funicular, LRT, metro, suburban rail and ferries), and there are often multiple operators for every mode. Thus the data used are very thoroughly collected and represent probably the best available measure of public transport travel in cities available anywhere in the world.

Walking and cycling

The data used to calculate the number of kilometres travelled by walking and cycling are derived from detailed Household Travel Surveys (HTS) in each of the cities. These surveys yield the number of daily trips by foot and by bike and sometimes they have estimates of the average distance travelled for such trips. However, this is not consistently so and often intrazonal trips (which are dominated by walking and cycling trips) are very poorly specified in traffic models (Kenworthy, 2012). For simplicity in this work, the average distance of a walking trip has been set in all cities at 1.0 km and for a bike trip, 5 km. There is thus room for refining person kilometres of travel by non-motorised modes, but in this study the level of usage of walking and cycling is the determinant of comparative differences between cities on these modes and this is derived from genuine survey data in each city.

Findings

The results for the forty-one cities in the developed world are shown in Table 1 in alphabetical order with data for both 1995 and 2005. Figure 1 summarises the percentage of total daily travel for each mode in 2005 with cities ordered from highest to lowest on the car use percentage.

Comparative differences in modal split for total travel in 2005

The first and most obvious observation that can be made is that in all these cities the automobile dominates mobility patterns with only two cities in which the percentage contribution falls below 50% (Singapore and Hong Kong). When motorcycles are added to the equation only one city, Hong Kong remains with less than 50% of travel by private motorised modes (in fact a mere 15.1%, an extraordinary figure by any standards – this is returned to later in the discussion). Singapore, the next lowest for cars and motorcycles has 55.2% of daily travel by these modes, followed by Vienna with 55.8%. On the other end of the spectrum we have Houston with 98.8% of daily travel by car and motorcycle, followed by Atlanta with 98.4%. The averages for the American, Australian, Canadian, European and Asian cities for car plus motorcycle mobility are respectively: 95.9%, 90.3%, 87.2%, 69.6% and 35.2%.

On a global scale, the data confirm what we already know in more general terms, that in the developed world, it is only the European and Asian cities that come anywhere near to having so called "balanced transport systems", though even these data reveal the wide differences between cities, even cities within these two more sustainable urban transport regions.

It is useful at this point if we are to just pause for a moment and take a step back from these data and reflect on a few facts. Consider the fact that human beings first became sedentary around 12,000 BC to 10,000 BC and cities with populations of tens-of-thousands of people apparently emerged around 3,100 BC (http://en.wikipedia.org/wiki/Cradle_of_civilization: accessed December 11, 2013). This means that cities, as perhaps we would be able to recognize them today, have been around for, let us say, over 5,100 years. Throughout most of that history every city on the planet essentially was a walking city until a technological revolution started in the mid-1800s, which gave us public transport systems such as horse-drawn trams, steam trams and trains, cable cars, electric trams, electric trains and so on (Schiller et al, 2010). So for about 4,900 out of 5,100 years, if we made graphs like Figure 1 for cities that existed at any time during that period, there would only have been one colour on the graph – purple – because virtually 100% of trips would have been by foot or by some form of horse-drawn contraption (Roman chariot, donkey-hauled cart etc).

Karl Benz invented the horseless carriage or automobile in 1885, but it was not until automobiles became mass-produced and therefore commenced their history as mass consumer items (let us say immediately following the Second World War), that the then developed world really started switching to cars. So in the space of let us say 70 years, certainly not much more than 100 years, out of a city history of over 5,000 years, as a civilization, human beings have managed to turn the table of urban transport to a situation whereby the major part of all mobility needs in so many cities (not all), are now accounted for by cars – a form of transport that is incredibly useful and convenient, but takes inordinate amounts of urban space, consumes prodigious quantities of fuel, makes extraordinary amounts of noise, produces vast quantities of emissions, including climate changing CO_2 and kills millions of people and other life forms every year – compared to a human being on foot or bike, which does none of these things.

This is really sobering - to consider that the greatest human enterprise of all, which is the city itself, managed to conduct all its affairs and meet all its movement needs essentially on foot, with no knowledge whatsoever of public transport or automobiles. That is, for 5,000 years out of its 5,100 year-history (and even longer if one considers the original human settlements dating back around 12,000 years), the city functioned without so much as the sniff of an automobile or indeed any form of motorized transport, to a situation now where we are left trying to figure out how to get more than 2% of daily mobility needs conveniently and safely back on foot (or even bike).

Of course, urbanization has exploded and cities have become massively larger places requiring travel over much greater distances. But there is still something haunting and disquieting about the picture in Figure 1. As a transport researcher I am left to consider that the takeover of urban transport by cars and the reshaping of the planet's cities around cars, has surely been simultaneously one of the greatest feats of human ingenuity and human folly ever achieved.

Back to the data. The leading cities for public transport travel are again, unsurprisingly, all Asian and European, with the next highest being the more transit-oriented of the Canadian cities (Toronto and Montreal). In the European cities the percentage of daily travel ranges from 7.5% in Geneva (very atypical of a European city and possibly due partly to very high wealth and partly to its hosting of so many global organisations), up to 41.4% in Prague (not so atypical, but exceptionally high due partly to its heritage as a former Eastern Bloc city which all developed remarkable public transport systems). The next highest city in Europe is Vienna with 36.9% public transport travel, a city with a significantly higher urban density than most other European cities, but only a moderate GDP per capita and a very diverse and dense network of public transport involving buses (both local and regional), trams/LRT, metro, suburban and regional rail, which in combination support very high public transport use. The average for the twenty European cities is 22.5% of travel by transit, a significant achievement compared to more automobile dependent regions.

The two Asian cities have very high transit travel with 78.5% in Hong Kong and 40% in Singapore. The five Canadian cities have rather moderate public transport use with only 11.1% of travel by these modes. Australian cities are not the lowest, but of the four cities studied here, the average is only 7.9% public transport travel. Finally, the US cities weigh in with a tiny 3.1%, which is very low clearly, but most US cities would be even more of a nightmare in their congested peak periods than they already are without these commuting-dominated public transport systems to ease the pressure.

