Department for Transport

COVERING NOTE

CWIS Insights Paper

Document status summary

The validity of the key principles and scenarios used in the model underlining the findings contained in this paper produced in 2019 has been affected by subsequent events. As a result, the headline cost ranges produced for each scenario and referenced in this paper are no longer valid.

Context

Following the publication of the first Cycling and Walking Investment Strategy (CWIS1) in April 2017, the Department commissioned Arup AECOM Consortium and Transport for Quality of Life to conduct the CWIS modelling project. This project aimed to understand how much additional investment would be needed to achieve the CWIS aims and target for 2025. A range of scenarios were developed to test what the costs and benefits would be under each.

This paper was produced in 2019 by Arup, AECOM Consortium and Transport for Quality of Life working closely with the Department and summarises the outputs from the CWIS Investment Model. The model draws on over 200 sources of evidence to estimate the impact of active travel investment on walking, cycling, and walk-to-school stages in England. The technical report and annexes setting out this evidence produced by Transport for Quality of Life were published on 7th February 2020.

The CWIS model, using packages of interventions under different scenarios, is based on three key principles:

Effectiveness of interventions (cost per trip) – the investment cost per additional trip generated. Revenue interventions are typically more effective in the short term but the impact fades (decays) more rapidly over time.

Intrinsic Potential – the effectiveness of interventions varies between different locations, depending on its Intrinsic Potential. This is calculated based on area-specific evidence including hilliness, deprivation, and demographic factors.

Synergy effects – when revenue and capital interventions are jointly delivered in the same location, they are more effective than when the same interventions made independently.

This paper refers to four 'central' scenarios which were used to inform the range of results, which were the 4 most plausible scenarios in practice at the time the research was carried out. The other scenarios (referred to as the 'higher cost' and 'lower cost' scenarios in the paper) provided illustrative sense checks of specific assumptions on the increase in active travel stages and value for money.

Validity of this paper

The validity of the key principles and scenarios used in the model has been affected by subsequent events, including inflation, and the long-term impact of covid-19 on travel behaviour. Active Travel England being established is also a notable change during this time. These events have changed the effectiveness of schemes and validity of scenarios modelled for the CWIS Insights paper, meaning that the headline cost ranges produced for each scenario and referenced in this paper (produced in 2019) are no longer valid. This report also includes redundant placeholder text concerning funding at para 2.13 which was not subsequently announced at the 2020 Budget.

Further work is required to update the CWIS Investment Model evidence base and scenarios to reflect recent events and build in new evidence. This will be developed as part of the preparation for the third Cycling and Walking Investment Strategy (CWIS3).

Department for Transport

ARUP AECOM

transport for quality of life

Cycling & Walking Investment Strategy

Insights from Investment Modelling

February 2020

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Contents

1. Executive summary 4
2. Introduction 8
   The Cycling and Walking Investment Strategy (CWIS) 8
   The Active Travel Investment Models 10
3. Progress towards the CWIS Aims and Target 16
4. Results and Insights 20
   Cycling Model 20
   Walking Model 22
   Walking to School Model 25
5. Benefits of Active Travel 28
6. Uncertainties 30

1. Executive summary

1.1 This paper sets out the results of the DfT's three Active Travel Investment Models. These models apply the latest evidence to estimate the impact of a range investment scenarios, on national levels of cycling, walking and walking to school.

1.2 The models have been developed to assess how the aims and target set out in the Cycling and Walking Investment Strategy (CWIS) for 2025 might be achieved, and the costs and benefits of the different options. Results from the models are also being used to inform the development of the next phase of the investment strategy, which will be aligned with the 2020 Spending Review period.

1.3 In summary it is estimated that, in the central scenarios set out in this report, some £5-8 billion of further investment across the economy (not solely using funds from central Government) is required to reach the cycling aim of 1.6 billion cycle stages[1], and some £400 million to increase walk to school rates by primary school children to 55%. The further investment required includes the funding to be allocated from the £5 billion buses and cycling package, announced by the Prime Minister on 11 February.

1.4 Benefit cost ratio (BCRs) for the cycling central scenarios are in the range 2.0 to 3.1, implying high value for money. Packages of interventions in areas with a high intrinsic cycling potential have BCRs over 5. Value for money of investment in walking to school is expected to be at least High.

1.5 The aim to increase walking to 300 stages per person per year has already been met. The walking investment model was instead used to assess the potential costs and benefits of increasing walking stages to meet a more stretching aim over the next period. This will be used to inform a review of the walking aim. Walking scenarios offer high or very high value for money with BCRs for central walking scenarios range between 2.6 and 3.8.

1.6 Increased active travel generates substantial social benefit, including improving health, increased productivity, lower congestion, better air quality and more attractive places. Value for money judgement for cycling, walking and walking to school central scenarios offer at least high value for money. BCRs alone underestimate the value of investment, they are calculated using conservative assumptions and omit real and potentially significant benefits that can not be quantified with current evidence.

1.7 Some interventions aimed at walking to school may also increase walking and cycling by adults, and some walking interventions may also increase cycling. This means that the benefits of the modelled options are likely to be somewhat higher than reported here.

[1] Stage: Trips consist of one or more stages. A new stage is defined when there is a change in the mode of transport.

Cycling

1.8 By 2025, current and committed investment is expected to get us about 40% of the way to our aim of 1.6 billion cycle stages.

1.9 In four most likely 'central' scenarios, the total investment needed to make up the remaining 60% is between £5.2 billion and £8.2 billion, depending on what the investment funds and where. Investment needed to reach the aim is estimated to offer high value for money. BCRs for the central scenarios are in the range 2.0 and 3.1, implying high value for money.

1.10 In two more challenging scenarios in which cycling investment is combined with strong traffic restraint, the additional investment needed to reach 1.6 billion stages is between £3.4 billion and £5.4 billion. Interventions could be as much as 30% more effective when delivered alongside traffic restraint measures, such as parking restrictions.

1.11 In two 'higher cost' scenarios in which all investment is in infrastructure (without accompanying revenue investment in behaviour change interventions to maximise take-up of new infrastructure) the additional investment to reach 1.6 billion stages is more than £10 billion. Investing only in capital is not reflective of national cycling investment, yet these scenarios illustrate the impact of adjusting the balance between revenue and capital investment.

1.12 Results suggest meeting the cycling aim by 2025 is only possible if investment is spread across all parts of the country, or if investment is accompanied by traffic restraint measures. However, it would be possible to reach the cycling aim slightly later (by 2027 or 2028) under most scenarios that have been modelled.

