Active Travel England

Active Travel Portfolio Research and Evaluation Programme

Evidence assessment: The Impacts of Early Consideration of Active Travel via Planning and Design

October 2024

Sheffield Hallam University, NatCen and Mosodi Ltd

ACTIVE TRAVEL PORTFOLIO RESEARCH AND EVALUATION PROGRAMME

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Date: October 2024

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Executive summary

About this evidence assessment

Sheffield Hallam University, NatCen, and Mosodi Ltd were commissioned by the Department for Transport (DfT) and Active Travel England (ATE) to carry out an evidence assessment on Planning Policy and Design and its role in active travel. Whilst active travel evidence and policy often refers to cycling and walking, a broader and more inclusive definition refers to any travel that is powered, partially or fully, by the sustained physical exertion of the traveller (Cook et al., 2022). As such the definition also includes wheeling (wheelchair use as well as a variety of other modes such as skateboarding or scooting).

In England, the government has an ambition to make walking, wheeling and cycling the natural choice for shorter journeys or as part of a longer journey. The second cycling and walking investment strategy[1] (CWIS2) aims, by 2025, to increase the percentage of short journeys in towns and cities that are walked or cycled to 46%; increase walking activity to an average of one walking stage per person per day; double cycling activity to 1.6 billion journey stages; and increase the percentage of children aged five to ten who usually walk to school to 55%. Over the longer term, the ambition is that half of all short journeys in towns and cities will be walked or cycled by 2030, and that England will have a 'world-class' cycling and walking network by 2040.

The role of planning and design

CWIS2 recognises that the spatial planning system plays an important role in delivering the strategy's objectives. ATE participates in the spatial planning system principally through its role as a statutory consultee in the determination of planning applications which meet certain thresholds and through its inspections of design standards. ATE also works with local authorities to embed active travel infrastructure within planning policies and urban design.

Land use and infrastructure planning in England operates both at the level of broader policy and plan-making – usually over the geography covered by local planning authorities – and the management of the development of individual local sites. Both activities must concord with national policy and guidance. As such this evidence assessment considers evidence of the impact of both broader planning policy (which includes national planning policies and local plan making) and more localised decision making at the levels of individual sites and developments, including site-specific development management and urban design factors. In practice, it was found that there are few studies that directly address planning as an activity within the specific context of the English planning system; literature tends instead to focus on general planning concepts.

Structure of this report

The findings of this evidence assessment have been organised into two chapters: planning policy and development management and urban design as defined above. Both play a role in supporting the delivery of active travel interventions, the achievement of active travel policy objectives and maximising their impacts. The evidence, however, also suggests an interrelationship between both policy and development: a strong policy framework coupled with good urban design and development management is likely to lead to the best active travel outcomes.

1 ATE & Department for Transport (2023). The second cycling and walking investment strategy (CWIS2), 10 March 2023.

Methodology

The report presents findings from 20 studies that were selected following a process of systematic searching, screening, prioritising, and evidence extraction. The evidence reviewed predominantly comprises robust academic studies of the role that planning policy and development design have in influencing and promoting active travel outcomes. Supplementing the academic studies are a small number of relevant reports from government and other non-academic sources.

It is important to note that the scope of the evidence assessment was limited. Therefore, more extensive and systematic research into the evidence base would be required to produce exhaustive findings.

Key findings

This evidence assessment attempted to answer the following research questions:

- **RQ1.** What is the contribution of strategic planning, planning policy and development management activities, including the role of statutory consultees like ATE?
- **RQ2.** How have land use and infrastructure planning and design led to observed outcomes? What are the barriers or enablers?
- **RQ3.** Does land use and infrastructure planning and design lead to better outcomes for active travel?

This section summarises the key findings of this evidence assessment. Key findings were also synthesised in the Key Findings Tables shown at the end of this section.

Planning policy and practice

A summary of key facts from the evidence assessment relating to planning policy is presented in Table 1 at the end of this Executive Summary. A synthesis of the key findings follows.

The search strategy was designed to capture evidence of planning impacts which arise both directly from planning policy, and indirectly from aspects of the built environment which planning policy can have an influence on.

Little evidence was found of the direct impacts of planning policy. However, more was found of the impact of built environment factors that planning policies can seek to influence. This includes evidence of the impact on active travel outcomes of affecting the density and arrangement of land uses and the configuration of transport networks. These factors govern travel demand, journey distances, and the suitability of routes for active modes of travel.

The assessment explicitly searched for studies of the impact on active travel of specific components of the English planning system (such as NPPF,[2] local plans, and LCWIPs[3]), but this yielded little evidence which otherwise met the inclusion criteria. Whilst specific planning concepts were not included (e.g., 'out of town development' or 'transit oriented development'), the literature covers generic planning concepts governing the relationship between the built environment and active travel outcomes. The key attributes covered by the evidence are: population and building densities; land use type and mix; and the configuration of the urban structure and its transport networks (especially the layout of streets and roads).

2 National Planning Policy Framework.

3 Local Cycling and Walking Implementation Plans.

Cycling. An important theme within the literature concerns the relationship between journey distance and type e.g., leisure and commuting (on the one hand) and the location and type of infrastructure (on the other). Several studies imply that the impact of planning policy on active travel outcomes is dependent on the types of journeys and distances anticipated and, consequently, the types and locations of infrastructure provided.

The evidence suggests that different journey types may require different planning approaches. For example, the factors that are found to promote commuting cycling over longer distances (5 km or more) may be different to those that promote cycling more generally (Banerjee et al., 2022). It was found that appropriate cycling infrastructure, such as dedicated cycle lanes, paths and cycle superhighways, may help to foster long-distance cycling trips, but that other infrastructure types (unspecified in the report, but could conceivably include quieter routes or shared paths) may better serve other journey types and distances. Research finds that cyclists may be willing to take a moderately less direct route to find a quieter, less stressful path (Banerjee et al., 2022).

At the level of planning practice, the literature suggests that the nature of planning as a political activity with important power relations may act as a significant barrier to the provision of infrastructure. The barriers to encouraging and promoting cycling are considered to be greater than for walking (Aldred et al., 2019). Some literature draws attention to the fundamental economic objective of transport planning working against active travel, suggesting that environmental and social goals need to be given more priority.

Walking. Whilst the literature reviewed on planning policy makes considerable reference to walking, we found little reference to wheeling in the included studies. As with cycling, walking is found to be more attractive where dedicated infrastructure is provided to a high standard and provides good access to amenities. For example, residents living in newly planned developments characterised by high levels of access to green space, but low levels of public transport, were three times more likely to do 60 minutes or more of recreational walking per week compared with those living in 'disconnected developments' characterised by poor accessibility and a lack of green space. In general, higher population densities are associated with higher rates of walking. However, the literature also reveals varying views on what makes an area more desirable for walking for different population groups (Hooper et al., 2015; Brookfield, 2016), which makes it more difficult to create a 'one size fits all' template when developing planning policies or design guidance.

Development management and urban design

Cycling. A range of studies considers how amenable the built environment is to cycling.[4] The evidence measures this according to place context, transport infrastructure, urban structure, and the characteristics of the surroundings. The siting of, arrangements for access to, and internal layout of new developments have an impact on amenability for cycling. The provision of facilities for cyclists within developments is important for encouraging commuting.

The literature evidences a tension in the design of cycling environments between the provision of infrastructure to consistent national design standards and responding to local needs and contexts. Attention to the importance of understanding different journey types and their implications for infrastructure – for example, cycle infrastructure designed to facilitate mass commuting (e.g. 'cycle superhighways' may be less suited to or attractive for leisure cycling.

4 Literature sometimes refers to this using the concept of 'bikeability', which is distinct from the specific programme of training run by the Bikeability Trust in the UK.

Walking. Several built environment attributes are important in determining walkability: street network connectivity, land use, safety and crime, pedestrian facilities (including street furniture, traffic calming measures, pavements and crossings), accessibility to amenities and other transport facilities (including car parking and public transport stops) and, to a lesser extent, streetscape design (Fonseca et al., 2022). However, while the importance of such 'walkability' is widely recognised, there is no agreement on how best to measure it, due to differences in the built environment, the characteristics of pedestrians, and journey purposes.

That said, the evidence reviewed tends to agree that some design aspects, especially pavement widths, are significantly and positively associated with the density of pedestrian movements (Özbil et al., 2015). Certain land uses also have an important influence on walking. For example, the existence, size and shape of urban parks together with their relationship to surrounding land use are found to have a relationship with walking rates.

Key determinants of and barriers to participation in active travel

Different population groups have varying needs and may face specific barriers to participation in active travel. Whilst the scope of the evidence assessment did not explicitly cover studies of specific population groups, example of important determinants and barriers were found in some of the evidence.

Key determinants include:

- What is appropriate cycling infrastructure (such as dedicated cycle lanes, paths and cycle superhighways) may vary according to different groups and their journeys.
- Highway layouts and the morphology of the street network are important determinants of active travel but may be experienced differently.
- Use of cash or gift incentives may be important for behaviour change projects supported through planning, especially for some groups.
- The physical demands of cycling may be lessened by specific interventions, such as traffic signalling technologies like 'green wave' which reduce stop/start and 'high stress' journeys.
- Neighbourhood design factors (e.g., walkable amenities, tranquil settings, social spaces, green areas, and lower land use density) are important for some population groups, but not universally so.

Key barriers include:

- Lack of safety, security and comfort.
- The nature of planning as a political activity with important power relations – which can be affected by the characteristics of those in power.
- A lack of technical expertise related to cycling amongst planners, which could be especially problematic if the professional workforce is not representative of local populations.
- Lack of resources/insufficient funding – for example in more deprived local authorities or areas.
- Cultural, media and public opposition (especially towards cyclists).

Whilst acknowledging that the search terms were generic, little specific evidence addressing disability or ethnicity was found. Some of the reviewed studies accounted for age, gender, and living in a deprived area. Some research addressed design assumptions that are unsuitable for older people, such as insufficient time to cross at pedestrian crossings. Evidence also finds that women, those living in a deprived area and those with poor health are more likely to have a walking impairment which further excludes them from walking.

Limitations and suggestions for further research

The evidence identified has been drawn from both quantitative and qualitative studies as well as several review studies. No systematic reviews or meta-studies were found. The evidence reviewed tends to focus on cities, with comparatively fewer studies of the impact of policies in towns and rural areas. As noted above, the literature identified in this assessment is also almost entirely silent on findings relating to disabilities and to wheeling. A more comprehensive study, such as a Rapid Evidence Assessment or systematic review, may be needed to identify relevant evidence.

In general, we conclude that the evidence base on the links between planning and design and on active travel is underdeveloped, particularly in relation to the direct impacts of specific planning policies and practices. Further research is needed to provide high quality evidence of the impact of:

- Specific planning policies in England, within a range of different geographic contexts (especially outside large cities), and relating to impacts on active travel in relation to ethnicity, age, gender and disabilities.
- Planning for active travel in a more integrated way – for example, considering walking, wheeling and cycling together and alongside other transport modes.
- Planning practice and intervention, including the ‘early consideration’ of active travel issues within the plan-making and development management processes, including the use of developer agreements and whether these deliver intended outcomes.

Key Findings Tables

This section provides summary tables on the key findings from the evidence assessment.

Table 1: Planning policy and its impact on active travel

Key evidence	Source/Method/Sample/Country
The impact of planning policies and practice: Evidence on culture and attitudes within planning policy and practice	
Planners believe that the successful implementation of cycling infrastructure is dependent on a supportive planning culture and societal environment (the beliefs and assumptions planners have regarding cycling are informed by the perceived social status of cycling). Therefore, ensuring the visibility and hierarchical status of cycle infrastructure within the broader planning policy framework is important, as is training and creating roles which promote the specialisation in active travel among transport planners.	Zhao et al. (2018) Interviews and comparisons between countries. 11 planners. China and Denmark
To respond to the need to change attitudes and behaviours in society, planning practitioners have suggested the use of educational programmes, awareness campaigns and 'mobility management' measures, which include programmes to promote cycling in schools.	Cunha et al. (2023) Focus groups, Interviews and Surveys. 21 planning practitioners in three case studies. Portugal, Germany and Finland
The main goal for planners is to normalise cycling and integrate cycling behaviours and infrastructure into development plans and transport systems.	Cunha et al. (2023) Focus groups, Interviews and Surveys. 21 planning practitioners in three case studies. Portugal, Germany, Finland
The education of officers and politicians may help overcome misunderstanding and fear of promoting cycling. Barriers often focused on technical limitations, and it is suggested that more positive stakeholder and public attitudes would help create more political will to overcome technical obstacles.	Aldred et al. (2019) 413 Surveys and seven interviews. UK

Key evidence	Source/Method/Sample/Country
The impact of planning policies and practice: Evidence on barriers within planning policy and practice	
There are specific barriers to promoting cycling that are not faced by other sustainable travel methods, making investment and political support difficult. Cyclists can be a stigmatised group in the UK, which, along with low modal share, makes it difficult for supportive planning policies to be created. Specific barriers are: political opposition, lack of resources/ insufficient funding, cultural, media and public opposition, a lack of technical expertise related to cycling amongst planners.	Aldred et al. (2019) Surveys and interviews. 413 survey responses, seven interviewees. UK
Barriers to cycling often stem from multi-level governance. Cycling infrastructure and requirements are regularly contested by government and people with political power. It is suggested that this could be due to the threat that cycling poses to the car systems within the UK that residents are so heavily reliant on, and any disruptions could lead to political parties receiving reduced endorsement.	Aldred et al. (2019) Surveys and interviews. 413 survey responses, seven interviewees. UK
Planners suggest that although politicians will sign up to strategies, local opposition proves difficult to overcome. Additionally, active travel schemes often have their funding cut or removed by local councils, yet the same councils promote strategies to get more people active.	Aldred et al. (2019) Surveys and interviews. 413 survey responses, seven interviewees. UK

Key evidence	Source/Method/Sample/Country
The impact of planning policies and practice: Evidence on barriers within planning policy and practice	
Resource barriers for active travel stem from traditional aims of transport planning which were to provide fast and efficient transport of people and goods. This means resources are focused on policies and plans which facilitate vehicular movements.	Koglin & Rye (2014) Theoretical Review.
There are problematic power relations in transport planning and lack of a theoretical understanding of planning for cycling within the planning profession has contributed to the marginalisation of cyclists.	Koglin & Rye (2014) Theoretical Review.
Frameworks used by planners need to be developed from a position of experience as a cyclist, to better understand cyclists' needs. This would emphasise more inclusive theories of mobility. Plans should aim for a positive portrayal of cycling, which have shared meaning that goes beyond class, gender, ethnic and other boundaries.	Koglin & Rye (2014) Theoretical Review.
Focus groups, interviews and surveys with planners in three EU countries (Portugal, Germany and Finland) found that issues of equity are not addressed or prioritised in cycle planning practices and that equity and equality concepts are frequently perceived as interchangeable. To improve equity, the provision of cycling infrastructure and diversifying land uses in disadvantaged areas should be considered as important policy objectives. Whilst there is some consistency in findings across the study countries, there should be caution in generalising across different socioeconomic and geographic contexts.	Cunha et al. (2023) Focus groups, interviews and surveys. 21 planning practitioners in three case studies. Portugal, Germany, Finland
Lack of funding and political support can lead to poor quality infrastructure. Even where cycling infrastructure investment is provided, the quality of the infrastructure is often poor due to underfunding or political issues. Poor quality infrastructure is then rarely used, further undermining local support.	Aldred et al. (2019) Surveys and interviews. 413 survey responses, seven interviewees. UK

