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North Essex Authorities

Mode Share Strategy For the North Essex Garden Communities

July 2019

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Version 1-4

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Appendices

1. Introduction

1.1 The North Essex Authorities (NEAs) (Colchester Borough Council, Tendring District Council, Braintree District Council and Essex County Council) have commissioned ITP to undertake an international best practice review of the effectiveness of transport interventions on mode share and how such best practice can be integrated into the transport strategy for the Garden Communities (GCs). ITP is an award-winning company of transport planning and research specialists, who deliver transport strategy and sustainable development projects across the UK and abroad, as well as rapid transit (RT) systems and smarter travel measures.

1.2 This technical note summarises key findings from a review of UK and European transport and planning interventions that have been implemented to limit car use and maximise sustainable travel patterns in new communities. The note then considers the relevance of such interventions in the context of the North Essex Garden Community (NEGC) proposals. This note complements the work undertaken by Jacobs to develop Rapid Transit System proposals for the North Essex area, and builds upon earlier work, including the Movement and Access Study by Jacobs, that sets out a range of detailed transport measures. It is anticipated that this note will inform detailed site-specific Development Plan Documents (DPD) and subsequent master planning.

Planning background

1.3 The NEAs have prepared a shared strategic Section 1 of their Local Plans which covers cross-boundary issues in North Essex including strategic infrastructure provision and setting out the housing and employment needs of the sub-region. These issues are addressed through a spatial strategy centred around the delivery of three new GCs. The GCs will not just be an important source of housing and jobs for North Essex; they will act as the standard bearer of the NEAs' transport and connectivity ambitions, demonstrating how existing patterns of movement can be improved both within new development and stimulating change beyond their boundaries.

1.4 This note demonstrates how the NEAs' ambitions can translate into delivery by setting out a 'menu of options' for how sustainable modal share targets can be achieved. It is anticipated that these options will help inform detailed site-specific DPDs, including the preparation of masterplans, for each of the GCs following the adoption of Section 1 by the NEAs.

Structure of this note

1.5 This note explores the following themes:

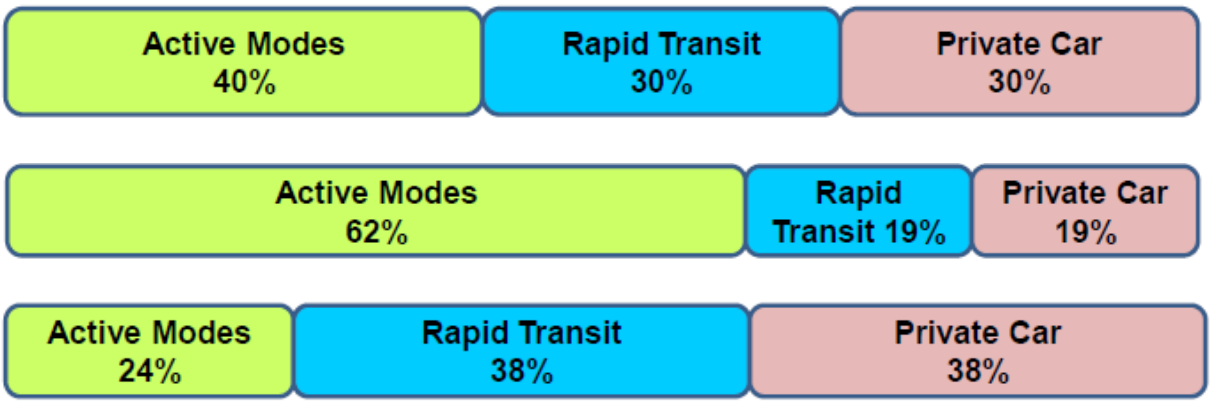
- Section 2 sets out the proposed mode share targets and reviews existing travel-to-work mode split and patterns of movement across the North Essex sub-region (derived from Census 2011 data).
- Section 3 considers 'where in the world' travel behaviours akin to those targeted for the GCs have been achieved.
- Section 4 sets out the land-use, transport and planning approaches from different countries that achieve high sustainable travel mode share and documents the critical success factors that appear to underpin these trends.
- Section 5 underlines the importance of having an integrated sustainable place and mobility vision from the outset of placemaking, by drawing on comparative case study evidence from Houten, in the Netherlands, and Milton Keynes, in the UK.
- Section 6 sets out how the target mode share will be delivered early on, how internalisation of trips will be achieved and sets out the range of measures that will be delivered in the GCs, along with how they will be phased and who will deliver them.
- Section 7 further refines the original mode share targets for the Garden Communities, based on the findings from this review.
- Section 8 summarises key conclusions and next steps.

2. Mode share in North Essex

The NEGC target mode share

2.1 The overall travel mode share target for all trips generated within and between each of the proposed North Essex Garden Communities is set out in the Movement and Access Strategy (MAS) and seeks 40% of trips to be completed by active modes (e.g. walking/cycling/scooting/running), with the remainder split equally between RT (30%) and private car (30%). For local journeys within each of the Garden Communities (GCs), the mode share targets are more ambitious. They take into account the potential for significant trip internalisation; giving a target for 62% of trips to be completed by active travel modes, with the remainder split equally between RT and private car (19% each). For longer distance journeys outside of each Garden Community (e.g. into the wider North Essex sub-region, and beyond), the target is for 24% of trips to be completed by active travel modes, and 38% each to be made by RT and private car. These are set out in Figure 2-1.

Figure 2-1: MAS mode share targets for all journeys (top), local journeys (middle) and journeys within immediate GC hinterland (bottom)



Source: Jacobs Movement and Access Strategy

2.2 Since the Movement and Access Strategy was produced in 2017 a robust RT strategy has been prepared (as set out in the report Rapid Transit System for North Essex produced by Jacobs), alongside additional work reviewing the proposed mode share targets and how they can be achieved, as set out in this report. Working within the ambitious mode share framework set out in the MAS, the targets have been reviewed, (Section 6) and further refined (Section 7).

Existing mode share in North Essex

2.3 In line with many locations outside the major cities in the UK, movement in North Essex is currently dominated by private car use. This is a result of limited public transport and cycle route options, which tend to offer slower and less direct journey times than is possible by car.

2.4 Trip patterns are therefore a product of the available transport links, including rail, bus and cycle routes.

- The rail network in the region is focused around the Great Eastern Main Line (GEML) with branch lines to Sudbury from Marks Tey and to Braintree from Witham.
- There are 18 'inter regional' bus routes that run through the area, the majority of which operate at low frequencies (from 1 per day up to 2-3 per hour) (although Colchester is reasonably well-served). However, low bus priority in the area contributes to unreliable journey times.
- The National Cycle Network (NCN) passes through Braintree and Colchester, with Flitch Way (a disused rail line) running to the south of the West of Braintree GC. Overall the cycle network is basic in the region, although somewhat better provision in Colchester as a result of historic investment through the Cycle Cities and Towns programme.

2.5 2011 Census Method of Travel to Work data has been interrogated to establish existing mode share in the area in relation to commuting trips for Braintree, Colchester and Marks Tey. Table 2-1 describes the travel patterns found in this dataset. Although there are a number of limitations with using this dataset, not least that it does not consider non-commuter trips, it does provide a useful indicator of general travel patterns in the region. The Census Middle Super Output Areas used for each location are shown in Appendix A.

Table 2-1: Existing North Essex mode share (Source: Census, 2011)

Mode		Braintree	Marks Tey	Colchester
Active Modes	Walk	12%	6%	16%
	Cycle	2%	2%	5%
	Total	**14%**	**7%**	**21%**
Public Transport	Rail	7%	11%	9%
	Bus	3%	2%	7%
	Total	**11%**	**13%**	**16%**
Car	Car	68%	74%	56%
	Car pax	6%	4%	5%
	Total	**74%**	**78%**	**61%**
Other		1.6%	2%	1%

Implications for the Garden Community proposals

2.6 What is evident from the existing travel patterns is that mode share within the areas varies across the towns in response to a range of factors. Key trends are that:

- Larger and more densely developed places like Colchester offer a broader range of work, social and leisure opportunities within reasonable walk and cycle distances, which is reflected in higher active travel mode share
- Colchester in particular has a denser local public transport network, which results in higher public transport mode share
- The level of car parking restraint is limited in all locations. Only Colchester has a car mode split for trips to work that is below the national average (67% in 2016).

2.7 Analysis of the Census data also reveals that around 40% of commuter trips are less than five kilometres in length, which suggests there is significant scope to encourage more widespread uptake in cycling and public transport use in the existing population if infrastructure is improved.

2.8 The scale and ambition of the proposed GCs offers a great opportunity to achieving better mode share:

- Providing high quality walking, cycling and public transport infrastructure will encourage higher travel mode share by these modes, as evidenced already in the North Essex travel patterns

- Higher density, mixed-use developments encourages greater trip internalisation and use of sustainable modes. For example, on average in the UK, 80% of journeys shorter than one mile are walked[1].
- Evidence suggests that life-stage changes, like moving into a new home, represents a great stimulus for changing behaviour[2], but the alternatives need to be in place from day one. If not, people receptive to these behaviours will either not be attracted to the GCs or will not have the opportunity to embed active travel and public transport use into their lives.

[1] https://www.sustrans.org.uk/sites/default/files/activetraveltoolbox_housinggrowthandplanning_part2v4.pdf
[2] http://eprints.uwe.ac.uk/9789/1/9789.pdf

3. Where sustainable mode share is achieved

3.1 Context for how the GCs will achieve the mode share targets can be set by examining locations in both UK and Europe that achieve comparable mobility trends (Table 3-1).

Table 3-1: Comparison of UK and European mode share

City	Country	Year	Population	Walking	Cycling	Public Transport	Private Car
NEGC	UK	-	-	20%	20%	30%	30%
Aarhus	Denmark	2015	325, 000	19%	18%	9%	54%
Amersfoort	Netherlands	2008	141, 211	13%	28%	7%	52%
Amsterdam	Netherlands	2013	2, 410, 960	29%	32%	17%	20%
Barcelona	Spain	2013	3,247,281	42%	2%	27%	29%
Berlin	Germany	2008	3,574,830	30%	13%	26%	31%
Cambridge	UK	2017	123,900	5%	39%	10%	37%
Copenhagen	Denmark	2013	1,307,000	6%	27%	27%	26%
Delft	Netherlands	2013	99, 737	27%	34%	8%	31%
Dresden	Germany	2013	512, 546	27%	12%	22%	39%
Durham	UK	2013	50,000	30%		11%	59%
Freiburg	Germany	2016	227, 000	29%	34%	16%	24%
Groningen	Netherlands	2008	182, 484	15%	31%	10%	44%
Houten	Netherlands	2008	48,000	27%	28%	11%	34%
Ljubljana	Slovenia	2003	265, 881	19%	10%	12%	58%
London	UK	2013	8,787,892	24%	2%	37%	37%
Malmo	Sweden	2013	313,000	15%	22%	21%	42%
Odense	Denmark	2008	178, 210	19%	27%	26%	28%
Oslo	Norway	2013	988,873	29%	6%	30%	35%
Oxford	UK	2011	150,200	19%	19%	21%	41%
Stockholm	Sweden	2013	1,538,517	21%	8%	47%	23%
Strasbourg	France	2009	439, 000	33%	8%	12%	47%
Warsaw	Poland	2013	1,753,977	18%	3%	47%	32%

3.2 While Table 3-1 shows that the mode share targets for the GCs are achieved in only a small number of towns and cities across the UK and Europe, it is noticeable that many places achieve higher active travel and/or public transport mode shares than proposed by the NEGC targets. The majority of these places appear to have one or two sustainable travel modes that dominate patterns of movement, rather than having the balanced mode share proposed in North Essex. In practice we anticipate the actual average mode share will vary across the GCs depending on the exact mix of transport facilities provided, the size of each GC (and associated community facilities they provide), and their proximity to nearby towns.

UK precedents

3.3 Importantly, high non-car mode splits are being achieved in the UK, as well as in Europe. London has very high walking (24%) and public transport (37%) use, although it is a world city with a very dense public transport network. Cambridge and Oxford both have very high active travel mode shares at 44% and 38% respectively, although they also have large student populations, medieval street patterns, limited city centre parking, and highly constrained road networks – all of which may increase their propensity for active travel. This demonstrates that there is nothing intrinsically different about the Dutch or Danes that predisposes them to sustainable travel in comparison to the UK context. Instead, people simply appear to choose the mode that is quickest, cheapest and most convenient based on the choices available to them. Many of the conditions that encourage active travel and public transport use, such as density, public transport priority, walking and cycling friendly street arrangements and permeability, can be created through the masterplanning process.

'Low-car' places

3.4 A number of places achieve car driver mode share at around the target 30%. The population of these cities varies widely from large towns such as Houten (48,000) and Delft (99,737) to large capital cities such as Berlin and Barcelona. This implies that achieving constrained levels of car use is not solely reliant on large populations and the substantial public transport networks that often accompany them. Indeed, looking at the non-car mode shares for those places cited along with other 'low-car' cities, there is little consistency in non-car mode shares between places (see Table 3-2). This suggests that there is no one main factor that results in low levels of car use, but instead a mix of influencing variables.

Table 3-2: Top ten places with lowest car mode share

City	Country	Year	Population	Walking	Cycling	Public Transport	Private Car
Amsterdam	Netherlands	2013	2, 410, 960	29%	32%	17%	20%
Stockholm	Sweden	2013	1,538,517	21%	8%	47%	23%
Freiburg	Germany	2016	227, 000	29%	34%	16%	24%
Copenhagen	Denmark	2013	1,307,000	6%	27%	27%	26%
Odense	Denmark	2008	178, 210	19%	27%	26%	28%
Barcelona	Spain	2013	3,247,281	42%	2%	27%	29%
Berlin	Germany	2008	3,574,830	30%	13%	26%	31%
Delft	Netherlands	2013	99, 737	27%	34%	8%	31%
Warsaw	Poland	2013	1,753,977	18%	3%	47%	32%
Houten	Netherlands	2008	48,000	27%	28%	11%	34%

Transit-oriented places

3.5 Those places that achieve the highest public transport tend to be significantly larger than the proposed GCs, in most cases the capital city of a country (see Table 3-3). This suggests that high frequency, multi-modal public transport, with significant penetration across the urban area that allows close matching of service provision with travel demand is important in encouraging high levels of public transport use. However, this is not universally the case as shown by Odense, where high levels of public transport use are secured with a high-quality bus network. The relative attractiveness of the car in comparison to public transport will be a key determining factor and this can be influenced through the careful design of the GCs and significant priority into, and through, nearby settlements.

Table 3-3: Top ten cities with highest public transport mode share

City	Country	Year	Population	Walking	Cycling	Public Transport	Private Car
Stockholm	Sweden	2013	1,538,517	21%	8%	47%	23%
Warsaw	Poland	2013	1,753,977	18%	3%	47%	32%

City	Country	Year	Population	Walking	Cycling	Public Transport	Private Car
London	UK	2013	8,787,892	24%	2%	37%	37%
Oslo	Norway	2013	988,873	29%	6%	30%	35%
Barcelona	Spain	2013	3,247,281	42%	2%	27%	29%
Copenhagen	Denmark	2013	1,307,000	6%	27%	27%	26%
Berlin	Germany	2008	3,574,830	30%	13%	26%	31%
Odense	Denmark	2008	178, 210	19%	27%	26%	28%
Dresden	Germany	2013	512, 546	27%	12%	22%	39%
Oxford	UK	2011	150,200	19%	19%	21%	41%

Walkable places

3.6 Table 3-4 shows that there is little similarity between the places with the highest walking mode share. Some are very large capital cities, such as Barcelona and Berlin, while Freiburg and Houten are large towns. Similarly, the urban form is also very different with many old historic cities represented, such as Strasbourg and Amsterdam, while Houten and Freiburg were built in the late 20th Century.