1.13 The model assumes that some places have greater intrinsic cycling potential than others. Factors that influence the cycling potential of an area include hilliness, journey distances, age profile and level of deprivation. Investment is expected to have more impact in places with higher intrinsic potential.

1.14 Deprived areas, which tend to have poorer health outcomes, also tend to have a lower intrinsic cycling potential. Reaching the aim by investing in these areas will require around £1.3 billion more than when investment is concentrated in areas with higher potential. However, value for money is projected to be similar, as greater health benefits will be generated from getting less active people cycling.

1.15 Revenue interventions, such as cycle training and workplace initiatives, are highly cost-effective and can increase cycling quickly. At investment levels of around £5-8 billion, these revenue interventions only represent 4-7% of the total investment, due to practical limits to the scale at which such revenue interventions can be delivered. With smaller budgets, the optimum proportion of revenue would be considerably higher. The impact of revenue investment is assumed to decay over time, with the rate of decay varying depending on the type of intervention.

1.16 The effect of capital investment in cycle infrastructure can take several years to build up to maximum impact. However, with ongoing maintenance, benefits from investment will continue to be realised over a longer period than revenue interventions.

1.17 The most effective way to achieve significant increases in cycling is through a package of capital and revenue interventions. There is evidence of a synergy factor when delivering complementing capital and revenue intervention in the same location, this would increase effectiveness of interventions, compared to

delivering the same interventions in separate locations. This would increase effectiveness of the central scenarios, beyond what has been estimated, but has not been included due to uncertainty in the extent of the impact.

Walking

1.18 The 2025 walking aim has already been met, even when it is adjusted for improvements in the way walking data is collected, which have led to less underreporting of short walks. The Walking Model has instead been used to understand the potential impact of different amounts of investment on future levels of walking.

1.19 After 10 years of decline in walking rates, there has been significant increase in recent years. The cause of the recent increase and whether it will continue is uncertain. However, firm and committed investment alone is not projected to increase walking substantially by 2025.

1.20 Due to uncertainty in estimating future walking demand without additional investment, results are presented as additional stages per person per year, rather than the total number of walking stages per person per year.

1.21 At investment of £600 million per year, walking is predicted to increase by between 13 and 17 stages per person per year between 2017 and 2025 in three 'central' scenarios that were modelled. BCRs of central these central scenarios range between 2.6 and 3.8, implying high or very high value for money.

1.22 In the areas where this investment would be targeted, the most effective investment in this range would increase walking by nearly one extra walk stage per person per week. This represents an increase in physical activity of 10 minutes per person per week, a worthwhile contribution towards the national target for physical activity for many people in these areas.

1.23 Investment that combines capital and revenue interventions performs better, in terms of additional walking, than investment that is solely composed of capital interventions.

1.24 As with the Cycling Model, the Walking Model assumes that some places have greater intrinsic walking potential than others. Factors that influence the walking potential of an area include density of housing, proportion of women, car ownership and level of deprivation. Deprived areas tend to have lower intrinsic walking potential.

1.25 Revenue interventions aimed at encouraging greater bus use could play a significant role in increasing levels of walking, they offer highly cost-effective ways to increase walking and could be delivered on a fairly large scale.

1.26 Changes to land use planning policy to avoid development of housing in car-dependent locations and to encourage it in urban areas, coupled with policy to encourage highly walkable design, could be a highly effective way to increase walking.

1.27 Some interventions affect both walking and cycling. However, most measures that are delivered on a large scale either affect walking or cycling. The saving on a combined budget for both walking and cycling would be about 1-2%.

Walking to school

1.28 Current and committed expenditure on walking to school is unlikely to deliver any substantive increase in walking mode share. It is predicted that total investment of between £420 and £450 million is needed to achieve the 2025 walk to school target, which is to increase the percentage of children aged 5 to 10 that usually walk to 55%. With sufficient investment the target can be met by 2025 in all scenarios.

1.29 The most cost-effective scenarios involve a combination of capital investment in infrastructure, revenue investment in walking promotion campaigns, and initiatives to close streets to traffic outside schools at the start and end of the school day. If the only interventions are capital investment in infrastructure, the cost of reaching the target is significantly higher.

1.30 Investment in walk to school interventions has the biggest impact on walking levels in areas with the worst health outcomes. This is because on average these areas have higher walk to school potential. Targeting these areas will enable the target to be met at the least cost and will likely deliver the highest health benefits.

1.31 Walk to school interventions are expected to offer at least High value for money. This is of an equivalent value for money as cycling and walking central scenarios. BCR calculations for walk to school scenarios omit substantial elements of the benefits expected, due to insufficient evidence to quantify benefits, including improved health for children.

2. Introduction

2.1 The analysis presented in this report has been conducted to assess the level of action needed to meet the 2025 cycling and walking target and aims, as set out in the Cycling and Walking Investment Strategy (CWIS).

2.2 This section summarises what was set out in the CWIS, explains the objectives of the analysis and gives an overview of the structure, underlying evidence base and assumptions used in the three Active Travel Investment Models for cycling, walking and walking to school.

The Cycling and Walking Investment Strategy (CWIS)

2.3 In April 2017 the Government published the statutory Cycling and Walking Investment Strategy (CWIS)[2], which set out the long-term ambition to make cycling and walking the natural choices for short journeys, or as part of a longer journey, by 2040.

2.4 This strategy represented a shift in approach from short term, stop start interventions towards a strategic long-term approach up to and beyond 2040.

2.5 To ensure we stay on track towards the long-term ambition for 2040 and begin to capture the significant social benefits from active travel, we set intermediate objectives for 2020 and aims and a target for 2025.

2.6 By 2020 the Department aims to increase cycling, walking and the percentage of children aged 5 to 10 that usually walk to school.

2.7 By 2025 the Department aims to:

- **Double cycling, where cycling activity is measured as the estimated total number of cycling stages made each year, from 0.8 billion stages in 2013 to 1.6 billion stages in 2025**
- **Increase walking activity, where walking activity is measured as the estimated total number of walking stages per person per year, to 300 stages per person per year in 2025**
- **Increase the percentage of children aged 5 to 10 that usually walk to school from 49% in 2014 to 55% in 2025**

2.8 Achieving all the aims and target for 2025 is challenging. It was suspected that current trends, investment and policies would not be enough on their own, and that a significant increase in investment would be needed to meet our 2025 aims and target.

[2] DfT (2017), "Cycling and Walking Investment Strategy": https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/603527/cycling-walking-investment-strategy.pdf

2.9 There is significant potential for more active travel. For instance, two out of every three personal trips are within five miles, which is an achievable distance to cycle for most people, and many shorter journeys are also suitable for walking.