Key evidence	Source/Method/Sample/Country
Policies and design factors which influence determinants of cycling	
Land use measures and accessibility measures have a statistically significant effect on active trips. Analysis of a large-scale survey in Australia shows that a 1-point increase in an entropy index of land-use mix (where 0 is a single homogeneous land use, and one is an equal distribution of land uses) increases active trips by 21% and a 1-point increase in population in an area increased active trips by 9%. Enhancing the cycling accessibility index (as measured by a gravity-based model of land use, activities and travel time) increased active trips by 15%; whilst increasing the walking accessibility index (as for cycling but using walking times) increased active trips by 19% ($p<.001$ in all cases). Improving accessibility through explicit planning policies is found to be a valuable tool.	Saghapour et al. (2019) Travel data - cross section survey and census data; modelling. 16,411 survey responses. Australia

Key evidence	Source/Method/Sample/Country
Impacts of road and cycling network design	
Designing cycle highways is a challenge for practitioners because it is unclear how related concepts such as "high quality", "functional", and "attractive" should be interpreted and how these criteria can be translated into physical design. Although it is noted that even though 'high quality' is frequently mentioned in describing the design of cycle highways, practitioners are unclear what exactly high-quality entails and feel that guidance is not clear on this. There are no definitive definitions for these concepts in design guidance.	Liu et al. (2019) Interviews – longitudinal, 11 practitioners. Netherlands, Belgium, UK, Germany, Denmark
Ensuring road safety was deemed as the most important consideration when planning for cycling by over half of respondents in a study of planning professionals.	Cunha et al. (2023) Focus groups, Interviews and Surveys. 21 planning practitioners in three case studies. Portugal, Germany and Finland
The probability of routinely commuting longer distance by bike is associated with the proportion of the route that can be covered on bicycle paths. In a survey of (staff and students) of a large university workplace in Canada, the probability of an average 34 year old male commuter travelling 5km 'usually' (their main mode during warm and dry weather) or 'always' (year-round) by bicycle is 0.21 where the share of the route which is a bicycle path is 33%, and 0.47 when the route is 75% bicycle path (an increase of just over double). Similarly, for a 7km commute to be 'usually' or 'always' undertaken by bicycle the probability increases from 0.20 (when the route is 33% bicycle path) to 0.45 (75% bicycle path). The study does not report probabilities for other demographic characteristics.	Manaugh et al. (2017) Cross Sectional Surveys, 6,600 university students and staff. Canada
Highway layout and the morphology of the street network has an impact on levels of cycling trips, with implications for cycling network design. 'Closeness centrality' (the reciprocal of the average shortest path from any given street segment to all other street segments) and 'betweenness centrality' (the frequency that a street appears on the shortest path between all other streets in the network) are significant predictors of cycling trips. A 1% increase in closeness centrality yields a 1.15% increase in trips ($p<.001$); a 1% increase in betweenness centrality yields a 0.28% increase in trips ($p<.001$).	Alattar et al. (2021) Spatial analysis of Strava data. Approx 13,000 trips. UK
In some networks (e.g. 'grid iron' street patterns) cyclists favour routes which flow along the shortest path, which may reinforce the 'safety in numbers' theory. This suggests that within planning for active travel the layout of the highway network should be taken into account, specifically in this report cyclists preferred routes that are open and follow the shortest path as this provided a sense of safety.	Alattar et al. (2021) Spatial analysis of Strava data. Approx 13,000 trips. UK
Technologies like 'Green Wave' (synchronised consecutive green light traffic signal phases for road users moving along a defined corridor) may be appropriate to reduce stop-start conditions for cyclists in city centres. Avoiding 'stop start' conditions for cyclists reduces stress and may encourage longer distance cycling for commuting.	Alattar et al. (2021) Spatial analysis of Strava data. Approx 13,000 trips. UK Banerjee et al. (2022) Systematic Review of 31 papers.
The share of long-distance bicycle trips (defined in the literature as 5 km or longer) among total bicycle trips and the distribution of trip lengths are relatively similar in different countries throughout North America and North and Western Europe (long distance cycling is between 29 and 36% of all cycling trips; the great majority in all countries being between 5 and 10 km).	Banerjee et al. (2022) Systematic Review, 31 papers.

Key evidence	Source/Method/Sample/Country
Impacts of road and cycling network design	
The proportion of cycle trips which are long distance is relatively constant in countries with different overall rates of cycling. A review of studies in selected countries in North America and north and western Europe reports that the share of long-distance bicycle trips (defined in the literature as 5 km or longer) among total bicycle trips and the distribution of trip lengths are relatively similar in different countries (long-distance cycling is between 29 and 36% of all cycling trips; the great majority in all countries being between 5 and 10 km). Overall rates of long-distance cycling vary, therefore, with rates of cycling. The review found that access to appropriate cycling infrastructure, such as dedicated lanes, paths and cycle highways, helps to foster long-distance cycling.	Banerjee et al. (2022) Systematic Review, 31 papers.
Longer-distance cycle commuters prefer to avoid 'high stress' routes. Very long-distance cycle commuters (>20 km) prefer long, straight and flat routes which do not have too many roads with 'high stress levels' caused by on-street parking, stop junctions and poor road quality.	Banerjee et al. (2022) Systematic Review, 31 papers.
Longer-distance cyclists are willing to take a longer route to avoid 'high stress' routes. Multiple studies find that long-distance cyclists are willing to take a longer route (around 1.2-2 km on longer commutes of 20 km) to benefit from less crowded streets or from segregated tracks.	Banerjee et al. (2022) Systematic Review, 31 papers.

Key evidence	Source/Method/Sample/Country
Evidence relating to the impact of incentives and workplace facilities on cycling	
Incentives programmes can help encourage longer-distance cycling commuting. Some international studies point to the positive impact of incentives in encouraging longer-distance cycle commuting (over 5 km). Findings show that such incentives should be tangible rewards (money, in-kind gifts) and based on accruing distance rather than number of trips. Planning policy at both national and local levels can provide guidance and tools for the inclusion of incentive programmes in travel planning and development management policies, which in turn can influence the uptake of active travel.	Banerjee et al. (2022) Systematic Review, 31 papers.
Workplace facilities for cyclists are important for encouraging cycle commuting over longer distances. A systematic review of studies found that workplace cycling amenities, such as storage, showers, lockers and clothes drying facilities, were particularly important for encouraging longer distance cycle commuting (which is generally taken to be commutes of over 5 km).	Banerjee et al. (2022) Systematic Review, 31 papers.

Key evidence	Source/Method/Sample/Country
Policies and design factors which influence determinants of walking: Impact of policies which promote land use mix and density	
The intensity of pedestrian activity in a location is largely dependent on the accessibility and attractiveness of that location within the broader context of the city, influenced by public transport, land use diversity and intensity, and the street network structure.	Dhanani et al. (2017) Census and Ordnance Survey Data. UK

Key evidence	Source/Method/Sample/Country
Policies and design factors which influence determinants of walking: Impact of policies which promote land use mix and density	
Focus groups of residents of existing 'walkable' neighbourhoods in Southampton revealed five dominant preferences for walkable neighbourhoods: walkable amenities, peaceful environments, sociable spaces, a green environment, and lower land use densities. It was found that the residents groups tended to dislike high density developments and mixed-use developments - due to noise, disturbance and the adverse effects on health and wellbeing. The authors suggest a link with concepts such as the 'suburban ideal'. Residents who already live in more 'walkable' neighbourhoods according to the above definition may support walkability as a policy goal, but it may be opposed by those from less walkable locations.	Brookfield (2016) Focus Groups. 46 individuals from 11 residents' groups. UK
Well-connected footpaths, residential density, and access to greenspace substantially increase the odds of walking for recreation. In a study of 36 Australian housing developments, the odds of participants living in 'connected and compacted developments' (characterised by good footpath infrastructure and medium density housing) doing 60 min or more per week of recreational walking was double (odds-ratio of 2.05) compared to those living in 'disconnected developments' (characterised by poor accessibility, including to greenspace). Residents in 'green developments' were three times more likely (OR 3.37) to walk 60 mins or more per week than those in 'disconnected developments'.	Hooper et al. (2015) Questionnaire survey. 664 respondents. Australia
Living in developments with access to amenities increases the odds of walking for transport (including 'utility' walking). In a study of 36 Australian housing developments, the odds of participants living in 'liveable developments' (characterised by access to amenities, shops and public transport) doing 60 min or more per week of walking was double (odds-ratio of 1.98) compared to those living in 'disconnected developments'.	Hooper et al. (2015) Questionnaire survey. 664 respondents. Australia
Built environment attributes are important in measuring walkability. Whilst the importance of walkability is widely recognised, there is no consensus on how this should be measured. However, a systematic review of 132 international studies of walkability suggests that the following built environment attributes are important in measuring walkability: street network connectivity (junction and street density, size of blocks, absence of cul-de-sacs etc.) (84% of studies reviewed); land use (density and mix) (81%); safety and security (70% of European studies focus on road safety; crime is less important); pedestrian facilities (e.g. pavement width, quality, topography) (42%); accessibility to amenities and other transport facilities (41%); and, to a much lesser extent, streetscape design (5%).	Fonseca et al. (2021) Questionnaire survey. 1,438 respondents. Portugal and Italy

Table 2: Development management and design factors

Key evidence	Source/Method/Sample/Country
Development management and design factors which promote cycling	
The design of vibrant and busy pedestrian environments can be difficult to reconcile with the design needs of cycle superhighways. Practitioners struggle to interpret the concepts of 'high quality', 'functional' and 'attractive' and translate them into physical design.	Liu et al. (2019) Longitudinal Surveys. 11 practitioners. Netherlands, Belgium, UK, Germany, Denmark
The concept of 'bikeability' (cycle-friendliness) can be measured qualitatively according to place context, transport infrastructure, urban structure, and the characteristics of the surroundings. A qualitative method to assess of the 'bikeability' (the extent to which it is possible and pleasurable to cycle) of the built environment emphasised the following attributes: place context (location and functional role of the area, topography, etc.); transport and traffic infrastructure (cycling infrastructure, traffic and junction characteristics, public transport accessibility); urban structure (density, land use, etc.); surroundings and activities (safety, design character, locations of destinations and points of interest). Application of the method to two small Norwegian cities demonstrates its potential utility in plan making and development management, with specific reference to making integrating 'bikeability' assessment into the appraisal of local plans, and to informing planning conditions attached to planning permissions. The importance of practitioners travelling by bike, thereby gaining first-hand experience, is stressed.	Hagen & Rynning (2021) Case studies. Two cities. Norway
The planning and design factors that promote cycling over longer distances (>5 km) may be different than those which promote cycling more generally. These include: cycle highways which are close to the shortest route possible and link suburbs with city centres; cycling infrastructure designs which reduce the need to give way; and cycle amenities at destinations.	Banerjee et al. (2022) Systematic Review. 31 papers.

Key evidence	Source/Method/Sample/Country
Development management and design factors which promote walking	
Perceptions of walkability are influenced by 'urban ambiance', pedestrian infrastructure, connectivity, and access to other transport. Exploratory factor analysis of a survey of pedestrians in two European cities shows that perceptions of the walkability of the urban environment are influenced by four components: 'urban ambiance', described as the 'material and affective dimensions' of the built environment; pedestrian infrastructure; 'connectivity and community facilities'; and other transport modes. Urban ambiance is principally correlated positively with residential density (r=0.823) and mix of land uses (r=0.729) (including, especially, retail - r=0.743). The pedestrian infrastructure component is principally correlated with pavement condition (r=0.795) and width (r=0.730), and lack of obstructions (r-0.770). Connectivity and Community refers to existence of a range of services that meet people's daily needs (e.g., education, health, cultural) (r=0.717) as well as availability of alternative routes (r=0.705). The availability of both car parking (r=0.806) and public transport stops (r=0.758) were correlated with the other transport modes component, highlighting the importance of infrastructure which serves multi-stage trips in planning for increased walkability. Together, the four identified components explain 58.6% of the variation in perceptions of walkability, with 'urban ambiance' explaining the most (21.9%), followed by pedestrian infrastructure (16.8%), connectivity and community facilities (10.4%) and access to other transport modes (9.5%).	Fonseca et al. (2022) Questionnaire survey. 1,438 respondents. Portugal and Italy

Key evidence	Source/Method/Sample/Country
Development management and design factors which promote walking	
The scale of built environment interventions is related to the size of the impact on walkability: small-scale interventions may improve walking experience, but larger-scale interventions are more effective in increasing rates of activity. Increases in walkability brought about by built environment interventions (road space reallocation and reconfiguration, more and wider pavements, green spaces, seating) across three central locations in Lisbon (Portugal) were associated with an increase in pedestrian volumes (an increase from 424 to 461 in mean pedestrians per hour [+8.7%, p=.056) for the smallest scheme, involving improvements to a 900m long, 30m wide avenue, and from 528 to 586 pedestrians per hour [+10.9%, p=.002] for a large scheme retrofitting a 1.5km long, 50m wide avenue). There was a small but insignificant decrease in pedestrian volumes in the adjacent control street (-3.7%, p=.335). Using a self-reported measure in a quasi-longitudinal survey snowballed (not randomly sampled) amongst staff and other mailing list members of organisations in the intervention area (final sample, n=802), which relied on participant's recall, there were increases 'walking experience' (change in mean walking experience scores [scale 0-9] from 4.84 to 6.99 (+2.37, p=.000) for the large scheme, and from 4.63 to 6.56 (+1.92, p=.000) for the smaller scheme. Changes in walking experience score were not reported for the control street. The authors also draw attention to the heavily touristed nature of the study location, which may limit transferability of this finding to other contexts.	Cambra & Moura (2020) Pedestrian Counts and surveys. 37 Streets. Portugal
The findings suggested that the following built environment attributes are important in measuring walkability: street network connectivity (junction and street density, size of blocks, absence of cul-de-sacs etc.) (84% of studies reviewed); land use (density and mix) (81%); safety and security (70% of European studies focus on road safety; crime is less important); pedestrian facilities (e.g. pavement width, quality, topography) (42%); accessibility to amenities and other transport facilities (41%); and, to a much lesser extent, streetscape design (5%).	Fonseca et al. (2022) Systematic Review. 132 documents. 38 countries.
The spatial structure and design of urban areas and streets plays a significant role in determining the volume pedestrian movements. Multivariate regression of pedestrian flows in 20 neighbourhoods in Istanbul (Turkey) concludes that the configuration of the street network (using two measures of connectivity [metric reach, being the total street length accessible from within 800m of a point - Std β=0.15, p<0.001; and directional reach, being the street length accessible from a point without having to make more than two changes of direction of over 20° - Std β=0.12, p<0.001, integration [accessibility of a street to all others within 800m] [Std β=0.12, p<0.05], choice [likelihood a street is used for all possible routes between pairs of origins and destinations within 800m radius] [Std β=0.09, p<0.05]) is strongly associated with pedestrian movement densities. The number (Std β=0.38, p<0.001) of non-residential land uses at street level is associated with pedestrian movement densities. Finally, street design, especially pavement width (Std β=0.17, p<0.001) and, to a much lesser extent, setback distance (Std β=0.06, p<0.1) and existence of pedestrian crossings (Std β=0.06, p<0.05), are significantly and positively associated with pedestrian movement densities.	Ozbil Özbil et al. (2015) On site observations, street audits, modelling. 790 street segments. Turkey