For walking mobility, the biggest contributions are again in the Asian and European environments, which average 3.6% and 3.4% of total distance travelled respectively. In US cities walking only accounts for a mere 0.7% of all the distances people travel in cities. Australian and Canadian fare slightly better, with 1.2% and 1.1% respectively. Patterns of global obesity follow these low modal splits for active transport (Bassett et al, 2008).

Bicycles rate a little more highly in the European cities than walking where they have relatively healthy usage and average 4.5% of all the distances travelled.

Plate 2: Copenhagen has very high bike use

However, in all the other groups of cities, bike travel is less than walking in its contribution to total mobility. Americans only have 0.3% of their travel distances accounted for by bikes while in Australian and Canadian cities it is about double that at 0.7%. Even the Asian cities have less bike use than their walking component at 1.9% of total travel distances. Hong Kong in particular is not very suited to bicycles, due to the exceptionally steep topography over much of the territory (and not very good infrastructure). Topographical factors in cities should, however, become less important with the growing popularity of Pedelecs and also other innovations such as the simple Norwegian street "escalator" designed to accommodate just one foot and help to propel pedestrians with prams and people on bikes, up very steep slopes (http://gadgets.boingboing.net/2007/10/29/trampe-norwegian-bic.html, accessed December 8, 2013).

Trends in modal split for total travel, 1995-6 to 2005-6

This section examines the extent to which modal splits in cities have changed over the decade between the mid-nineteen nineties and the mid-two thousands, a period that embraces the first appearance of "peak car use." Each mode is systematically examined.

a) Cars

Examining the data in Table 1 reveals that thirty-two of the forty-one cities (78%) showed a decline in the contribution of cars to total person travel in this global sample. Two further cities showed no change in the share (Brisbane and Melbourne), while only seven cities (17% of the sample) increased their share of car travel. These cities were Manchester (+0.2%), Atlanta (+0.3%), Washington (+0.4%), Sydney (+0.7%), Ottawa (+0.9%), Munich (+2.7%), Prague (+9.2%).[4]

For those cities that increased, the average increase was only 2.1 percentage points. On the contrary, for the thirty-two cities that declined, this ranged from only 0.1% in Houston, up to 15.0% in Vienna, with an average of 2.8 percentage points of decline.

Taking the whole sample, Table 1 shows that notwithstanding the fact that on average across the forty-one cities the average daily travel by cars per capita increased from 27.0 km to 28.0 km, the percentage contribution to total personal travel decreased from 79.3% to 77.4%. It can be concluded that while car travel on average rose 1 km per day over the ten year period in these cities (a 3.7% increase in actual daily car person kilometres per capita) this is a very low increase for such a large sample of cities and the car's relative contribution to total personal mobility did in fact decline 1.9 percentage points.

4 Note these are percentage point changes. For example, Atlanta increased 0.3 % points from 97.7% cars to 98.0% cars and Prague rose from 47.0% cars to 56.2% cars.