Table 3-4: Top ten cities with highest walking mode share

City	Country	Year	Population	Walking	Cycling	Public Transport	Private Car
Barcelona	Spain	2013	3,247,281	42%	2%	27%	29%
Strasbourg	France	2009	439, 000	33%	8%	12%	47%
Berlin	Germany	2008	3,574,830	30%	13%	26%	31%
Oslo	Norway	2013	988,873	29%	6%	30%	35%
Amsterdam	Netherlands	2013	2, 410, 960	29%	32%	17%	20%
Freiburg	Germany	2016	227, 000	29%	34%	16%	24%
Dresden	Germany	2013	512, 546	27%	12%	22%	39%
Houten	Netherlands	2008	48,000	27%	28%	11%	34%
Delft	Netherlands	2013	99, 737	27%	34%	8%	31%
London	UK	2013	8,787,892	24%	2%	37%	37%

Cycling towns and cities

3.7 When considering the places with the highest cycle mode share (Table 3-5) some factors become apparent. They tend to be relatively small places with populations generally lower than 250,000 inhabitants and public transport use tends to be relatively low, mostly below 20%. Walking mode share tends to be relatively high, although not consistently, for example both Cambridge and Copenhagen have walk mode share below 10%. Generally, the cities tend to have well developed and segregated cycle networks, although Cambridge is a notable exception as it does not have a consistent network across the whole city but a strong cycling culture rooted in the university student population.

Table 3-5: Top ten cities with highest cycling mode share

City	Country	Year	Population	Walking	Cycling	Public Transport	Private Car
Cambridge	UK	2017	123,900	5%	39%	10%	37%
Freiburg	Germany	2016	227, 000	29%	34%	16%	24%
Delft	Netherlands	2013	99, 737	27%	34%	8%	31%
Amsterdam	Netherlands	2013	2, 410, 960	29%	32%	17%	20%
Groningen	Netherlands	2008	182, 484	15%	31%	10%	44%
Houten	Netherlands	2008	48,000	27%	28%	11%	34%
Amersfoort	Netherlands	2008	141, 211	13%	28%	7%	52%
Odense	Denmark	2008	178, 210	19%	27%	26%	28%
Copenhagen	Denmark	2013	1,307,000	6%	27%	27%	26%
Malmo	Sweden	2013	313,000	15%	22%	21%	42%

3.8 The following sections set out examples of best practice in relation to specific types of measures and the impact these have had on creating sustainable travel patterns. In addition to these general lessons, these will help identify how the proposed mode share targets will be achieved in North Essex.

4. How sustainable mode share is achieved

4.1 Quantifying the impact of transport and planning interventions is challenging because the places in which they are delivered do not operate in a vacuum. Isolating the impacts of single interventions is seldom possible, but the case studies and discussion collated in this section demonstrate that:

- Combining multiple measures that are known to contribute to sustainable travel patterns increases their effectiveness as a range of measures is more likely to meet more people's needs, for a wider range of trips.
- Positively influencing travel behaviours depends on human choice, so a range of measures that 'push' and 'pull' people towards desirable travel modes is required.
- Infrastructure investment is vitally important but works best when accompanied by behavioural measures to help people make more sustainable travel choices.

Placemaking & land use planning

4.2 Often, new developments (particularly where built on greenfield sites) are designed primarily with car-use in mind, with strong provision of parking and roads. Public spaces within these developments are often minimalist and uninviting and prioritise cars over walking or cycling space[3].

Figure 4-1: An example of public realm dominated by car access considerations (Clackers Brook, Melksham)

Source: Transport for New Homes

[3] http://www.transportfornewhomes.org.uk/wp-content/uploads/2018/07/transport-for-new-homes-summary-web.pdf

4.3 As recognised in the work being undertaken as part of the NHS Healthy New Towns Programme, the design of the urban environment can encourage active travel and contribute positively to public health and social wellbeing. A key part of this is limiting the access of motor vehicles, and where access is provided, the volume and speed of vehicles in 'human' spaces (including public squares and residential streets) through traffic management measures such as filtered permeability.

4.4 A good mix of uses (residential, employment, leisure, retail and education) within new developments also encourages more sustainable travel patterns, by allowing more trips to be made internally, as does building at higher density. This creates a virtuous circle of more active streets, which encourages more walking and cycling.

Case study evidence

4.5 Particularly good examples of this are Houten in the Netherlands, and Freiburg in Germany. In Houten a core part of the strategy is to restrict through-highway movements in order to make walking and cycling the most direct and convenient travel mode for most journeys. Similarly, in Freiburg, the core focus is on limiting vehicular traffic by creating a compact place that people can cross quickly on foot or by bike, with strong neighbourhood centres. This means that many leisure and shopping trips can be completed within the neighbourhood, reducing the need for longer distance travel and the consequent reliance on the car.

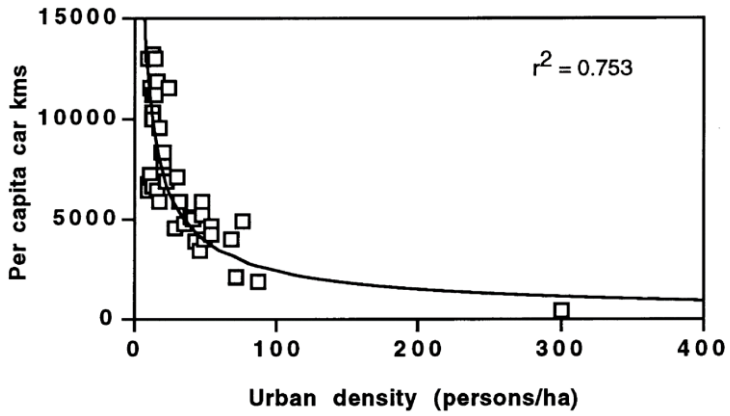
Figure 4-2: Bicycle shed parking and residential street in Vauban, Freiburg

Source: Andrea Broaddus

4.6 To further aid this, higher density development should be encouraged and prioritised as this delivers multiple benefits in terms putting a larger number of jobs, services and day to day needs within walking and cycling distance. Houten's urban population

density is 54 people/ha[4], whilst in Freiburg it is 140 people/ha[5]. For comparison, Milton Keynes' (UK) population density is around 22/ha[6]. Density has been shown to have a clear relationship with car kilometres driven per capita (as shown in Figure 4-3)[7].

Figure 4-3: Relationship between urban density and per capita car kilometres



Source: Kenworthy & Laube, 1999

4.7 It should be noted however that building at higher density need not entail tall buildings and compromised public spaces. Houten, for example, has maintained a green and leafy suburban feel with density varying across the town, depending on location and access to facilities and public transport, and housing stock ranging from detached single family homes to three or four storey buildings within local centres.

4.8 Land-use planning can help to reduce travel distances to the extent that residents do not necessarily need to own a car. In Vauban, housing for 5,000 residents and work premises for up to 600 jobs allow some internalisation of trips, but do not provide enough employment for all residents. As such an integrated land use and transport plan has ensured that local facilities and jobs are within easy reach by walking or cycling - implementing the idea of 'a district of short distances'. Consequently a school, nurseries, a shopping centre, farmers' market, food co-op, recreation areas and businesses are all within walkable and cycle-able distances for most people.

4.9 In the UK (and on a smaller scale), BedZED (Beddington Zero Energy Development) is a multi-award-winning development, and one of the most coherent examples of sustainable living in the UK. A number of travel demand management techniques help to maintain low car use, including low parking provision per residential unit and a separation between the cost of housing and parking (residents have to 'opt-in' and pay

[4] https://itdpdotorg.wpengine.com/wp-content/uploads/2014/07/22.-092211_ITDP_NED_Desktop_Houten.pdf
[5] https://www.freiburg.de/pb/site/Freiburg/get/params_E-1604864046/647919/Infotafeln_Vauban_en.pdf
[6] https://itdpdotorg.wpengine.com/wp-content/uploads/2014/07/22.-092211_ITDP_NED_Desktop_Houten.pdf
[7] http://web.mit.edu/11.951/oldstuff/albacete/Course%20Reader/Transportation/High-Speed%20Tranist%20Literature%20Review/Kenworthy%20and%20Laube%201999.pdf

extra for a parking space). In addition, BedZED contains a mix of housing and employment space, albeit on a small scale, allowing at least some residents to walk to work. Good public transport links allow most residents to commute by public transport.

Figure 4-4: 'Green architecture' between homes and offices at BedZED

Source: Sonja Raca

4.10 Poundbury in Dorset is another UK example with varied land-uses and high-quality public realm. It was built with a conscious integration of employment (including factories and offices) and residential buildings to maximise 'internalisation' of trips within the town[8]. The town itself is based around several 'centres', generally squares, which form a 'hub' for each phase of development.

Figure 4-5: Public space in Poundbury

Source: Transport for New Homes

[8] http://www.discoverpoundbury.co.uk/

Table 4-1: Summary of interventions - Placemaking & Land-use

Core Measure / Intervention	Location(s)	Outcome / mode split impact	Complementary measures	How it will be applied to the GCs
Make all urban facilities easily accessible by active travel by providing residential, leisure and employment land uses together	Houten	42% of trips shorter than 7.5km are made by bike, with around 21% completed by foot.	Smarter choices Personalised Travel Planning (PTP) Cycle infrastructure Parking restraint measures	The GCs can draw on these examples to design and construct neighbourhoods where urban facilities are carefully and coherently planned to provide for of residents' daily needs. Resulting in short average distances which facilitate journeys made by active travel. The GCs will be designed around public transport facilities with high degrees of priority and streets that do not allow general traffic access, meaning that destinations within the CGs and further away will be most conveniently accessed without a car.
	Freiburg (Vauban)	61% of commuting trips are made by bicycle in car-owning households, with 91% in non-car-owning households		
Use road restrictions and filtered permeability to reduce traffic on internal roads	Houten	Houten ring road structure has reduced 40% of traffic from the central areas		
	Freiburg (Vauban)	Car mode share is only 16% of all trips		
Higher density development instead of suburban sprawl	Houten / Freiburg	42% of trips shorter than 7.5km are made by bike, with around 21% completed by foot.		
Availability of public transport for longer distance trips	Freiburg (Vauban)	32% of residents have a public transport season ticket		
	BedZED	61% of residents travel to work by public transport		

Core Measure / Intervention	Location(s)	Outcome / mode split impact	Complementary measures	How it will be applied to the GCs
Provide a high-quality, well-maintained, public realm and mixed uses	Poundbury / Houten / Freiburg / BedZED	In Poundbury 32% of residents walk to work, far higher than achieved in other new developments[9]		

[9] http://www.transportfornewhomes.org.uk/wp-content/uploads/2018/07/transport-for-new-homes-summary-web.pdf

Walking

4.11 Walking forms a key part of almost every journey. Nonetheless the design of the walking environment is all too often compromised in order to provide car parking and carriageway space, which encourages increased car ownership and use. People without access to a car are more likely to walk as a mode of transport, with 47% of their trips and 10% of their distance travelled by foot[10]. Whilst entirely car-free lifestyles are unlikely to become widespread in North Essex, measures that work to reduce car use and ownership will be implemented in order to increase walking rates. The walking environment will be of the highest quality and there will be a range of employment, education and other facilities within walking distance.

4.12 In addition to the measures already discussed for reducing car use and ownership, there are a number of specific measures that can be used to encourage walking, including personalised travel planning (PTP) and promotional events. These behavioural measures are discussed elsewhere in this report but can have significant impacts on perceptions of walking in terms of safety and walkable distances, as well as personal health and financial benefits.

4.13 Finally, removing physical space for cars represents a commitment to pedestrian safety and access, as occurs when large roads are pedestrianised (e.g. Mariahilferstraße in Vienna[11] - Figure 4-8), or when pedestrian-unfriendly infrastructure is removed (including underpasses and flyovers - Figure 4-7). In the case of the GCs, these pitfalls will be avoided from the outset, but there are still lessons to be learned for ensuring that a visible commitment to a positive walking environment is made.

Case study examples

4.14 Internationally, best practice examples of high-quality walking environments are in large (often capital) cities including Barcelona, Amsterdam and Vienna. While the experiences of these cities are not directly replicable in the context of North Essex, there are still lessons to be learnt from their approaches. Across these cities, designers seek to provide high-quality, permeable walking infrastructure, that allows for easier movement through and around the cities using active modes compared to using the car.

4.15 In Peterborough under the Sustainable Travel Towns initiative an 18% increase[12] in walking levels was achieved between 2004 and 2008. In early 2005, delivery of a large-

[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/4415/chap8.pdf
[11] https://www.viennconver.com/2015/01/viennas-begegnungszone-shared-space-program/
[12] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/4423/chap16.pdf

scale Individualised Travel Marketing (ITM) programme, offering personalised travel information and support to a total target population of approximately 30,000 households across the city. The measures used included[13]:

- An integrated sustainable transport guide
- Interactive kiosks
- An interactive mapping system
- Travel information centre
- Marketing and promotion activities, including a reward and travel awareness campaign
- Business, residential, school and workplace travel planning programs

4.16 The project ran in the context of local transport planning measures across several priority areas, one of which was walking infrastructure improvements. During the same period the city's strategic bus network underwent further development by Stagecoach, including higher-frequency services and low-floor vehicles. All of these measures contributed to the increase in walking levels that was experienced.

Figure 4-6: Market Square in Peterborough, with pedestrianised area in front

Source: Been there – Done that

[13] http://www.travelchoice.org.uk/wp-content/uploads/2013/06/Travel-behaviour-research.pdf

4.17 Behavioural measures can also be employed to encourage the uptake of active travel modes, including the promotion of walking routes, cycle to work schemes, and work place travel plans. In Freiburg and Houten, early promotion of walking, cycling and public transport for new residents through PTP schemes has seen mode shifts between 10-17% away from car use, whilst 60% of travel to work journeys are now made using active modes in the areas that have benefitted from PTP.

4.18 In Leicester, the demolition of the Belgrave flyover and the subsequent creation of a shared use path for pedestrians and cyclists to traverse the large remaining roundabout has significantly increased walking and cycling. A post demolition survey in 2017 found 4,000 to 5,000 people travelling on-foot across the site of the former flyover per day and 300 to 500 cycling, an increase in 16% for pedestrians and 43% for cyclists based on surveys in 2013. Meanwhile feared increases in traffic congestion have not materialised[14].

Figure 4-7: Pedestrian/cycle access over Belgrave Circle, Leicester

Source: Leicester City Council

4.19 In Vienna, the main shopping street, Mariahilferstraße, was recently redesigned to include a pedestrian zone and shared spaces. The redesign was considered due to increasing pedestrian volumes (around 70,000 per day) and put to a local referendum.

[14] https://news.leicester.gov.uk/news-articles/2019/february/walking-and-cycling-thrive-five-years-on-from-flyover-demolition/

The decision was backed by a narrow 53.2% approval rate, and the pedestrianisation of the 1.6km stretch was completed in 2014. After its implementation, 71% said they would now vote in favour of the schemes.