Key evidence	Source/Method/Sample/Country
Development management and design factors which promote walking	
Parks and green spaces have a relationship to the density of walking trips within their catchments. A study of walking trip stages in the London Travel Demand Survey shows that the shape (the ratio of a park's area to its minimum circumscribing circle) of parks has a positive relationship (p=.003) to walking density (total length of walking trips divided by total length of all street links) within their catchments (1 km radius), both for transport and recreational trips. Although an explanation is not given, it is speculated that irregular parks have an adverse effect on pedestrian activity in the surrounding area because of how this may reflect irregularity in the surrounding street morphology. Larger parks are associated with lower walking density. The density of parks (measured as the number of in an area) was not a large association nor a significant one (p=.032) The intensity of retail opportunities within the catchment of parks is positively associated with walking density (p=.000), whilst higher residential density is associated with lower walking density (once controlling for all other factors) (p=.008). The study concludes that parks have an important influence on walking and that the size and shape of parks together with their relationship to surrounding land use are important considerations in infrastructure, planning and design.	Zhang et al. (2020) Analysis of travel survey. 54,910 respondents. UK

Key evidence	Source/Method/Sample/Country
Evidence on designing walking environments for demographic groups	
Assumptions used in the design of pedestrian crossings are unrealistic for older people. A UK study of older people, based on interviews and a nurse visit which included timing how long it took the participant to walk eight feet at their normal pace, found that for pedestrians aged over 65, 76% of men and 85% of women walk more slowly than the assumptions used in the design of UK pedestrian crossings. Studies in Ireland, Spain, USA and South Africa also unanimously found that older adults have insufficient time to cross at pedestrian crossings.	Asher et al. (2012) Cross-sectional survey. 3,145 adults aged over 65. UK
Older people can be put off walking due to a lack of public benches and toilets. Stakeholders of a consultation felt that benches and accessible toilets were essential to increase confidence among older people taking longer walking trips. Supporting this finding is cited secondary evidence that there was a 40% drop in the number of public toilets in the UK between 2003-2013.	Holley-Moore & Creighton, 2015 Stakeholder focus groups and review of literature. UK
Women, those living in a deprived area and those in poor health were more likely to have a walking impairment which further excluded them from walking.	Asher et al (2012) Cross-sectional survey. 3,145 adults aged over 65. UK

1. Introduction

1.1 Active travel policy context

Active travel can be defined as travel that is powered – either partially or fully – by the sustained physical exertion of the traveller. Whilst active travel evidence and policy often refers to cycling and walking, a broader and more inclusive definition refers to any travel that is powered, partially or fully, by the sustained physical exertion of the traveller (Cook et al., 2022). As such the definition also includes wheeling (wheelchair use as well as a variety of other modes such as skateboarding or scooting). In recent years, active travel has received increasing recognition for its potential to help facilitate a range of environmental, public health and economic policy outcomes (Hirst, 2020).

In England, the government has an ambition to make walking, wheeling and cycling the natural choice for shorter journeys or as part of a longer journey. The government's original Cycling and Walking Investment Strategy (CWIS) published in 2017 set out specific, measurable aims and provided the financial resource to help achieve them.

The second cycling and walking investment strategy[5] (CWIS2), published in 2022 and updated in March 2023, aims, by 2025, to increase the percentage of short journeys in towns and cities that are walked or cycled to 46%; increase walking activity to an average of one walking stage per person per day; double cycling activity to 1.6 billion journey stages; and increase the percentage of children aged 5 to 10 who usually walk to school to 55%. The latter is set out as a specific target. Over the longer term, the strategy is that half of all short journeys in towns and cities will be walked or cycled by 2030, and that England will have a 'world-class' cycling and walking network by 2040. CWIS2 also introduced a more inclusive definition of active travel to include wheeling.

To support the implementation of projects that deliver its active travel aims, the Government has made an investment projected to be £3.6 billion from 2021 to 2025, and established ATE. ATE's role is to administer the funding whilst working with local authorities to ensure the delivery of high-quality active travel infrastructure for walking, wheeling and cycling, provide tools to deliver ambitious active travel programmes, and support children and other people to cycle.

1.2 Background to the evidence assessment

In 2022, the Department for Transport (DfT) commissioned Sheffield Hallam University in partnership with the National Centre for Social Research (NatCen) and Mosodi Ltd to undertake a portfolio evaluation of active travel. Overall management of this evaluation programme was transferred to ATE in September 2023. The overall aims of the evaluation are to understand how active travel interventions are being delivered; what impact they are having on uptake of active travel; whether they represent value for money; and how they are contributing to the government's walking and cycling objectives.

To support the development of evaluation activities, ATE commissioned a suite of evidence assessments across a range of research and policy priority areas to help assemble evidence of 'key facts' and identify research gaps. The complete list of these evidence assessments is:

5 ATE and Department for Transport (2023). The second cycling and walking investment strategy (CWIS2), 10 March 2023.

1. Enabling adult cycling.
2. Walking and wheeling.
3. Early consideration of active travel via planning and design.
4. Economy.
5. Health and wellbeing.
6. Journey times, congestion, and resilience.
7. Active school travel.

1.3 Planning and design

CWIS identifies the spatial planning system as playing an important role in delivering the strategy's objectives. The strategy recognises that significant uptake in active travel cannot be achieved without improvements to safety and integrated mobility within the public realm. Planning policies and local plans are identified as important mechanisms to help achieve active travel aims, including the specific suggestion that developers should contribute to local active travel infrastructure priorities. A key part of ATE's role, therefore, is participating in the spatial planning system and working with local authorities to embed active travel infrastructure within planning policies and design. In support of this, ATE has been designated a 'statutory consultee' for certain planning applications since 2023.

Land use and infrastructure planning in England operates both at the level of broader policy and plan-making – usually over the geography covered by local planning authorities – and the management of the development of individual local sites. Both activities must concord with national planning policy and practice guidance. This evidence assessment considers evidence of the impact of both broader planning policy and more localised site-specific planning and design factors. The review of evidence is therefore organised into two chapters: planning policy and development management and design, as defined above. Both factors play a role in supporting the delivery of active travel interventions, the achievement of active travel policy objectives and maximising their impacts. The evidence, however, also suggests an interrelationship between both policy and development: a strong policy framework coupled with good design and development management is likely to lead to the best active travel outcomes.

1.4 Research questions

This evidence assessment aimed to synthesise available evidence to address the following three research questions.

- **RQ1.** What is the contribution of:
  - Strategic planning and planning policy?
  - Development management activities, including the role of statutory consultees like ATE?
- **RQ2.** How have land use and infrastructure planning and design lead to observed outcomes? What are the barriers or enablers?
- **RQ3.** Does land use and infrastructure planning and design lead to better outcomes for active travel, in terms of:

- Provision of active travel infrastructure?
- Modal choice?
- Network design?

Whilst these research questions were important in guiding the search strategy and extraction of findings, it is important to note that we found little evidence in practice which answered these questions directly. This is reflected on in the report as representing several important gaps in the evidence base.

1.5 The structure of this report

The report is structured as follows:

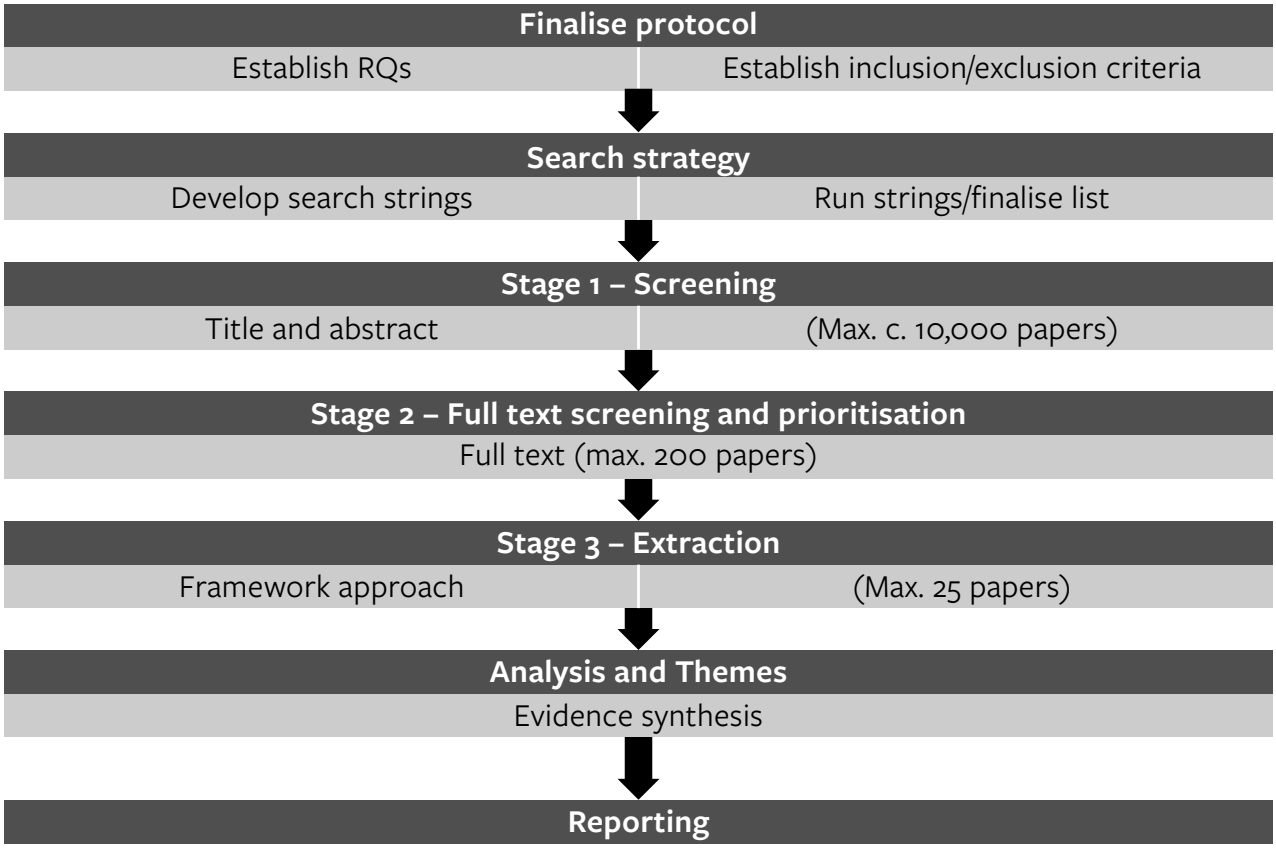
- **Executive summary.** The executive summary provides a high-level summary of the report, as well as a summary of key findings.
- **Introduction.** The first chapter provides background to this evidence assessment.
- **Methodology.** The second chapter provides a summary of the methodology used for identifying and synthesising relevant evidence.
- **Planning policy.** The third chapter explores evidence on the impact of planning policy on active travel outcomes.
- **Development management and design.** The fourth chapter considers the evidence on the impact of site-level development management and design considerations on active travel outcomes.
- **Key determinants of and barriers to participation in active travel.** This chapter briefly summarises the implications of the evidence in terms of key determinants of participating in active travel, and the barriers to these.
- **Conclusion and next steps.** A final chapter provides a summary conclusion of the evidence against the research questions and sets out implications and recommendations in terms of addressing gaps in the evidence base.

2. Methodology

This section outlines the overall methodology and approach to the evidence assessment. It provides further detail about the development of the assessment protocol, each of the specific stages in the identification, screening and extraction of evidence, as well as identifying the limitations of the research design.

The overall design was organised into three key stages and a set of supporting activities, as summarised in Figure 1.

Figure 1: Evidence assessment stages



2.1 Evidence assessment protocol

A protocol was developed which outlined the process and method to be followed. This helped to ensure consistency across the suite of assessments and to support the identification of relevant, high-quality papers within each assessment within a finite resource.

Initial thematic priorities for the evidence assessment were determined with ATE. A stakeholder engagement process was held with key staff within ATE, DfT and other organisations to discuss and agree the thematic scope, agree a set of sub-themes to structure the identification and assessment of evidence, research questions and the concepts and terms that would be used to specify the inclusion criteria. Suggestions were also made by stakeholders for specific non-academic studies and reports for consideration in the evidence assessment. Initial scoping was supported by running a series of test searches using generic search strings on bibliographic databases to provide an initial indication of the likely size of the evidence base. This was used to help further refine the thematic scope of the assessment and its sub-themes and provide initial information on the broad composition of the evidence base (e.g. likely availability of UK-based evidence, types of methods and studies, availability of systematic or meta review studies).

2.2 Search strategy

Academic literature was identified as being potentially relevant to the assessment theme and sub-themes using two database searches: an academic search using the Scopus database and a manual grey literature search across a range of relevant sites (full details of this, including the specific search strings used, can be found in Annex A). In addition to this, evidence identified by experts from ATE and DfT at the stakeholder engagement stage was incorporated into the screening.

2.2.1 Inclusion and exclusion criteria

The inclusion criteria were developed to narrow the search to the papers most relevant to the overall theme. These criteria were applied to both search pathways but not to the third pathway, which was the suggested evidence from ATE and DfT staff.

