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The Influence of Office Location on Commuting Behaviour

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Abstract

To fully appreciate the environmental impact of an office building, the transport-related carbon dioxide (CO_2) emissions resulting from its location should be considered in addition to the emissions that result from the operation of the building itself. Travel-related CO_2 emissions are a function of three criteria, two of which are influenced by physical location and one of which is a function of business practice. The two spatial criteria are, first, the location of the office relative to the location of the workforce, the market, complementary business activities (and the agglomeration benefits this offers) and, second, the availability and cost of transport modes. The business criterion is the need for, and therefore frequency of, visits and this, in turn, depends on the requirement for a physically present workforce and face-to-face contact with clients. This paper examines the commuting-related CO_2 emissions that result from city centre and out-of-town office locations. Using 2001 Census Special Workplace Statistics which record people's residence, usual workplace and mode of transport between them, distance travelled and mode of travel were calculated for a sample of city centre and out-of-town office locations. The results reveal the extent of the difference between transport-related CO_2 emitted by commuters to out-of-town and city centre locations. The implications that these findings have for monitoring the environmental performance of offices are discussed.

1. Introduction

Twice as much land is devoted to roads in England than to dwellings (ONS 2005), transport activity accounts for over a quarter of UK CO_2 emission and is rising faster than any other sector of the economy (SDC, 2009). Over the past half century widespread use of the car as a means of transport for office workers has freed households and businesses from the need to locate close to public transport nodes. Instead they have been able to decentralise to suburban, edge and to out-of-town locations where land is cheaper and development is usually quicker and cheaper as a result of fewer constraints relating to ownership, planning and previous uses. Developers, purchasing land at low cost, building cheaply and letting at rents comparable to nearby urban locations, were able to reap increased profit at lower risk. Business occupiers, when deciding to locate in edge- and out-of-town locations, have been able to externalise some of the transport-related costs associated with a city centre location. Furthermore, homeowners, faced with considerable house price inflation, have located at increasing distances from workplaces because travel costs have not inflated at the same rate. In effect, rising housing costs have been traded off against lowering travel costs at an increasing rate, thus extending the distances people are prepared to commute. An unintended environmental cost of this development trend is increased CO_2 emission.

These trends are borne out in travel data collected by the Government. In 1951 25 per cent of households had access to a car. In 1969 it was 59 per cent (Department of Transport, 2007a). The average distance people travel annually has increased by nearly 60 per cent since 1972/73 from around 4,500 miles to 7,133 miles in 2006 (Department for Transport, 2006 and 2007b). This is the combined effect of an increase in average trip length of nearly 50 per cent and an increase in the number of trips made per person per year of eight per cent. This rise is comparable to that recorded in the USA where vehicle miles travelled per household increased by nearly 50 per cent between 1970 and 2005. In the UK commuting / business trips accounted for 29 per cent of average annual distance travelled (2,073 miles) and figures from the Department for Transport (2006) report that 70 per cent of commuting trips and 73 per cent of all commuting miles travelled were made by car. In the USA approximately 76 per cent of workers drive alone by car to work (Horner, 2004). This has major implications for the environmental performance of office space due to the high levels of CO_2 emitted as a result of car-based commuting in comparison to public transport. Between 1990 and 2005 total UK carbon emission as a whole fell by 6 per cent but transport emissions rose by 11 per cent and road transport accounts for 93% of transport emissions by source (excluding the UK's share of international aviation and shipping) (Commission for Integrated Transport, 2007).

Travel to and from an office location generates CO_2 emissions. The central premise of this paper is that, when assessing the environmental performance of office space, insufficient attention is paid to CO_2 emitted as a result of commuting. Commuting-related emissions are a function of (a) the location of the office relative[1] to the location of the workforce, (b) the availability and cost[2] of transport modes[3] and (c) frequency of visits, which depends on the requirement for a physical presence of workforce. Other things equal, office locations that require workers to commute by car will generate more emissions than locations that are easily accessible via public transport and locations that require shorter commutes will be more CO_2 efficient than those that require long distance commutes.