Figure 4-8: Mariahilferstraße in Vienna

Source: American in Vienna

Table 4-2: Summary of interventions - Walking

Core Measure / Intervention	Location(s)	Outcome / Mode Shift Achieved	Complementary measures	How it will be applied to the GCs
Smarter choices programs including PTP, promotional events	Peterborough	18% increase[15] in walking levels	Filtered permeability Traffic demand management Parking management	Smarter choice measures will be employed to encourage people to make behavioural changes during a period of change (i.e. moving house). A strong culture of walking and cycling will be delivered with the GCs, enabled by providing pleasant walking environments and short distances to key destinations and amenities.
Introduction of innovative pedestrian-friendly concepts (shared and pedestrianised zones), further traffic calming measures and easier crossing of main roads.	Vienna	Support for the scheme improved after implementation (53% to 71%), although hard to quantify impact on mode shares		
Removal of pedestrian-unfriendly infrastructure such as flyovers	Belgrave Circle, Leicester	16% increase in walking and 43% increase in cycling		

[15] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/4423/chap16.pdf

Cycling

4.20 As with walking, encouraging cycling necessitates a combination of infrastructure and behavioural measures. Segregated cycle lanes and secure cycle parking can both contribute to increasing cycling mode share. Cycle hire also allows people to cycle for a single stage of a longer journey, while also encouraging people to try cycling who otherwise might not. The use of PTP, cycle training and promotional events can be used not only to increase awareness of these measures, but also to work with people in terms of their psychology to remove the apprehension often associated with cycling.

4.21 Although here we focus mainly on these measures as specific cycling measures, many of the key ways in which cycling can be encouraged are covered in terms of land use planning, urban realm and traffic demand management - particularly in the European context. These leading European cities are successful because they implement holistic city-wide schemes to reduce traffic levels and make cycling more attractive to all.

Case Study examples

4.22 Copenhagen has one of the most developed cycle networks in the world. The Government has invested over £35-per-head each year on cycling since the 1990s, with measures including the creation of PLUSnet, a network of 'Bicycle Superhighways' on very congested routes and allowing bicycles to be taken onto trains and metro. In 2016, 41% of trips to work and education in the city were made by bike and 76% of resident's felt secure when cycling.

4.23 Copenhagen was also the inspiration for London's cycle superhighways, which have had a significant impact on the number of cyclists, both as commuters and for leisure. Transport for London (TfL) analysis showed that there was a 50% increase in cycling along the North-South Cycle and East-West Superhighways within five months of opening and that the volumes of cycles exceed that of all other traffic during the peaks along the Embankment and over Blackfriars Bridge[16].

4.24 Nottingham achieved a 28% uplift in cycling levels under the Local Sustainable Transport Fund project, due to interventions including the introduction of 14 secure cycle parking hubs, which were accessed over 900 times per month in 2014/15. Survey evidence indicated that these hubs had encouraged 38,500 additional cycle trips since their implementation.[17] The hubs were integrated with the Nottingham Express Transit (NET) tram network, linking up active travel with public transport.

[16] http://content.tfl.gov.uk/pic-161130-07-cycle-quietways.pdf
[17] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/738264/evaluation-and-synthesis-of-lstf.pdf

Figure 4-9: Cycle hub located at a Nottingham Express Transit (NET) stop

Source: NET, 2015

4.25 Public bike hire has also contributed to increasing cycling rates. After the first ten weeks of operation of TfL's Santander bike hire scheme, one million cycle rides were taken, 95% of which were previously made by another mode or not at all. Seven out of ten users said the scheme had prompted them to start cycling in the city or to cycle more often.[18] This has been the case across cities that have implemented such schemes – in Lyon a 44% increase in cycling mode share was achieved within the first year of implementation of Velo-v, its bike-share system[19].

Figure 4-10: Velo'v in Lyon

Source: Ppierart

[18] https://www.centreforpublicimpact.org/case-study/londons-cycle-hire-scheme/
[19] https://en.wikipedia.org/wiki/V%C3%A9lo%27v

4.26 In addition to bike sharing of standard bikes, there have also been pushes to expand the use of cargo bikes for journeys that would otherwise be made by car. In Copenhagen, 26% of families with more than two children own a cargo bike, and a quarter of these say their cargo bike replaces their need for a car[20]. Improving provision for cargo bikes includes ensuring a sufficient width for cycle lanes, providing widely spaced cycle parking and ensuring safe routes to schools, as cargo bikes are commonly used for transporting children.

4.27 The personal investment considered with a cargo bike is significantly higher than a standard bike. Cargo bike hire schemes can increase public knowledge about cargo bikes and can give people a chance to 'try before they buy'. London Bike Hub has worked with Ealing Borough Council to operate a cargo bike hire scheme, allowing local residents and businesses to hire a cargo bike for free. 80% of those who hired the cargo bike said they would hire it again, whilst 22% expressed interest in purchasing their own cargo bike[21].

[20] http://www.copenhagenize.com/2015/10/cargo-bike-nation-copenhagen.html
[21] http://mobility-workspace.eu/wp-content/uploads/CasestudyCargobikesharing.pdf

Table 4-3: Summary of interventions - Cycling

Core Measure / Intervention	Location(s)	Outcome / Mode Shift Achieved	Complementary measures	How it will be applied to the GCs
Expansion of segregated cycling infrastructure with priority measures to reduce conflicts between pedestrians, cyclists and vehicles	Copenhagen	41% of trips to work and education in the city were made by bike; 76% of Copenhagener's feel secure when cycling	Filtered permeability Traffic demand management Integrated land-uses Bike hubs Parking measures	Smarter choices measures are will be implemented in order to encourage behavioural changes during a period of change (e.g. moving house). New streets in the NEGCs will be attractive to cycle on, alongside a dedicated network of cycle paths that link into a longer distance network, connecting the NEGCs and existing destinations together. Integrating cycling with other modes is essential - bike and ride will be encouraged, particularly around
	London	32% increase in cycling along the North-South Cycle Superhighway after a year		
Maintenance of cycle tracks at a high standard	Copenhagen	53-76% improved perception of safety following improvements to cycle routes and cycle priority lights		
Cycle parking and bike hubs located at public transport interchanges	Nottingham	28% uplift in cycling; encouraged 38,500 bicycle journeys		
Introduction of cycle hire schemes	London	1m rides in the first 10 weeks post-scheme, 95% of which previously made by another mode or not at all; 7/10 users said it had prompted them to start cycling in the city or to cycle more often.		

Core Measure / Intervention	Location(s)	Outcome / Mode Shift Achieved	Complementary measures	How it will be applied to the GCs
	Lyon	44% increase in cycling within the first year of opening		Colchester and Marks Tey and to Braintree via Flitch Way.
Increase the number of commuters and families who travel to work and school by cargo bike through wide cycle lanes and appropriately spaced cycle parking	Copenhagen	25% of all families in Copenhagen with 2 children have a cargo bike; in 1/3 of these the cargo bike replaces a car		
Cargo bike hire schemes	Ealing (London)	80% of those who hired the cargo bike said they would hire it again; 22% expressed interest in purchasing their own cargo bike[22]		

[22] http://mobility-workspace.eu/wp-content/uploads/CasestudyCargobikesharing.pdf

Public transport

4.28 There are several important elements for ensuring widespread uptake of public transport. Places that secure high public transport mode shares consistently provide high-quality links into existing public transport networks, or forward-fund infrastructure that ensures rapid and direct connections to key destinations. Although routinely delivered in Europe, this approach is often lacking in new housing developments in the UK, resulting in the delivery of less healthy and car-dominated places[23]. As well as integrating the provision of infrastructure and integrating it into new developments, financial pump-priming of new routes or services is crucial, along with integrated ticketing schemes, and strategically connecting public transport networks with key walking and cycling corridors.

Case Studies

4.29 Comparison of the top five UK cities for bus patronage reveals that there are several similarities between them that contribute to their success. In the top five UK cities for bus patronage, excluding London (Brighton & Hove, Nottingham, Reading, Bournemouth and Bristol), passenger journeys on local bus services per capita (2016/17) exceeded 80 journeys, with the highest (Brighton & Hove) at 171.8[24]. The average across England for the same year was 46 journeys per capita, with the figure being 30.2 in Essex. These top five cities all implement multi-operator smartcard ticketing, simple fare structures and demonstrate levels of local political support for public transport services – enabling road space allocation and priority in favour of public transport and active travel. They also all operate their systems under Quality Bus Partnerships, which contractually ensure the local authority maintains the network to a high standard, and the operator performs the service and maintains the fleet at a high standard.

4.30 As these cities are generally larger than the intended GCs the large passenger base allows for significant investment to be put into public transport, creating an excellent network that is sustainable. However, the Rapid Transit System for North Essex document developed by Jacobs demonstrates that a high-quality network in North Essex can be delivered to serve key destinations, such as Colchester and Stansted. Examples of successfully integrating public transport with new developments are widespread across Europe.

4.31 In Freiburg, the new development of Vauban is arranged around a tram line down the spine of the development (*Vaubanallee*), which offers trams to the city centre every five

[23] http://www.transportfornewhomes.org.uk/wp-content/uploads/2018/07/transport-for-new-homes-summary-web.pdf
[24] https://www.gov.uk/government/collections/bus-statistics

minutes during the peak hour. As a result, 32% of residents have a public transport season ticket. This may reflect the legacy of measures to encourage sustainable travel behaviour enacted during the earliest stages of development – a local car club was set up and members received a free one-year pass on local public transport and a one-year 50% discount on trains. The public transport mode share in Vauban is around 19% (with walking and cycling accounting for 64% of trips).

Figure 4-11: The tram is central to the eco-suburbs of Freiburg

Source: Sven Eberlein, 2011

4.32 Hammarby Sjostad is the biggest development project in Stockholm. Home to 24,000 people and a workplace for 5,000, the development is located about 3km from central Stockholm. Its success with public transport has been partially due to its proximity to Stockholm as a leading public transport city, but also careful design. The development is fairly high density (115 residential units per net hectare) allowing easy access to public transport routes. Public transport ferries run year-round, every ten minutes from early morning to midnight. A tram line runs through the whole length of the development along a central avenue, and several bus lines connect the development with other important destinations. Combined, these factors have allowed Hammarby Sjostad to achieve a 52% public transport mode share.

4.33 In addition to new developments, existing large-scale destinations such as hospitals or universities are often under-served by dedicated public transport, which can be a barrier to increasing sustainable mode shares. Increasing bus access to Nottingham City Hospital increased the proportion of PT travel by 9%, while solo car use declined by 17%.[25]

4.34 The quality of the public transport provided is vitally important to providing a viable alternative to private car use. Fastway, a guided bus scheme in Crawley (delivered between 2003 and 2006) has increased patronage by 160% over ten years and facilitated a 19% decrease in traffic levels between 2006 and 2013.[26] Between the 2001 and 2011 Census bus use in Crawley for travel to work increased by 30%[27]. Some of the key factors for success include:

- Availability: Many existing services operated at low frequencies and home-destination journeys often required interchange. A fully integrated system was introduced to provide a comprehensive service across the area and increase the availability of direct services.
- Speed: Bus speeds were low and unreliable due to congestion and lack of priority, giving little incentive to use buses for car users. Road space reallocation and priority improved journey times by 20%.
- Vehicle design: New, modern air-conditioned vehicles with easy access were required in place of the traditional buses used on most local services. Twenty zero-emission fuel cell electric buses are now being introduced on the Fastway, indicating the potential for additional benefits when a bold and game changing scheme is introduced to a car dependent urban area.
- Fares: Fare levels in West Sussex were perceived as being high compared with other Shire Counties. A balance needed to be struck between the fare level and the quality of service.
- Perception: There had been a long-term decline in patronage across Crawley prior to introduction of the service. The overall branding, communications and customer service enhancements negated people's reluctance to try the bus, resulting in the growth in mode share set out above.

4.35 The Glider BRT network is a further example of a successful service in an area of high car use. Opened in Belfast in September 2018 the Glider provides attractive, tram-like, vehicles, off-board ticketing, large high-quality stops and significant priority and road

[25] http://webarchive.nationalarchives.gov.uk/+/http:/www.dft.gov.uk/pgr/sustainable/travelplans/work/ngtravelplansworklessons5783.pdf (Page 52)
[26] https://greenerjourneys.com/wp-content/uploads/2015/09/Ex-Post-Evaluation-of-Bus-Infrastructure-150908-v-STC-FINAL.pdf
[27] Census Travel to Work data 2001 and 2011

space reallocation along its route. Belfast historically has a low level of public transport use at 11% (including Black Taxi)[28], comparable to Braintree (11%), Marks Tey (13%) and Colchester (16%). Car travel is the dominant mode, with a 53% share of all trips, followed by walking (29%)[29]. This low level of public transport use and high dependence on the car came about partly as a result of people moving out of the city during the Troubles but continuing to work there and travelling in by car, leading to lower density and a difficult market for public transport to serve[30]. Despite these challenges the service has been a success and within its first six months it is carrying 40,000 passengers per week above existing bus patronage levels and is already achieving the 2031 business case figures.

Figure 4-12: Belfast Glider

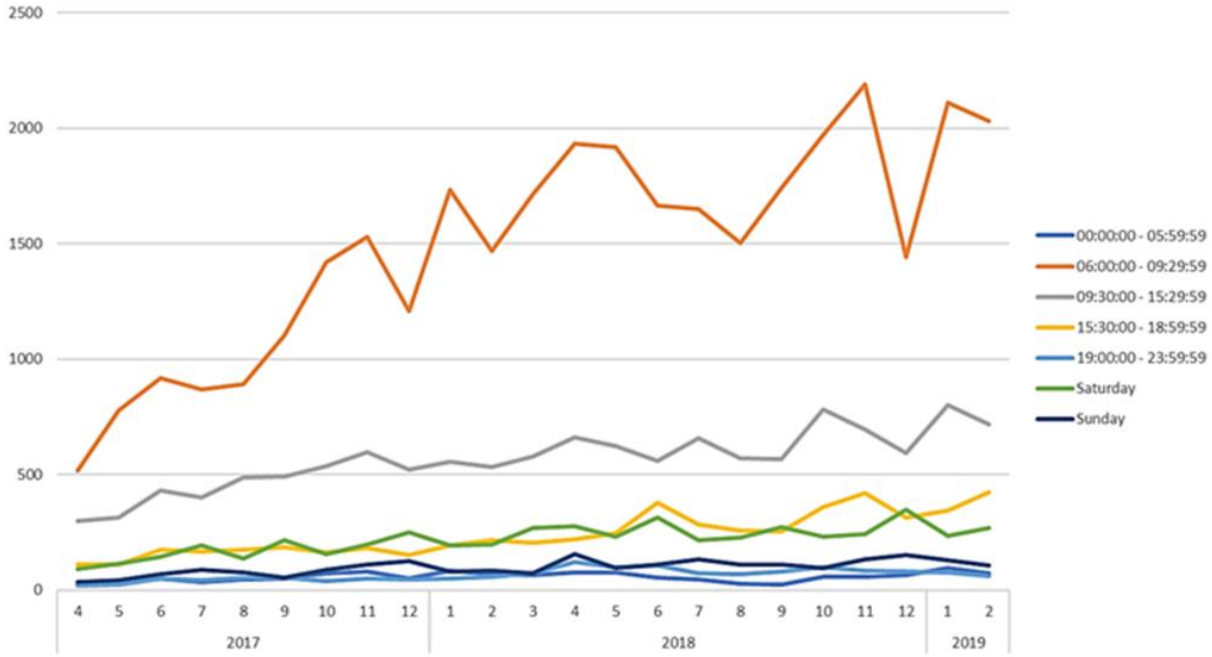
Source: Love Belfast

4.36 The Morbus service, run between Bournemouth and Poole, has seen growth in patronage of 110% since introduction of a package of measures including new vehicles with free WiFi and USB charging, contactless payments, high service frequencies (up to every three minutes) and creative marketing campaigns and communications that have increased the attractiveness of bus travel along the corridor[31].