2.10 For school children, the opportunities are even greater. Three quarters of children live within a 15-minute cycle ride of a secondary school, while more than 90% live within a 15-minute walk or bus journey from a primary school.

2.11 Whilst the Department for Transport is a key player in active travel investment, the total quantum of investment comes from a range of sources. Consequently, achieving the aims and target requires coordination with a complex delivery chain including a range of Government departments, dozens of agencies, public and non-Government organisations and hundreds of Local Authorities.

2.12 The CWIS identified £1.2bn which would likely be invested in cycling and walking over the period 2016-21. This included over £300m of dedicated funding and other funding drawn from Cycling Ambition Cities, Highways England, schemes already committed in the Local Growth Fund and a portion of the Integrated Transport Block based on previous trends.

2.13 Investment over this period has since been projected to exceed this amount, with a revised estimated total of some £2.4bn, equivalent to around £10 per head in England. Additionally, on 11 February the Prime Minister announced a new £5 billion funding package for buses, cycling and walking, of which £X [We expect to announce this at Budget] billion is projected for active travel. While this additional funding will provide part of the additional investment required to get us to our aims and target, it is unlikely that it will be sufficient.

3.

The Active Travel Investment Models

3.1 Following the setting of the CWIS aims and target for 2025, the Department commissioned Arup AECOM Consortium and Transport for Quality of Life to undertake the CWIS modelling project, with the objective to determine:

a. **The gap to achieving the aims and target** - This is derived from understanding the impact of firm and committed investment, from all sources, on cycling, walking and walking to school rates by 2025.

b. **The cost to bridge the remaining gap** - This is the total quantum of additional investment, under different scenarios, that would be required to raise levels of active travel to the level set in the aims and target for 2025.

3.2 This project has led to the development of three Excel based Active Travel Investment Models, covering cycling, walking and walking to school. The models draw on the latest evidence to estimate the impact of active travel interventions on levels of cycling, walking or walking to school between 2020 and 2040.

3.3 Scenarios have been created in each model to represent a range of options to reach the respective aim or target. These scenarios differ in the combinations of interventions used and where investment takes place.

3.4 Investment costs and additional active travel stages predicted by the models have been used to determine the value for money of the different scenarios. This has been done by applying established cost benefit analysis methods and taking non-monetised benefits into consideration.

3.5 Results from this project have provided the Department with the means to determine the total quantum of investment required, and assess the different ways to achieve the CWIS aims and target. This analysis is proving to be pivotal in informing the level of Government investment on active travel required beyond the 2015 spending review period.

Evidence and Model Design

3.6 The input assumptions to the model draw on a comprehensive assessment of the existing evidence base, including over 200 sources of evidence from past active / sustainable travel programmes such as Sustainable Travel Towns, Cycling Demonstration Towns, Local Sustainable Transport Fund, and Cycle City Ambition; academic literature; and grey literature including evaluations of active travel interventions delivered by NGOs and transport consultancies.

3.7 An overview of the evidence, and an explanation of how it has been applied, is available in an earlier paper on the model structure and evidence base[3] and an accompanying technical appendix[4].

3.8 The key model parameters that have been developed from the evidence include:

- **The counterfactual** - This is the predicted level of cycling, walking and walking to school with only current and committed spending (excluding the new £5 billion buses and cycling package, which has not yet been allocated). This has been calculated using local data from local authorities where cycling and walking growth is most pronounced, Census data, and knowledge of committed investment. It enables us to determine the expected 'gap' that will need to be met by additional investment and policy. Further explanation of how the counterfactual was developed is set out in the earlier paper and a technical appendix[5].
- **Costs per additional stage generated** - the evidence gathered from over 200 sources has been used to estimate the 'cost per additional stage generated' of 30 active travel interventions. This is used as the basis to estimate the impact of different active mode interventions. Further explanation of how costs per stage were derived is set out in the earlier paper and a technical appendix[6].
- **Expected build up and decay rates of effects of interventions** - This enables the development of a profile of impact over the life time of each intervention. This profile is different for capital and revenue interventions: the effect of revenue interventions builds up quickly but decays over time, whilst the effect of capital interventions takes longer to build up but does not decay if the resulting infrastructure is maintained. Empirical evidence about build up and decay rates is limited, but the assumptions used in the models are consistent with those used in previous research.
- **Influence of local characteristics on effectiveness of interventions** - Interventions are likely to be more effective in some places than in others. To account for this, analysis has been conducted to determine the characteristics influencing demand for cycling, walking and walking to school. This has enabled 'intrinsic potential' factors to be developed for each local authority. These factors enhance or dampen the average 'cost per additional stage generated' of an intervention depending on the characteristics of the local authority. Further explanation of how intrinsic potential factors were derived is set out in the earlier paper and a technical appendix[7].
- **Impact of traffic restraint** - implementing a cycling or walking intervention whilst also making car journeys less attractive through traffic restraint will increase the impact of the intervention. The model enables an adjustment to be made in scenarios where traffic restraint is assumed. There is relatively little evidence that enables the size of this effect to be quantified.

[3] Sloman L, Cairns S, Green A, Hopkinson L and Perrotta F (2019) CWIS Active Travel Investment Models: Model structure and evidence base

[4] Hopkinson L, Cairns S, Heinen E, Schuller Z, Stoddart I and Sloman L (2019) Technical appendix 4: Overview of evidence on increasing active travel

[5] Sloman (2019) Technical appendix 2: Defining the counterfactuals

[6] Cairns S, Hopkinson L, Schuller Z, Stoddart I, Heinen E and Sloman L (2019) Technical appendix 5: Compendium of interventions

[7] Cairns S (2019) Technical appendix 7: Factors affecting walking and cycling levels, and model scaling factors

3.9 Table 1 outlines the range of interventions that can be applied in the cycling, walking and walk to school models. Only those marked as ✓ are included in the Investment Models. Interventions for which the available evidence (at the time of our study) was too limited to enable inclusion in the models are shown as (✓).