This paper is structured as follows. Section two reviews literature relating to the location of economic enterprises and the way in which workers interact with them. The focus is on the energy consumption and CO_2 emission that results from the way in which workers travel to and from their workplace locations. Section three describes the data and methods used to estimate the number of commuters, the distances that they travel, and the resultant CO_2 emitted. Section four presents the findings at the national and workplace-specific levels before section five offers some concluding comments and suggestions for further work.

2. Literature Review

Investigation of the economic cost of locating economic activities in specific locations began with the seminal works of Ricardo and von Thunen who recognised that certain agricultural locations (near market, material or labour supply for example) bear lower transport costs than other locations. Haig (1926) applied these theories to urban land use and argued that transport cost was a payment to overcome 'friction of space'. More recent research has examined the relationship between urban size, travel demand and energy use (Banister, 1992)

[1] Relative location means the topology (proximity, connectivity and adjacency) of land uses
[2] Each mode has a mix of economic, social and environmental costs and differ in terms of the extent to which these costs are externalised by the firm
[3] Communications networks such as broadband, land-lines and cell networks might be regarded as substitutes for physical transport networks

and results showed a higher level of car use in rural areas and the car was the dominant mode of domestic passenger transport, accounting for 48% journeys and 90% energy consumption. Breheny (1993) also found rural areas had the highest transport-related energy consumption levels. Banister and Banister (1994) used work-travel data from 1981 census and found that the commuter hinterland around London had the highest fuel use levels, followed by large metropolitan areas, and that the physical characteristics of urban settlements (size, availability of facilities and services, and public transport provision) are important too. This basic relationship is modified, however, by two influences: the socio-economic characteristics of the population, which can influence the frequency and length of trips as well as mode of travel, and location of each settlement in relation to other large urban areas. Breheny (1990) considered the issue of urban self-containment and energy use and found new towns to be more self-contained regarding work-related travel and larger ones to be more so than smaller ones. Breheny (1993) also investigated counter-urbanisation and energy use and found that areas of population growth were associated with high energy consumption rates per head: as people move into new areas their demand travel increases and this leads to higher energy consumption. Titheridge and Hall (2006) found that the creation of new growth centres in South East England led to increased car use as they provided less opportunity for access by rail. Population density has been shown to be strongly associated with vehicle miles travelled per capita but the effect is moderated by traffic-inducing effects of increased density. Accessibility of basic employment, urban size and rail transit supplies and usage were found to have relatively modest effects (Cervero and Murakami, 2010).

Empirical studies of commuting activity at the intra-urban scale point to decentralized commercial activity as a contributory factor to higher levels of commuting. Cervero (1988) found that office decentralisation in North America led to longer journey distances and greater use of private vehicles, although these findings were contested (see Gordon *et al*, 1991 for example). In the Netherlands Konings *et al* (1996) found that developments in existing city limits attracted a greater proportion of public transport commuting than urban extension or rural developments. In Canada the IBI Group (1990) found significant variation in public transport patronage depending on whether the urban form was decentralised (26 per cent), compact (35 per cent) or nodal (29 per cent). In the UK, Frost *et al* (1997) found that work-travel had increased due to greater travel distances as a result of counter-urbanisation and other decentralisation trends. They found that car-based commuting dominated work-travel in the cities they chose to investigate, London, Birmingham and Manchester, and there had been a large increase during the 1980s. The high level of energy consumption per person kilometre that car-based commuting produces meant that it dominated work-travel energy consumption from these three cities (89, 97.5 and 98 per cent respectively). A centralised compact city should reduce travel due to shorter journeys and increased public transport use but retail, office and leisure uses have decentralised. “The already considerable separation of workplaces and residences in urban systems seems to be increasing...” (p2). McQuaid *et al* (2004) argued that transport developments have increased the accessibility of suburban and exurban locations relative to city centre locations. This has moved the accessibility-to-cost ratio in favour of out-of-town business locations.