City	Cars	%	MCs	%	Transit	%	Foot	%	Bike	%	Total
Atlanta	67,5	97,7%	0,3	0,4%	1,0	1,4%	0,1	0,2%	0,2	0,2%	69,1
Atlanta	66,1	98,0%	0,2	0,4%	0,9	1,4%	0,2	0,3%	0,0	0,0%	67,5
Berlin	11,8	63,9%	0,1	0,8%	4,8	25,8%	0,8	4,4%	1,0	5,2%	18,4
Berlin	13,3	59,1%	0,1	0,5%	6,2	27,4%	0,9	4,1%	2,0	8,9%	22,5
Berne	21,7	65,3%	0,5	1,4%	8,5	25,6%	1,0	2,9%	1,6	4,7%	33,3
Berne	22,8	60,6%	0,5	1,3%	11,7	31,2%	0,9	2,4%	1,7	4,5%	37,6
Brisbane	34,2	91,1%	0,4	1,1%	2,0	5,2%	0,5	1,2%	0,5	1,4%	37,6
Brisbane	36,0	91,1%	0,4	0,9%	2,6	6,5%	0,4	0,9%	0,2	0,6%	39,5
Brussels	9,2	62,7%	0,1	0,8%	4,4	30,0%	0,9	6,4%	0,0	0,2%	14,7
Brussels	9,6	59,5%	0,2	1,4%	5,3	33,2%	0,8	4,8%	0,2	1,1%	16,1
Calgary	30,7	91,7%	0,0	0,0%	2,5	7,6%	0,1	0,4%	0,1	0,2%	33,5
Calgary	30,2	88,2%	0,3	0,8%	3,1	9,0%	0,5	1,4%	0,2	0,6%	34,3
Chicago	43,0	93,9%	0,3	0,6%	1,9	4,1%	0,4	0,8%	0,2	0,5%	45,8
Chicago	45,9	93,6%	0,2	0,4%	2,1	4,2%	0,6	1,2%	0,3	0,6%	49,0
Copenhagen	21,8	73,0%	0,1	0,4%	4,7	15,7%	0,4	1,2%	2,9	9,6%	29,8
Copenhagen	22,2	72,1%	0,2	0,6%	4,2	13,7%	0,6	2,0%	3,5	11,5%	30,8
Denver	48,7	97,6%	0,2	0,4%	0,6	1,1%	0,2	0,4%	0,3	0,5%	49,9
Denver	59,6	97,4%	0,4	0,6%	0,9	1,4%	0,2	0,3%	0,2	0,3%	61,2
Dusseldorf	20,0	77,7%	0,2	0,8%	3,3	12,8%	0,7	2,9%	1,5	5,8%	25,7
Düsseldorf	20,4	76,6%	0,3	1,3%	3,1	11,7%	0,9	3,2%	1,9	7,2%	26,7
Frankfurt	18,8	78,8%	0,1	0,4%	3,2	13,4%	0,8	3,4%	0,9	3,9%	23,8
Frankfurt	21,3	71,7%	0,3	0,9%	5,1	17,2%	0,9	3,1%	2,1	7,2%	29,7
Geneva	18,8	80,8%	0,2	0,8%	2,1	9,1%	1,0	4,2%	1,2	5,1%	23,2
Geneva	22,4	80,2%	1,3	4,6%	2,1	7,5%	1,2	4,4%	0,9	3,3%	28,0
Graz	16,3	67,6%	0,4	1,6%	4,3	17,7%	0,7	2,8%	2,5	10,3%	24,2
Graz	14,3	64,5%	0,3	1,5%	4,5	20,1%	0,6	2,8%	2,5	11,1%	22,2
Hamburg	22,3	79,1%	0,2	0,8%	4,0	14,0%	0,5	1,7%	1,2	4,4%	28,2
Hamburg	21,4	72,4%	0,2	0,8%	4,7	15,8%	0,9	2,9%	2,4	8,0%	29,6
Helsinki	15,2	67,1%	0,0	0,1%	5,4	23,9%	0,5	2,1%	1,5	6,7%	22,6
Helsinki	15,5	65,8%	0,6	2,4%	5,4	22,8%	0,9	3,7%	1,3	5,4%	23,6
Hong Kong	2,5	18,6%	0,1	0,9%	10,1	73,4%	1,0	7,0%	0,0	0,1%	13,7
Hong Kong	2,5	14,3%	0,1	0,8%	13,6	78,5%	1,0	5,8%	0,1	0,5%	17,4
Houston	69,4	98,8%	0,1	0,1%	0,5	0,7%	0,1	0,2%	0,1	0,2%	70,2
Houston	57,6	98,7%	0,1	0,1%	0,5	0,9%	0,1	0,2%	0,1	0,1%	58,4
London	15,0	68,1%	0,2	1,1%	5,6	25,5%	1,0	4,4%	0,2	0,9%	22,0
London	15,4	62,5%	0,3	1,4%	7,9	31,9%	0,7	3,0%	0,3	1,2%	24,6
Los Angeles	47,5	97,0%	0,1	0,2%	0,9	1,8%	0,4	0,7%	0,1	0,2%	49,0
Los Angeles	46,2	95,6%	0,2	0,5%	1,3	2,8%	0,4	0,8%	0,2	0,3%	48,4
Madrid	13,4	72,7%	0,3	1,5%	4,0	21,6%	0,7	4,1%	0,0	0,1%	18,4
Madrid	14,9	65,8%	0,3	1,3%	6,7	29,7%	0,7	3,2%	0,0	0,0%	22,6
Manchester	15,0	87,3%	0,1	0,3%	1,5	8,6%	0,5	2,8%	0,2	1,0%	17,2
Manchester	18,0	87,5%	0,1	0,4%	1,7	8,1%	0,7	3,2%	0,2	0,8%	20,6
Melbourne	32,7	89,4%	0,2	0,5%	2,7	7,5%	0,7	1,8%	0,3	0,8%	36,5
Melbourne	31,7	89,4%	0,2	0,5%	2,9	8,2%	0,4	1,1%	0,3	0,8%	35,5
Montreal	20,8	86,7%	0,0	0,1%	2,7	11,3%	0,3	1,3%	0,1	0,6%	24,0
Montreal	17,7	82,9%	0,2	0,8%	3,1	14,4%	0,2	1,2%	0,2	0,7%	21,3
Munich	16,2	62,8%	0,3	1,2%	7,2	27,9%	0,6	2,3%	1,5	5,8%	25,8
Munich	21,3	65,5%	0,4	1,2%	8,2	25,3%	0,9	2,8%	1,7	5,2%	32,5
New York	34,2	89,2%	0,1	0,1%	3,5	9,0%	0,5	1,3%	0,1	0,3%	38,4
New York	35,9	88,0%	0,1	0,2%	3,9	9,5%	0,8	2,0%	0,1	0,3%	40,8
Oslo	21,4	77,3%	0,3	1,1%	4,1	14,9%	1,0	3,4%	0,9	3,3%	27,8
Oslo	25,6	76,8%	0,7	2,0%	5,5	16,4%	0,8	2,4%	0,8	2,3%	33,3
Ottawa	22,7	88,2%	0,1	0,5%	2,3	9,0%	0,4	1,4%	0,2	0,9%	25,8
Ottawa	23,9	89,1%	0,1	0,5%	2,3	8,7%	0,3	1,0%	0,2	0,7%	26,8
Perth	37,1	93,0%	0,2	0,6%	1,8	4,4%	0,3	0,6%	0,6	1,4%	39,9
Perth	37,4	92,8%	0,2	0,5%	2,0	5,1%	0,3	0,9%	0,3	0,7%	40,3
Phoenix	41,3	98,2%	0,1	0,3%	0,3	0,7%	0,1	0,3%	0,2	0,6%	42,1
Phoenix	42,8	97,5%	0,2	0,5%	0,3	0,7%	0,3	0,7%	0,3	0,6%	43,9
Prague	11,9	47,0%	0,1	0,2%	11,8	46,8%	1,1	4,2%	0,5	1,8%	25,3
Prague	19,3	56,2%	0,1	0,3%	14,2	41,4%	0,7	2,0%	0,0	0,1%	34,3
San Diego	51,2	98,1%	0,2	0,3%	0,6	1,1%	0,2	0,3%	0,1	0,2%	52,2
San Diego	52,8	97,0%	0,5	0,8%	0,8	1,5%	0,1	0,1%	0,3	0,5%	54,5
San Francisco	47,2	94,0%	0,1	0,3%	2,2	4,4%	0,4	0,8%	0,2	0,5%	50,2
San Francisco	49,0	93,5%	0,3	0,5%	2,5	4,7%	0,4	0,7%	0,3	0,5%	52,3
Singapore	8,3	48,8%	0,6	3,5%	7,3	42,9%	0,3	1,5%	0,6	3,2%	17,0
Singapore	8,3	47,0%	1,4	8,2%	7,1	40,0%	0,3	1,5%	0,6	3,4%	17,7
Stockholm	23,2	74,6%	0,2	0,6%	6,3	20,4%	0,5	1,7%	0,8	2,7%	31,1
Stockholm	20,1	71,7%	0,2	0,7%	6,5	23,0%	0,7	2,5%	0,6	2,0%	28,0
Stuttgart	19,1	77,1%	0,3	1,1%	3,7	14,8%	0,8	3,2%	0,9	3,8%	24,8
Stuttgart	21,6	76,5%	0,2	0,9%	4,7	16,8%	0,8	2,8%	0,9	3,1%	28,3
Sydney	28,8	85,1%	0,1	0,4%	4,1	12,2%	0,6	1,9%	0,1	0,4%	33,8
Sydney	31,2	85,8%	0,1	0,3%	4,3	11,7%	0,7	1,8%	0,2	0,5%	36,4
Toronto	18,7	85,8%	0,0	0,0%	2,9	13,2%	0,1	0,5%	0,1	0,4%	21,8
Toronto	17,2	83,7%	0,1	0,4%	3,1	15,0%	0,1	0,6%	0,1	0,3%	20,6
Vancouver	25,5	89,9%	0,1	0,4%	2,1	7,4%	0,4	1,6%	0,2	0,7%	28,4
Vancouver	27,4	89,1%	0,1	0,4%	2,5	8,3%	0,4	1,2%	0,3	1,0%	30,7
Vienna	13,4	68,9%	0,2	1,2%	4,5	23,2%	0,7	3,6%	0,6	3,1%	19,4
Vienna	12,1	53,9%	0,4	1,9%	8,3	36,9%	1,0	4,5%	0,6	2,7%	22,5
Washington	47,4	94,8%	0,1	0,1%	2,1	4,3%	0,3	0,6%	0,1	0,2%	50,0
Washington	56,5	95,2%	0,1	0,2%	2,4	4,0%	0,3	0,4%	0,1	0,1%	59,4
Zurich	21,8	71,2%	0,3	0,8%	6,9	22,4%	0,8	2,6%	0,9	2,9%	30,6
Zurich	22,0	67,0%	0,5	1,5%	6,5	19,7%	2,6	7,8%	1,3	4,0%	32,9
Overall average 1995	27,0	79,3%	0,2	0,7%	3,8	15,5%	0,5	2,2%	0,6	2,3%	32,1
Overall average 2005	28,0	77,4%	0,3	1,1%	4,5	16,7%	0,6	2,2%	0,7	2,5%	34,2