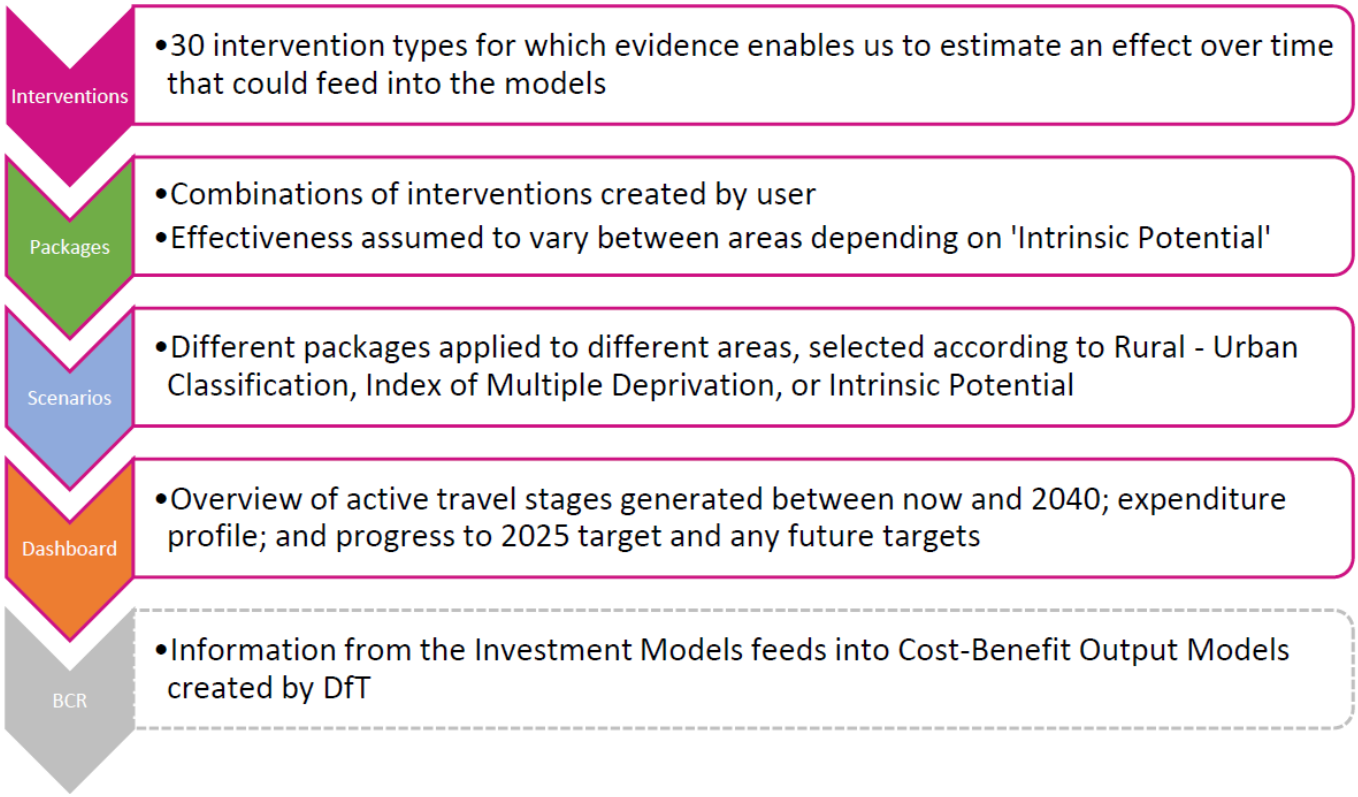
Table 1- Interventions modelled in the Active Travel Investment models

Intervention type	CYCLING MODEL	WALKING MODEL	WALK TO SCHOOL MODEL
Area-wide cycle networks	✓		
Town centre walking infrastructure schemes		✓	(✓)
Flagship cycling and walking links	✓	✓	(✓)
Neighbourhood traffic calming schemes (20mph zones)	(✓)	✓	(✓)
Cycle parking at stations	✓		
Adult cycle training	✓		
Child cycle training	✓		
Conventional bike loans/subsidies	✓		
On-street cycle hire (of conventional bikes)	✓		
Bike refurbishment	✓		
Bike purchase via salary sacrifice	✓		
Electrically assisted bikes (grants to individuals)	✓		
Secure cycle parking (with associated facilities)	✓		
Mass cycle rides/festivals/events	✓		
Cycle inclusion schemes	✓		
Led walks		✓	
Walking promotion		✓	(✓)
Household personalised travel planning	✓	✓	(✓)
Workplace personalised travel planning	✓	(✓)	
Workplace travel challenges	✓		
Community based initiatives (multi-stranded approaches)	(✓)	(✓)	(✓)
Workplace travel initiatives	✓	✓	
School travel initiatives (walking/cycling promotion)		(✓)	✓
Links to schools	(✓)	(✓)	✓
Bus route enhancements		✓	
Concessionary fares		✓	
School streets closures / parking restraint		(✓)	✓
Built environment*		✓*	
School travel plans		(✓)	(✓)
Shared e-bike schemes	(✓)		

* This category has been built into the Walking Investment Model via the differing counterfactual scenarios for new housing. Blanks are interventions that are assumed not to be relevant to the mode (and model) in question.

3.10 All three Active Travel Investment Models have the same basic structure illustrated in Figure 1. Interventions are combined into packages that are delivered at a local authority level. Different packages can be allocated to different types of areas - for example, the package for rural areas may be different to the package for urban areas. The types of area where investment is focussed can also be varied - for example, investment can be concentrated in areas with most potential, or in areas with higher levels of deprivation.

Figure 1 - How the models work



Investment Scenarios Modelled

3.11 The scenarios used in the Investment Models are outlined in the tables below. More detailed descriptions of the scenarios are provided in an earlier paper[8].

3.12 The intervention packages in each scenario are informed by experience of the sorts of active travel programmes that local authorities have delivered in the past. In particular, judgement has been used about the relative proportions of investment in different types of scheme that a typical local authority might choose.

3.13 Scenarios can be split into three groups (1) central scenarios (2) lower cost scenarios requiring traffic restraint or supportive land use planning (3) higher cost capital-intensive scenarios.

3.14 The central group of scenarios, outlined in Table 2, represent the most likely way that the aims and target will be achieved. They vary by where investment is placed and the mixture of interventions, but they all include a combination of capital and revenue investment (reflecting experience of the nature of active travel investment in most areas) and they assume policies on traffic restraint that are comparable with those in the recent past.

3.15 The Biggest Bang per Buck, Geographical Equity and the Social Equity Scenarios have been applied in all three models. The Mini Holland and Tackle Child Obesity Scenarios are specific to the Cycling and Walk to School Models respectively.

Table 2: Central Scenarios

Scenario	Description	Models used in
Biggest Bang per Buck	Packages of capital/revenue low 'cost-per-trip' schemes, in areas where interventions are most effective	
Geographical Equity	Packages of capital/revenue low 'cost-per-trip' schemes, spread across all local authority areas	
Social Equity and Health	Investment in more deprived areas. Packages include interventions to encourage active travel by women, people with disabilities or on lower incomes etc.	
Mini Holland	Investment in urban areas. Similar intervention types and level of expenditure per head of population to that in the 'high dose' area of the Waltham Forest Mini-Holland	
Tackle Child Obesity	Variant of the Social Equity and Health scenario, but with investment in areas with high or medium child obesity	

3.16 The lower cost group of scenarios explores how the cost of achieving the CWIS aims might be affected under different policy conditions: either if active travel investment were complemented by stronger traffic restraint policies, or if new housing development were built in places and with designs that minimise car dependency and encourage walking. These scenarios are outlined in Table 3.