- **Language:** Only English language papers.
- **Country:** UK, Europe, North America, New Zealand and Australia (those deemed most relevant to the English context).
- **Year:** Papers published from 2013 onwards (to ensure the most recent evidence was prioritised).
- **Publication status:** Published peer-reviewed academic literature and published grey literature.
- **Type of studies:** Systematic/evidence reviews, meta-analysis, theoretical paper, or empirical studies using primary data collection or secondary data analysis.

2.2.2 Academic database search and search strings

Separate search strings were developed for each of the identified sub-themes within the overall theme. For this assessment, these sub-themes and their broad coverage were as follows:

1. **Planning policy,** including national planning policy (e.g., the National Planning Policy Framework, NPPF), local plans development, network design, and Local Cycling and Walking Implementation Plan (LCWIP) development; and
2. **Development management and design,** including planning applications, scheme planning and design, and organisational travel planning and engagement.

These strings were then used to search the Scopus bibliographic database, which is a large and comprehensive database of peer reviewed academic publications. Annex A provides an outline of the search strategies deployed and breaks down the number of results returned for each search string and in each database. The total number of studies identified as being potentially relevant was as follows:

- Sub-theme 1 (planning policy): 6,980.
- Sub-theme 2 (development management and design: 4,890.

2.2.3 Grey literature search

To supplement the academic database search, a search of 'grey' literature was conducted across a range of relevant websites using the Google search engine. This applied a standardised set of search strings for all evidence assessments to identify further sources. The results were then manually screened by each theme to identify relevant evidence for inclusion in the full text screening stage. Theme leads coordinated to avoid including the same piece of evidence in multiple themes. For this theme, no additional papers and reports were identified for inclusion in the full text screening. In all cases, the returned literature contained no research or evaluation study, was guidance (e.g. to planners), or were documents which supported specific local plans (e.g., local transport plans). A full list of the websites searched for grey literature is included in Annex A.

2.2.4 Suggested evidence

A final pathway through which evidence was identified was the suggestions of experts at ATE and DfT. For this theme, 11 additional studies were identified through this pathway. These were reviewed for specific study findings and evidence but in most cases did not contain anything that was not covered by the academic literature. One study, published by Age UK, was included as it provided specific evidence considered to be useful.

2.3 Screening and extraction

2.3.1 Title and abstract screening

11,870 titles were initially screened. This process involved assessment of titles and the publication title against the inclusion criteria. Several rounds of refinement were required to exclude irrelevant articles or publications. All papers were considered against a prioritisation tool and checklist to ensure the final list of papers would address the research questions specifically. The criteria used at this stage were:

- Relevance to the theme and sub-themes.
- Geographic focus (aiming to identify UK based studies where possible).
- Paper type[6] (e.g. systematic review paper, primary research paper, literature review, discussion paper).
- Study/data type (aiming to prioritise inclusion of studies which used real-world data as opposed to modelled or synthetic data).
- Coverage across sub-themes (aiming for a pragmatic distribution of studies across the agreed sub-themes).
- Whether the study was specifically recommended at the stakeholder engagement stage for inclusion.
- Age of the study (aiming to include most recent studies where possible).

Following this screening process, 106 studies were accepted for full text review.

6 Systematic review papers were prioritised (where available) as these papers synthesise the available evidence on a topic or the effectiveness of an intervention by drawing on multiple primary research papers. This means that evidence from systematic reviews is more comprehensive and reliable than from individual studies.

2.3.2 Full text screening and prioritisation

106 papers went through full text review from the academic search. Of the additional sources identified from recommendations from ATE and DfT, one study was included. The remainder were reviewed briefly and found to contain findings not directly related to planning; more general evidence which was covered in other Evidence Assessments; or were otherwise covered by included academic articles drawn from the same study.

A Weight of Evidence (WoE) approach was used to score evidence according to the quality of its research design and presentation of findings. This was assessed using the questions and scoring scheme set out in Table 3 to arrive at a final WoE score out of 14 for each candidate source.

Table 3: Weight of Evidence scoring scheme.

Question	Score
Is there a clear statement of the aims/objectives or clear research questions?	1-4
Is the sampling strategy (or data selection strategy if not collecting primary data) clearly described and appropriate for the research questions/aims?	1-4
Is the method of data collection and analysis clearly described, and appropriate to answer the aims/research questions?	1-3
Are there any concerns regarding accuracy (e.g. discrepancies within the report)? (high score means no concerns).	1-3
Total Weight of Evidence (WoE) score	**4-7 (low)** **8-11 (medium)** **12-14 (high)**

2.3.3 Data extraction

Using the WoE scoring to prioritise the most robust studies, 25 papers were identified to extract data and evidence from. The full list of papers is shown in Annex B along with their WoE scores. An extraction framework was developed to organise the evidence extracted. The framework was structured thematically, to ensure a spread of papers across the sub-themes. Once extraction was complete, the evidence was summarised and synthesised for inclusion in this report.

2.4 Limitations of the research design

This was a focused evidence assessment. It drew on a limited number of sources in line with the available resource, using a systematic screening and prioritisation process. To draw more exhaustive conclusions a larger Rapid Evidence Assessment (REA) or systematic review would be required to ensure broader coverage of sources.

3. Planning Policy

3.1 Introduction

Planning policy and the design and approval of specific developments and schemes all play a role in supporting the delivery of active travel interventions, the achievement of active travel policy objectives and maximising their impacts.

The statutory land use planning system operates both at a national and local level. The NPPF (National Planning Policy Framework) sets out the government's overarching planning policies for England. It also sets out how these are expected to be applied in the formulation of local plans and in the determination of planning applications. Local plans set out a positive but deliverable vision for the future of an area and provide a policy framework that shows how sufficient provision can be made for land use of different types, infrastructure, community facilities, the conservation and enhancement of the natural, built and historic environment, and measures to mitigate and adapt to climate change. Plans and policies are expected to be consistent with NPPF, not duplicating national policies but serving a clear local purpose.

NPPF sets out a number of national policies to promote sustainable transport. It encourages the early consideration of transport issues in plan-making and development proposals, in part so that opportunities to promote walking and cycling are identified and built-in. Policies within local plans are expected to provide for attractive and well-designed networks for walking and cycling, drawing on Local Cycling and Walking Implementation Plans (LCWIP) where these are in place.

The system is designed to be plan-led, in that there is a presumption that development which is in accordance with the plan and is sustainable will be permitted. In general, policies which are consistent with NPPF are accorded greater weight in decision making.

The section considers evidence of the role of broader policy. Our initial screening found few specific studies which provided evidence of the specific impacts of planning policy on active travel within the English (or UK) systems. Therefore, this report considers broader policies and approaches across a range of different spatial planning systems, including internationally. The focus is consequently on broad, transferrable land use planning concepts (e.g. relating to the arrangement of land uses or the characteristics of the built environment) which can be influenced by planning policies.

Although this section considers the impact of broader policy, it was found that there was a high degree of overlap between policy and site-specific issues in determining the outcomes of the studies. Site or development-specific design factors – where there is evidence of a positive impacts associated with a specific scheme – can also be replicated and scaled up in appropriate circumstances and so planning policy can in turn, and in time, draw on 'best practice' observed in the design of individual sites and their provision for active travel.

This chapter attempts to answer the following research questions:

- **RQ 1.** What is the contribution of strategic planning, planning policy and development management activities, including the role of statutory consultees like ATE?
- **RQ 2.** How do land use and infrastructure planning and design lead to observed outcomes? What are the barriers and enablers?

The assessed evidence demonstrates that this topic is complex but also makes clear that there is unlikely to be a one-size-fits-all when considering how planning policy can increase the opportunity for, and uptake of, active travel.

The evidence on the link between planning and active travel is generally separated into walking and cycling as two separate activities. There is very little specific reference to wheeling as a distinct set of active travel activities with specific infrastructure needs, which appears to be a gap within the evidence base. There is also a significant focus on barriers to active travel within the literature, with comparatively less evidence on specific planning policies or initiatives.

The evidence assessed in this section is organised into the following categories:

- Planning policy, practice and barriers.
- Planning to influence the determinants of cycling.
- Planning to influence the determinants of walking and wheeling.

The evidence identified has been drawn from both quantitative and qualitative studies. No systematic reviews or meta-studies were found, although several review studies on this theme brought together related literature.

A key finding has been that studies which evidence the link between planning policies and active travel outcomes tend to be focused on cities and urban areas, with comparatively fewer studies of the impact of policies in smaller towns and rural areas. The evidence on studies within the specific context of the English or other UK planning regimes is also comparatively scant, although this does provide opportunities to learn from valuable studies in key international locations internationally, especially a range of mature and more developing active travel cultures in Europe, the US and Australia. As an example, whilst search terms included specific tools and policies within the English planning system (e.g. National Planning Policy Framework and Planning Practice Guidance [NPPF/PPG], Local Cycling and Walking Implementation Plans [LCWIPs] or the Community Infrastructure Levy [CIL]), no studies including these terms which also met our screening and prioritisation criteria were found.

The evidence assessed includes a broad mix of data collection methods, including cross-sectional and longitudinal data collection, focus groups, transport modelling and literature reviews.

3.2 Planning policy, practice and barriers

Although no evidence was found on the direct impacts of specific planning policies and mechanisms, there is evidence on general policy and practice that can support built environment outcomes which in turn enable active travel. Whilst the evidence discussed here is generally sourced from studies of planning practice and policy, there is a strong link with evidence on the factors that enable cycling, walking and wheeling discussed in other evidence assessments in this series. The evidence assessed in The Impacts of Interventions to Enable Adult Cycling (Gregory et al., 2024) and The Impacts of Walking and Wheeling Interventions (Bhagat et al., 2024) is particularly relevant.

3.2.1 Culture and attitudes within planning policy and practice

Research into the practice of planning for active travel appears to place significant emphasis on a supportive planning and wider societal culture for promoting active travel. This has implications for the training and professional development of planners and others who hold power within the planning system (Zhao et al., 2018; Aldred et al., 2019; Cunha et al., 2023).

According to the authors of a study by Zhao et al. (2018) which compared senior planners' views in two contrasting contexts (Copenhagen and Beijing), a supportive planning culture for cycling infrastructure requires that policy makers focus on sharing the rationales and values which underpin active travel policy, and on the 'professionalisation' (experience of and knowledge in transport planning for active modes) of planners in relation to cycle infrastructure. The societal environment refers to planners' beliefs and assumptions regarding cycling as informed by the social status of cycling. Ensuring the visibility and hierarchical status of cycle infrastructure planning within the broader planning policy framework is therefore important, as is training and creating roles which promote the specialisation of transport planners in active travel. This is reinforced by other work, such as a qualitative study of planners in three contrasting European cities by Cunha et al. (2023). They conclude:

> *"The main goal for planners is to normalise and integrate cycling into urban fabric and transport systems because the bicycle remains a little bit segregated or marginalised in many European countries"* (*Cunha et al., 2023, pg.10*).

Planners believe that the successful implementation of cycling infrastructure in particular is dependent on a supportive planning culture and societal environment. Based on interviews with senior planners across two international cities with different approaches to planning for cycling (Beijing and Copenhagen), Zhao et al. (2018) found that a 'supportive' planning culture relates to the sharing of rationales and values between policy makers which underpin active travel policies. The professionalism of active travel specialisms among planners is also considered important when planning for active travel and cycle infrastructure.

There are problematic power relations in transport planning and lack of a theoretical understanding of planning for cycling has led to the marginalisation of cyclists within planning practice. The beliefs and rationalities held by urban politicians, planners and policy makers are critical in influencing behaviours and attitudes, constituting a source of power (Koglin & Rye, 2014; Zhao et al., 2018). Theoretical frameworks used by planners need to be developed from a position of experience as a cyclist, to better understand cyclists' needs. This would emphasise more inclusive theories of mobility, whilst backgrounding traditional 'modernist' theories of transport planning which valorise efficiency and flow and, with them, automobility (Koglin & Rye, 2014). Plans should aim for a positive portrayal of cycling, which have shared meaning that goes beyond class, gender, ethnic and other boundaries. Practically, this means care should be taken in the depiction and portrayal of cycling activities in policy documents and plans (for example not using stereotypical imagery of cyclists or cycling behaviours).

3.2.2 Barriers within planning policy and practice

The evidence on planning's role in active travel covers a wide range of significant barriers which researchers find frustrate the achievement of active travel outcomes. There are notably more barriers to encouraging and promoting cycling than there are for walking, and this is associated with a perception that financial or funding barriers for cycling infrastructure are significant (Aldred et al., 2019). Based on their survey of 400 transport professionals in local and regional government, consultants, academics, business stakeholders, voluntary advocates and politicians, Aldred et al. (2019) categorised the barriers to [government] investment in

cycling as (i) political, (ii) resources, (iii) institutional and (iv) wider stakeholder attitudes. These were seen as interrelated, with participants in follow up stakeholder interviews all citing lack of political support as a key barrier and underpinning lack of support for cycling investment. Cyclists in particular are considered within the research to be a particularly stigmatised group. Not recognising cycling as a serious and reliable form of transport brings into focus the subtle nature of pollical barriers that prevent funds being invested into cycling (Aldred et al., 2019).

Political barriers. Planning is an inherently political activity which takes place within complex systems of multi-level governance. The promotion of active travel infrastructure, particularly for cycling, is regularly contested by national and local politicians within a public discourse characterised by division. Aldred et al. (2019) suggests that the promotion of cycling as a policy objective is perceived as a threat to car-centric transport systems within the UK that citizens are heavily reliant on. This is supported by the findings of Koglin & Rye (2014), who conclude that planning policies tend to give more power to vehicle users than to active travel users. Aldred et al. (2019) note the challenge of public opposition within planning consultation processes which can introduce a contradiction between councillors' overall support for the promotion of active travel within policy, but opposition to specific schemes or funding.

Resources. The resources barriers for active travel stem back to the initial aims of transport planning which were to provide fast and efficient transport of people and goods. This meant that resources have tended to be focused on facilitating motorised vehicular movements and thus this is the aspect of transport planning that sees the most funding (Koglin & Rye, 2014). Lack of funding and political support can lead to active travel infrastructure that is of poor quality. This in turn may mean that it is not well used (Aldred et al., 2019).