Table 1. Daily person-kilometres by mode and resulting modal splits in forty-one global cities 1995 and 2005

Note: White rows represent 1995 and yellow rows represent 2005.

b) Motorcycles

The first observation about motorcycles is that in this sample of relatively advanced and wealthy cities their contribution is the lowest of all modes (1.1% of total person kilometres in 2005), notwithstanding the fact that these modes can service much greater travel distances than walking, and typically also cycling (walking at 2,2%, accounted for double the motorcycle figure in 2005). However, the data also show that motorcycles have increased relatively significantly from only 0.7% of total daily travel in 1995 up to the new figure of 1.1%.

By far the greatest use of motorcycles in this sample is in Singapore with 8.2% of total daily travel, a fact that is probably at least partly explained by Singapore's draconian cost regime for car ownership and use, chiefly through its longstanding Certificate of Entitlement (COE) scheme which requires would-be car owners to bid at a monthly auction for the right to purchase a car (http://www.lta.gov.sg/content/ltaweb/en/roads-and-motoring/owning-a-vehicle/vehicle-quota-system/certificate-of-entitlement-coe.html. Accessed December 9, 2013).

The cost for this certificate is many tens of thousands of Singapore dollars, in August 2013, at least $75,500 Singapore dollars (SGD) for a car of 1600cc or less and the cost of the actual car is additional to this (e.g. see: http://www.straitstimes.com/breaking-news/singapore/story/coe-prices-rise-across-the-board-despite-slightly-bigger-supply-certif and http://www.telegraph.co.uk/expat/10366160/Where-on-earth-would-a-family-car-cost-you-88000.html. Both accessed December 9, 2013). By contrast a motorcycle COE costs less than $2,000 SGD.

On the other hand, motorcycles reach as low as 0.1% of total personal mobility in Houston and still only 0.2% in the New York and Washington metropolitan regions. However, a close examination of Table 1 shows that out of the forty-one cities, in twenty-four of those cities the proportion of total daily travel by motorcycle has increased (by an average of 0.7 percentage points), in seven it has remained constant and in ten that proportion has gone down (by an average of 0.2 percentage points).

Overall, it can be concluded that motorcycles are more often than not becoming more important forms of personal mobility in cities. The cities where they are increasing are doing so at three-and-a-half times the rate at which motorcycles are declining in some cities. There are probably numerous reasons behind such a trend but amongst the most important are likely to feature cheaper mobility costs (both capital and running costs) and increasing congestion, with motorcycles allowing greater mobility and speed within the jammed traffic. The downsides of course are the well-known safety issue associated with riding motorcycles compared to driving cars (Keall and Newstead, 2012) and the generally increased noise from petrol-driven motorcycles. The noise and air pollution aspects of motorcycles in large cities such as in China are likely to be progressively overcome through the increasing use of electric motorcycles.

c) Public transport

In twenty-seven of the forty-one developed cities in this study (66%) for which trends are available, public transport travel as a percentage of total daily travel has increased. Vienna increased by a large 13.7 percentage points, while London and Madrid increased significantly with 6.4 and 8.1 percentage point increases. Two cities have remained the same (Atlanta and Phoenix) and twelve decreased in their share. These cities were Copenhagen, Düsseldorf, Geneva, Helsinki, Manchester, Munich, Prague, Zurich, Ottawa, Sydney, Washington and Singapore (three-quarters of these cities are in Europe). Overall, public transport modal share in the sample increased from 15.5% to 16.7% and the actual travel per capita per day increased by 18% from 3.5 km to 4.5 km.

For the cities that increased, this ranged from 0.1 percentage point in Chicago, up to 13.7 percentage points in Vienna. The average increase for these cities was 2.6 percentage points. On the other hand, the average decrease for the twelve decreasing cities was 1.7 percentage points. The cities with the largest decrease in modal share for public transport travel were Prague and Singapore with 2.6 and 2.9

percentage point decreases respectively.