[28] Based on journeys per person per year (Travel Survey for Northern Ireland In-depth Report 2015-2017: https://www.infrastructure-ni.gov.uk/system/files/publications/infrastructure/tsni-in-depth-report-2015-2017.pdf)
[29] Ibid
[30] CIHT Transportation Professional, April 2019
[31] UK bus awards website: http://www.ukbusawards.org.uk/content/index.php/rbr-mu-16/1147-south-of-england-thames-valley

4.37 Closer to North Essex, the Beaulieu Park development in Chelmsford has seen over 800 free 'taster' bus passes distributed to 341 dwellings since first occupation April 2017. Bus services were extended into the site in Autumn 2018, which corresponded with an increase in use of the service as housing phases were completed. As a result of this early support for established local public transport services, over 50% of households now have a bus season ticket of some form, with over 3,700 passenger journeys originating from Beaulieu Park each month. The development will ultimately deliver up to 3,600 new homes and Figure 4-13 shows how the bulk of bus trips are carried during the weekday AM/PM peak and inter-peak travel periods.

Figure 4-13: Beaulieu Park bus passenger trips (by month and time of journey)



Source: Countryside Properties

4.38 Nantes, in France, provides both a tram network and Bus Rapid Transit (BRT) service with tram-like levels of segregation. A user satisfaction survey in the city found only a very marginal overall difference between the two networks, with a slight preference towards BRT. Taken together with the examples of significant modal shift highlighted above following bus-based improvements, this suggests that if RT is built with the same levels of priority as would be expected for a tram network then the outcomes, in terms of mode shift from car and user satisfaction, can be comparable.

Figure 4-14: Nantes trams and BRT user satisfaction survey results

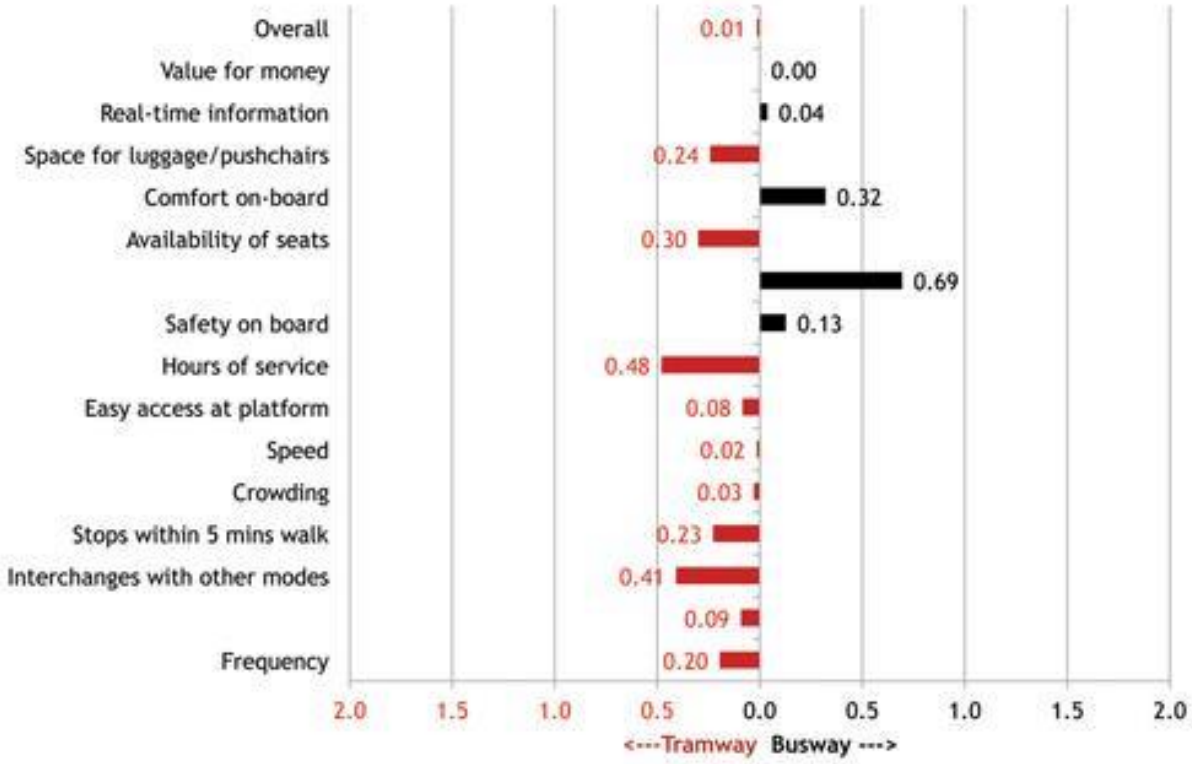


Table 4-4: Summary of interventions - Public Transport

Core Measure / Intervention	Location(s)	Outcome / Mode Shift Achieved	Complementary measures	How it will be applied to the GCs
New developments built around a central high-frequency RT line	Vauban (Freiburg)	32% of residents have a public transport season ticket, including central tram line	Smarter choices Personalised Travel Planning (PTP) Cycle infrastructure Bike hubs Integrated land-uses (short distances to access PT)	New RT links will be provided that enable seamless use of public transport between the GCs and other major settlements, reducing the need to own and use a private car High quality infrastructure with significant priority will be provided to ensure that RT is more attractive than private car travel Integrated ticketing systems across modes will improve ease of access to public transport with extension to MAAS platforms, helping to
	Hammarby Sjostad	52% public transport mode share, resulting from central tram line		
Introduction of smart cards, E-ticketing and integrated payments	Barcelona	Increase in PT use by 7% between 2012-2015 following introduction of smart-card		
	London / Brighton & Hove / Nottingham / Reading / Bournemouth / Bristol	Smartcards are used in the top five UK cities for bus patronage		
	Bournemouth and Poole			

Core Measure / Intervention	Location(s)	Outcome / Mode Shift Achieved	Complementary measures	How it will be applied to the GCs
Giving free/promotional public transport tickets to new residents/as part of membership to car club	Vauban (Freiburg)	32% of residents have a public transport season ticket		provide a more attractive alternative to car use
High quality dedicated public transit infrastructure	West Sussex	Fastway increased patronage by 160% over ten years and facilitated a 19% decrease in traffic levels between 2006 and 2013		As set out in the Rapid Transit Strategy prepared by Jacobs, the vision for the RT network includes the principles of the service being frequent (turn up and go), fast (cannot be impeded by traffic), reliable (segregated so journey time is dependable) and comfortable (high quality vehicles with wifi allowing productive use of time)
Service must be frequent, fast, reliable and comfortable	Bournemouth and Poole, Crawley Fastway	110% increase in patronage		

Core Measure / Intervention	Location(s)	Outcome / Mode Shift Achieved	Complementary measures	How it will be applied to the GCs
Appropriate bus partnership or franchising approach to ensure quality operation from operators	London / Brighton & Hove / Nottingham / Reading / Bournemouth / Bristol	Quality bus partnerships are used in the top five UK cities for bus patronage		Opportunities for adopting powers available from the Bus Services Act should be investigated, as set out in the Rapid Transit Strategy developed by Jacobs

Parking management

4.39 Parking provision in terms of its location, quantity, cost and the way users pay for it, is a key influence on car use, and a key demand management tool available to local authorities. Car clubs allow residents to have the benefits and comfort of car availability, with the need to own a vehicle. Such schemes are important to the success of encouraging less car focused life styles.

Case studies

4.40 TfL analysis into the relationship between car ownership and a range of factors, including parking provision, has suggested that the availability of parking is a strong determinant in whether people choose to own a car or not[32]. Even so, low parking provision alone doesn't appear to be enough to reduce car ownership – good alternatives need to be available to enable people to choose not to own a car. In Inner London, car ownership is 18% lower in developments with <0.5 parking spaces per unit, and in areas with high public transport accessibility, car ownership is 10% (or more) lower than comparable low PTAL areas[32]. There is therefore a link between car parking levels, public transport accessibility and car use. Clearly, in the North Essex context very low or car free development is unlikely to be acceptable on a large scale. However, the need to provide good public transport connections as part of constraining parking levels is crucial. Such constraint must also go hand in hand with a robust way of managing and enforcing parking on-street.

4.41 In Freiburg, this is exemplified in the construction of the new eco-district of Vauban, which has excellent connections to the tram system and enhanced connections to the main cycle network; reducing the need to use major roads.

[32] PTAL refers to Public Transport Accessibility Level, a measure of a location's proximity to public transport. See: http://content.tfl.gov.uk/residential-parking-provision-new-development.pdf

Figure 4-15: *Stellplatzfrei* (free from parking spaces) streets in Vauban, Freiburg

Source: Steve Melia

4.42 Parking restrictions formed a core part of Vauban's transport strategy. Residents can choose to own cars and can drop off and pick up at their homes, but they must park their cars in communal multi-storey car parks at the edge of the development. For this they pay a one-off purchase charge based on the construction costs and a monthly charge to cover ongoing maintenance. Households without cars are not subject to these charges and therefore do not in any way subsidise the cost of parking provision for car owners. All residents nevertheless have access to a local car club when they require a car.

4.43 Requiring cars to park in multi-storey car-parks on the edge of residential areas not only decreases the convenience of owning a car, it also prevents cars from negatively impacting on public space. In Vauban (see Figure 4-15) there are designated *stellplatzfrei* streets (literally 'free from parking spaces'), which cars may travel on at walking speed for picking up and dropping off only.

4.44 The influence of the level of parking provision and its charging structure can be seen in Table 4-5, which shows a comparative car ownership per 1,000 vehicles in each of the ecodistricts, against total vehicles in Freiburg, and that of another eco-suburb, Rieselfeld. Rieselfeld had more traditional parking provision with per-house parking spaces, included in the house price, but retained the high-quality public transport and active travel links that Vauban benefitted from.

4.45 This shows that car ownership is significantly lower in the two eco-districts, particularly in Vauban where it is less than half of the total Freiburg figure. This is tied to the number of residential parking spaces, which are similarly low in the eco-districts. Further, in Vauban 422 households are registered car-free, contrasting with none of these in the wider Freiburg area, or in Rieselfeld.

Table 4-5: Car Ownership and Parking Provision in Freiburg

District	Personal Vehicles	Personal Vehicles (per 1,000 people)	Residential Parking spaces (estimated)	Registered Car-Free Households
Total Freiburg	81,979	408	N/A	None
Rieselfeld district	2,408	292	3,300	None
Vauban district	809	169	1,200	422

4.46 This pattern is echoed elsewhere. At BedZED, as at Vauban, residential parking spaces are not provided with housing and must be paid for separately at an annual charge of £220[33]. As a result, around 54% of households are car owners, compared with 71% in Sutton as a whole (2001), and 84% in Hackbridge (the area immediately around BedZED). In both examples, separating the cost of car parking from housing has resulted in car ownership levels significantly lower than in the local area, with much reduced car use as a result. Notably, the investment in alternatives is central to the success of these parking schemes – particularly in terms of having well-developed public transport networks available.

4.47 Providing alternatives to car ownership, particularly through car clubs, is also important for reducing parking provision. BedZED and Vauban both implemented car clubs, with clear results for car ownership (54% and 17% respectively – both low in the context of the surrounding area). Hammarby Sjostad, a new development outside of Stockholm, also implemented a car club, with 6% of households being members. Research into car club user travel habits in England and Wales (excluding London) demonstrates that car club members walk, cycle and use public transport more often than the national average[34].

[33] https://www.bioregional.com/wp-content/uploads/2016/04/The-BedZED-Story.pdf
[34] https://como.org.uk/wp-content/uploads/2018/11/Carplus-Annual-Survey-of-Car-Clubs-2015-16-England-and-Wales_Final.pdf

Table 4-6: Summary of interventions - Parking

Core Measure / Intervention	Location(s)	Outcome / Mode Shift Achieved	Complementary measures	How it will be applied to the GCs
Restraining car park levels	London	Car ownership is 18% lower in developments with <0.5 parking spaces per unit	Smarter choices Personalised Travel Planning (PTP) Cycle infrastructure Good public spaces Traffic demand management Good public transport Bike hubs	Parking levels will be set relative to public transport availability in order to provide restraint on car ownership and use with on-street parking controlled. Land use planning which places parking off-plot, alongside traffic demand management measures to reduce the permeability of the development to car traffic, will better balance the convenience of driving with other modes. Car clubs will provide the comfort of car availability to residents.
Payment for residential parking space separate to housing costs and not provided on-plot	BedZED	Only 54% of households are car owners, compared with 71% in Sutton as a whole (2001), and 84% in Hackbridge (the area immediately around BedZED).		
	Freiburg (Vauban)	Only 17% of households own a car, compared to around 30% in Rieselfeld (another eco-suburb) and 41% in Freiburg as a whole.		
Providing alternatives to car ownership through Car Clubs	BedZED	As above		
	Freiburg (Vauban)	As above		
	Hammarby Sjostad	6% of households are car club members; car journeys account for 21% of mode split		

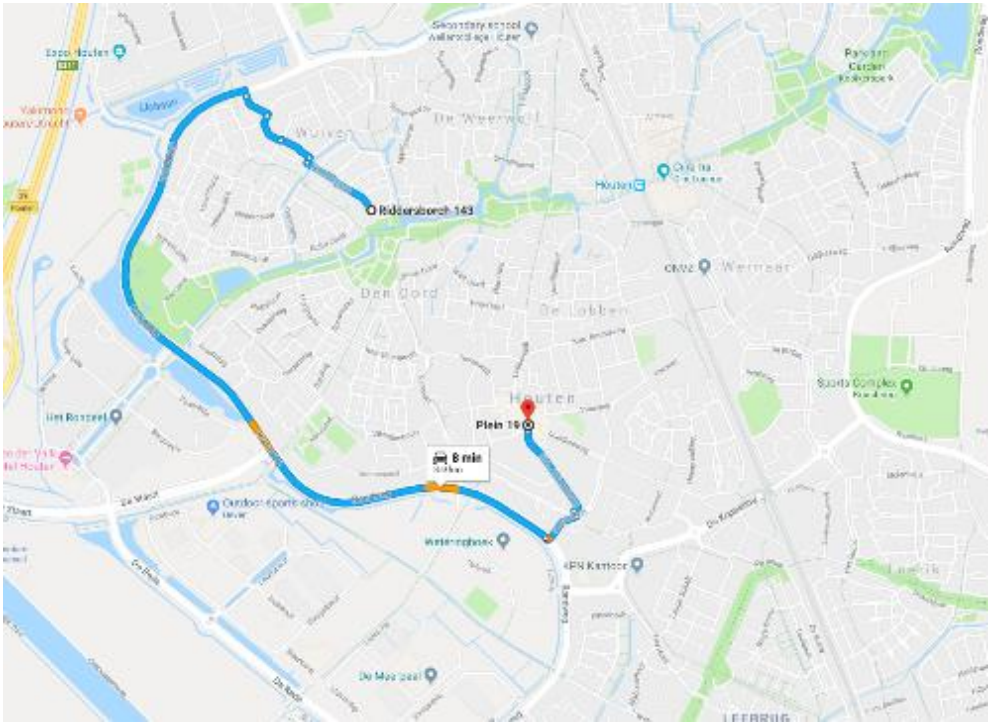
Traffic management

4.48 A key traffic management tool used in locations that achieve lower levels of car use is the introduction of filtered permeability. This involves reducing the ability for motorised vehicles to travel through the centre of an area by closing sections of streets to general traffic whilst maintaining accessibility for pedestrians and cyclists, as well as public transport, servicing and freight. The new GCs will be designed this way. The benefits of this type of traffic management are wide ranging – creating high quality 'human scale' spaces, reducing local pollution, increasing active travel and improving safety. A key benefit is that, when introduced at a network wide level walking, cycling and public transport become quicker than driving a car, and therefore the preferred choice for shorter distance trips.