Analysis of commuter flows in England and Wales has been undertaken using census data. Nielsen and Hovgesen (2007) mapped the origin-destination commuting flows using data from the 1991 and 2001 censuses. Their study was at a fairly small scale and illustrated how, over the decade, the main commuter corridor between London and Manchester had widened. They suggested that this was a result of decentralisation of population and jobs and increased commuting distances. Hincks and Wong (2010) investigated the spatial interaction between housing and labour markets in north-west England by analysing commuting flows. They found that the majority of housing market areas (HMAs) intersected two or more travel-to-work areas (TTWAs) suggesting complex outward commuting. Similarly there were dual and multiple HMAs serving single TTWAs, so TTWAs attract significant inflows of commuters from a range of HMAs. Intersection is indicative of potential travel-to-work relationships. They found that “...since population and jobs have decentralised, many of the work-trips are now between non-urban residential and workplace locations...” (p644). They also found that “...commuting tends to be shorter in urban areas whilst commuting to non-urban locations tends to be longer distance” (p644). It was also shown that patterns have diversified and length increased with the majority of workers travelling to workplaces outside the CBD. “As workforce becomes increasingly professionalised, the complexity of the commuting process is likely to increase” and “the fragmentation of housing and labour market issues in national and regional policy frameworks has to be addressed in order to achieve the objectives of developing sustainable communities” (p645).

Method

To estimate annual CO_2 emissions per person for each transport mode, three inputs are required: the proportion of workers that travel by each mode, the distance that they travel and the CO_2 emissions per kilometre.

Commuting travel modes and distances travelled can be obtained from national statistics. Two types of data are required: the locations of residences and work-places and the volume and mode of travel between them. The decennial census of population records people's usual workplace and the usual mode of transport to that workplace. The data were derived from questions on the 2001 census form relating to place of usual residence and the place of work for the respondent's main job. The relevant question on the census form is: "what is the address of the place where you work in your main job?" Together with home address, this allows the construction of origin-destination data for work-related travel, including home-workers. The data have thus been derived from a 100% sample and include imputed households. Where workplace locations were unknown, these were also imputed. These 'interaction' data are published as Census Workplace Statistics (Office for National Statistics, 2001) and report journey-to-work flows within and between various levels of administrative and electoral geographical areas including local authorities, wards (of which there are approximately 9,000 in England and Wales) and census output areas (numbering approximately 80,000 in England and Wales). The data do not take account of periods when people may not be travelling because they are on holiday, off sick, working at home[4] for part of the week or attending meetings away from the workplace. Work-travel behaviour involves more complex interactions than simply journeying to and from work. Sometimes people work at home but sometimes they travel long distances to meet clients. The data are therefore a proxy for actual travel flows and tend to over-estimate activity at centres of employment. Only full-time workers were selected for this study, part-time workers and students were not included in the analysis. The figures may, therefore, under-represent the actual flows but it was felt that excluding part-time workers would counter-balance those full-time workers who do not commute to their usual place of work every day of the week. Although the interaction data can be classified by mode of transport and by employment type, both cannot be done simultaneously. Consequently it is not possible to select only office-based workers and investigate their mode of travel. This is a constraint of the web-site from

[4] Home-working may reduce transport usage but increase domestic energy use and reduce the energy efficiency of existing workplaces.

which the data are obtained. Because the focus of this investigation is carbon emission it was essential that mode of travel was selected as the classification scheme for commuting behaviour. Travel mode is categorised as working at home, walking, cycling, travelling by bus, train, underground, taxi, car (as driver or passenger), motorbike or other.