Overall, public transport has performed relatively well in terms of its relative role in personal mobility, though clearly this is not consistently the case. The cities where a decline has been experienced are very diverse and there is no consistent set of explanations that can be used to explain this phenomenon. For example, detailed investigations into the Singapore data reveal that buses seem to have dragged down the Singapore public transport system's performance. In Copenhagen, there has been a shift to walking and cycling, and despite a reduced share to transit, the car has also reduced its share of daily travel. Prague is simply reducing a little from the extraordinary public transport modal shares under Communist rule until 1989. But still today, some 24 years after the Velvet Revolution, 40 % of the city's mobility needs are met by public transport. Apart from Hong Kong, this is the highest modal share for public transport of all cities in the study.

d) Walking

Across this global sample, walking and cycling are roughly equal in their contribution to daily travel distances. There are more walking trips of course, but they are much shorter than the less numerous bicycle trips. In the sample as a whole, walking has maintained it share of daily travel distances at 2.2% over the ten-year period, while the average daily travel has increased from 0.5 km to 0.6 km. This is not an especially impressive performance, but at least it is not going backwards.

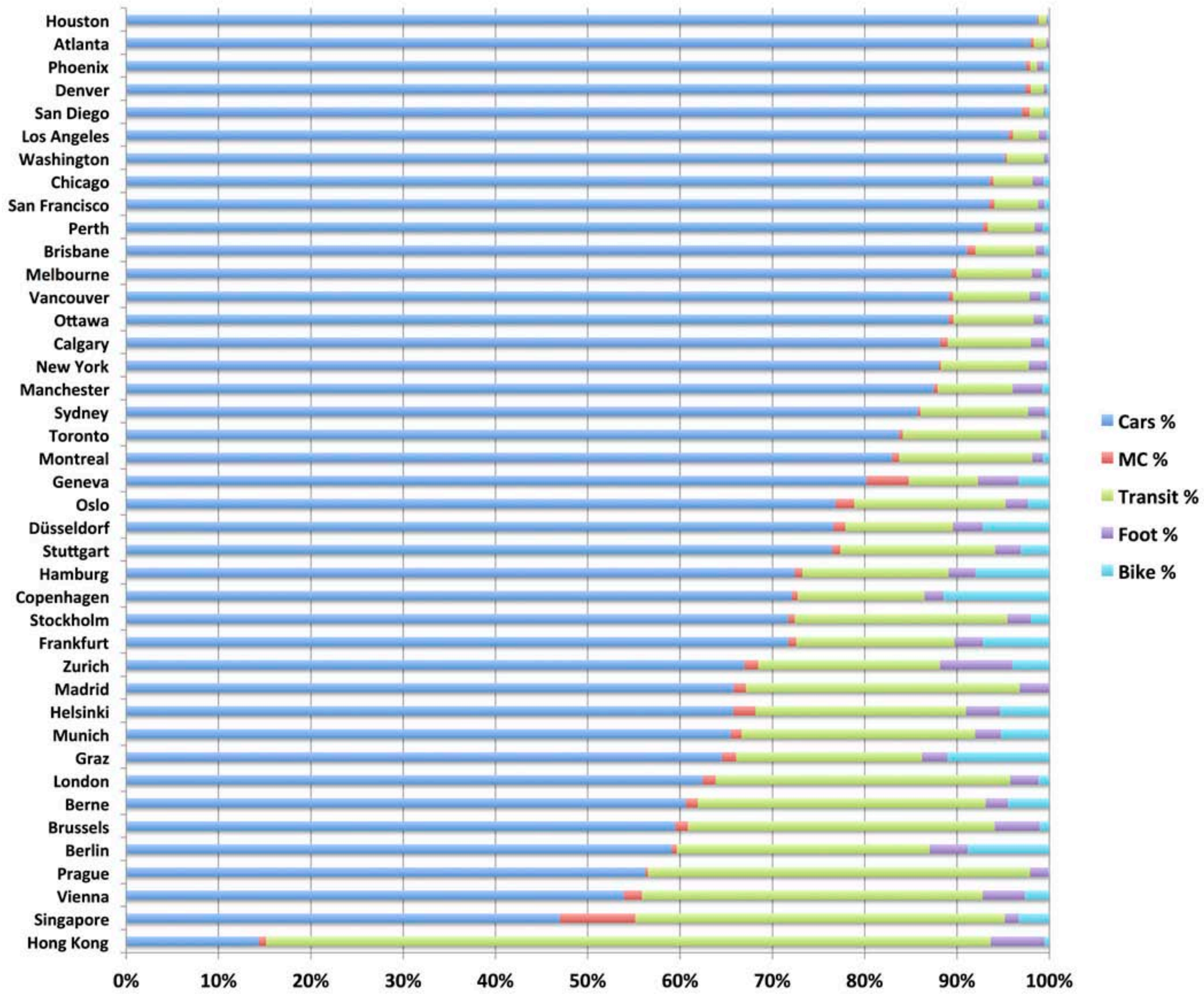

Figure 1. Total modal split by travel distance for all passenger modes in forty-one global cities, 2005-6.

The average distance walked per day though is really just equivalent to a return trip to the local bus stop, a round-trip distance that would take on average (at 4 km/h) about 17 minutes of walking to complete. This is not enough for the absolute minimum of 30 minutes per day of walking to maintain cardio-vascular health. Rather 60 minutes per day of slow walking and 30 minutes per day of fast walking are recommended (Morabia and Costanza, 2004). This would translate (at say 4 km/h for slow walking and 6 km/h for fast walking) to a minimum of 4 km of slow walking per person per day or 3 km of fast walking (roughly six times more on average than people are walking today in cities). The only city in this sample that would appear to even approach these figures is Zurich, with 2.6 km per person per day of walking[5].

The average American urban dweller, based on the numbers in these ten American cities, walks about 340 metres per day or roughly ten times less than what they should be walking to remain relatively fit. In the twenty European cities the figure is 910 metres per day, which is still only about one-quarter of the more ideal situation. Of course, when it comes to obesity prevention, one must also factor in bike travel as a part of daily physical activity, which is dealt with in the next section.