Institutional and stakeholder barriers. A common theme in the evidence assessed is the importance of awareness and education across a diverse set of actors within the planning system. As a response to changing attitudes and behaviours some studies suggest the use of educational programmes and awareness campaigns which improve understanding of active travel and its benefits (Banerjee et al., 2022; Cunha et al., 2023). The importance of learning and practicing active travel behaviours in early childhood is highlighted (Banerjee et al., 2022). The importance of education for stakeholders such as local politicians, planners and transport engineers is also stressed by Aldred et al. (2019), with their participants raising concerns about the 'significant amount of power' wielded by transport engineers 'dogmatically' using concepts like capacity and smooth traffic flow in adherence to a car-centric and economic growth paradigms and associated guidance 'laid out… in the 1950s' (p. 155). Aldred et al. (2019) suggest that the public's understanding of cycling infrastructure is generally low unless they are themselves a cyclist. Importantly, Aldred at al. (2019) also highlight problems with understanding of cycling issues among local politicians:

> *"…in many places local political leaders were described as ranging from apathetic to actively hostile towards cycling investment; often more interested in motorised modes."* (*Aldred et al., 2019, p. 152*)

To overcome barriers related to the attitudes of stakeholders, cycling should be portrayed in a positive way within plans (Koglin & Rye, 2014; Cook et al., 2022). Koglin & Rye suggest that these representations of cycling should have 'shared meaning' that goes beyond class, gender, ethnic and other boundaries. Practically, this means care should be taken in the depiction and portrayal of cycling activities in policy documents and plans (for example not using stereotypical imagery of cyclists or cycling behaviours).

Media and public consultation. Aldred et al. (2019) also found that local media has a large part to play in how cycling is perceived within public discourse. The media has a history of portraying cycling issues in terms of conflicts with motorists (Aldred et al., 2019) which has led to people feeling they need to 'pick a side' in terms of debates and attitudes, which are then reflected politically. This has practical implications for the way that wider public consultation in the planning process, including at the point of consulting on draft local plans, is publicised and framed by planners.

3.3 Planning to influence the determinants of cycling

Although the studies reviewed for this evidence assessment did not consider the direct impacts of specific planning policies and mechanisms, there was evidence on the impact of general policies that underpin and enable an increase in cycling. These relate to policies governing land use, accessibility and distance; highway and cycle network design; and incentives and facilities; as well as development management and design factors which promote cycling. Each is considered in turn.

3.3.1 Land use and accessibility policies

It is widely known that distance is a key determinant of modal choice in relation to active travel (for example, see the Active School Travel evidence review by Bhagat et al., 2024). Distance is therefore a key dimension which informs consideration of the impact of planning policies on active travel outcomes. Intuitively, planning policies which govern aspects of urban structure such as the mix and arrangement of land uses (including employment, retail and residential) and the density of different land uses can have a strong influence on travel distances and therefore on the propensity to travel using active modes. It can be inferred that the impact of active travel infrastructure on active travel outcomes depends on how well its form, location and quality fit the travel types and distances that are implied by local planning policies.

Whilst the search strategy for this evidence assessment did not explicitly look for studies covering specific planning concepts such as 'out of town development' and 'transit oriented development' (which are intuitively understood to have an impact on the amenability of the built environment to active travel) the literature nevertheless does look at the fundamental attributes of the built environment such as population and building densities, land use type and mix, and the configuration of the urban structure and its transport networks (especially the layout of streets and roads).

Land use mix and accessibility both have a statistically significant effect on active travel trips. Modelling by Saghapour et al. (2019) using a large-scale survey dataset in Australia shows that a one-point increase in an entropy index of land use mix is associated with an increase in active trips (all modes) by 21% ($p<0.001$). A 1% increase in net population density of an area was associated with an increase in active trips of 9% ($p<0.001$). This further confirms findings elsewhere (Zhang et al., 2020; Özbil et al., 2015) that population density is associated with higher rates of active travel, although studies do not always distinguish between cycling and walking or may relate principally to walking. Enhancing accessibility (measured using a gravity model of land use, activities and travel time) is also associated with increased active trips (Saghapour et al., 2019). The same authors conclude that improving accessibility through explicit planning policies is a 'valuable tool.'

The evidence indicates that there is a relationship between journey distance and the location and type of cycle infrastructure which best serves journeys of different lengths. Given that planning policies influence the broad locations of different land uses and the densities of different types of development, it follows that they will affect demand for different journey types and distances, with implications for the type of infrastructure that could meet those needs.

Longer distance cycling. Increasing the number of commuting trips which are cycled is seen as an important part of mode shift objectives. In general, commuting journeys are considered to be longer trips compared with leisure or local transport trips. Banerjee et al. (2022) foud that the planning factors that promote cycling over longer distances (defined consistently in the literature as 5 km or longer) may be different to those that promote cycling more generally. A range of factors that may be influenced by planning policy can help to promote commuting by cycle over longer distances. Banerjee et al. (2022) reviewed 31 studies in selected countries in North America and north and western Europe which examined the factors which facilitate cycle commuting by cycle over longer distances. The evidence found highlights the following factors as being important in facilitating longer distance cycle commuting: cycle highways which are close to the shortest route possible and link suburbs with city centres; 'appropriate' cycling infrastructure designs which have dedicated lanes and paths, and which reduce conflicts and the need to stop/start and give way; the provision of cycle amenities at destinations; and the use of incentives.

Planning policies which facilitate these factors are therefore important in increasing the proportion of commutes that are undertaken by bicycle. One cited study (Manaugh et al., 2017) of staff and students at a large university workplace in Canada concluded that the probability of commuting 5-7 km by bicycle for an average 34-year-old male doubled (from 0.21 to 0.47) when the proportion of cycle path coverage increased from 33% to 75%). Similarly, for a 7 km commute to be 'usually' or 'always' undertaken by bicycle, the probability increased from 0.20 (when the route was 33% bicycle path) to 0.45 (when it was 75% bicycle path).

The share of long-distance bicycle trips among total bicycle trips and the distribution of trip lengths are relatively similar in different countries. Banerjee et al.'s (2022) review found that long distance cycling comprises between 29% and 36% of all cycling trips; the great majority in all countries being between 5 and 10 km. Rates of long-distance cycling vary in proportion, therefore, with overall rates of cycling.

The same review concluded that commuters who cycle even longer distances (over 20 km) prefer long, straight and flat routes which do not have too many roads with 'high stress levels' caused by on-street parking, stop junctions and poor road quality. Several studies within the review noted that to avoid the 'high stress' routes it was found that long-distance cyclists were prepared to take longer routes (around 1.2-2 km on routes longer than 20 km) (Banerjee et al., 2022).

3.3.2 Road and cycling network design

Cycle superhighways. The concept of cycle superhighways has been an important transport planning tool within some UK cities, with the first routes opening in 2010 (Liu et al., 2019). The objective of cycle superhighways is typically to connect suburbs with city centres, thus facilitating long distance cycling (Banerjee et al., 2022) and, therefore, commuting. Cycle superhighways play a particular role within broader cycle infrastructure, which is to provide traffic free routes and an important alternative to other modes especially for commute-length travel.

Interviews with 11 planning practitioners across six European countries by Liu et al. (2019) found that dedicated cycle routes are an important factor in determining the proportion of commuters who may choose to cycle to work, especially over longer distances. Whilst the authors do not define 'long distance' they suggest that it would generally refer to journeys such as those between suburbs and city centres. As noted earlier, other studies consistently define long distance as journeys of over 5 km.

Reducing vehicle conflict and the need to stop. Although research has found that cyclists are willing to take a moderately less direct route to find a quieter, less stressful path (Banerjee et al., 2022), ideally cyclists favour routes which flow along the shortest path. This is particularly important for some groups, including disabled cyclists (Andrews et al., 2018). Spatial analysis by Alattar et al. (2021) of crowdsourced data on cycling trips in 2018 in a city with a grid-iron street pattern (Glasgow, UK) shows that 'closeness centrality' (the reciprocal of the average shortest path from any given street segment to all other street segments) and 'betweenness centrality' (the frequency that a street appears on the shortest path between all other streets in the network) are significant predictors of cycling trips. A 1% increase in closeness centrality yields a 1.15% increase in trips ($p<.001$); a 1% increase in betweenness centrality yields a 0.28% increase in trips ($p<.001$). Although the magnitude of these effects will depend on the study context, the empirical finding that network topology has a relationship to cycling trips can be used to inform network design. One clear implication seems to be that cycle networks that have links which are maximally accessible to/from other streets ('closeness centrality') and would be maximally useful for through journeys ('betweenness centrality') will be better used by cyclists.

Where legacy networks provide little alternative to the use of roads, traffic signals can be optimised to reduce conflict and the need for cyclists to stop and start. Reflecting on their finding that routes which are closest to the central path for the greatest number of routes will be used most, Alattar et al. (2021) suggest the potential benefits of 'Green Wave' technology, which attempts to synchronise the green phase of traffic signals across a group of intersections and routes in a way that is optimised for cyclists and reduces their need to stop and start.

3.3.3 Incentives and facilities

In encouraging more longer distance cycle commuting (over 5 km), some international studies have found that incentive programmes have a positive impact, specifically those with tangible rewards such as money or in-kind gifts. Studies reviewed by Banerjee et al. (2022) found that for optimal uptake and promoting longer cycle distances the rewards should be based on accruing distance rather than the number of trips. One implication of this may be that policies could make clear that a portion of planning gain (e.g., through the Community Infrastructure Levy, S106 agreements or similar) could be used for revenue funding to support workplace-based incentives.

3.3.4 Summary

In summary, planning policies can promote cycling as a modal choice for a range of journeys, including commuting, because of their overall influence on the density and arrangement of land uses and the overall configuration of transport networks. These in turn govern factors such as the overall demand for travel, the distances that need to be travelled, and the extent to which routes are amenable to cycling.

Planning policies can also set conditions and requirements of new development which can facilitate cycling. Specifically, there is evidence that workplace facilities for cyclists and the use of incentives (which can be funded through developer contributions) have an impact on rates of cycle commuting.

Barriers to good planning policy for cycling include the problem of politics and power relations within the development of plans and policies, and the marginalisation of cycling knowledge and policy prioritisation within planning practice.

3.4 Planning to influence the determinants of walking

As noted earlier, evidence on planning impacts on active travel mostly treats cycling and walking separately or bundles them together as 'active modes'. Whilst this separation is important from a design perspective (and a key principle underpinning LTN1/20), there is a general lack of evidence which considers walking and cycling networks together from an integrated transport planning perspective (e.g. multi-modal trips). The evidence assessed focuses on achieving higher rates of walking through the promotion of built environment factors that are amenable to walking. These include:

- Neighbourhood design.
- Wider built environment determinants.
- Proximity and access to facilities.

3.4.1 Summary

In summary the evidence suggests that there are a range of political, resource and institutional barriers and wider stakeholder attitudes which restrict planning policy from having a bigger impact on active travel outcomes in practice, whilst recognising the key role that planning policy could play in overcoming these barriers.

Planning policy has an important role in 'normalising' cycling as a form of transport and reducing stigma, but education, awareness and communication will also be required to overcome attitudes and decision making which have their roots in traditional car-centric spatial planning and the transport planning paradigms which support them. The literature suggests that identifying and targeting specific groups is important: for example, addressing the respective roles of local politicians, transport engineers, journalists and other stakeholder identified as having an influence on funding decisions. The literature reviewed on planning practice tends to stress the importance of first-hand experience of active travel amongst practitioners.

4. Development Management and Design

4.1 Introduction

Street design and urban form have long been associated with levels of physical activity. Urban design generally has been accorded increasing importance in planning (Doĝan, 2021).

Having a favourable built environment around the immediate neighbourhood has been associated with a rise in general levels of physical activity within the population. The impact of better provision for active travel on health and wellbeing is addressed in another Evidence Assessment within this series. Losada-Rojas et al. (2022) stress that transport planning for active travel is consistent with public health strategies. The transport planning process can benefit from integrating social determinants of health, with place specific strategies needed to increase physical activity as part of a wider public health strategy.

Development management and other processes which govern the design of the built environment can have an impact on active travel activity and behaviour. Generally, evidence suggests that the better and higher quality the environment the more likely people are to walk – quality in this respect includes not only the physical configuration of the built environment and its infrastructure, but also aesthetic qualities, standards of cleanliness and perceived safety. To increase and promote cycling and walking (active travel) as achievable alternatives to car travel development management and design have important roles in ensuring that sites and new developments promote walking, wheeling and cycling.

This chapter summarises how planning and design considerations at the level of specific sites and developments can lead to active travel outcomes. It assesses evidence in relation to the following research question:

- **RQ 3.** 'Does land use and infrastructure planning and design lead to better outcomes for Active Travel'?

Overall, the evidence suggests that the design of infrastructure and the existing and proposed land use of an area have significant impacts on active travel outcomes. These outcomes, however, are sometimes contested within the evidence and in some instances the implied or explicit theory of change is complex. Evidence also suggests that the demographic or socioeconomic context of areas are important in framing views on what a 'walkable' or 'bikeable' built environment are and what active outcomes are realised.

The evidence on development management and design is split into the following subcategories:

- Factors promoting cycling.
- Factors promoting walking.
- Designing for different demographic groups.

The evidence identified has been drawn from both quantitative and qualitative studies as well as a several reviews which attempt to synthesise multiple related studies.

In line with the evidence for planning policy, the evidence of the impact of development management and design is from both the UK and international sources. Whilst no included studies were, again, from rural contexts, with evidence drawn principally from urban centres or in some cases suburban developments. This may be an important finding in itself: that as a whole more attention to design issues is paid in busier, more central locations, such as city

centres (where development values may be more capable of paying for higher quality design).

The evidence assessed includes a broad mix of data collection methods, including cross-sectional and longitudinal data collection, focus groups, transport modelling and literature reviews.

4.2 Design factors promoting cycling

The design of dedicated cycle routes is something that practitioners notably struggle with. Following a study undertaken with practitioners across five European countries including the UK it was concluded that the uniform, predictability and regulated engineering of cycle superhighways is difficult to balance with the diverse, vibrant and human scale design of pedestrian environments which need to accommodate cycle highways. Planners may find it difficult to interpret subjective concepts like 'quality', 'functionality' and 'attractiveness' therefore making it challenging to translate them into physical designs (Liu et al., 2019), noting that LTN 1/20 provides no definitive definitions for these concepts.

A key aspect for planners when designing the layout of urban areas to be suitable for cyclists is a way of measuring the effectiveness of different options. Hagen & Rynning (2021) discovered that the evaluation of 'bikeability' can be measured qualitatively according to place context, transport infrastructure, urban structure, and the characteristics of the surroundings, this provides an opportunity for planning professionals to assist in designing development management. The study was undertaken in two Norwegian cities and provides a good foundation for future design and policy.

A systematic review by Scheepers et al. (2014) of 19 studies of US and European interventions aimed at inducing shifts to active travel modes concluded that the majority of site or scheme-level built environment interventions (new infrastructure and traffic management schemes) studied yielded positive impacts on mode shift. The review noted, however, that study methods were generally weak and the statistical significance of findings not clear. That said, the review finds support for the notion that a combination of different intervention tools is more effective than using only one tool.