Commuter origins (people's residences) were mapped at local authority level for the 354 local authority areas in England. There are 390 polygons representing the English local authority areas but these include polygons representing small uninhabited islands off the mainland coast. Removing these from further analysis left 354 administrative local authority polygons and these were matched to the 354 English census interaction districts. Commuter destinations were the wards in which the sample of office locations (defined below) can be found[5]. In order to differentiate city centre from out-of-town commuter destinations, a sample of work-place locations was constructed as follows. CLG[6] publish boundaries and statistics for areas of consistently defined area of town centre activity for the years 1999-2004. These statistics and associated polygons are good at locating heart of a town or city centre. The 1,500 Areas of Town Centre Activity and 700 Retail Cores are defined using data on employment, net internal floor-space and rateable value. Employment data is sourced from the Annual Business Inquiry at the individual person level and include full time and part-time employees. Floor-space and rateable value data are sourced from the Valuation Office Agency (VOA). 2001 statistics were selected to coincide with the 2001 census work-place statistics and the 'retail cores' were removed. In order to focus on the larger towns and cities, those less than 40ha were removed. This excludes places like Truro (39.75ha) and Tooting (39.5ha) but includes Farnham (40ha) and Solihull (40.25ha). 141 wards contain a centroid[7] from the 2001 town centre polygons as defined above (i.e. not a retail core and greater than 40 hectares in size). One of the centroids was central London and this destination has been treated separately for analysis purposes. That leaves 140 wards for non-London in-town office locations. London work-place destination wards were selected as those which had their centroid in the central London town centre polygon. There were 95 such wards.

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[5] For queries involving aggregation of geographies to different levels, for any pair of areas with different geographies, the internal flow is the flow that takes place within the smaller area.
[6] http://www.communities.gov.uk/publications/corporate/statistics/retailcores19992004
[7] Hawth's Tools (http://www.spatialecology.com/htools/tooldesc.php) were used to calculate the coordinates of the centre points of the of the 141 town centre polygons, 354 local authority polygons (the commuter origins) and the 341 ward polygons (the commuter destinations).

Out-of-town office work-place locations were sampled from businessparks.net. 153 business parks are listed ranging from 9,290 to 6,900,000 square metres. The average size is 100,000 square metres. In order to geographically locate these business parks, their postcodes needed to be matched to the National Statistics Postcode Directory which records the spatial coordinates of the centroid of each UK postcode. Postcodes could not be found for 14 business parks and no match could be found for six business parks. These matching errors and omissions appeared to be due, at least in part, to the fact that some of the business parks had not yet been developed or were under construction. With the remaining business parks spatially referenced to their postcode centroids, a point-in-polygon GIS routine was used to determine which census ward each business park was located in. Because there can be more than one business park in a ward, after the matching process was complete, there were 105 wards containing one or more business parks.

The remaining methodological issue is the estimation of travel-related CO_2 emissions. Some work has been undertaken. Frost *et al* (1997) used energy consumption figures, rather than CO_2 emission, to calculate work-travel energy consumption. Per kilometre estimates of energy consumption for each vehicle type were adjusted for seating capacity and average occupancy to derive a standardised energy consumption estimate per person kilometre. So car travel consumed 2.5 mega joules per person kilometre while train travel was 0.31, light rail was 0.28 and bus travel was 0.25MJ/person km. Work-travel energy consumption is equal to person km travelled by each mode multiplied by the standardised energy consumption value per person km for that mode. Mackay (2008) adopted a similar but more simplified approach that focused on car-based commuting only. He assumed commuters travelled 50 kilometres per day and that the distance that could be travelled per unit of fuel was 12 kilometres per litre. Daily energy consumption was calculated as distance travelled divided by distance per unit of fuel, multiplied by energy per unit of fuel. Energy per unit of fuel is 10 kilowatt hours per litre so daily commuting energy amounted to 40 kilowatt hours per day. Mackay (2008) argued that this represents around one third of our total daily energy consumption. The focus of this paper is CO_2 emission, which is related to energy consumption but uses different metrics. Figures reporting CO_2 emission per kilometre of each mode of travel are available from the Atmospheric Emissions Inventory (AEA, 2009) and these are summarised in Table 1. These emissions figures were compared with figures published by the UK Department for Transport[8]. In order to link modes of travel defined in the census workplace statistics to the modal classification used by the National Atmospheric Emissions Inventory, the Department for the Environment, Farming and Rural Affairs and the Department of Energy and Climate Change, walking and cycling were combined (because neither emits CO_2), car driver and taxi have been combined.