[8] Sloman L, Cairns S, Green A, Hopkinson L and Perrotta F (2019) CWIS Active Travel Investment Models: Model structure and evidence base.

They provide an indication of the maximum extent to which investment could be reduced while still achieving the CWIS aims, under favourable conditions. The cost of these scenarios does not take account of any costs incurred as a result of the different policy context.

3.17 The Locally Driven by a Few Authorities and Nationally Driven High Priority Scenarios are only applied in the Cycling and Walking Models and the Favourable Land Use Planning Scenario is only applied to the Walking Model.

Table 3: Lower Cost Scenarios with traffic restraint or favourable land use planning

Scenario	Description	Models used in
Locally Driven by a Few Authorities	Comprehensive investment packages, in areas where interventions are most effective, in combination with a high level of traffic restraint measures	
Nationally Driven High Priority	Comprehensive investment packages in all areas (cycling) or low 'cost-per-trip' investment packages in areas where interventions are most effective (walking), in combination with a high level of traffic restraint measures	
Favourable Land Use Planning	Variant of the Biggest Bang per Buck Scenario, with assumption that new housing developments are as walkable as the most walkable areas in each local authority	

3.18 Finally, the higher cost group of scenarios explores how the cost of achieving the aims and target might be affected if only capital investment were available (with no complementary revenue investment). These scenarios are outlined in Table 4. They indicate the impact of changing the balance of capital and revenue investment.

3.19 The Capital Only Scenario is applied in all three models and the Focussed on Economic Growth Scenario is applied in the Cycling and Walking Models.

Table 4: Higher Cost Scenarios with capital investment only

Scenario	Description	Models used in
Capital Only	Packages of capital schemes, across all local authority areas	
Focused on Economic Growth	Package of capital schemes, in conurbations where active travel investment may provide benefits to productivity	

4. Progress towards the CWIS Aims and Target

4.1 This section gives an overview of past trends in active travel, and shows projections of future trends. The projections are the best estimate of the likely effect of firm and committed investment in the current policy context. Where applicable, these projections are used to estimate the 'gap' in meeting the relevant aim or target for 2025.

4.2 More detail on trends in cycling, walking and walking to school is available from walking and cycling national statistics[9].

4.3 The projections have been used as the counterfactuals in the Active Travel Investment Models. A description of how the projections have been estimated is provided in a technical appendix to the paper on the model structure and evidence base[10].

Cycling aim

4.4 Measured per person, cycling levels have shown little change over the last 15 years, with the 3-year average being stable at about 17 stages per person per year (pppy). However, there has been a slight upward trend in the total number of cycling stages over this period. This is largely due to population growth.

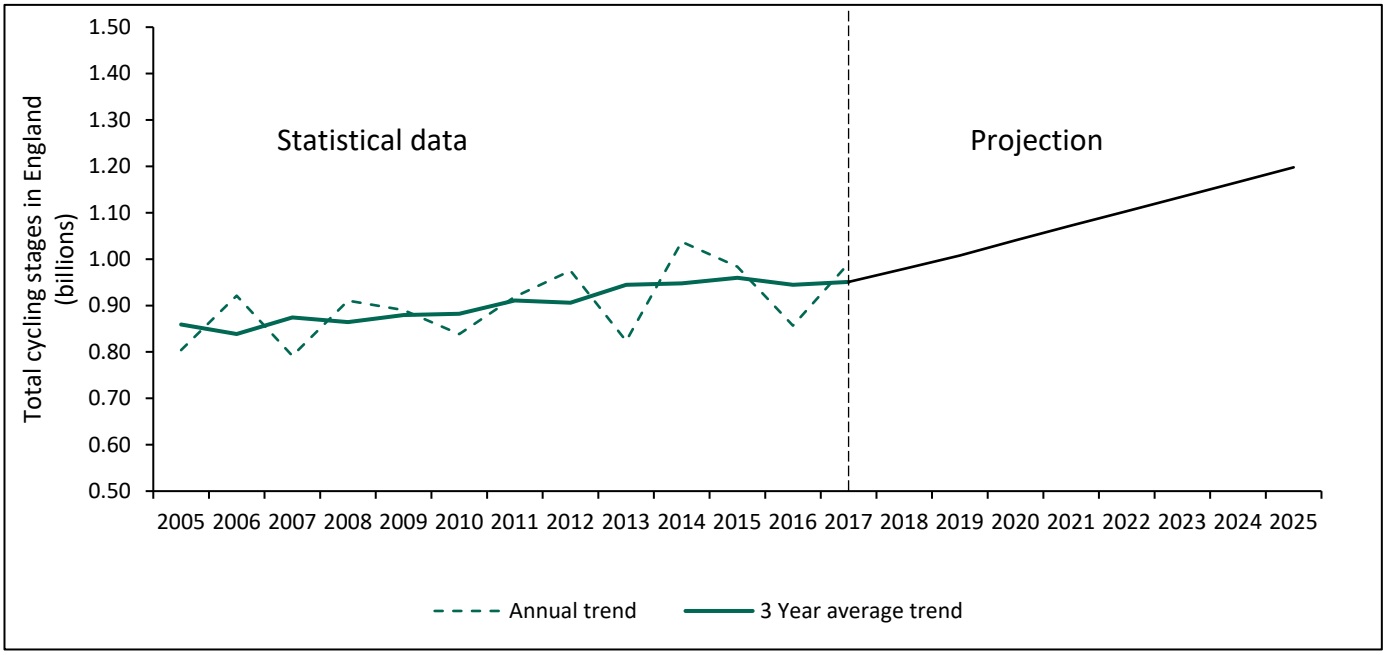
4.5 The most recent data shows that the 3-year average for 2016-2018 was a total of 951 million cycling stages. This is 649 million stages short of the CWIS aim of 1.6 billion stages.

4.6 Analysis suggests that a combination of past and committed investment (excluding the new £5 billion buses and cycling package funding), and population growth, will deliver about 1.2 billion cycle stages per year by 2025. This means that without any additional investment, we will be just under 40% of the way towards the target by 2025.