Case studies

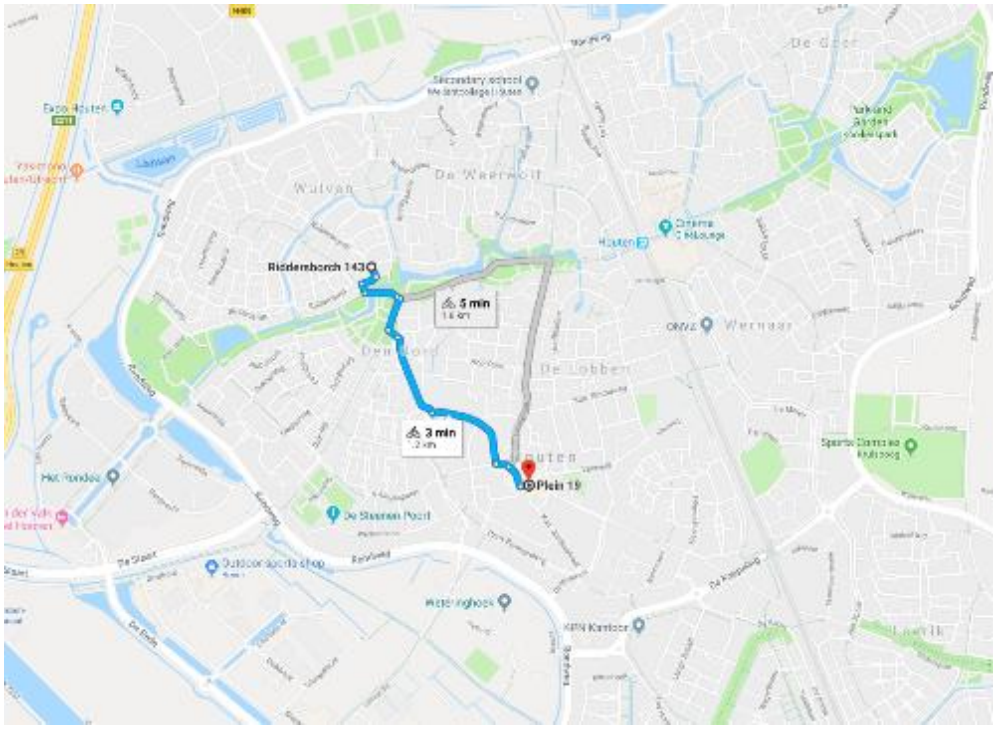
4.49 These measures are used extensively in various continental cities, including Freiburg and Houten, but also Barcelona, Dresden and Copenhagen. In Houten, car driving is restricted on internal roads, meaning that most journeys are required to use the external ring road. The use of filtered permeability on the internal roads as part of enforcing this has been very successful in the context of increasing the attractiveness of cycling in comparison to driving. Figures 2-7 and 2-8 show an example of journeys between a primary school in Wulven and Houten's centre. Due to thoughtful road layouts and restrictions on internal roads, the time taken to drive this distance is almost three times higher than the time to cycle (eight minutes versus three minutes) and is more than three times further in terms of distance (3.9km versus 1.2km). In this way, driving becomes the less natural choice for shorter distance trips, naturally helping people form more active travel habits. It is important to stress that access to all points by car is possible, which ensure that those who rely on a car for mobility are not disadvantaged.

Figure 4-16: Suggested route for driving a short distance in Houten



Source: Google maps

Figure 4-17: Suggested route for cycling a short distance in Houten



Source: Google maps

4.50 In the UK, filtered permeability has been used successfully in the London borough of Waltham Forest, which was awarded £30m to increase cycling in the borough as part of the London Mayor's 'Mini Holland' programme.

4.51 In Walthamstow Village (in Waltham Forest), the transformation of Orford Road has reduced the daily traffic flow on the street by almost half (from 8,493 to 4,808). In the wider neighbourhood traffic volumes decreased on internal by around 56%, or 14,516 cars. The traffic increase on the roads outside of the town centre was significantly lower being 4,113 cars representing a net overall reduction in traffic.[35] The initial assessments of the Mini Holland scheme suggest they have increased the amount of active travel by around 41 minutes per person per week.[36]

Figure 4-18: Filtered permeability onto Orford Road, Waltham Forest

Source: The Ranty Highwayman

4.52 Some places have been even more radical in their management of car use. At GWL Terrein in the Netherlands, the interior of the entire six-hectare site (home to 1,400 people), is entirely car free, with only emergency vehicles allowed to enter for access. In

[35] https://www.enjoywalthamforest.co.uk/work-in-your-area/walthamstow-village/comparison-of-vehicle-numbers-before-and-after-the-scheme-and-during-the-trial/
[36] https://www.sciencedirect.com/science/article/pii/S0965856417314866#b0160

order to enforce this, the entire interior of the development is raised from 'street' level (see Figure 4-19) and guarded with bollards to prevent motor vehicles from entering. This creates a pleasant and safe environment within the development that encourages walking and cycling, creates space for children to play and promotes community cohesion. The car-free nature of the development means that car ownership is low, with only 190 cars per 1,000 residents[37].

Figure 4-19: Bollards and raised curbs prevent motor vehicles from entering GWL Terrein

[37] https://www.itdp.org/wp-content/uploads/2014/07/19.-092211_ITDP_NED_GWL.pdf

Table 4-7: Summary of interventions - Traffic Management

Core Measure / Intervention	Location(s)	Outcome / Mode Shift Achieved	Complementary measures	How it will be applied to the GCs
Filtered permeability to promote walking and cycling permeability and make car journeys less direct, through street typology and layout	Waltham Forest	Overall decrease in traffic on internal roads of around 56%, with a net decrease in traffic of around 10,000 vehicles per day.	Smarter choices Personalised Travel Planning (PTP) Parking measures	Filtered permeability will be designed into the street layout of the new GCs. Making cycling and walking more convenient than driving from the outset, alongside providing a wide range of mixed uses at an appropriate density, will reduce the need for car ownership and use in new developments.
	Houten	Internal journeys can take more than three times as long to drive than to cycle, due to filtered permeability and the ring road system		
Car-free areas of development to produce areas ideal for walking and cycling, as well as other outdoor uses including children's play	GWL Terrein	Low car ownership of 190 cars per 1,000 residents; car mode share of 6%		

Travel Planning and Smarter Choices

4.53 Travel planning and smarter choices are behavioural measures that enable mode shift, delivering real benefits. Travel Plans are often required in the UK through the planning process, although different local authorities have varying rules on the situations when Travel Plans should be required and what they should contain. Generally, both public sector (schools, hospitals) and large developments that could be expected to have a significant impact on the transport network, are required to have a Travel Plan, which sets out how the organisation will encourage sustainable travel and reduce single person car trips.

4.54 Smarter choices programmes and personal travel planning are both key methods for linking hard infrastructural changes with behavioural changes. The benefits of building walking, cycling and public transport infrastructure will be magnified through programmes that promote the facilities and encourage local people to use it.

Case Studies

4.55 Travel plans can have significant impacts on the mode split of how people travel to and from the subject sites. For workplace travel plans, a study comparing 20 organisations found an average reduction of 18% in the proportion of commuter journeys being made as a car driver. The most successful of these organisations reduced commuter car driving by more than 50%.[38] These gains were made by a variety of measures, including restricting employee parking and converting parking spaces to cycle parking. Many businesses invested in showers and lockers for employees who chose to cycle. Employees not awarded car parking were given a substantial monthly payment, set to be similar to the cost of a public transport season ticket, this acts as a 'pull' factor, complementing the 'push' of limited parking.

[38] http://webarchive.nationalarchives.gov.uk/+/http:/www.dft.gov.uk/pgr/sustainable/travelplans/work/ngtravelplansworklessons5783.pdf (Page 12)

Figure 4-20: Showers and lockers provided alongside bike parking

Source: Paul Mackie, 2012

4.56 Smarter choices programmes generally involve improving people's awareness of alternative modes of travel. SUSTRANS have found that PTP projects generally achieve an 11% reduction in car driver trips and increases in walking, cycling and public transport trips of between 15% and 33%[39].

4.57 They can contain a variety of different approaches. In Brighton & Hove personalised travel planning (PTP) has been approached as a way to 'activate' local residents to using nearby sustainable transport facilities. A PTP-targeted area receives a package of cycle engineering measures approximately a year before the PTP campaign is launched. This means that the PTP can have the maximum impact on moving people onto using already established infrastructure. Over the year 2006 to 2007, cycling trips increased by 122%, from 1% to 2% of total mode share. Over the same period, walking trips increased 39% (to 18.7% of total mode share), and car driver trips decreased by 6% (to 50.1% of total mode share)[40].

4.58 In Colchester, alongside the provision of off-road cycle paths, various other measures were implemented between 2008 and 2012 under the Cycle Cities and Towns project. This included Bikeability training, events and activities delivered by Bike It and Bike Club officers. The project also promoted cycle-rail interchange with commuters and delivered Personalised Travel Planning to occupants of certain residential developments. The results of these interventions in Colchester has been to maintain

[39] http://www.epomm.eu/newsletter/v2/eupdate.php?nl=1115&lan=en

[40] http://webarchive.nationalarchives.gov.uk/20110504141948/http://www.dft.gov.uk/pgr/sustainable/travelplans/ptp/makingptpworkcase.pdf

Colchester's position as having the highest level of total cycling in Essex[41] within the context of reduction in cycling in the surrounding area.

4.59 Smarter choices can also include public transport, often including trial passes for public transport or promotional tickets. When Vauban was in its early stages of development, members of the local car club were offered a free one-year pass for local public transport and a one-year 50% discount on trains. This investment at the outset of the development is reflected by the public transport mode share in Vauban (19%), and 32% of residents have a public transport season ticket.

[41] https://www.essexhighways.org/uploads/files/Getting%20Around/Cycling/Colchester-Borough-CAP.pdf

Table 4-8: Summary of interventions - Travel Planning and Smarter Choices

Core Measure / Intervention	Location(s)	Outcome / Mode Shift Achieved	Complementary measures	How it will be applied to the GCs
Comprehensive workplace, school and residential travel plans	UK-wide	Can significantly decrease car-driver mode share through a range of measures	Cycle infrastructure Good public spaces Filtered permeability Traffic demand management Integrated land-uses Good public transport Bike hubs	Travel Plan and Smarter Choices measures will be developed in order to encourage people to make behavioural changes during a period of change (e.g. moving house) and to maximise benefits of infrastructure investment
Personalised travel planning	SUSTRANS	Consistently achieve an 11% reduction in car driver trips and increases in walking, cycling and public transport trips of between 15% and 33%		
	Brighton & Hove	Cycling trips increased by 122%, from 1% to 2% of total mode share; walking trips increased 39% (to 18.7% of total mode share), and car driver trips decreased by 6% (to 50.1% of total mode share)40		
	Colchester	Highest level of total cycling in the area achieved, compared to decreases in surrounding towns.		
Free/discounted public transport tickets	Vauban (Freiburg)	19% public transport mode share; 32% of residents have a public transport season ticket		

5. The impact of strategic vision

5.1 As well as the range of measures identified in Section 3, a clear vision must be created and this must be consistently applied. Milton Keynes (UK) and Houten (Netherlands) present interesting counterpoints when considering the importance of vision, and strategic thinking, in the development of new towns.

5.2 Both towns were established in the late 1960s and both Milton Keynes and Houten were each designed to provide further housing capacity for the nearby cities of London and Utrecht respectively. However, Milton Keynes was conceived as a town designed to accommodate the car, whilst Houten focused on providing connectivity via walking, cycling and public transport.

5.3 Milton Keynes was the largest (and last) New Town built in the UK under the 1946 New Towns act. It's vision for a city of the future was for a city where transport (along with telecommunications) would reduce the importance of distance on its operation[42]. As such, it was built to be low density, covering a large area with high capacity, high speed roads connecting areas in a grid pattern. It was also designed to be polycentric, with the centre of each grid square forming a local centre. The grid squares were designed to be approximately 1km wide, allowing walking access to bus stops from anywhere in the grid square. Due to the high volumes of traffic using the major grid roads, travelling at relatively high speeds, roundabouts were implemented at most junctions. Underpasses or bridges were put in place to allow pedestrians to cross these major roads, avoiding direct interaction with the traffic. The numbers of parking spaces provided are also 2-3 times higher than would normally be expected for a city of this size[43] and consequently parking is also relatively cheap.

[42] https://www.citymetric.com/fabric/fifty-years-has-milton-keynes-lived-its-utopian-ideals-2741
[43] Whiteside, Kevin (2007). MK Transport— Moving with the Times, Urban Design, Issue 104, pp. 27–33.

Figure 5-1: An underpass in Milton Keynes

Source: Citymetric, 2017

5.4 Houten, conversely, was built with an explicit commitment to sustainable travel and reducing car dependency. The city is arranged around two main railway stations which is surrounded by a ring road with a diameter of up to 3km. Within this space there are 31 residential districts, each of which is only accessible by car from the ring road (i.e. cars are not able to drive from one residential district to another with the town).

5.5 Filtered permeability means that these internal journeys can easily be made by bicycle or on foot, presenting active travel as the fastest and most convenient option for travel within Houten. Many schools and businesses are built along this axis of pedestrian and cycle access, rather than near to the ring roads, further encouraging active travel for these journeys. For journeys into Utrecht or further afield, the train stations provide ample bicycle parking (although this is beginning to become congested with the current high levels of cycling).

Figure 5-2: Cycle infrastructure in Houten

5.6 The result of these differences is that in Houten, car mode share is less than half that of Milton Keynes, and bike mode share is nine times higher (see Table 5-1).

Table 5-1: Key comparisons between Milton Keynes and Houten

	Milton Keynes	Houten
Year established	1968 (50 years)	1966 (52 years)
Population	229,941 (2011 Urban Area)	43,900 (2014)
Urban density (persons/ha)	22[44]	54[45]
Car mode share	70%	34%
PT mode share	10%	11%
Bicycle mode share	3%	27%
Walking mode share	17%	27%

[44] https://itdpdotorg.wpengine.com/wp-content/uploads/2014/07/22.-092211_ITDP_NED_Desktop_Houten.pdf
[45] Ibid

6. Delivering sustainable mode share in North Essex

Early delivery of mode share targets

6.1 Creating brand-new places presents additional opportunities for sustainable transport mode share but can also present challenges when the sustainable transport infrastructure and services are not already embedded in existing towns and communities.