Table 1: Transport CO_2 emissions by mode of travel ($kgCO_2/km$)

Source	Car driver (inc taxi)	Car Pass'r	Train	Motor-cycle	Walk/ bike	Bus	Underground
AEA (2009)	0.20282	0.10141	0.07305	0.11606	0	0.10351	0.065
DfT (2009)	0.1276-0.257	0.063-0.1288	0.0577	-	0	0.1035	0.0780

Results

Part (a) of Table 2 shows the number and proportion of commuters to each of the three work-place types (town centres, business parks and London) classified by mode of transport. The numbers for each transport mode are calculated by summing the number of commuters, *C*, from each origin, *i*, to each workplace destination, *j*, and then adding these figures over all origin-destination combinations to produce a total for each workplace type. This calculation is shown in equation [1].

$$\sum_{j=1}^{n} \sum_{i=1}^{n} C_{ij} \qquad [1]$$

Clearly a substantial proportion of London's workforce commutes on the underground rail network. This is why London has been treated separately from other towns and cities in the UK. Interestingly the same cannot be said for bus patronage which is comparable to business parks and lower than for other town centres. It would seem that the underground network takes the place of not only car commuters in London but bus passengers too. Around half (52 per cent) of commuters to towns and cities travel by car whereas 72 per cent of commuters to business parks travel by car. Lift-sharing seems to be more popular outside London, with no difference for town centre or out of town locations.

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8 www.dft.gov.uk/transportdirect.info

Part (b) of Table 2 shows the total distances travelled to each of the work-place types. This is the number of commuters for each mode from each commuter origin multiplied by the distance (in kilometres) to each work-place destination, as shown in equation [2].

$$\sum_{j=1}^{n}\sum_{i=1}^{n}\left[C_{ij} \cdot D_{ij}\right] \qquad [2]$$

It is interesting to compare the figures from part (b) of Table 2 with the corresponding figures in part (a). Focusing on the underground and train modes for London, while approximately one third of commuters patronise each mode, the distances travelled by train are far greater, as expected. More interesting as far as CO_2 emission is concerned is car use. Around half of commuters to towns and cities (excluding London) travel alone by car. For London it is much lower (13 per cent) but for business parks it is 72 per cent. All of these figures increase when the commuting distances are examined, revealing the longer journeys made by car relative to other modes of travel. For business parks in particular, 81 per cent of commuter miles are completed in single-occupancy cars.

The short distance measures should be treated with caution, particularly for walking and cycling, as they measure from centre points of local authority polygons to centre points of ward polygons and this may not accurately reflect the typically short distances travelled on foot or by bike. In Figure 1 (a) represents the actual distance travelled and (b) the estimated distance travelled. Over longer commutes the overall distance travelled between origin and destination centroids means the impact of any intra-origin bias is less pronounced. Moreover, since walking and cycling emit negligible CO_2 these distances are not used in subsequent calculations. Examination of the data at the destination-ward level reveals some anomalies. These may be due to the fact that mixed mode journeys are not recorded or are incorrectly recorded by residents completing the census questionnaires. There are, for example, three commuters from Bromley who work on a business park in Leeds and state their travel mode as underground. Also, some workers choose to live a long distance from their place of work and commute from a secondary residence during the working week. These origin-destination distances and modes of travel may be documented on the census form incorrectly if the respondent's main residence and usual work-place are recorded. Given the sample size used in this study, these anomalies will not influence the overall results unduly but do prevent detailed site-by-site analysis without further investigation.