Meeting ideal infrastructure standards can be difficult in practice, especially when there are space conflicts in urban settings. According to Liu et al. (2019) practitioners cite difficulties when the ideal physical requirements of cycle highway design conflict with other uses of space in urban settings. Although there is evidence to suggest that planners struggle with a perceived trade-off between cycling and car infrastructure (e.g. in road space allocation terms and where to provide each mode of transport with adequate facilities to cater to everyone), there is also evidence that that cycling planning and vehicular planning can be aligned and operate in tandem. In Copenhagen, for example, a specific planning department is responsible for integrating bicycle infrastructure planning with wider urban space planning, integrating and coordinating skills and interactions with relevant stakeholders. This integration with planning helps cycling to be "prioritized organizationally and politically" (Zhao et al., 2018, p. 153).

In their study of the users of an active travel accessibility planning tool, Cunha et al. (2023) found that ensuring road safety was deemed the most important consideration when planning for cycling by half of the participants.

4.3 Design factors promoting walking

Whilst several studies support the hypothesis that improving the walking infrastructure increases walking levels (Fonseca et al., 2021; Hooper et al., 2015; Losada-Rojas et al., 2022; Scheepers et al., 2014), few have focused on providing robust quasi-experimental assessment, which would provide appropriate comparators with non-intervention groups or areas. In general, the evidence from studies is mixed with some interventions considered more successful than others.

4.3.1 Neighbourhood design factors

Planners and policy makers increasingly aim to promote the development of 'walkable' neighbourhoods. However, the evidence reveals a range of views regarding what makes a neighbourhood walkable. Planners must ensure that conversations and consultation within policymaking recognise the potential for a diversity of views which should be considered when designing and implementing policy. Understanding the distinction between walking for recreation and walking for transport is a key point emerging from the literature.

While residents' groups can have clear views on what makes a neighbourhood walkable, walkability goals are most likely to be supported by those already living in more walkable areas as opposed to those living in areas where walking is more difficult (Brookfield, 2016). Focus groups with residents in a 'walkable' neighbourhood revealed five dominant preferences: walkable amenities, peaceful environments, sociable spaces, green environment and a lower land use density. Most significantly, residents' groups tended to dislike high density developments and mixed developments due to noise, disturbance and the impact on their health and wellbeing from motorised traffic in mixed used areas, especially large goods vehicles (Brookfield, 2016). This is reinforced by similar findings from a survey of residents of 36 new suburban housing developments in Australia, which found that well connected footpaths, residential density and access to greenspace substantially increased the odds of walking for recreation (Hooper et al., 2015).

Although population density has a positive association with the overall number of walking trips (e.g. Özbil et al., 2015; Saghapour et al., 2019; Zhang et al., 2020) the proportion of journeys undertaken on foot may also be positively influenced by lower density, 'greener' environments. This suggests that whilst underlying development and population densities influence the 'baseline' levels of walking activity, additional walking trips for specific purposes may be positively influenced by neighbourhood design factors such as amenities and what Fonseca et al. (2022) elsewhere refer to as 'urban ambience.' This may make it more difficult to create a 'one size fits all' template when developing planning policies that promote walking.

4.3.2 Wider built environment factors

Studies support the notion that the arrangement of the built environment can have a significant association with increasing the levels of active travel, especially walking (Hooper et al., 2015; Brookfield, 2016; Dhanani et al., 2017). These aspects may include land use type and mix, the density of different land uses, perceptions of the quality of the built environment, provision of amenities in the built environment, and the provision of specific infrastructure for walking within the built environment.

Both the density of residential developments and the extent to which they are connected to other areas have an impact on rates of walking. The likelihood of residents of 'connected and compacted developments' (characterised as good footpath infrastructure and medium density of housing) doing more than 60 minutes or more per week of recreational walking was double (an odds-ratio of 2.05) that of those living in 'disconnected developments' (characterised

by poor accessibility, including to greenspace) (Hooper et al., 2015). Participants living in 'green developments' (characterised by lack of public transport connections and high areas of public parkland) were three times (odds-ratio of 3.37) more likely to walk 60 minutes per week than those in the reference case 'disconnected developments' (Hooper et al., 2015). An important enabler for local journeys to be undertaken by walking, including for recreation, is the presence and continuous coverage of suitable pedestrian infrastructure, namely footpaths (Hooper et al., 2015; Brookfield, 2016).

In their study of the impact of parks on walking in London, Zhang et al. (2020) note a moderate positive correlation between population density and walking density (r=0.38) but also a slight negative correlation between residential density and walking density (r=-0.09). This suggests that higher building densities work against the generally positive influence of population density (confirming Brookfield's [2016] findings), although the reasons why can only be speculative: high building densities being within areas with large or busy roads could be one reason; another could be the link between socioeconomic deprivation and residential density.

On land use mix, Hooper et al.'s (2015) study of Australian housing developments found that the odds of residents of 'liveable developments' (characterised by access to amenities, shops and public transport) doing 60 minutes or more per week of walking for any purpose (including 'utility walking', i.e., walking for transport) was nearly double (odds-ratio of 1.98) compared to those living in 'disconnected developments'.

Saghapour et al.'s (2019) analysis of a large-scale survey in Australia concludes that enhancing walking accessibility (as measured by a gravity-based model of land use, activities and travel time) increased active trips by 19% ($p<.001$).

A 'space syntax' analysis of London by Dhanani et al. (2017) found that the structuring of locations of intensity of pedestrian activity is largely dependent on the accessibility and attractiveness of a location within the broader context of the city, influenced by public transport, land use diversity and intensity and the street network structure. They conclude that:

> *"... aggregate activity in London is still structured according to pedestrian principles of proximity, centrality and travel time. This highlights the paramount importance of considering pedestrian activity on an equal if not higher footing than other modes of travel and movement" (Dhanani et al., 2017, p. 67)*

In a systematic review of 132 international studies of walkability (Fonesca et al., 2021) the following built environment attributes were considered important in measuring walkability: street network connectivity (junction and street density, size of blocks, absence of cul-de-sacs etc.) (84% of studies reviewed); land use (density and mix) (81%); safety and security (70% of European studies focus on road safety; crime is of less importance in European studies); pedestrian facilities (e.g. pavement width, quality, topography) (42%); accessibility to amenities and other transport facilities (41%); and, to a much lesser extent, streetscape design (5%).

A study of the impacts of a comprehensive redesign of major streets in central Lisbon, Portugal by Cambra & Moura (2020) showed that increases in walkability brought about by built environment interventions (road space reallocation and reconfiguration, more and wider pavements, green spaces, seating) across three central locations were correlated with an increase in pedestrian volumes. The study concluded that the scale of built environment interventions is related to the size of their impact on walkability: small-scale interventions

may improve walking experience, but larger-scale interventions are more effective in increasing rates of activity. The interventions were associated with an increase in pedestrian volumes: an increase from 424 to 461 in mean pedestrians per hour [+8.7%, p=.056) for the smallest scheme (improvements to a 900m long, 30m wide avenue), and from 528 to 586 pedestrians per hour [+10.9%, p=.002] for a large scheme (retrofitting a 1.5 km long, 50 m wide avenue). There was a small but insignificant decrease in pedestrian volumes in the adjacent control street (-3.7%, p=.335). Using a self-reported measure in a quasi-longitudinal survey snowballed (not randomly sampled) amongst staff and other mailing list members of organisations in the intervention area (final sample, n=802), which relied on participant's recall, there were increases 'walking experience' (change in mean walking experience scores [scale 0-9] from 4.84 to 6.99 (+2.37, p=.000) for the large scheme, and from 4.63 to 6.56 (+1.92, p=.000) for the smaller scheme. Changes in walking experience score were not reported for the control street. The authors also draw attention to the heavily touristed nature of the study location, which may limit transferability of this finding to other contexts.

Urban ambience, infrastructure, connectivity and access to other modes of transportation are key factors when designing an area with walkability in mind. Exploratory factor analysis of a survey of pedestrians in two European cities found that perceptions of the walkability of the urban environment were influenced by four components: 'urban ambiance', described as the 'material and affective dimensions' of the built environment; pedestrian infrastructure; 'connectivity and community facilities'; and other transport modes. Urban ambiance was principally correlated positively with residential density (r=0.823[7]) and mix of land uses (r=0.729) (including, especially, retail [r=0.743]). The pedestrian infrastructure component is principally correlated with pavement condition (r=0.795) and width (r=0.730), and lack of obstructions (r=0.770). Connectivity and Community refers to existence of a range of services that meet people's daily needs (e.g., education, health, cultural) (r=0.717) as well as availability of alternative routes (r=0.705). The availability of both car parking (r=0.806) and public transport stops (r=0.758) were correlated with the other transport modes component, highlighting the importance of infrastructure which serves multi-stage trips in planning for increased walkability. Together, the four identified components explained 58.6% of the variation in perceptions of walkability, with 'urban ambiance' explaining the most (21.9%), followed by pedestrian infrastructure (16.8%), connectivity and community facilities (10.4%) and access to other transport modes (9.5%) (Fonseca et al., 2022).

In a study undertaken in Istanbul, Turkey, the spatial structure and design of urban areas and streets were found to play a significant role in determining the volume and direction of pedestrian movements. Multivariate regression of pedestrian flows in 20 neighbourhoods concludes that the configuration of the street network (using two measures of connectivity [metric reach, being the total street length accessible from within 800m of a point – Std β=0.15[8] $p<0.001$; and directional reach, being the street length accessible from a point without having to make more than two changes of direction of over 20° – Std β=0.12, $p<0.001$]), integration (accessibility of a street to all others within 800m) (Std β=0.12, $p<0.05$) and choice (likelihood a street is used for all possible routes between pairs of origins and destinations within 800m radius) (Std β=0.09, $p<0.05$) are strongly associated with pedestrian movement densities. The number of non-residential land uses at street level is associated (Std β=0.38, $p<0.001$) with pedestrian movement densities.

7 r = Pearson correlation coefficient, which measures linear correlation between two variables. A value of one equals and perfect positive correlation; a value of one is a perfect negative correlation; a value of zero means the variables are perfectly uncorrelated.

8 Std β = standardised Beta coefficients allow a measurement of the strength and direction of the relationship between the independent variables and the dependent variable in a regression model.

Finally, street design, especially pavement width (Std β=0.17, p<0.001) and, to a much lesser extent, setback distance (Std β=0.06, p<0.1) and existence of pedestrian crossings (Std β=0.06, p<0.05), are significantly and positively associated with pedestrian movement densities (Özbil et al., 2015).

4.3.3 Parks and Green Spaces

A qualitative study undertaken in London, UK found that the density and shape of parks has a positive relationship with walking density (total length of walking trips divided by total length of all street links) within their catchments (1 km radius), both for transport related and recreational walking trips. However, larger parks were associated with lower walking density (Zhang et al., 2020) the reasoning could be that larger parks are more of a destination rather than a walking route. Areas with higher residential density have lower walking density (Zhang et al., 2020) generally higher residential areas do not have immediate access to parks and green spaces.

The study concludes that parks have an important influence on walking, but that the size and shape of parks together with their relationship to surrounding land use are important considerations in infrastructure, planning and design.

In considering the effects of green space on walking, Zhang et al. (2020) noted that the density of walking trips was higher in areas that have a higher presence of retail land use. As discussed in the previous chapter, evidence from a study of residents' views on walkability (Brookfield, 2016) found that lower densities and a green environment were important attributes, although these related more to walking for leisure rather than transport purposes and was not drawn from a socioeconomically or demographically representative study.

4.3.4 Safety, security and comfort

The evidence reviewed distinguished between safety (meaning road safety, such as that which might relate to traffic type and volume) and security (personal safety such as related to crime or antisocial behaviour). Ensuring that users feel safe and secure are important when designing active travel routes and facilities. Evidence suggests that pedestrians are concerned about both road safety and feeling safe from crime and anti-social behaviour, although the strength of the relationship varies and there may be important geographic differences as well as by gender and social class.

Evidence of the impact of traffic volumes on walking appears to vary. In a systematic review of studies of walkability, Fonseca et al. (2021) found that high traffic volumes were a barrier to active travel as they were associated with a higher risk of accidents. The same review also found studies which concluded a much weaker relationship between security and active travel levels (see also Fonseca et al., 2022, which had similar findings).

They also conclude that attributes of the built environment which give rise to safety concerns amongst users – poor street lighting, graffiti, routes which go through known crime hotspots - significantly reduce the volume of active travel. The systematic review by Fonseca et al. (2021) suggests that crime is a feature typically found to be important in South American, Asian, US, and African studies, but less so in European studies. Whilst more conclusive research is needed, the review authors, perhaps reflecting the 'safety in numbers' hypothesis, recommend that when designing active travel routes and policies, safety considerations are prioritised on lightly trafficked areas (Fonseca et al., 2022).

A non-scientific review of evidence on different components of walkability Forsyth (2015) states that, while research findings are mixed, perceived safety is likely a more important factor than reported crime rates, whilst further noting that 'perceptions vary greatly with factors such as gender and social class' (Forsyth, 2015, p. 9).

4.4 Designing for different demographic groups

According to a study by ILC-UK and Age UK (Holley-Moore & Creighton, 2015) a lack of information on active transport options and poor infrastructure in the built environment represent challenges to supporting more active travel amongst old people. They found that improving the built environment can encourage older people to walk and cycle more. Referring to the built environment, they found that older people can be put off walking due to a lack of public benches and toilets, which were felt by participants to be essential to increase confidence among older people taking longer walking trips. Holly-Moore and Creighton (2015) cite evidence by the British Toilet Association (2013) that there was a 40% drop in the number of public toilets in the UK between 2003-2013. Drawing on engagement with stakeholders, Holley-Moore and Creighton (2015) also found that encouraging mixed-use development improves the safety and convenience of active travel for older people. In addition to this, the London Area Travel Survey found that of all people with an impairment who were able to walk 30% could manage no more than 50 meters without stopping and 20% could manage between 50-200 meters (DfT, 2021).

Assumptions used in the design of pedestrian crossings are unrealistic for older people. Studies in Ireland, Spain, USA and South Africa all found that older adults have insufficient time to cross at pedestrian crossings (Asher et al., 2012). Similarly, a UK study of older people, based on interviews and a nurse visit which included timing how long it took the participant to walk 8 feet at their normal pace, found that for pedestrians aged over 65, 76% of men and 85% of women walk more slowly than the assumptions used in the design of UK pedestrian crossings (Asher et al., 2012).

The study undertaken by Asher et al. (2012) also found that being female, living in a deprived area and those in poor health were more likely to have an impairment which further excluded them from walking. It is therefore key that all demographics are considered when designing policy and infrastructure to increase active travel.