6.2 SUSTRANS identified some of the key conditions necessary for sustainable mode shares from a 'standing start'[46], many of which are to do with the physical form of development. These are:

- Proximity – Ensuring that key destinations people need to access are within distances that encourage the use of active travel modes.
- Density – Building at higher densities not only supports active travel due to proximity, but more people living in a defined area increases the number of customers and demand for public transport services, making services more financially viable and frequent.
- Mixed use – As well as helping to ensure proximity to key destinations, building mixed use developments also encourages streets to become destinations. This additionally encourages walking and cycling and improves safety and the perception of safety through increased natural surveillance.

6.3 In addition, many of the measures mentioned throughout this report, particularly those with the aim of decreasing car ownership and dependency, will play a central role in securing the target mode share from the start. There must be a high-quality walking and cycling network. Parking must be managed (quantum, location and pricing) to ensure driving is not the first choice. Fast, affordable and reliable public transport to key trip attractors within and outside the GCs (e.g. nearby towns) must be provided to limit demand for car ownership and use.

6.4 Creating an environment that encourages sustainable mode share as part of a new development can also take advantage of people being more willing to change their travel behaviour at points of life-stage transition (e.g. when moving house)[47]. This

[46] https://www.sustrans.org.uk/sites/default/files/activetraveltoolbox_housinggrowthandplanning_part2v4.pdf
[47] http://eprints.uwe.ac.uk/9789/1/9789.pdf

emphasises the importance of facilities, and particularly public transport, being available from the first day residents are living in the development, as this is when their new habits begin to form. In some circumstances this may involve operating public transport services before they become commercially viable (due to an incomplete customer base) with financial 'pump priming' secured via planning obligations or other sources of revenue – potentially linked to rebates for accelerated delivery of housing (and, with it the market for public transport) in accordance with appropriate development frameworks (those which support low-car and more walk/cycle/public transport use).

Case studies

6.5 Französisches Viertel is a sustainable urban neighbourhood of Tubingen in Germany, built on a 60-hectare ex-military site and located around 3km from Tubingen's city centre. The development was completed in 2008, and in 2009 had a mode share of 26% walking (31% internal trips), 39% cycling (47% internal trips), 16% public transport (13% internal trips) and only 21% private car (10% internal trips)[48]. The sustainable mode share achieved is significantly higher than Tubingen, which itself is higher than the German average. The development has used a variety of techniques in its design to achieve this mode share.

6.6 The development houses around 6,000 people and provides 2,500 jobs. The development was also built at a reasonably high residential density (150-200 residents per hectare), which contributes to a compact neighbourhood with the majority of amenities within walking or cycling distance.

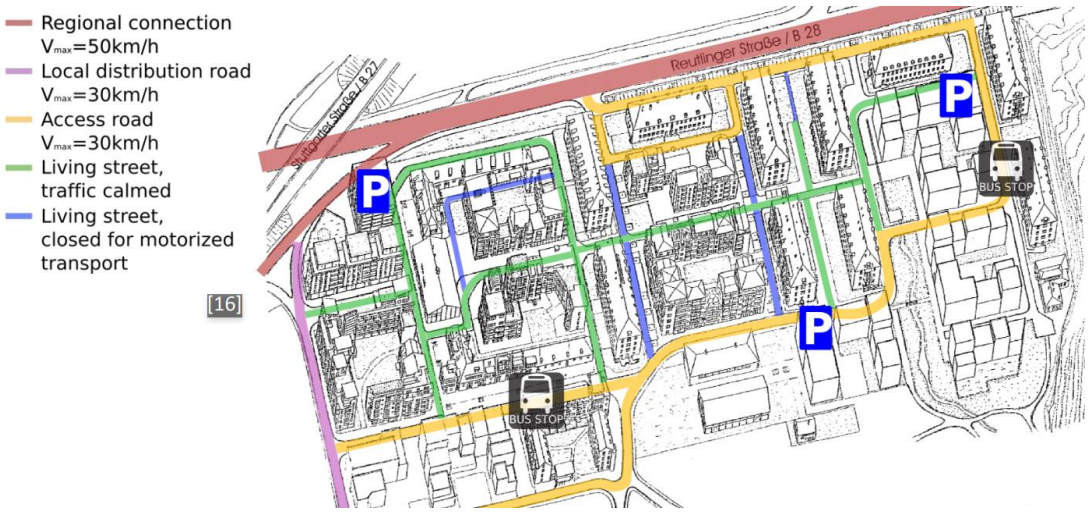
[48] BMZ (Federal Ministry of Economic Cooperation and Development) 2012, The 'French District' Sustainable Urban Neighborhood in Tubingen, Germany

Figure 6-1: Cycle parking on traffic calmed streets in Französisches Viertel

Source: Federal Ministry of Economic Cooperation and Development

6.7 Access to the central areas of the development for motorised traffic is heavily restricted, through traffic calming measures and filtered permeability. This helps to reduce motorised traffic on residential streets and increases attractiveness for people walking and cycling. The street typology is carefully managed, with all 'living streets' benefitting from at least some traffic calming measures (see Figure 6-2). The result of this is that car-ownership is low. On average 220 people own cars per 1,000 inhabitants, which compares favourably with 493 in the general population of Tubingen[49].

Figure 6-2: Road typology in Französisches Viertel



Source: Federal Ministry of Economic Cooperation and Development

[49] Ibid

6.8 Parking is not provided directly for buildings but at the district's edges in automated multi-storey car parks. The aim of the location of parking facilities is that car users must walk at least as far to access a car park as to a public transport stop (see Figure 6-2).

6.9 Three bus routes provide a ten-minute frequency from Französisches Viertel, providing access to Tubingen and its main railway station 20 minutes away. As seen in previous sections, in other locations developments have been built around a central public transport route (e.g. Vauban's tram). The most important feature of public transport in this context is that routes are running by the time residents move into the development. This ensures that new habits around travel modes are shaped with the planned public transport lines in place.

Table 6-1: Summary of interventions - achieving sustainable mode share from early on

Core Measure / Intervention		Outcome / Mode Shift Achieved	How it will be applied to the GCs
Land-use Planning	Make all urban facilities easily accessible by active travel by providing residential, leisure and employment land uses together	Car ownership is 220 people per 1,000 (493 in the general population of Tubingen) Mode share: 26% walking, 39% cycling, 16% public transport, 21% private car 78% of internal trips are completed using active modes, and a further 13% are completed using public transport[50]	The masterplans for the GCs will provide the structure for the developments and will clearly set out factors including density, mixed use, street structure and walking, cycling, public transport priority. Car parking levels will be managed in the GCs in a way that reflect public transport accessibility.
	Higher density development instead of suburban sprawl		
Public Transport	New developments built around a pre-delivered public transport network Incentivised rapid transit uptake through free travel for a defined period of time		
Parking Management	Restraining car park levels through parking restrictions on specific streets		
	Payment for residential parking space separate to housing		
	Parking provided away from homes; similar walking distance as PT stops		

[50] Ibid

Core Measure / Intervention		Outcome / Mode Shift Achieved	How it will be applied to the GCs
Traffic Management	Filtered permeability to promote walking and cycling permeability and make car journeys less direct, through street typology and layout		
	Car-free areas of development to produce areas ideal for walking and cycling, as well as other outdoor uses including children's play		

Internalisation of trips

6.10 The GCs have an internalisation target of 33% of all trips, with 62% of these to be completed by active travel modes and the remainder split equally between RT and private car (19% each). Delivering this rate of trip-internalisation will be central to achieving the mode share targets.

6.11 The key elements to achieving this were set out in Section 4, with a key determinant being the proximity of key services to residential areas - which can be achieved by building mixed-use developments at higher densities. In addition, if these internal trips are to be completed using sustainable travel modes, a number of other measures are required, as set out in Table 6-2.

Table 6-2: Measures to increase trip internalisation

Measure	Relevance to internal trip generation
Increasing internalisation of trips	
Proximity	Ensuring that key destinations (employment, schools, shops, leisure facilities) are close to where people live.
Mixed-use	Ensuring, through master planning, that a mix of commercial and employment uses, as well as different housing types, leisure and schools are all provided within easy walking and cycling distance of one another.
Higher density	Building at higher residential density means that the potential customer base for services (including public transport) is higher, improving their likelihood of success. The distances involved to reach services will also be reduced, thereby encouraging use of sustainable modes.
Achieving high sustainable mode share for internal trips	
Public Realm	Creating spaces that are pleasant and safe to walk through at all times of day and night is vital to increasing walking mode share. Ensuring proper long-term maintenance is also crucial.
Active travel infrastructure	Prioritising infrastructure that enables people to walk and cycle safely between their destinations is vital.
Discouraging car ownership	Measures which discourage cars ownership and use also reduce the likelihood of people who do own cars using them for short journeys (eg removing on-plot parking, paying for parking separately from the property, filtered permeability, lower parking levels).

Delivery strategy

6.12 The range of measures set out in Section 4 have been distilled into 17 headline measures. For each measure we have highlighted how it can be secured, who would take delivery responsibility, and the timeframe for delivery.

6.13 A combination of all the measures laid out below will need to be implemented in the GCs and, as the discussion in Section 3 indicates, the places with the highest sustainable mode shares tend to be those that implement a range of sustainable travel measures.

6.14 It is also important to note that the proposals set out in this note must be complemented by a package of enhancements in existing settlements, alongside measures to control parking and access, if the target mode share is to be achieved. This will ensure the benefits of development are felt by existing residents through improved infrastructure and an enhanced public realm, alongside appropriate parking and access controls that give priority to sustainable modes.

Placemaking and land-use planning

Measure	How is it secured?	Who delivers it?	Delivery timeframe / phasing
1: High quality public realm is central to encouraging sustainable travel	Masterplan, design code, DPD	Developer / Dev Corp	The basic building blocks for successfully achieving the mode share targets in the GCs. Incorporated into the GC masterplans and delivered from the start of the project. GC masterplans, design codes and DPDs must be robust in order to ensure consistent delivery in each GC across development phases over time
2: Mixed-uses allow more local trips to take place on foot and by bike, encouraging social interaction and active spaces	Masterplan, DPD	Developer / Dev Corp	
3: Higher density encourages more local trips, supports better services and therefore reduces car use	Masterplan, DPD	Developer / Dev Corp	

6.15 These headline measures will be complemented with:

- A masterplan that sensitively incorporates higher density, with the highest density provided within local centres and along RT corridors and lower densities elsewhere

- A high-quality walking and cycling network that connects key destinations within the GCs seamlessly
- Provision of well location RT stops and mobility hubs to capitalise on higher density locations and provide easy access by all modes

Walking

Measure	How is it secured?	Who delivers it?	Delivery timeframe / phasing
4: Removing physical barriers to pedestrian movement and reducing traffic volumes results in a safer, more pleasant walking environment	Masterplan, design code, DPD	Developer / Dev Corp	Designed into the masterplan and delivered from the start of the project. GC masterplans, design codes and DPDs must be robust in order to ensure consistent delivery in each GC across development phases over time

6.16 These headline measures will be complemented with:

- A high specification walking environment with generous footways, extensive greenery and no obstructions (e.g. parked cars)
- A maximum design speed of 20mph (lower on residential streets)
- Traffic volumes controlled through careful planning of the street hierarchy and use of measures such as filtered permeability
- A walking network connected with the surrounding countryside, making use of, and upgrading where necessary, local public rights of way

Cycling

Measure	How is it secured?	Who delivers it?	Delivery timeframe / phasing
5: Providing segregated cycle facilities on busier streets, reducing traffic volumes in residential areas and providing ample cycle parking encourages cycling	Masterplan, design code, DPD	Developer / Dev Corp (on-site), LA with developer funding (off-site)	Designed into the GC masterplans and delivered from the start of the project. Developer funding or direct delivery to provide off-site connections. GC masterplans, design codes and DPDs must be robust in order to ensure consistent delivery in each GC across development phases over time
6: Cycle hire allows single journey stages to be made by bike for longer trips, reducing the need to drive, and encourages people to try cycling	Masterplan, DPD, planning obligation	LA with developer / Dev Corp funding	Delivered initially to link development plots with local centres and RT stops / mobility hubs and expanded as development progresses to include surrounding settlements in order to provide a more comprehensive service as demand grows

6.17 These headline measures will be complemented with:

- Extensive, well connected and traffic free cycle network within the sites (connecting houses and workplaces with the long-distance network)
- Off-site, a long-distance cycle network, potentially delivered alongside the RT network and connecting to and upgrading existing routes, such as Flitch Way
- Cycle hire docking stations at main RT stops and within nearby centres including Braintree, Marks Tey and Colchester
- Utilisation of cargo bikes for consolidated 'last mile' deliveries for business and residential areas, promotion of cargo-bikes to residents

Public transport

Measure	How is it secured?	Who delivers it?	Delivery timeframe / phasing
7: Providing high quality links into existing public transport networks and forward funding public transport infrastructure provides quick connections to key destinations, driving demand	Masterplan, design code, DPD, planning obligation	Developer / Dev Corp (on-site), LA with developer funding (off-site)	Designed into the GC masterplans and delivered from start of development, along with associated off-street interventions. Available from first occupation. A demonstration of the priority afforded to RT. Connected into existing public transport networks. Expanded as additional development is delivered. Off-site works will include the range of interventions set out in the Rapid Transit Strategy
8: A high degree of segregation and priority for public transport is required to deliver fast and reliable journey times	Masterplan, design code, DPD, planning obligation	Developer / Dev Corp (on-site), LA with developer funding (off-site)	
9: Use of powers from the Bus Services Act (such as Quality Bus Partnerships) will ensure high quality (comfortable – pleasurable and productive) services and best use of dedicated infrastructure	LA negotiation with RT operators	LA negotiation with RT operators	Delivered alongside the RT infrastructure
10: Provision of high frequency bus services from opening of new development provides a reliable service to new residents, encouraging use of RT	DPD, planning obligation	RT operators with developer funding	Delivered in accordance with the Rapid Transit Strategy with the core network delivered at a 'turn up and go' frequency from first occupation of the GCs. Network expanded as the GCs are built out
11: Integrated ticketing makes it easier to use public transport and allow simple fare structures to be developed that encourage high levels of use	LA negotiation with RT operators	RT operators with developer funding	Introduced as part of Quality Bus Partnerships (or alternatives) and expanded as the network expands

Measure	How is it secured?	Who delivers it?	Delivery timeframe / phasing
12: Incentivised PT tickets at occupation, to maximise early uptake of existing bus and new rapid transit options	Planning obligation, LA/developer negotiation with PT operators	Developer / LA negotiation with RT operators	Free taster tickets are provided for an initial period as new residents/employers occupy the site, with the offer continued through each phase of delivery until public transport services, and their use, is normalised within the GCs.

6.18 These headline measures will be complemented with:

- The RT service must offer a 'turn up and go' service, with a minimum headway of eight minutes throughout the day (and more frequent during peak travel periods).
- Key destinations must be served rapidly and directly by RT.
- Journey time must give an advantage over the private car through filtered permeability for cars in GCs and high segregation/priority for RT on main roads, taking advantage of the realignment of the A12 and A20 where possible.
- Integrated ticketing across operators in a multi-operator scenario, or otherwise the use of simple fare structures using contactless technology.
- Free season tickets as part of the Travel Plan packages.
- Mobility Hubs should be introduced with a consistent branding across the GCs and these should include some or all of the following (depending on location): travel information, RT stops, car club parking, cycle hire, cycle parking, on-demand / RT feeder service transport stops, online shopping drop-off / fulfilment, convenience retail, community facilities.