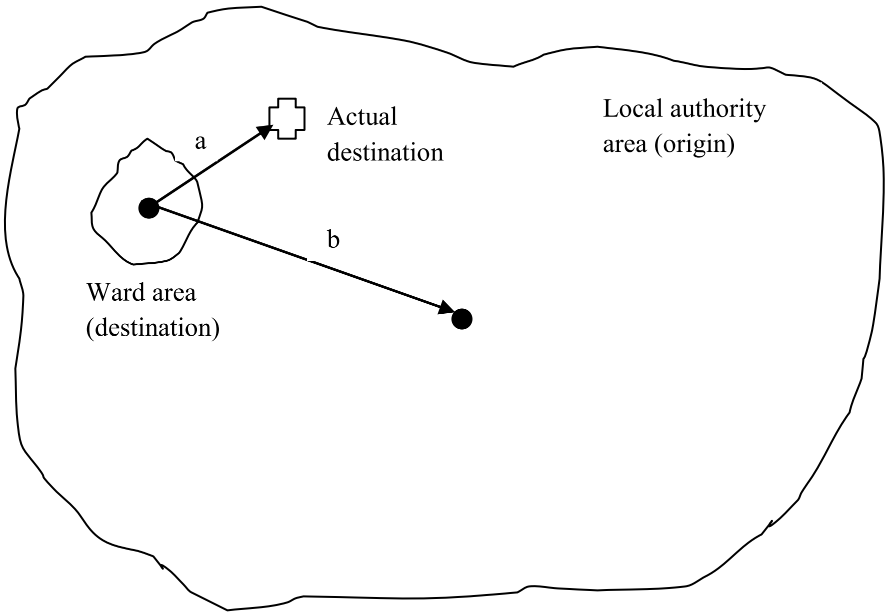

Figure 1: Small distance bias

Part (c) of Table 2 shows the total distance travelled using each mode of transport weighted by the number of commuters using that mode. Mathematically this is the equation from part (b) divided by the equation from part (a), as shown in equation [3].

$$\sum_{j=1}^{n}\sum_{i=1}^{n}\left[C_{ij}\cdot D_{ij}\right]/\sum_{j=1}^{n}\sum_{i=1}^{n}C_{ij} \quad [3]$$

These figures shift the focus away from the work-place types and on to the commuters. This is an intermediate step towards the calculation of CO_2 emissions per commuter. It is interesting to note the long journeys that London commuters take by train and by car. The results show that, although only 13 per cent of London commuters travel to work by car, they travel a long distance on average. In overall terms commuters to towns and cities travel the shortest distance, followed by business parks and then London, but noting that 76 per cent of London commuters travel using public transport.

Table 3 expresses commuting activity for each of the work-place types in terms of CO_2 emission per commuter and classified by travel mode. The table shows daily and annual emissions. For train and bus travel the results are broadly comparable across the work-place types; each commuter emits approximately one tonne of CO_2 per annum when travelling by train and around half of that figure in the case of bus travel. For single-occupancy car travel, the longer distances travelled by London commuters translate to high CO_2 emissions, as does the high proportion of shared car travel. Although car-sharing is regarded as energy efficient, if the distances travelled are long then the CO_2 emission will be high. The average emissions from commuters travelling to town centres, business parks and London workplaces weighted by the number of commuters using the various transport modes are 1,129, 1,573 and 938 kilograms of CO_2 per commuter per annum respectively. This is a way of aggregating the various modes and providing a single figure result for each workplace type. It shows that, on average, business parks are responsible for approximately 40% more emissions than town centres and 68% more than London. Over the time period of the 2001 census, UK annual CO_2 emissions per capita averaged 9.57 tonnes between 1997 and 2006 (US Energy Information Administration, 2006) so the significant contribution that commuting activity makes to that total is evident.

Conclusions

This research has used origin-destination commuting data from the last national population census in England to examine whether commuting behaviour differs between town centres, business parks and London work-places. The results show that there is a significant difference both in terms of mode of travel and distance travelled. This behaviour has implications for CO_2 emissions that result from commuting activity due to the heavy reliance on private, single-occupancy vehicles by business park workers.