One caveat on these data is that, the way Household Travel Surveys allocate trips to specific modes, means that they only record Walk Only and Bike Only trips. If someone does walk to a bus or train, the trip is coded as a public transport trip. Likewise, if someone cycles to a railway station, locks the bike up and travels to the CBD, the trip goes down as a train trip. So the data here on walking and cycling trips thankfully understates the true amount of walking and cycling that actually occurs in cities.

The trends in walking are split more or less evenly between the cities. Three cities remained with identical percentages of total daily mobility by walking in 1995 and 2005 (Graz, Houston and Singapore), while eighteen cities increased in their walking contribution to daily travel, by an average of 0.8 percentage points.[6] There is no particular regional logic to the cities that increased their share of walking travel. A further twenty cities declined in the contribution of walking, by an average of 0.6 percentage points, but again with no regional logic or pattern to the trends.[7] The two cities that gain the most in walking were Helsinki and Zurich with 1.6 and 5.2 percentage point increases respectively. The biggest losers in walking were Prague and Brussels at 2.2 and 1.6 percentage point declines respectively (with London not far behind at -1.4 percentage points).

Of course, one of the problems for walking in its contribution to total daily travel is the short distances that are involved. Even with significant increases in the percentage of daily trips by walking, this mode struggles much more than any other to maintain or increase its share of actual travel, especially in the face of much longer and often still increasing trip lengths by motorized modes (cars, motorcycles and public transport modes). There is not much that can be done about this because of the inherent limit on walking speed, which puts a cap on the distances most people can cover within an acceptable timeframe.

e) Cycling

The final mode to be examined is bikes. Overall, we can see that bikes have increased their share from 2.3% to 2.5% of daily travel in cities from 1995 to 2005. This share is about the same as walking

5 My own personal observations (which are purely anecdotal) after having lived in Switzerland for eight months and Zurich in particular for about a month, is the extraordinary walking mobility of elderly people. Notwithstanding the steep topography in parts of Zurich, it is very common to see much older men and women (75 years old and upwards), slowly toting their groceries in shopping bags up steep hills from local supermarkets, to take just one example. In Frankfurt, where I have lived for 6 years, it is certainly not unusual to see older people walking (and cycling), but not to the same extent as I have observed in Zurich. As for Perth, where I have spent the majority of my career, elderly people walking anywhere in the city is a very rare sight indeed. One feels almost obliged to enquire, from which retirement home has this person absconded?!

6 The increasing cities for walking were: Atlanta, Calgary, Chicago, Copenhagen, Düsseldorf, Geneva, Hamburg, Helsinki, Los Angeles, Manchester, Munich, New York, Perth, Phoenix, Stockholm, Toronto, Vienna and Zurich.

7 The cities that decreased in walking share were: Berlin, Bern, Brisbane, Brussels, Denver, Frankfurt, Hong Kong, London, Madrid, Melbourne, Montreal, Oslo, Ottawa, Prague, San Diego, San Francisco, Stuttgart, Sydney, Vancouver and Washington.

(2.2%), even though the percentage of daily trips by bike in cities is generally a lot less than by walking. This is because the average trip length for bikes is much longer. Like walking, the actual average amount of travel per day by bike has also increased a little from 0.6 km to 0.7 km.

If we take average bike speed in cities as roughly equal to 13 km/h[8], then the average time per day spent cycling is about 3 to 4 minutes. When added to the 17 minutes for walking, this average active transport time of around 20 minutes per day is still well under the absolute minimum recommended for health reasons. One must bear in mind, however, the caveat mentioned above about these data representing bike-only trips and not the cycling involved in a bike-public transport trip.

The data in Table 1 make it very clear that the contribution of cycling to personal mobility in cities varies a lot more than for walking. For example, bike travel in Atlanta in 2005 is so low that it does not even register to one decimal place…it is effectively zero, down from 0.2% in 1995. Interestingly, Madrid is the same. In 1995 it registered only 0.1% of daily travel by bike and in 2005 this was effectively reduced to zero as well. Prague has the unenviable situation of falling from 1.8% of total daily travel by bike in 1995, to 0.1% in 2005, effectively wiping bikes out as a significant contributor to total personal mobility, even though about 0.4% of daily trips are by bike. Bike travel is generally no more than 0.5% of the total person kilometres per capita in US cities as a whole. On the other hand, in Graz and Copenhagen bike travel accounts for 11.1% and 11.5% of all personal mobility and in Hamburg 8.0%.

Examining Table 1 in more detail we find that like walking, the use of bikes for mobility is split pretty much down the middle in terms of the trends. Eighteen of the cities have achieved an increase in the modal share for bike travel (on average an increase of 1.1 percentage points)[9]. The cities that increased most in their bike modal share were Berlin, Hamburg and Frankfurt (3.7, 3.6 and 3.3 percentage points respectively). Four cities have remained identical in their modal split for bikes (Melbourne, New York, Phoenix and San Francisco). The bad news is that nineteen cities declined in the proportion of total daily mobility that is accounted for by bikes (on average by 0.6 percentage points). The biggest reductions in bike modal share occurred in Geneva and Prague (1,8 and 1.7 percentage points). The good news is the cities that did increase in bike modal share, increased by a lot more than the amount of the decreasing modal share in the cities than declined.[10]

A brief overview of Taipei and Sao Paulo as examples of rapidly motorizing cities.

Table 2 presents a summary of the key data on daily personal mobility in Taipei and Sao Paulo in 1996 and 2006 (Taipei) and 2011 (Sao Paulo). Intuitively, based on popular notions of the rapid motorization in these two cities (e.g. Sao Paulo is now well-known for its traffic jams and helicopter use and Taipei is well known as a burgeoning motorcycle city), one would expect that:
(a) there may be quite high modal splits to private transport and
(b) private modes will have increased a lot in the decade in the case of Taipei and fifteen years in the case of Sao Paulo.