Findings discussed above suggest a potential tension in planning for active travel with equity objectives in mind. That is, schemes which improve the built environment, and which can in turn encourage more active travel are likely easier to deliver in central areas, where trip densities are high, and in those areas as well as affluent suburbs, where development values are higher and more able to withstand developer contributions to active travel schemes or built environment improvements. In contrast, less affluent areas (such as older inner suburbs) may have a higher density, more constrained urban environment where retrofitting active travel schemes is more difficult from an engineering perspective (Cunha et al., 2023). The resulting competition for road space may contribute to political opposition. Yet, to improve equity, the provision of cycling infrastructure and diversifying land uses in disadvantaged areas should be considered as important policy objectives (Cunha et al., 2023).

It may be helpful to note that specific design guidance on inclusive mobility exists – a brief summary is provided at Annex C.

4.4.1 Summary

It is difficult to identify definitively from the literature assessed a ‘one size fits all’ approach to design and the management of new developments which will lead to guaranteed increases in active travel. However, some key themes and principles can be synthesised.

Planners and urban designers may find the operationalisation of key planning and design principles difficult, especially where tensions arise. Such tensions may be particularly apparent in planning for both cycling and walking together. The factors which improve perceptions of ‘walkability’ may vary according to different demographic and socioeconomic groups. There may be difficult practical and engineering challenges; and concepts like quality and functionality may be subjective and difficult to interpret consistently. As with planning policy, education and experience are important to ensure that design can proceed from a user perspective.

Despite site specific design considerations, evidence also suggests that the underlying propensity to travel actively may be governed first and foremost by spatial and socioeconomic considerations. For example, central areas with mixed land use and higher use densities will have greater underlying rates of active travel use. Accessibility to, and the availability of amenities, including parks and public transport options, are important determinants of active travel and yet are unequally distributed across space.

5. Key determinants of and barriers to participation in active travel

Different population groups have varying needs and may face specific barriers to participation in active travel. Whilst the scope of the evidence assessment did not explicitly cover studies of specific population groups, several key determinants of and barriers to active travel participation were noted. These are summarised as follows:

5.1 Key determinants

- **Appropriate infrastructure** such as dedicated cycle lanes, paths, cycle superhighways, and workplace facilities for cyclists. Improving the surrounding built environment can encourage older people to walk and cycle more. For example, older people can be put off walking due to a lack of public benches and toilets, which can be essential to increase confidence among older people taking longer walking trips. But certain infrastructure types, such as superhighways which could encourage higher speeds or volumes, may be off-putting to some users.
- **Highway design,** including road layouts, junction design and the overall morphology of the street network. Yet, specific designs may be experienced differently by different groups.
- **Traffic management technologies,** such as 'green wave' to reduce stop/start and 'high stress' journeys. 'Green wave' technology attempts to synchronise the green phase of traffic signals across a group of intersections and routes in a way that is optimised for cyclists and reduces their need to stop and start, which may reduce the physical demands of cycled journeys and therefore improve their accessibility.
- **Neighbourhood design factors,** e.g., walkable amenities, tranquil settings, social spaces, green areas, and lower land use density – although the evidence is mixed on which attributes are valued by different population groups.
- **A supportive planning culture.** This relates to the sharing of rationales and values between policy makers which underpin active travel policies. The professionalism of active travel specialisms among planners is also considered important when planning for active travel and cycle infrastructure. Planners and professionals who travel actively themselves, and also who are representative of local populations, will be important in creating a supportive planning culture.
- **Positive portrayal of active travel.** Plans should aim for a positive portrayal of walking, wheeling and cycling, which have shared meaning that goes beyond class, gender, ethnic and other boundaries. Practically, this means care should be taken in the depiction and portrayal of active travel activities in policy documents and plans (for example, not using stereotypical imagery of cyclists or cycling behaviours).

5.2 Key barriers

- **Distance.** Evidence suggests that a key determinant of active travel is the distances that people need to cover in their day-to-day transport. Planning policy and plan making have a key role in influencing the type and location of development of the built environment. This may have implications for the type of infrastructure that could meet diverse needs. Population groups may think about time and distance in different ways – a short active journey for some may be long for others.
- **'High stress' routes.** Several studies within the review found that cyclists were prepared to take longer routes to avoid what they may perceive to be 'high stress' environments. That said, although research has found that cyclists are willing to take a moderately less direct route to find a quieter, less stressful route, ideally cyclists favour routes which flow along the shortest path. Having shorter or more direct routes may be particularly important for some groups, including disabled cyclists.
- **Lack of safety, security and comfort.** Pedestrians are concerned about both road safety and feeling safe from crime and anti-social behaviour, although the strength of the relationship varies and there may be important geographic differences as well as by gender and social class. Poor street lighting, graffiti, and routes which go through known crime hotspots also significantly reduce the volume of active travel.
- **The nature of planning as a political activity** with important power relations. Problematic power relations in transport planning have led to the marginalisation of cyclists within planning practice. The beliefs and rationalities held by urban politicians, planners and policy makers are critical in influencing behaviours and attitudes. A supportive planning culture for cycling infrastructure requires that policy makers focus on sharing the rationales and values which underpin active travel policy. Ensuring the visibility and hierarchical status of cycle infrastructure planning within the broader planning policy framework is therefore important, as is training and creating roles which promote the specialisation of transport planners in active travel.
- **Cultural, media and public opposition.** The promotion of active travel infrastructure, particularly for cycling, is regularly contested by national and local politicians within an often-divisive public discourse. Active travel infrastructure is often perceived as a threat to car-centric transport systems within the UK that citizens are heavily reliant on. Planning for dominant groups and their travel behaviours can marginalise others.
- **Lack of resources.** The way that the objectives of transport planning have been traditionally framed has tended to favour funding for motorised transport. Lack of funding and political support can lead to poor quality active travel infrastructure that undermines public support.
- **A lack of technical expertise and skills** related to active travel, including cycling, amongst planners. Some studies suggest that more planners should have personal experience of walking, wheeling and cycling to be able to effectively plan and design for active travel.

Whilst acknowledging that the search terms were general, little specific evidence addressing disability or ethnicity was found, although some studies accounted for age, gender, and living in a deprived area. Some research addressed design assumptions that are unsuitable for older people, such as insufficient time to cross at pedestrian crossings (Asher et al., 2012). Evidence also finds that females, those living in a deprived area and those with poor health are more likely to have a walking impairment which further excludes them from walking.

6. Limitations

Despite the breadth of evidence included this assessment there are several key limitations. Few tended to employ robust quasi-experimental methods that are capable, through counterfactual design, of supporting robust evidence of impacts. More typical are pre-/post studies. The methodology of studies which aim to assess the impact of planning policies and development management and design on active travel outcomes could make more use of quasi-experimental designs, natural experiments, and trials.

Although the scope of the assessment is limited to the included studies, our screening approach and use of a weight of evidence assessment meant that the most relevant studies were prioritised. Consequently, although the existence of relevant evidence cannot be ruled out, it is suggested that the specific evidence base on the link between planning and active travel is relatively weak – especially in the UK.

The following gaps are particularly evident:

- More research is needed into the UK context and the specificities of the English planning system.
- A wider range of geographic contexts needs to be covered within the evidence base, including smaller towns, rural locations, and peri-urban areas.
- Further research into how different demographic groups in society require the design of active travel infrastructure to be specifically tailored to their needs, specifically focusing on gender, ethnicity and race.
- Of the studies identified for inclusion in the study, none specifically addressed wheeling or forms of micromobility such as scooter travel.

Further research could also address the contribution of planning in a more holistic and integrated way, especially as regards the interplay between wider policy (at the level both of national guidance and local plans) and site-specific development management and design considerations. In particular:

- More research into UK specific planning policies would be beneficial, including NPPF, Local Transport Plans and Local Plans in England.
- Planning for both walking and cycling together as active travel would be beneficial– very few studies of planning policy and design appeared to consider both cycling and walking from an integrated perspective.
- Research into planning policy for people with disabilities was not found during the search; more investigation into how this would impact active travel outcomes for people with disabilities would be recommended – for example, specific evidence on the impact of guidance like Inclusive Mobility (DfT, 2021) and Manual for Streets (DfT et al., 2007; CIHT, 2010).

We found little by way of studies which provide evidence of the impact of development management in delivering intended outcomes. Further research into outcomes once planning permission has been granted would be useful, addressing for example:

- Whether permanent alterations or improvements to the public highway promised by developers through Section 278 and Section 38 agreements and which would improve infrastructure for active travel are delivered as agreed.

- The effectiveness and adequacy of Section 106 agreements (planning obligations) in contributing towards active travel infrastructure or behaviour change programmes.
- Whether specific mechanisms such as the use of Travel Plans are effective in delivering active travel outcomes and, where this is the case, the circumstances and factors which led to such effectiveness.

Finally, we did not find any evidence which answered the specific question of the likely impact of early consideration of active travel in policy and plan making. This question of the timing of intervention in policy and plan making, whether by ATE or others, remains an important gap in evidence.

7. Conclusions

This report has attempted to answer the following research questions:

- **RQ1.** What is the contribution of: Strategic planning and planning policy and Development management activities, including the role of statutory consultees like ATE?
- **RQ2.** How have land use and infrastructure planning and design led to observed outcomes? What are barriers or enablers?

The evaluated evidence highlights the complexity of the topic while also indicating that a universal 'one size fits all' approach may not be effective in enhancing the potential for, and the adoption of, active travel through planning policy. The evidence is drawn from a range of different place contexts and planning regimes, so drawing generalisable conclusions on the impact of specific planning policies is difficult. A significant observation is that much of the research establishing the connection between planning policies and active travel outcomes predominantly focuses on cities and urban settings. There is a relative scarcity of studies examining the effects of these policies in smaller towns and rural areas. Moreover, evidence specific to the planning frameworks in England or other parts of the UK is notably limited. The strength of the evidence that has been reviewed is indicated by the Weight of Evidence score, given in Annex B.

Nevertheless, the broader international evidence reviewed in this analysis suggests that planning policies, at a general level, are important in encouraging active modes. Considering planning and design may be particularly important for enabling and encouraging active commuting, especially over longer distances by cycling. Strategic plans and planning policy have a particular important role in enabling active travel due to their influence on land use density, the spatial organisation of land uses, and the configuration of transport networks. These factors influence travel demand, the distances that must be covered, and the suitability of routes for walking, wheeling and cycling.

Furthermore, planning policies can establish requirements for new developments that support active travel. There is specific evidence showing that workplace facilities for cyclists and incentives, potentially funded through developer contributions, positively affect cycling commuting rates. For walking, the evidence indicates a significant correlation between the design of the built environment and increased walking activity. This correlation is influenced by factors such as land use type and mix, land use density, perceived quality of the built environment, availability of amenities, and the provision of dedicated walking infrastructure. Pedestrians tend to favour neighbourhoods with walkable amenities, tranquil settings, social spaces, green areas, and lower land use density. Whilst the evidence assessed tended not to refer to wheeling specifically, which has specific barriers and enablers especially in terms of design, many planning policies which generally promote walking should also enable wheeling.

The evidence points to various political, resource, and institutional barriers, as well as broader stakeholder attitudes, that limit the effectiveness of planning policies in advancing active travel outcomes. While planning policy plays a crucial role in normalising cycling as a viable mode of transport and reducing associated stigma, there is also a need for education, awareness, and communication efforts to address attitudes and decision-making processes rooted in traditional car-centric spatial and transport planning paradigms. The literature emphasises the importance of identifying and targeting specific groups, such as local politicians, transport engineers, journalists, and other stakeholders who influence funding decisions. Additionally, it underscores the value of first-hand experience with active travel among practitioners in the field.

- **RQ3.** Does land use and infrastructure planning and design lead to better outcomes for active travel?

Overall, the evidence indicates that the design of infrastructure, along with the existing and planned land use of an area, plays a crucial role in influencing active travel outcomes. However, these outcomes are sometimes contested within the evidence, and in some cases, the underlying or explicit theory of change is complex. Additionally, the evidence suggests that the demographic or socioeconomic context of an area is significant in shaping perceptions of what constitutes a 'walkable' or 'bikeable' built environment and the active travel outcomes that are achieved.

It is important to note, however, that although these research questions were key in directing the search strategy and guiding the extraction of findings, there was limited evidence available that directly addressed these specific questions. This highlights several important gaps in the current evidence base.

7.1 Future research

There is a specific need identified for robust studies which evaluate the impact of specific planning policies and activities. For example, no evidence was found that was capable of isolating the impact of changes to (for example) NPPF or how developer contributions may be contributing to active travel outcomes.

Given that the evidence demonstrates how planning exerts its influence on active travel in indirect ways – such as by influencing the density and arrangement of the built form – future research will need to control carefully for the impact of wider covariates on active travel outcomes. For example, to determine the additionality of specific activities, such as the statutory consultation of applications over specific thresholds, on active travel outcomes, studies will need to account for the general influence of guidance on promoting factors generally associated with positive active travel outcomes (e.g. densification).