[9] DfT (2019), Statistical Release: "Walking and Cycling Statistics, England 2018", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/821842/walking-and-cycling-statistics-2018-accessible.pdf

[10] Sloman (2019) Technical appendix 2: Defining the counterfactuals

Graph 1 - Cycling Demand Projection from committed investment



Walking aim

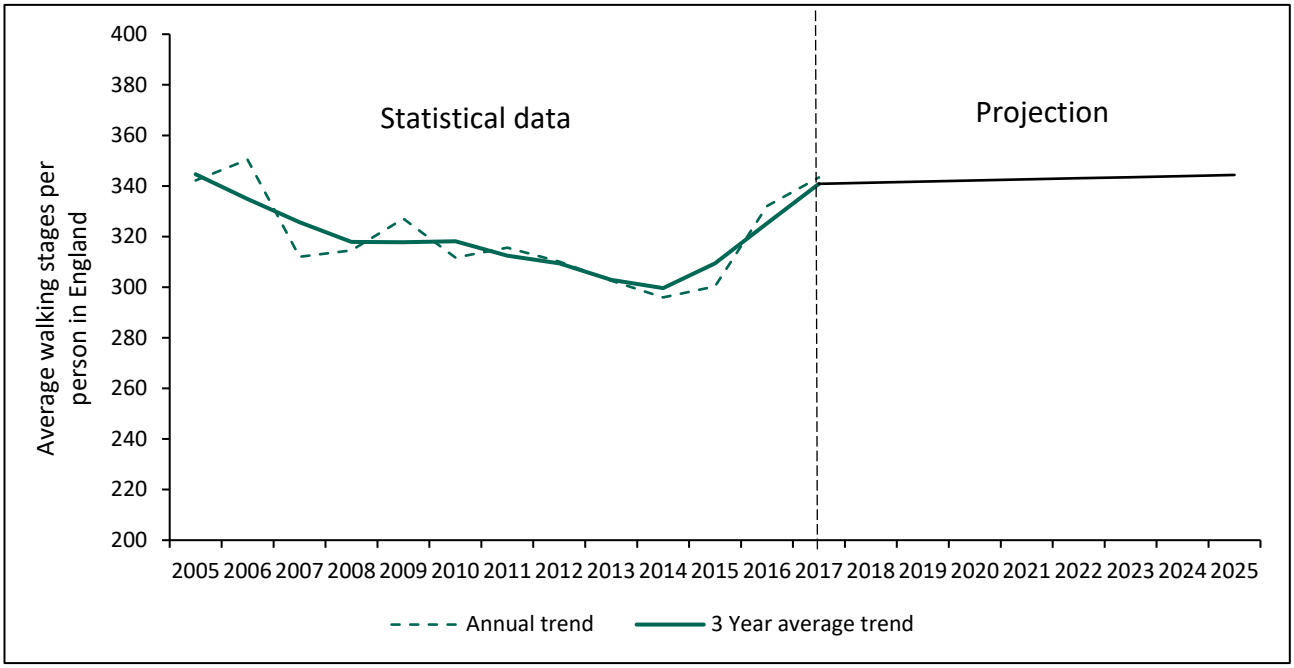
4.7 The original walking aim, to increase walking to 300 stages pppy in 2025, has already been met. This is partly because of improvements in the way walking data is collected by the National Travel Survey, which mean that there is now less under-reporting of short walks.

4.8 However, using the new NTS data collection methodology, walking has been on a rising trend since 2014. This is a reversal of the trend before 2014. The 3-year average has gone up from 300 stages pppy in 2013-2015 to 341 stages pppy in 2016-2018.

4.9 The cause of this increase is not fully understood. The magnitude of the increase is so big that it is unlikely to be attributable solely to interventions to encourage walking. The data for 2018 suggests that the rate of increase may be levelling off, which means that it would not be a safe assumption that the recent rate of increase will continue. Separate research is being conducted to understand the possible reasons for the upward trend.

4.10 Analysis suggests the projected growth in walking stages pppy as a result of past and committed investment is likely to be small (excluding the new £5 billion buses and cycling package funding). Due to the recent unexplained increase in walking there is uncertainty about the projected trend.

Graph 2 - Walking Demand Projection from committed spending



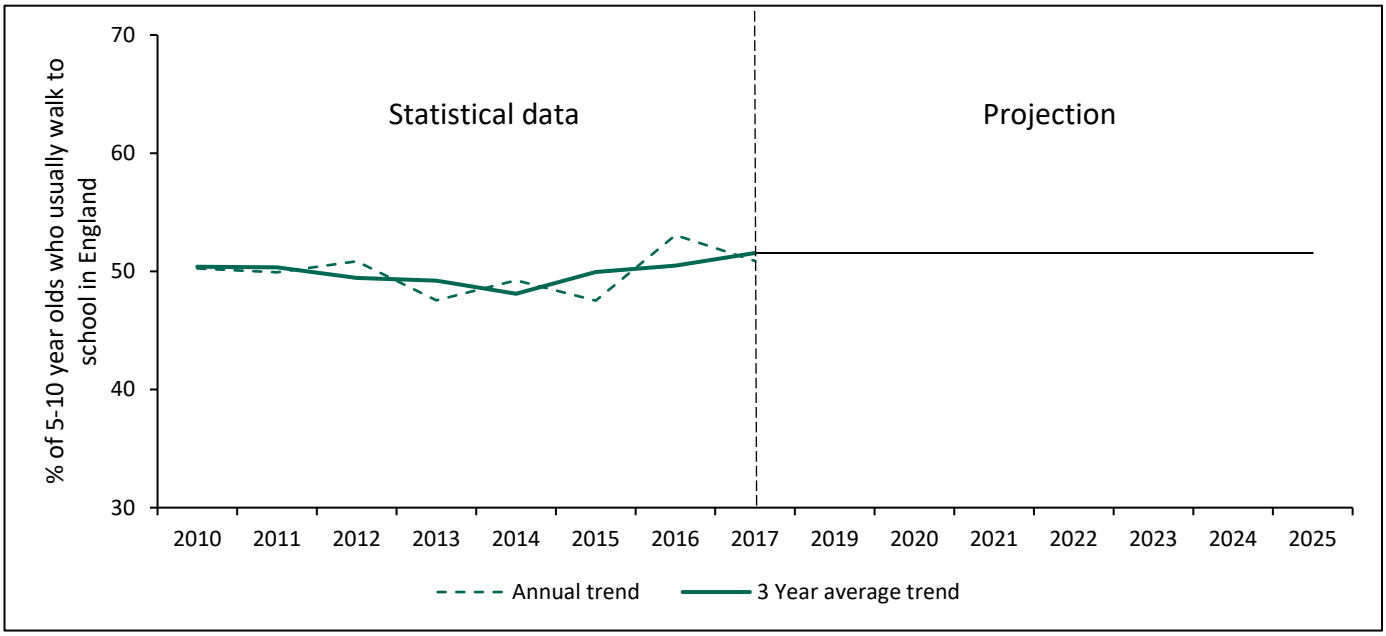
Walk to School Target

4.11 Graph 3 shows the proportion of children who usually walk to school has remained stable over the last decade (49% in 2014 and 51% in 2018, but without strong evidence of a clear upward trend).