This, however, is not the case on either count. Taipei had only 37.1% of daily travel by car in 2006 and this is down from 45.7% in 1996. On the contrary, motorcycles are relatively high with 31.9% of daily travel, up significantly from 24.6% in 1996. Nevertheless, public transport constitutes 24.2% of daily travel in Taipei, which is also up a little from 1996 (23.8%). And compared to many of the cities in Table 1, walking and cycling are also comparatively strong with 3.8% and 3.1% respectively

8 I live in Frankfurt and cycle everywhere in the city and have done for years. My average speed of travel for these urban trips varies from about 12.5 km/h to about 15.0 km/h (kerb-to-kerb). Riding a bike in cities is on average about 3 to 4 times faster than walking, depending on the specific trip and the infrastructure available.

9 The cities that increased in bike modal share were: Berlin, Brussels, Calgary, Chicago, Copenhagen, Düsseldorf, Frankfurt, Graz, Hamburg, Hong Kong, London, Los Angeles, Montreal, San Diego, Singapore, Sydney, Vancouver and Zurich.

10 The cities that decreased in bike modal share were: Atlanta, Bern, Brisbane, Denver, Geneva, Helsinki, Houston, Madrid, Manchester, Munich, Oslo, Ottawa, Perth, Prague, Stockholm, Stuttgart, Toronto, Vienna and Washington.

of daily travel catered for by these modes. There has also been growth in walking and cycling since 1996 of 0.6 and 0.4 percentage points respectively.

For Sao Paulo the situation is quite similar. Cars in 2011 only represented 48.5% of total personal mobility and this is down from 1996 when it was 50.5%. Like Taipei on the other hand, motorcycles have increased from 1.8% of peoples' mobility needs up to 4.2% (though the use of motorcycles is much smaller than in Taipei). Public transport retains an extremely healthy 44.0% of personal mobility, with only a tiny decline over 15 years (from 44.2%). Foot travel has, however, declined a little from 3.2% to 2.9%, while bikes have increased from a tiny 0.3% to 0.4% of personal mobility.

City	Cars	%	MCs	%	Transit	%	Foot	%	Bike	%	Total
Taipei 1996	8,4	45,7%	4,5	24,6%	4,4	23,8%	0,6	3,2%	0,5	2,7%	18,4
Taipei 2006	7,8	37,1%	6,7	31,9%	5,1	24,2%	0,8	3,8%	0,7	3,1%	21,0
Sao Paulo 1996	10,0	50,5%	0,4	1,8%	8,8	44,2%	0,6	3,2%	0,1	0,3%	19,8
Sao Paulo 2011	11,0	48,5%	1,0	4,2%	9,9	44,0%	0,7	2,9%	0,1	0,4%	22,6

Table 2. Daily person-kilometres by mode and percentage of total daily person-kilometres by mode in Taipei and Sao Paulo

Overall, this snapshot of where personal mobility is headed in these two rapidly developing cities is not conforming to the perhaps general view that such cities are on a rapid and inevitable decline towards automobile and motorcycle dependence. On the contrary, it would appear that processes are happening in both cities that limit the growth in private motorized mobility. One of the factors involved could be simply the space constraints inherent in dense cities, that no amount of extra road building will ever be able to overcome.

Policy Implications

The data here make it abundantly clear that virtually all of these cities have considerable ground to make up before they could claim to have at least a semblance of balance in their passenger transport systems. Singapore and Hong Kong clearly can lay claim to this and Vienna and Prague are certainly in that direction, though the car has made a lot of inroads into mobility in Prague in recent years. At a stretch, one could also say that Berlin, Brussels, Bern and London have some credentials in the sustainable transport field as well. But going further north in the graph in Figure 1 clearly gets very quickly into more private motorized mode-dominated territory with two-thirds or more of total person movement in the cities being accounted for by cars and motorcycles. Of course, at the top of the graph most of these cities have more than 95% car and motorcycle mobility, an incredible and problematic outcome for any urban transport system, no matter which way one looks at it.

Of course, all of these cities at the top of the graph are new world cities that set down most of the urban development that exists today within what one can call the "automobile era" – the post World War 2 period. In that sense it is understandable that their transport systems are so dominated by the car. Planning, urban development and transport grew together with the assumption of almost universal car ownership. All urban development was car-based. Cities further down the graph have higher proportions of their urban fabric that was shaped in another era – the walking and transit city era. The problem is that this historical fact does not help the car-dominated cities to survive and flourish in what is rapidly becoming a very different urban transport and urban development scene than we have experienced in the last 70 years or so. They have to change if they are going to compete economically. This does not mean a total transformation of these cities overnight, but it does mean gradually building into them attractive options for car-reduced, car-free lifestyles, which must grow in importance and extent as time moves on. But such changes need to be accelerated for many reasons, none the least of which is the need for every city to contribute urgently to climate change mitigation.

On the positive side, one can say from the data here covering a decade from 1995 to 2005 and thus a little into the "peak car use" timeframe, that overall public transport in cities is for the most part making positive inroads into the total mobility equation. For walking and cycling the picture is more or less equally poised, with roughly half the cities either holding their ground or increasing in these modes and the other half declining. However, for walking and cycling to increase in their contribution to total daily mobility, the modal shifts have to be rather large due to the low average trip distances involved. Public transport does not have such a problem, because trip distances are typically similar to that of cars and motorcycles.

The kind of policies that cities have to adopt to move towards less dominance by cars and motorcycles, have mostly been said before. They just have to be more consistently and widely and more rapidly practiced. These include:

1. A cessation of high capacity road building and perhaps even removal of key pieces of freeway in cities in the way Seoul has done by removing almost 6 km of elevated freeway (and part of the surface road below) right through the heart of the city (Schiller et al, 2010).

2. Construction of much better and more reliable and attractive public transport infrastructure, including the implementation light rail transit systems throughout cities on dedicated rights-of-way on existing roadways, even if this means removing lane capacity from roads (and not replacing it elsewhere). This will not reduce but rather it will enhance the person carrying capacity of the corridor. Ultimately this is not an argument that needs to be won technically, it is a political argument over the right to road space.

3. Give public transport systems and cyclists green wave pre-emptive traffic signal support to enhance travel times and safety and thus compete better with the car.