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Annex A – Database searches

Database	Scopus
Fields	Title and Abstract
Years	2013 - 2024
Document Types	Articles or Reviews
County/region	UK, Europe, North America, Australia or New Zealand
Subject	Social Sciences and Environmental Sciences

Sub-Theme	Search string	Results
Planning policy	TITLE-ABS (″Active travel″ OR bicycl* OR cycl* OR bik* OR walk*) AND (″national planning policy framework″ OR ″nppf OR ″spatial strategy″ OR ″planning policy″ OR ″planning policy guidance″ OR ″PPG″ OR ″npps″ OR ″housing growth″ OR ″transport planning″ OR ″spatial structure″ OR ″scale, location″ OR ″proximity″ OR ″density″ OR ″land use″ OR ″site selection″ OR ″deliverability″ OR ″sustainable development″ OR ″decarbonisation″ OR ″healthy communities″ OR ″safe communities″ OR ″design quality″ OR ″design code″ OR ″place quality″ OR ″pride in place″ OR ″accessibility″ OR ″permeability″ OR ″connectivity″ OR ″green space″ OR ″open space″) AND PUBYEAR > 2012 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE , ″ar″) OR LIMIT-TO (DOCTYPE , ″re″)) AND (LIMIT-TO (LANGUAGE , ″English″))	9,391
Network design	TITLE-ABS (″Active travel″ OR bicycl* OR cycl* OR bik* OR walk*) AND (″network design″ OR ″network management″ OR ″network management duty″ OR ″road space reallocation″ OR ″network plan*″) AND PUBYEAR > 2012 AND PUBYEAR < 2025 AND (LIMIT-TO (SRCTYPE,″j″)) AND (LIMIT-TO (DOCTYPE,″ar″) OR LIMIT-TO (DOCTYPE,″re″)) AND (LIMIT-TO (LANGUAGE,″English″))	84
LCWIP development	TITLE-ABS (″Active travel″ OR bicycl* OR cycl* OR bik* OR walk*) AND (″Local Transport plan*″ OR ″LTP″ OR ″Local Cycling and Walking Infrastructure Plan*″ OR ″LCWIP″ OR ″network plan*″ OR ″Rights of Way″ OR ″S278″ OR ″section 278″ OR ″Cycle Audit″) AND PUBYEAR > 2012 AND PUBYEAR < 2025 AND (LIMIT-TO (SRCTYPE , ″j″)) AND (LIMIT-TO (DOCTYPE , ″ar″) OR LIMIT-TO (DOCTYPE , ″re″)) AND (LIMIT-TO (LANGUAGE , ″English″))	357
Local Plans development	TITLE-ABS (″Active travel″ OR bicycl* OR cycl* OR bik* OR walk*) AND (″Local Plan*″ OR ″Area Action Plan*″ OR ″Neighbourhood Plan*″ OR ″Supplementary Planning Guidance″ OR ″SPG″ OR ″Design Brief″ OR ″Transport Plan*″ OR ″Transport Assessment, Transport Statement″ OR ″Travel Demand Management Plan*″ OR ″Planning Obligation″ OR ″Community Infrastructure Levy″ OR ″CIL″ OR ″site allocation″ OR ″viability appraisal″ OR ″Road Safety audit″ OR ″Local plan inspection″ OR ″examination in public″ OR ″EIP″ OR ″London Plan″) AND PUBYEAR > 2012 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE , ″ar″) OR LIMIT-TO (DOCTYPE , ″re″)) AND (LIMIT-TO (LANGUAGE , ″English″))	1,441
Planning applications	TITLE-ABS (″Active travel″ OR bicycl* OR cycl* OR bik* OR walk*) AND (“development management” OR “planning application” OR “planning consent” OR “statutory consult*” OR “planning agreement” OR “planning obligation” OR “developer agreement” OR “s106” OR “section 106” OR “design and access statement”) AND PUBYEAR > 2012 AND PUBYEAR < 2025 AND (LIMIT-TO (SRCTYPE , ″j″)) AND (LIMIT-TO (DOCTYPE , ″ar″) OR LIMIT-TO (DOCTYPE , ″re″)) AND (LIMIT-TO (LANGUAGE , ″English″))	804

Sub-Theme	Search string	Results
Organisational travel planning and engagement	TITLE-ABS (″Active travel″ OR bicycl* OR cycl* OR bik* OR walk*) AND (″organisational travel plan*″ OR ″transport impacts″ OR ″modeshift″ OR ″modeshift STARS″ OR ″Sustainable Modes of Travel Strategy″ OR ″SMOTS″) AND PUBYEAR > 2012 AND PUBYEAR < 2025 AND (LIMIT-TO (SRCTYPE , ″j″)) AND (LIMIT-TO (DOCTYPE , ″ar″) OR LIMIT-TO (DOCTYPE , ″re″)) AND (LIMIT-TO (LANGUAGE , ″English″))	130
Scheme planning and design	TITLE-ABS (″Active travel″ OR bicycl* OR cycl* OR bik* OR walk*) AND (″scheme planning″ OR ″scheme design″ OR ″LTN 1/20″ OR ″Cycling infrastructure design″ OR ″manual for streets″ OR ″MfS″ OR ″National Design Guide″ OR ″National Model Design Code″ OR ″NMDC″ OR ″accessibility″ OR ″amenities″ OR ″design* for walking″ OR ″building for a healthy life″ OR ″BHL″ OR ″streets for a healthy life″ OR ″streets for all″ OR ″junction safety″ OR ″cycle parking, cycle facilit*″ OR ″cycle hub″ OR ″green infrastructure design guide″ OR ″active design″) AND PUBYEAR > 2012 AND PUBYEAR < 2025 AND (LIMIT-TO (SRCTYPE , ″j″)) AND (LIMIT-TO (DOCTYPE , ″ar″) OR LIMIT-TO (DOCTYPE , ″re″)) AND (LIMIT-TO (LANGUAGE , ″English″))	3,692

Google (grey literature)

Table 9: Search strings used in Google

String no	String	No of results
1	(INTITLE:research OR study OR analysis OR evaluation OR impact) AND (active AROUND(2) (travel OR commute OR journey OR transport)) AND (planning AROUND(2) policy) AND AFTER:2012	21
2	(INTITLE:research OR study OR analysis OR impact OR evaluati:on) AND (active AROUND(2) (travel OR commute OR journey OR transport)) AND planning AND ((development AROUND(2) management) OR application OR permission OR consent OR statutory AROUND(2) consult* AND AFTER:2012	8
3	(INTITLE:research OR study OR analysis OR impact OR evaluation) AND (active AROUND(2) (travel OR commute OR journey OR transport)) AND planning AND NPPF AND AFTER:2012	79
4	(INTITLE:research OR study OR analysis OR impact OR evaluation) AND (active AROUND(2) (travel OR commute OR journey OR transport)) AND planning AND network AROUND(2) (design OR management) OR roadspace AND AFTER:2012	30
5	(INTITLE:research OR study OR analysis OR impact OR evaluation) AND (active AROUND(2) (travel OR commute OR journey OR transport)) AND LCWIP AND AFTER:2012	28
6	(INTITLE:research OR study OR analysis OR impact OR evaluation) AND (active AROUND(2) (travel OR commute OR journey OR transport)) AND (″Local Plan*″ OR ″Area Action Plan*″ OR ″Neighbourhood Plan*″ OR ″Supplementary Planning Guidance″ OR ″SPG″ OR ″Design Brief″ OR ″Transport Plan*″ OR ″Transport Assessment, Transport Statement″ OR ″Travel Demand Management Plan*″ OR ″Planning Obligation″ OR ″Community Infrastructure Levy″ OR ″CIL″ OR ″site allocation″ OR ″viability appraisal″ OR ″Road Safety audit″ OR ″Local plan inspection″ OR ″examination in public″ OR ″EIP″ OR ″London Plan″) AND AFTER:2012	32

Annex B – Details of sources included in the full assessment

Reference and DOI	Method / data	Sample	Geography	Weight of Evidence score	Reason for inclusion where WoE is not high	Planning policy	Development management and design
Alattar, M.A., Cottrill, C., & Beecroft, M. (2021). 'Modelling cyclists' route choice using Strava and OSMnx: A case study of the City of Glasgow. *Transportation Research Interdisciplinary Perspectives*, 9, 100301.	Spatial analysis of Strava data	Approx. 13,000 trips	UK	13 (High)	N/A	✓	✓
Aldred, R., Watson, T., Lovelace, R., Woodcock J (2019). Barriers to investing in cycling: Stakeholder views from England. *Transportation Research Part A: Policy and Practice*, 128, 149–159.	Survey and interviews	413 respondents, 7 interviews	UK	11 (Med)	Relevance, Real World	✓	✓
Asher, L., Aresu, M., Falaschetti, E., & Mindell, J. (2012) Most older pedestrians are unable to cross the road in time: a cross-sectional study. *Age and Ageing*. 41(5), 690-694.	Cross-sectional survey	3,145 adults aged ≥65 years	UK	14 (High)	ATE/DfT recommended	✓	
Banerjee A., Łukawska M., Jensen A.F., & Haustein S. (2022). Facilitating bicycle commuting beyond short distances: insights from existing, literature. *Transport Reviews*, 42(4), 526-550.	Systematic review	31 Papers	UK, Europe, Australia, North America	10 (Med)	Review Paper, Relevance	✓	✓
Brookfield, K. (2016). 'Residents' preferences for walkable neighbourhoods. *Journal of Urban Design*, 22(1), 44–58.	Focus groups	46 individuals from 11 residents groups	UK	11 (Med)	Ensure coverage across Sub themes, Real World, UK Based	✓	✓
Cambra, P., &Moura, F. (2020). How does walkability change relate to walking behavior change? effects of a street improvement in pedestrian volumes and walking experience. *Journal of Transport & Health*, 16, 100797.	Pedestrian Counts, Surveys	37 streets	Portugal	10 (Med)	Relevance to theme	✓	✓

Reference and DOI	Method / data	Sample	Geography	Weight of Evidence score	Reason for inclusion where WoE is not high	Planning policy	Development management and design
Cunha, I., Silva, C., & Büttner, B. (2023). 'Practitioners' perspectives on cycling equity: Bridging the gap between planning priorities'. *Transportation Research Part D: Transport and Environment*, 123, 103902.	Focus groups, interviews and surveys	21 practitioners in 3 case study cities	Portugal, Germany, Finland	14 (High)	N/A	✓	✓
Dhanani, A., Tarkhanyan, L., & Vaughan, L. (2017). Estimating pedestrian demand for active transport evaluation and planning. *Transportation Research Part A*, 103, 54-69.	Census and Ordnance Survey data	N/A	UK	9 (Med)	Relevance to theme	✓	✓
Fonseca, F., Papageorgiou, G., Tondelli, S., Ribeiro, P., Conticelli, E., Jabbari, M., & Ramos, R. (2022). Perceived Walkability and Respective Urban Determinants: Insights from Bologna and Porto. *Sustainability*, 14, 9089.	Questionnaire survey	1,438 respondents	Italy, Portugal	12 (High)	N/A	✓	✓
Fonseca, F., Ribeiro, P.J.G., Conticelli, E., Jabbari, M., Papageorgiou, G., Tondelli, S., & Ramos, R.A.R. (2021). Built environment attributes and their influence on walkability. *International Journal of Sustainable Transportation*, 16(7), 660–679.	Systematic review	132 Documents	38 countries (59% from Australia and North America)	10 (Med)	Review, Relevance to theme	✓	
Hagen, O.H., & Rynning, M.K. (2021). Promoting cycling through urban planning and development: A qualitative assessment of bikeability. *Urban, Planning and Transport Research*, 9(1), 276–305.	Case study	2 cities	Norway	8 (Low)	Relevance to theme		✓
Holley-Moore, G., & Creighton, H.J. (2015). The Future of Transport in an Ageing Society, Age UK.	Focus groups	Unknown	UK	7 (Low)	ATE/DfT recommended	✓	✓

Reference and DOI	Method / data	Sample	Geography	Weight of Evidence score	Reason for inclusion where WoE is not high	Planning policy	Development management and design
Hooper, P., Knuiman, M., Bull, F,. Jones, E., & Giles-Corti, B. (2015). Are we developing walkable suburbs through Urban Planning Policy? identifying the mix of design requirements to optimise walking outcomes from the "liveable neighbourhoods" planning policy in Perth, Western Australia. *International Journal of Behavioral Nutrition and Physical Activity*, 12(1).	Questionnaire survey	664 respondents in 36 neighbourhoods	Australia	14 (High)	N/A	✓	✓
Koglin, T. and Rye, T. (2014). The marginalisation of bicycling in Modernist Urban Transport Planning. *Journal of Transport & Health*, 1(4), 214–222.	Theoretical review	N/A	N/A	11 (Med)	Review, Ensure Coverage across sub-themes	✓	✓
Liu, G,. te Brommelstroet, M., Krishnamurthy, S., & van Wesemale, P. (2019). Practitioners' perspective on user experience and design of Cycle Highways. *Transportation Research Interdisciplinary Perspectives*, 1, 100010.	Interviews - longitudinal	11 practitioners	Netherlands, Belgium, Germany, Denmark, UK	14 (High)	N/A	✓	
Losada-Rojas, L.L., Pyrialakou, D., Waldorf, B.S., Banda, J.A., & Gkritza, K. (2022). The effect of location on physical activity: Implications for active travel. *Journal of Transport Geography*, 104, 103441.	Surveys - longitudinal	2,600 responses	USA	11 (Med)	Relevance, Recent Study	✓	
Manaugh, K., Boisjoly, G., & El-Geneidy, A. (2017). Overcoming barriers to cycling: understanding frequency of cycling in a University setting and the factors preventing commuters from cycling on a regular basis. *Transportation* 44, 871–884.	Cross-sectional survey	6,600 University students and staff	Canada	13 (high)	N/A	✓	
Özbil A., Yeşiltepe D.,& Argin G. (2015). Modeling walkability: The effects of street design, street-network configuration and land-use on pedestrian movement. ITU.	On site observations, street audits, modelling	790 street segments	Turkey	12 (High)	N/A	✓	✓

Reference and DOI	Method / data	Sample	Geography	Weight of Evidence score	Reason for inclusion where WoE is not high	Planning policy	Development management and design
Saghapour, T., Moridpour, S., & Thompson, R. (2019). Sustainable transport in neighbourhoods: effect of accessibility on walking and bicycling. *Transportmetrica A: Transport Science*, 15(2), 849-871.	Travel data - cross section survey and census data; modelling	16,411 Survey responses	Australia	12 (High)	N/A	✓	✓
Zhang, X., Melbourne, S., Sarkar, C., Chiaradia, A., Webster, C. (2020) 'Effects of green space on walking: Does size, shape and density matter?', *Urban Studies*, 57(16), pp. 3402–3420.	London Travel Demand Survey	54,910	UK	11 (Med)	UK Based, Real World, Relevance	✓	✓
Zhao, C,. Carstensen, T.A,. Sick-Neilsen, T.A., Olafsson, A.S. (2018) 'Bicycle-friendly infrastructure planning in Beijing and Copenhagen - between adapting design solutions and learning local planning cultures', *Journal of Transport Geography*, 68, pp. 149–159.	Interviews and Comparison between countries	11 planners	Denmark and China	14 (High)	N/A	✓	✓

Annex C – Note on design guidance

The included studies said little about the design of places and the uptake of active travel for disabled people. This is a recognised gap in the literature (Cook et al., 2022). Although it was not a study of a specific planning tool or intervention, and therefore not reviewed as part of this evidence assessment, Andrews et al. (2018) provide a useful review of how disability is represented within transport and cycling strategies in London, including a discussion of barriers. Relevant UK government guidelines are set out in Inclusive Mobility – a Guide to Best Practice on Access to Pedestrian and Transport Infrastructure (DfT, 2021) on designing transport infrastructure to ensure that it is accessible and inclusive to all. Some of the key design recommendations for planners and developers are as follows:

- Design of pedestrian routes needs to include appropriate seating as 24% of respondents to the London Area Travel Survey could manage 5-10 minutes of standing before requiring a rest. However, street furniture must be appropriately positioned to ensure the minimum recommended footway width is still achievable. This must also not be of detriment to visually impaired people. This is also supported by the Manual for Streets where it also recommends that seating is covered by streetlights and CCTV as it can attract antisocial behaviour.
- The width of footways is required as a minimum to be 1.5m as this allows a wheelchair and pedestrian to pass, however it is preferred under normal circumstances that a 2m footway is provided to allow safe passing of two wheelchairs.
- Design of tonal and colour contrasts for visually impaired people, specifically focused on poles and obstructions on the footway.
- Gradients should not exceed one in 20 as this is the maximum a wheelchair user can manage under normal circumstances.
- Where a footway has a hazard, precautionary handrails must be installed, for example a steep slope or drop.