4.12 For trips of less than a mile, around 80% are made on foot, and this proportion has been stable for some time. However, for trips over one mile, the proportion that are walked is declining. For trips of 1-2 miles, walk mode share has fallen from about a third to about a fifth since 2002.

4.13 No data is available to enable a forecast to be made of the change in walking to school that would happen in the absence of additional investment, and so the Walk to School Investment Model assumes a counterfactual in which walking to school remains constant over time, in all areas. The CWIS Walk to School Model has a baseline of 2013 = 49% of pupils usually walking to school.

Graph 3 - Trend of the proportion of primary age children who usually walk to school



5. Results and Insights

Cycling Model

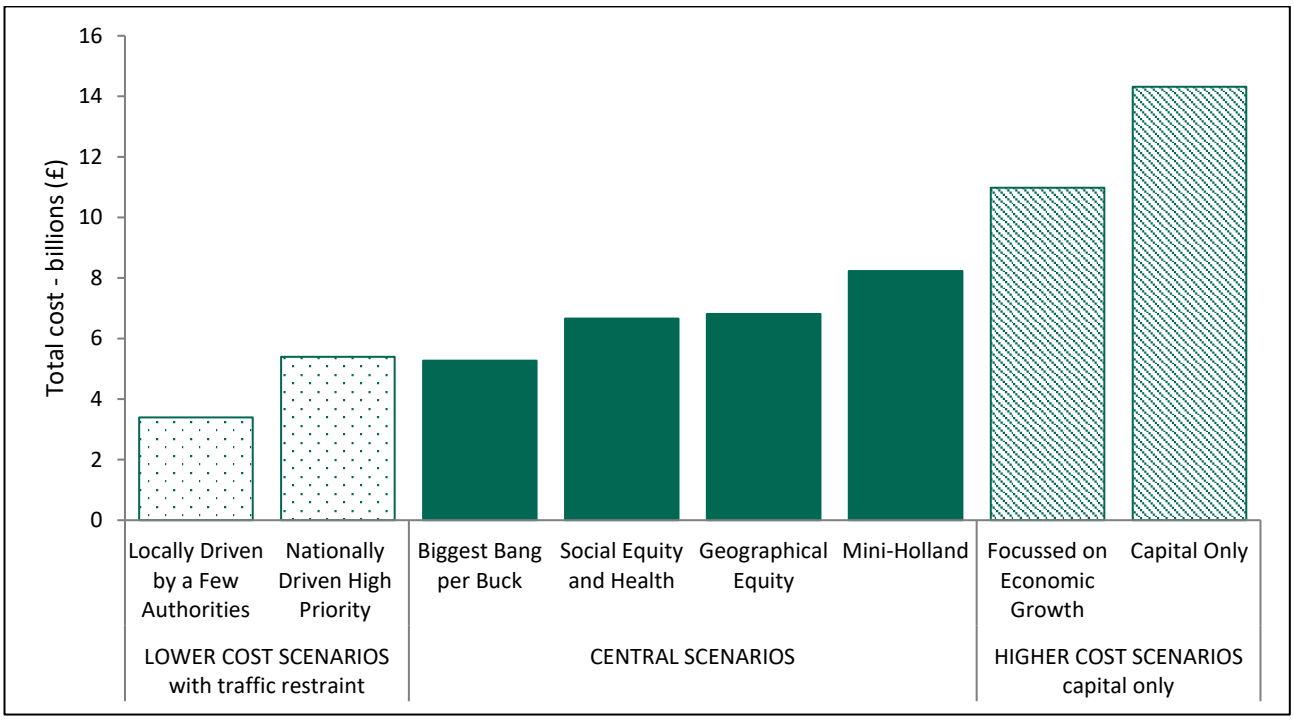
5.1 The CWIS cycling aim is to increase the total number of cycling stages made each year, from 0.8 billion stages in 2013 to 1.6 billion stages in 2025.

5.2 The Cycling Investment Model was used to estimate the cost of reaching 1.6 billion stages. In the group of four central scenarios (Biggest Bang per Buck, Social Equity and Health, Geographical Equity and Mini Holland), the cost was between £5.3 and £8.2 billion, as shown in Graph 4 and Table 5. This group of scenarios represents the most likely way that the cycling aim will be achieved.

5.3 In the group of lower cost scenarios, in which investment in cycling is accompanied by stronger traffic restraint policies, the cost was between £3.4 and £5.4 billion. These are the Locally Driven by a Few Authorities and Nationally Driven High Priority Scenarios.

5.4 In the group of higher cost scenarios, in which only capital investment is available, the cost was between £11.0 and £14.3 billion. These are the Focussed on Economic Growth and Capital Only Scenarios. These are not reflective of nature of cycling investment, but illustrates the impact of shifting the balance between of capital and revenue investment.

Graph 4 - Total cost of reaching 1.6 billion cycle stages in the cycling scenarios



5.5 Table 5 shows investment to reach 1.6 billion cycling stages has an estimated benefit cost ratio (BCR) of between 2.0 and 3.1, implying high value for money. When taking into account the non-monetised benefits from increased cycling, the value for money is expected to be at least High. Section 5 gives details on how BCRs and VfM has been determined.

5.6 Table 5 also shows the earliest year the cycling aim can be met under the different scenarios. In most of the scenarios, it is not possible to reach the aim by 2025, because local authorities would be unlikely to be able to deliver the infrastructure required within the timeframe available.

5.7 The only central scenario which enables the aim to be met by 2025 is the Geographical Equity scenario. For this scenario, deliverability at local authority level is less of a constraint because investment is spread across all areas in England, rather than being concentrated in fewer areas, as in the Biggest Bang per Buck, Social Equity and Health and Mini Holland scenarios.

5.8 The aim of 1.6 billion cycling stages can be met by 2025 in both the lower cost scenarios. This is due to the enhanced impact of cycling interventions when combined with traffic restraint measures.

5.9 The higher cost scenarios, in which only capital investment is available, are the last scenarios to reach the aim of 1.6 billion stages. The Capital Only Scenario reaches 1.6 billion stages in 2028, and the Focussed on Economic Growth Scenario reaches 1.6 billion stages in 2034.