Parking management

Measure	How is it secured?	Who delivers it?	Delivery timeframe / phasing
13: Parking levels must reflect accessibility by public transport in order to reduce car travel	Masterplan, design code, DPD, planning condition / obligation	Developer / Dev Corp	Designed into the GC masterplans and delivered from start of development. Potentially reduced parking levels delivered in later phases depending on location / public transport accessibility
14: On-plot parking should be avoided and the cost of parking should not be included in the sale price of properties, in order to encourage use of alternative modes	Masterplan, design code, DPD, planning obligation	Developer / Dev Corp, estate management	Designed into the GC masterplans and delivered from start of development. Management by the estate management body in perpetuity
15: Car clubs and car share offer the benefits of car availability without the costs of ownership and the negative impacts on the public realm	Masterplan, design code, DPD, planning obligation	Developer / Dev Corp, estate management, car club operator	Designed into the GC masterplans and delivered from start of development. Scaled up as later phases are delivered and including surrounding settlements

6.19 These headline measures will be complemented with:

- Car-free development is unlikely to be appropriate in the North Essex context, however car parking should be managed and relate to the provision of walking, cycling and public transport facilities.
- Parking should be provided in parking courts or on-street, not on-plot.
- Parking should be leased on an annual basis rather than sold.
- Local car clubs with links to Colchester and Braintree to enable local journeys (including one-way journeys).

Traffic management

Measure	How is it secured?	Who delivers it?	Delivery timeframe / phasing
16: Filtered permeability should be designed in during the masterplanning stage and at a development wide level in order to provide the quickest journey times for walking, cycling and public transport	Masterplan, design code, DPD	Developer / Dev Corp	Incorporated into the GC masterplans and delivered from the start of the project. GC masterplans, design codes and DPDs must be robust in order to ensure consistent delivery in each GC across development phases over time

6.20 This measure will be complemented with:

- Provision of high-quality alternatives to the car for local journeys, including a dense walking and cycling network and RT stops / mobility hubs
- A docked cycle hire scheme
- Approaches to manage urban logistics, as part of a wider delivery and servicing strategy (freight consolidation centres and the use of alternative vehicles such as cargo-bicycles in last-miles logistics deliveries)

Travel planning and smarter choices

Measure	How is it secured?	Who delivers it?	Delivery timeframe / phasing
17: A range of complimentary measures (PTP and promotional events) will encourage walking, cycling and public transport, increasing the benefits of investment in physical infrastructure	DPD, planning obligation	LA with developer / Dev Corp funding	Delivered from first occupation and at each new phase of development with reviews and on-going programmes throughout the life of the development

6.21 These headline measures will be complemented with:

- Robust and well-funded Travel Plans including measures such as free cycle hire and car club membership, free public transport tickets, cycle grants, cycle training and PTP.

Securing the mode share strategy

6.22 A key component of successfully securing the measures required to achieve the mode share targets will be through site specific DPDs. The DPDs for each GC will be based upon a masterplan and transport strategy that embeds the requirements of the delivery strategy outlined above. This will ensure the spatial arrangement (urban form, density mix of uses) of the GCs deliver the key building blocks for success, including indicating alignments of walking, cycling and RT networks as well as key infrastructure such as mobility hubs, car and cycle parking and off-site connections.

6.23 As well as the physical form of the GCs, the DPDs will build upon the policy framework within the Local Plan and, using the evidence from this document along with the Rapid Transit Strategy and other supporting documents, will include policies that secure key principles in relation to walking, cycling, public transport, parking, traffic management and travel planning. This will include cycle and car parking standards and the requirement for, and approach to, planning obligations including funding for RT (services and infrastructure), cycle hire, travel planning and PTP, parking management and car clubs.

6.24 Once adopted it is likely that Design Codes will be developed for each GC that take the masterplan and principles set out in the DPDs and provide more detail regarding how the masterplan should be interpreted. This might include setting out a hierarchy of streets and determining for each type elements such as access arrangements, dimensions, parking arrangements, treatment of walking, cycling and RT routes, landscaping, SuDS and materials. The Design Codes will ensure that as the GCs are delivered over the coming years the design principles, connections and quality is maintained.

6.25 The GC masterplans will be developed through a process of local engagement and consultation. The DPDs themselves will also be subject to staged consultation, including setting out initial issues and options and developing the final suite of proposals and policies based on public engagement. The final document will be subject to third party examination via the Planning Inspectorate, which also includes public consultation via Examination in Public.

7. Refined mode share targets

7.1 Drawing together the mode share precedents identified in Section 4, and anticipating that the measures identified in Section 6 will be applied in each of the Garden Communities as they grow in scale, a refined set of mode share forecasts has been developed for each Garden Community across different stages of delivery:

- 2026: reflecting the anticipated 'year one' of housing delivery at the Garden Communities, except for CBBGC where the first housing completions are 2029.
- 2033: reflecting early stages of delivery and end of the Local Plan period.
- 2051: reflecting continued housing delivery across the Garden Communities.
- 2078: assumed completion of proposed development across Garden Communities, except for CBBGC where a later completion date is anticipated.

7.2 These forecasts build on the 2017 Movement and Access Strategy, and more recent transport model forecasts prepared to determine the potential impact of the Rapid Transit System for North Essex, which is being developed by Jacobs/Essex County Council. The detailed methodology for the modelling work undertaken by Jacobs can be found in Rapid Transit System for North Essex document. The proposed mode share targets seek to translate the model forecasts into a set of targets across the motorised and non-motorised modes of travel that we anticipate will be commonly used in the GCs. The targets are deliberately more progressive than the model forecasts, reflecting:

- The model's strategic nature, which means it focuses on 'between zone' movements, rather than localised trips that will characterise each of the Garden Communities and the mix of land-uses they will comprise as they scale-up.
- The model's focus on motorised modes of travel, and inherent reliance upon input data (including trip rates derived from TRICS, NTEM traffic forecast data) that are based primarily on (status quo) car-based travel options and predict long-term increases in car use as a default. Consequently, the model, in its current form, cannot accurately forecast linked trips (such as Park & Ride, or people cycling a longer distance to a transport hub so as to catch rapid transit/rail connections) and underestimates the potential for non-car-based modes of travel.
- The evidence presented in this note on the range of local sustainable transport, smarter choices, place-shaping, and urban design features that will set the GCs apart from existing residential and employment centres in North Essex. The mode

share targets assume these interventions (documented in general for all of the GCs in Table 7-1) are delivered in line with the GCs.

7.3 Each set of GC mode share targets is annotated with the rationale and assumptions we have made about the way travel demand is likely to change as the GC's grow.

7.4 There are a number of changes to mobility, such as greater uptake of electric vehicles (EV), Connected and Autonomous Vehicles (CAV) and Mobility As A Service, that will, to a lesser or greater extent, become more prominent in the future. With growing populations the need to find increasingly efficient ways of moving high volumes of people around North Essex will become ever more pressing. A future where CAVs simply replace private cars is likely to lead to a substantial increase in private car mileage and congestion. Within urban areas, where vehicles mix with pedestrians and cyclists, any potential capacity benefits are likely to be reduced further through the more cautious driving required from CAVs in these settings. This means that RT and other forms of mass transit, such as rail and buses, will need to form the backbone of any future transport system in North Essex.

Table 7-1: Target mode share across all GCs and key measures

	Active travel modes (~40%)		Public Transport modes (~30%)			Car-based modes (~30%)	
Sub-modes	**Walking (up to 20%)**	**Cycling (up to 20%)**	**Rapid Transit (Up to 20%)**	**Rail (up to 11%)**	**Local Bus / Park & Ride (up to 5% each)**	**Private car (Max 25%)**	**Car Club/Share (Up to 10%)**
Measures required (in order of priority)	1: High quality public realm		3: Higher density			13: Car parking levels controlled	
	2: Mixed use		7: Forward funded RT infrastructure			14: On-plot parking avoided	
	3: Higher density		10: High frequency RT services			16: Filtered permeability	
	4: High quality walking routes		8: High degree of RT segregation			4: High quality walking routes	
	5: High quality cycle routes		9: Partnerships with PT operators			5: High quality cycle routes	
	6: Cycle hire		11: Integrated ticketing			15: Car clubs and car share	
	16: Filtered permeability		4: High quality walking routes			17: Complimentary measures	
	13: Car parking levels controlled		12: Incentivised (free) PT tickets at occupation				
	14: On-plot parking avoided		16: Filtered permeability				
	17: Complimentary measures		1: High quality public realm				
			14: On-plot parking avoided				
			13: Car parking levels controlled				
			17: Complimentary measures				

Tendring Colchester Borders Garden Community

7.5 The strategic transport model forecasts for future levels of public transport and car use associated with TCBGC are shown in Table 7-2. Both the model forecasts and the proposed mode share targets anticipate reducing levels of car use (as a proportion of trips) and increasing public transport use (again, as a proportion) as TCBGC scales-up.

Table 7-2: TCBGC forecast motorised trips and mode share (from RTS model)

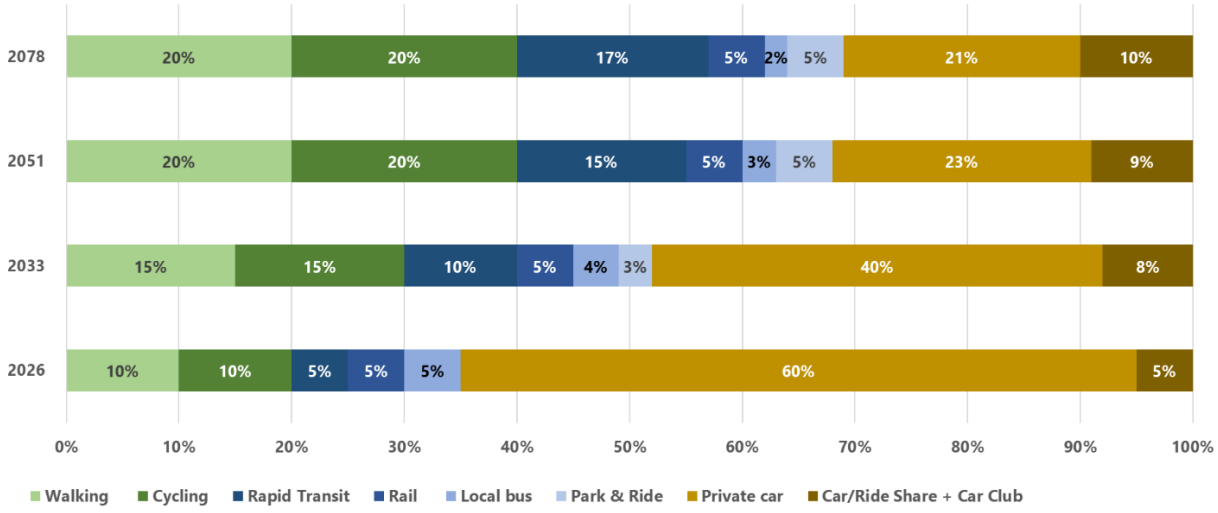
Forecast Year	Public Transport (all types)		Car (all types)	
	Trips	% motorised trip share	Trips	% motorised trip share
2026	145	17%	692	83%
2033	435	19%	1,820	81%
2051	1,428	30%	3,401	70%
2078	1,401	29%	3,476	71%

7.6 The mode share targets presented in assume that initial growth in TCBGC adopts a similar pattern to existing neighbouring land uses to the east of Colchester. Aside from core assumptions set out in Table 7-1 regarding the form and nature of the places being created, the following GC-specific rationale underpins the refined mode share targets:

- **2026:** Rapid Transit is delivered through the development from day one, linking to the University and Colchester town centre. This will encourage higher levels of public transport use than is currently evident in Census 2011 travel to work data for neighbouring residential areas. As set out in Table 5-3 of the Rapid Transit Strategy prepared by Jacobs, infrastructure is funded from 2024 to ensure it is in place from day one. Early provision of public transport (local bus and Rapid Transit) incentives and a subsidised Car Club help to reduce car ownership levels, while high-quality segregated cycle routes though the development area to the University, and on to the town centre help to extend Colchester's existing cycle mode share level to the GC.
- **2033:** Further housing and employment land are delivered at higher-than-current densities and in ways that make walking and cycling the obvious choice for trips within the GC, and public transport and cycling the natural option for a large proportion of journeys into Colchester. The addition of a new Park and Ride site

close to the A12 coincides with the Rapid Transit line's extension to the north of the city, affording a wider range of direct home-work connections for commuters and increasing demand for the service. New occupants of homes in the GC continue to receive introductory public transport and Car Club offers that incentivise their utilisation and lock-in the benefits of early investment.

Figure 7-1: Refined TCBGC mode share targets



- **2051 and 2078:** As the GC nears its envisaged scale; walking, cycling and rapid transit become key modes of travel, and primary methods for accessing onward rail services from the stations at Hythe, Colchester Town and Colchester. Over time they come to account for more trips than private car options, which are predominantly electrically-powered and further limited through the availability of Car Club vehicles and pre-emptive design of pick-up and drop-off locations for on-demand ride-hailing trips. Local bus use declines as a proportion of all trips as more homes and employment sites are delivered around the rapid transit route stop locations, which have become key local centres through considerate master planning and clear application of low-car principles. Car-based access and parking is prioritised for people who experience mobility difficulties and who are unable to use other modes of travel, and for people travelling from along the A12 corridor to the employment sites that deliver over 4,000 new jobs between 2033 and 2078.

Colchester Braintree Borders Garden Community

7.7 The strategic transport model forecasts for future levels of public transport and car use associated with CBBGC are shown in Table 7-3.Model outputs are not available for

2026 because the first homes are not delivered until 2029. Both the model forecasts and the proposed mode share targets anticipate reducing levels of car use (as a proportion of trips) and increasing public transport use (again, as a proportion) as CBBGC scales-up.