The extent to which a property generates and relies upon carbon-based transport is significant to its environmental performance. “Organisations in out-of-town locations are likely to have more difficulty in achieving low levels of car use” (Department for Transport, 2005). It is, therefore, important to consider environmental performance beyond the operation of the building itself. This may lead to a re-evaluation of the role of out-of-town locations in the light of their growing contribution to CO_2 emissions based on their generation of individual car movements. In the future, increasing objections to road-building, out-of-town development and unrestrained vehicle use may influence the location and use of buildings. Locations that generate increased road traffic may fall out of favour. Haig (1926) used the phrase ‘friction of space’ to describe the way occupiers seek to minimise economic transport costs when choosing a location. A similar notion might be used to describe how occupiers may seek minimise the environmental and social costs of work-related travel.

Further research will investigate the origin geography at ward level and will examine the relationship with travel-to-work areas. Also, network distances will be constructed instead of straight line distances and an attempt will be made to normalise the commuting data for occupation type.

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Table 2: Numbers of commuters and distances travelled by commuters

	(a) Commuters						(b) Distance (number of commuters x kilometres travelled)						(c) Round-trip distance travelled per commuter (km)		
	Number			Percentage			Distance (km)			Percentage					
	Towns	BParks	London	Towns	BParks	London	Towns	BParks	London	Towns	BParks	London	Towns	BParks	London
Under-ground	97,204	6,080	434,299	5%	1%	32%	2,552,898	223,868	10,788,342	4%	1%	18%	26	37	25
Train	156,043	15,312	469,843	8%	2%	34%	8,881,222	931,210	32,172,364	14%	4%	54%	57	61	68
Bus	272,844	47,506	104,991	14%	7%	8%	5,311,812	942,550	2,409,372	8%	4%	4%	19	20	23
Taxi	8,843	2,089	6,482	0%	0%	0%	171,010	62,602	145,110	0%	0%	0%	19	30	22
Car	1,002,598	465,685	183,532	52%	72%	13%	37,885,672	20,286,370	10,266,000	60%	81%	17%	38	44	56
Car-pass	109,676	37,236	14,000	6%	6%	1%	2,792,346	1,013,254	749,748	4%	4%	1%	25	27	54
Motor-bike	22,937	7,973	27,170	1%	1%	2%	674,638	253,312	912,252	1%	1%	2%	29	32	34
Bike	52,987	15,023	31,973	3%	2%	2%	875,092	278,968	596,882	1%	1%	1%	17	19	19
Walk	162,139	26,107	66,316	8%	4%	5%	2,900,570	494,826	1,175,502	5%	2%	2%	18	19	18
Home	32,337	24,388	28,463	2%	4%	2%	279,124	332,072	115,830	0%	1%	0%	9	14	4
Other	7,027	1,619	4,458	0%	0%	0%	924,580	140,988	419,256	1%	1%	1%	132	87	94
TOTAL	1,924,635	649,018	1,371,527	100%	100%	100%	63,248,964	24,960,020	59,750,658	100%	100%	100%	33	38	44

Table 3: CO_2 emissions per commuter										
Transport mode	**Round-trip distance travelled per commuter (km)**			**CO_2 emission ($kgCO_2$/km)**	**CO_2 emission (kg CO_2/commuter/day)**			**CO_2 emission (kg CO_2/commuter/yr*)**		
	Towns	**BParks**	**London**		**Towns**	**BParks**	**London**	**Towns**	**BParks**	**London**
Underground	26	37	25	0.06500	1.71	2.39	1.61	393	550	371
Train	57	61	68	0.07305	4.16	4.44	5.00	956	1,022	1,150
Bus	19	20	23	0.10351	2.02	2.05	2.38	463	472	546
Taxi	19	30	22	0.20282	3.92	6.08	4.54	902	1,398	1,044
Car	38	44	56	0.20282	7.66	8.84	11.34	1,763	2,032	2,609
Car-pass	25	27	54	0.10141	2.58	2.76	5.43	594	635	1,249
Motor-bike	29	32	34	0.11606	3.41	3.69	3.90	785	848	896
Weighted average (by number of commuters using each mode)								1,129	1,573	938

*assuming workers commute for 46 weeks per annum and five days per week