4. Control congestion – this is the million dollar question in urban transport – how will cities finally implement citywide controls over cars and their usage of the public street system? It has to be done. Singapore is just about the only city that has fundamentally changed the car equation as the city has become more and more affluent. They have held car ownership at 100 cars per 1000 people for many years through an extremely expensive auction/quota system, as mentioned previously. We have suggested an alternative to traditional road pricing by considering the road system as a commons to be regulated (for example, in the same way we regulate parking on streets), rather than seeing the road system as a market to be bought and sold (Bradley and Kenworthy, 2012). The Dutch have experimented successfully with paying people directly not to use particular road corridors in the peak period, which they have found to be a lot cheaper than freeway capacity increases (http://www.vtpi.org/spitsmijden.pdf. accessed December 13, 2013).

5. Integrate development around public transport systems. This would mean revitalized corridors along which light rail and trams operate, with perhaps continuous four to five-storey shop-top housing. It would also mean the development of significant and attractive higher density mixed use centres of various scales built around rail stations up to a radius of about 800 metres, peaking in density near the centre at the rail station (Cervero, 1998; Newman and Kenworthy, 2006). Such centres would be built around rail access to the centre from most other parts of the city, but would also prioritise foot and bicycle access from surrounding local areas. They would be attractive, livable places especially in their vibrant public realm.

Plate 3: Auto-dependent cities are developing new transit and bike systems linked to compact, mixed use redevelopment (Portland, Pearl District)

Plate 4: Creating pedestrian zones in critical areas helps to encourage non-motorised modes (La Rambla, Barcelona)

6. Significant pedestrianisation and traffic calming schemes in various parts of every city to radically improve the enjoyment, viability and safety of walking and cycling in cities. This could include more extensive pedestrian zones in the city centre and the pedestrianisation of other centres and sub-centres throughout metropolitan regions. Major six lane roads can be reduced to four lanes with slower traffic to allow for wider footpaths, planting of trees and provision of cycleways on both sides of the street. Four lane roads can be reduced to two lanes in the same way.[11]

7. Provision of citywide facilities for bicycles including bike paths (both off-road and on-road dedicated facilities), more bike sharing schemes, provision of free tyre inflation facilities throughout cities (such as in Odense in Denmark), more buses equipped with bike racks, more secure bike parking in vulnerable locations and better workplace facilities for cyclists, including secure bike parking and shower facilities. Bicycles should be included in salary packages for those who would prefer this over a car.[12] It would mean employees would be able to package a more expensive, better bike such as a Pedelec than they would normally buy for cash up front.

8. Provision for Pedelecs. The sale of Pedelecs in Germany is now around 10% of the new bike market and over 20% in some retail outlets (pers. comm. - bike retailer in Frankfurt). Pedelecs can be expensive (up to around 5,000€) with a probable average of over 1,500€. This tends to limit sales to people who have secure bike storage facilities to minimize theft of a valuable item. In Europe this often means Pedelec owners have their own homes, or access to inside locked facilities in secure courtyards or basements of apartment buildings. This is not the majority of the population in Europe or in many other places. Also Pedelecs require charging so there will develop a need to provide community-based, secure parking and charging possibilities for Pedelecs. This is one way to help achieve higher contributions to daily mobility from bikes, because a trip of 15 to 20 km or even further, is no problem with a Pedelec, compared to the more typical 5 km urban bike trip. For example, 2012 data for Chengdu in China (over 14 million population) show that while only 12.1% of trips are now by walking and cycling (a shocking decline from the more typical 60% or more in Chinese cities in the mid-1990s – Kenworthy and Laube, 2001), the modal split for E-Bikes in Chengdu is now 24.3% (official data supplied through Chinese colleague from the Chengdu Household Travel Survey). Some of these trips will be fully self-propelled electric bikes and some will be pedal assisted electric bikes, but whichever way this is viewed it means a big reduction in noise and emissions and especially space consumption in the city compared to if people were using cars (though not necessarily a huge contribution to reducing obesity, depending on the ratio of Pedelecs to full E-bikes). Only 26.4% of daily trips in Chengdu are by car so the relative contribution of E-bikes plus walking and cycling (36.4%) is much higher than the car. Finally, there is the potential to use 100% renewable energy to recharge any electric vehicle.

11 Slower traffic means greater throughput of vehicles because down to a certain limit, reduced headways between vehicles travelling more slowly means greater numbers through in a given time.

12 In Australia the Taxation Department does not permit bicycles to be salary packaged as fortnightly payments with pre-tax dollars – only cars qualify for this extraordinary financial incentive. And the capital gains tax reduces the more kilometres ones travels in a year, with the lowest tax rate for travelling more than 40,000 km in the car!

9. Better control over motorcycles. Motorcycles are growing significantly in a majority of cities, though in most this mode still constitutes a very tiny part of total daily mobility (Taipei is one of a number of exceptions to this). While this presents certain advantages, it also presents many disadvantages, which will need to be considered. Cities need to decide how they propose to respond to the growing popularity of motorcycles.

Plate 5: Motorcycles are growing in use nearly everywhere and can bring many problems (Ho Chi Minh City)

Conclusions

The data presented in this paper on forty-three cities worldwide show the extraordinary dominance of cars and motorcycles in the mobility patterns of wealthier cities. It also however shows that a majority of these cities are in fact declining in the proportion of daily travel undertaken by car, albeit only to a small degree. Public transport use is increasing for the better part of the sample, while walking and cycling tell a mixed story of hope and despair. The data demonstrate how the automobile has essentially hijacked the urban transport systems of world cities and has done so with tremendous alacrity and speed in the space of only about 70 years – an amazing achievement given that urban settlements have been with us for around 12,000 years and except for about 100 years of that period when public transport came to the fore, walking and other non-motorised transport have constituted 100% of daily travel requirements. A wide range of different urban planning and transport policy packages need to be brought to bear on this situation and rapidly, and they need to act in a coordinated way, each one reinforcing the other and not fighting each other, moving one step forward and then two steps backwards.

Author details:
Jeff Kenworthy
Curtin University Sustainability Policy Institute
Curtin University,
Perth,
Western Australia

Email:
J.Kenworthy@curtin.edu.au

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