Table 7-3: CBBGC forecast motorised trips and mode share (from RTS model)

Forecast Year	Public Transport (all types)		Car (all types)	
	Trips	**% motorised trip share**	**Trips**	**% motorised trip share**
2026[51]	-	-	-	-
2033	434	19%	1,805	81%
2051	1,846	28%	4,633	72%
2078[52]	2,970	35%	5,526	65%

7.8 The mode share targets presented in Figure 7-2 assume that initial growth in CBBGC adopts a similar pattern to existing neighbouring land uses around Marks Tey, with a considerable proportion of trips taken by train from the nearby station. Aside from core assumptions set out in Table 7-1 regarding the form and nature of the places being created, the following GC-specific rationale underpins the refined mode share targets:

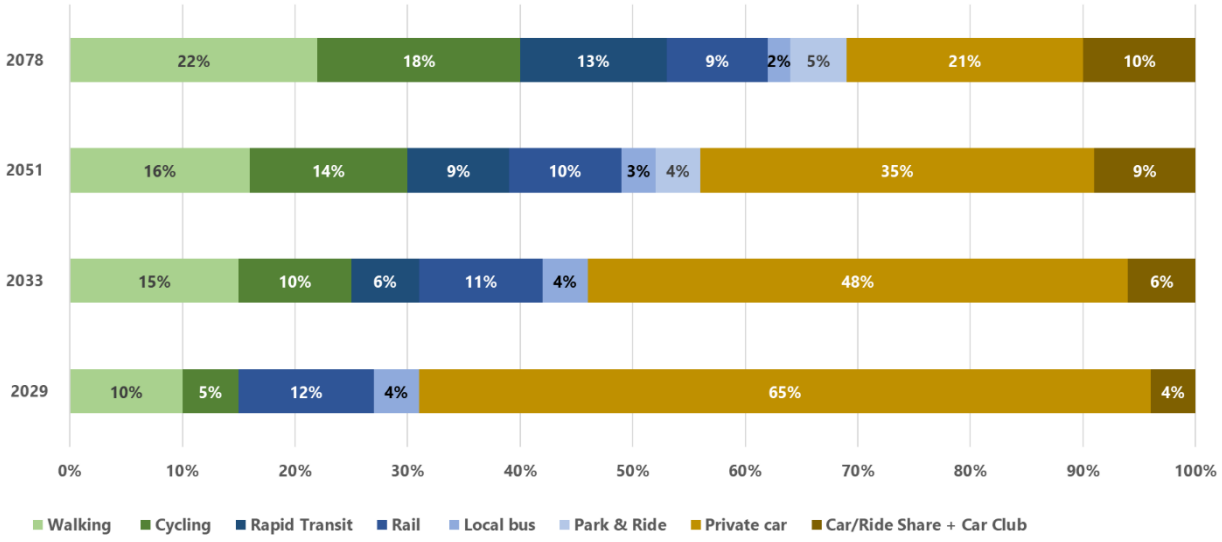
- **2029**: RT infrastructure will be delivered alongside the first homes in 2029, as set out in Table 5-4 of the Rapid Transit Strategy developed by Jacobs and will allow services to operate on enhanced routes from Colchester to the GC from day one. In the first few years 'pump-priming' funding for services will be used to extend and enhance the existing high-frequency services that operate towards Marks Tey into the site. Faster and more frequent services will ensure higher levels of public transport use than currently exists in the area. , Safeguarded routes for rapid transit will ensure good penetration as the GC develops. Early incentives for local bus and Car Club use will be important for the initial group of residents, but with the number of new jobs being delivered expected to outweigh new homes there is an acceptance that car-based options will remain the primary mode of travel. Enabling works focused on the A12 and A120 will address existing traffic

[51] No figures are provided for 2026 as no homes are delivered by this point at CBBGC
[52] Due to the limitations of forecasting substantially beyond 2078, a model year of 2078 has been used. It is understood that a later 'final state' completion year is anticipated for CBBGC

congestion and road safety concerns, while helping to establish capacity on other local roads for more reliable local bus services and future Rapid Transit corridors.

- **2033**: Rapid Transit will have arrived in CBBGC before 2033, at around 1,400 homes, and before the end of the Local Plan period. By 2033 the service will be established and will ensure the first 2,500 homes delivered in CBBGC are an attractive place to live and work. As well as providing access to new and existing employment sites in the Marks Tey area (particularly for people who live to the west of Colchester), the rapid transit route will provide a direct cross-Colchester link to the University and Community Stadium (east and north of the town, respectively). Coupled with strategic cycle routes and clearly-defined local transport 'hubs', where electric Car Club vehicles and public-hire bikes are stabled, these new sustainable movement corridors will help to accelerate the delivery of well-connected residential and employment land at higher-than-current densities. They will also ensure Marks Tey Station is well connected to the new GC settlement. Reflecting its strategic long-term role as an access point to the National Rail network, the station's interchange facilities will continue to be improved.

Figure 7-2: Refined CBBGC mode share targets



- **2051:** Significant housing and employment growth in the GC is not accompanied by a proportionate increase in car trips, which are reducing as a proportion of all motorised and non-motorised journeys. This is primarily achieved through continued extension of the Rapid Transit line and strategic cycle routes through the development area – establishing a significant internal network of routes that

offer shorter journey times across the development area than is otherwise possible by car. Given the physical size of the GC, complementary 'feeder' local bus and demand responsive services will help maximise access to the rapid transit network. A range of Travel Plan initiatives (including information packs, pre-paid public transport accounts, and introductory Car Club and bike-hire offers) encourage new residents and workers to make sustainable travel choices. The continued expansion of Marks Tey station's interchange facilities will give rise to its function as a rail and rapid transit Park & Ride – serving both new jobs created in the development area and people rail-heading to access other destinations.

- **Final state**: Having doubled in population since 2051 the CBBGC will have several established local centres. Each will combine attractive public spaces, employment opportunities, convenience and comparative retail, leisure facilities and a smart mobility hub served by rapid transit and local bus services, on-demand mobility services, and high-quality cycle parking/e-bike charging facilities. The rapid transit service will now link through to Braintree and, ultimately, Stansted Airport – maximising the range of employment destinations that can be reached by public transport in journey times that are comparable to travelling by car. At its scale, the GC now resembles a town in its own right, and one that has been built to the highest standards of place-making and sustainable connectivity. The rapid transit routes into Colchester and Braintree are accompanied by strategic long-distance cycle routes that afford an alternative journey option for people willing to travel by bicycle or e-bike, whilst also improving access to opportunities for people who live in intermediate locations between the new GC and existing towns. People do travel by car into and out of the Garden Community, but only when their origins or destinations are not conveniently served by the combination of rapid transit, rail, local bus, and cycle connections that have been delivered in parallel with the new homes and employment sites.

West of Braintree Garden Community

7.9 The strategic transport model forecasts for future levels of public transport and car use associated with CBBGC are shown in Table 7-4. Model outputs are not available for 2026 due to the relatively small number of homes delivered at this point. Both the model forecasts and the proposed mode share targets anticipate reducing levels of car use (as a proportion of trips) and increasing public transport use (again, as a proportion) as WOBGC scales-up.

Table 7-4: WOBGC forecast motorised trips and mode share (from RTS model)

Forecast Year	Public Transport (all types)		Car (all types)	
	Trips	% motorised trip share	Trips	% motorised trip share
2026[53]	-	-	-	-
2033	388	25%	1,193	75%
2051	1,251	31%	2,783	69%
2078	1,361	33%	2,818	67%

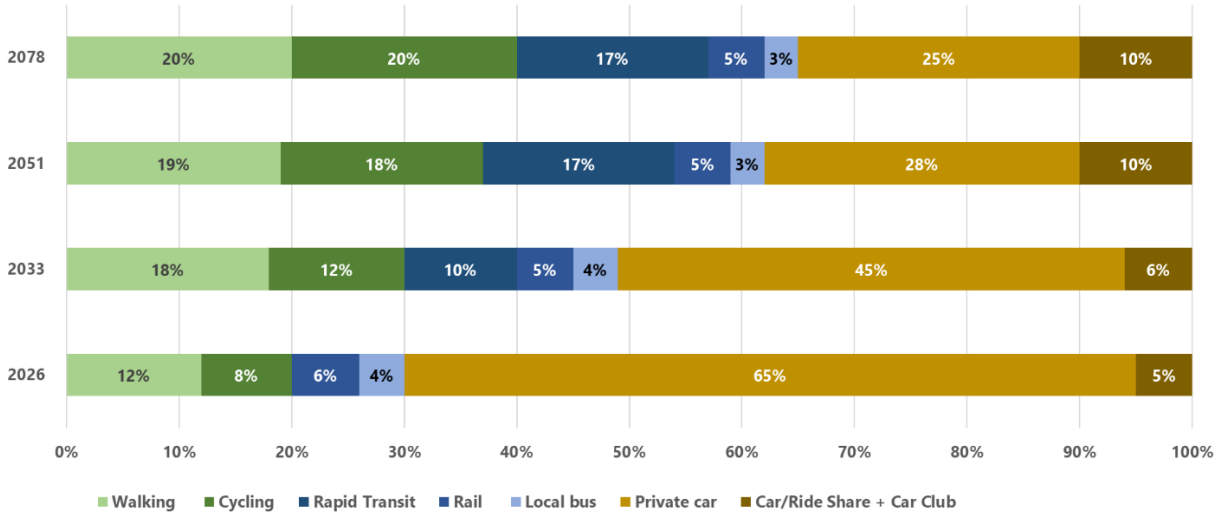
7.10 The mode share targets presented in Figure 7-3 assume that the growth being allocated to the WOBGC achieves similar levels of rapid transit mode share and walking and cycling trip-making as the TCBGC. This reflects their similar proximities to existing towns, and the proximity to key employment sites (Braintree and Stansted, and Colchester and the University of Essex's Colchester Campus, respectively). Aside from core assumptions set out in Table 7-1 regarding the form and nature of the places being created, the following GC-specific rationale underpins the refined mode share targets:

- **2026**: As set out in Table 5-5 of the Rapid Transit Strategy produced by Jacobs, funding for on and off-site RT infrastructure will be in place from 2024, ensuing this is delivered in advance of the first homes. 'Pump-priming' funding will ensure extended and higher frequency, fast local bus services for the first residents, with connections to Braintree's two rail stations. There is also considerable scope for cycling trips from the development area into the centre of Braintree, which is within the national average cycle route distance of 5km. Establishing improved strategic cycle routes from the GC, and bus priority measures along the B1256, into Braintree will be central to achieving the mode share targets for cycling, rail, and local bus trips (which could account for up to 20% of all trips) as result of the first 500 homes and 100 jobs being delivered. In practice, the majority of trips will continue to be by car at this early stage of the GC's genesis.
- **2033:** The arrival of a rapid transit link to the centre of Braintree improves local connectivity and helps to accelerate the delivery of local centres that are focused around enhanced rapid transit and cycling connectivity. These will adopt the placemaking principles already described in relation to the TCBGC and CBBGC,

[53] No figures are provided for 2026 as relatively few homes are delivered by this point at WOBGC

with incentivised public transport accounts for new occupiers coupled to an urban form that prioritises sustainable travel choices over private car use through dedicated infrastructure and faster journey times to key local destinations than are possible by car at peak times.

Figure 7-3: Refined WOBGC mode share targets



- **2051 and 2078:** As the GC nears its envisaged scale; walking, cycling and rapid transit become key modes of travel, and primary methods for accessing Braintree and – following rapid transit line extensions to Stansted, Marks Tey and Colchester – other key employment locations. Over time they come to account for more trips than private car options, which are predominantly electrically-powered and further limited through the availability of Car Club vehicles and pre-emptive design of pick-up and drop-off locations for on-demand ride-hailing trips. Local bus services remain important, but their use declines slightly as a proportion of all trips as more homes and employment sites are delivered in close proximity to the rapid transit route's stop locations, which become key local centres through considerate master planning and clear application of low-car principles. Car-based access and parking is prioritised for people who experience mobility difficulties and who are unable to use other modes of travel, and for people travelling from along the A120 corridor to employment sites that deliver almost 3,300 new jobs in total.

8. Conclusion and next steps

8.1 ITP's review of Census travel-to-work data revealed that, in the existing North Essex context, wherever public transport services and walk/cycle infrastructure are most-developed the mode share by these modes is higher. Furthermore, nearly 40% of existing commuter trips are shorter than five kilometres and could therefore be converted into trips by sustainable modes rather than those made by car.

8.2 We found that high sustainable mode share is achieved not only across Europe, but also in specific places in the UK. The conditions that contribute to highly sustainable mode share vary depending on factors such as social factors, scale, density, type of infrastructure provided, parking restraint and the physical arrangement of streets. A key finding in this report is that the most successful places for sustainable travel in the world are those which combine high quality walking, cycling and public transport infrastructure with constraints on car ownership and use.

8.3 Ultimately though there is nothing intrinsically 'Dutch' or 'Danish' about achieving high sustainable mode share - with the right investments and placemaking decisions they can be, and are, achieved in the UK. This report demonstrates which measures have been successful elsewhere and outlines the key elements that will be delivered in the GCs.

8.4 As well as detailing the range of measures required, the report sets out how each measure can be delivered in a phased way as development progresses across the GCs, including how it will be secured and who will deliver it. A range of complementary measures have also been set that will also be secured and help ensure delivery of a refined set of mode share targets for each of the GCs.

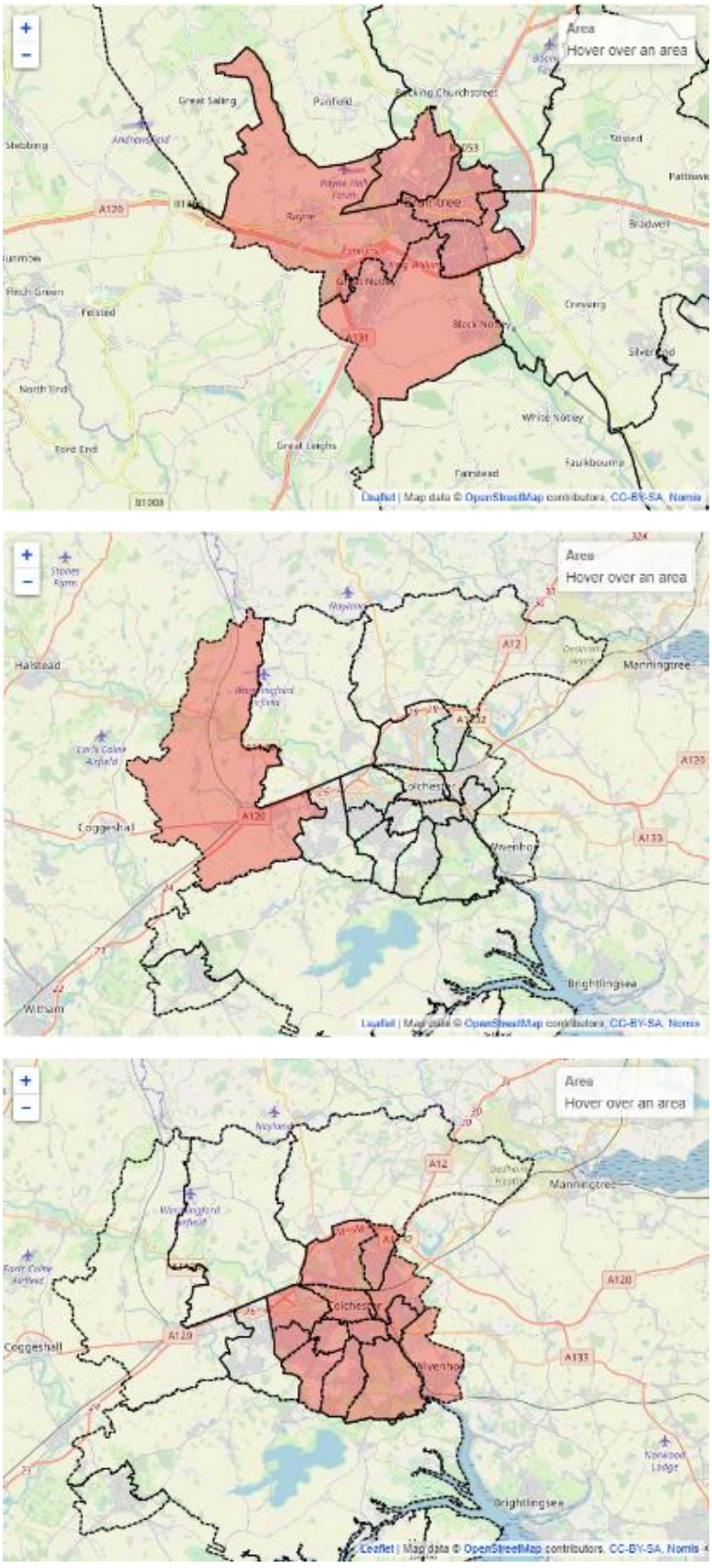
8.5 The range of measures set out in this report will form the basis of the transport strategies for each GC and will be secured by DPDs and enshrined in the emerging masterplans for each new community.

Appendix A

Census MSOAs selected for Braintree, Marks Tey and Colchester

Delivery of the Proposed Mode Share Targets at the North Essex Garden Communities

Census MSOAs selected for Braintree (top), Marks Tey (middle) and Colchester (bottom)



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