5.10 The results suggest that in order to meet the cycling aim by 2025, or shortly after, investment will either need to be spread across the whole country, avoiding deliverability constraints, or combined with traffic restraint to enhance the impact of interventions.

Table 5 - Cycling results: meeting the CWIS cycling aim from Central Scenarios

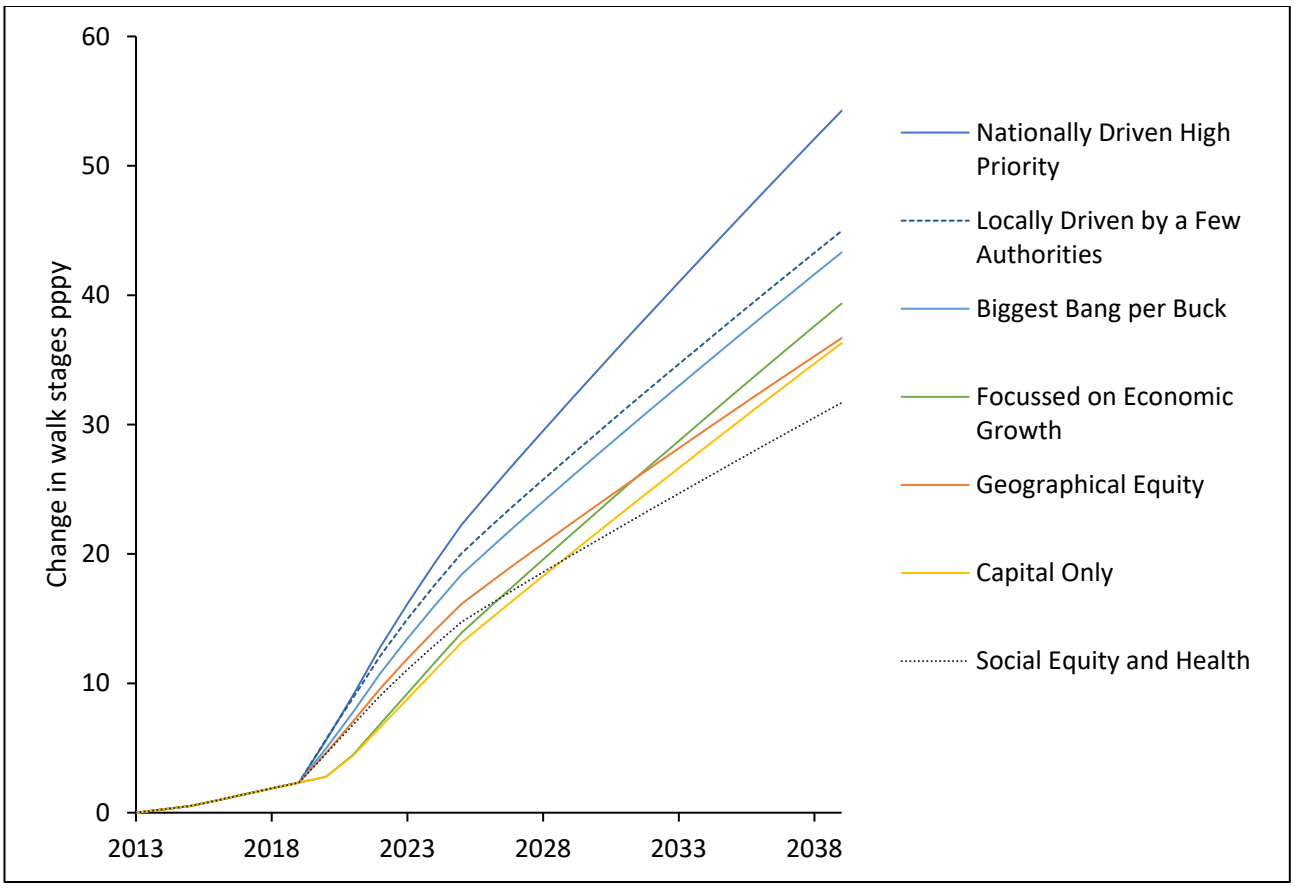
Scenario	Year aim can be met	Total cost (£)	Benefit cost ratio (BCR)	Value for Money (VfM)
Biggest Bang per buck	2027	£5.3bn	3.1	High
Social Equity and Health	2028	£6.7bn	2.4	High
Geographical Equity	2025	£6.8bn	2.3	High
Mini Holland	2027	£8.2bn	2.0	High

Walking Model

5.11 As the CWIS aim for walking has already been met, the Walking Investment Model has instead been used to examine the impact of investment over time under different scenarios. This is to inform the development of a more stretching walking target for the next phase of the investment strategy.

5.12 To illustrate the impact of different scenarios over time, Graph 5 shows the estimated trajectory of each of the scenarios with £600 million per year investment. Given the uncertainty with the walking projection, results are presented as additional walking stages generated, rather than total number of walking stages.

Graph 5 - Walking stages generated with £600m per year investment



The Nationally Driven High Priority Scenario uses the same 'cost-effective' packages as the Biggest Bang per Buck Scenario, and invests in the same areas, but is more effective because of LADs – i.e. the only reason for the difference between the Nationally Driven High Priority and Biggest Bang per Buck lines is the application of a synergy factor. The cycling Nationally High Priority Scenario uses the ' Comprehensive' packages, rather than 'Cost effective' packages, hence the effectiveness relative to other scenarios differs for the walking and cycling results

5.13 Table 6 shows the impact of the central scenarios under different levels of investment. BCRs of these scenarios range from 2.6 to 3.8, indicating value for money judgements of high to very high. This judgement is strengthened further when also considering non-monetised benefits from increased walking. Section 5 gives details on how BCRs and VfM has been determined.

5.14 In a Biggest Bang per Buck Scenario in which investment is focussed on cost-effective measures in areas with higher Intrinsic Walking Potential, it would be feasible to increase walk stages by 17 per person per year (pppy) by 2025, and 26 pppy by 2030, with expenditure of about £600 million per year.

5.15 In the areas where this investment would be targeted, it would increase walking by nearly one extra walk stage per person per week. This represents an increase in physical activity of 10 minutes per person per week, which would be a worthwhile contribution towards the national target for physical activity for many people in these areas.

5.16 A Social Equity and Health Scenario, involving measures designed to increase physical activity participation and with a focus in more deprived areas, requires about £800 million per year to achieve a similar increase in walk stages (17 pppy by 2025 and 25 pppy by 2030). It would result in an increase in physical activity of 8 minutes per person per week in the areas where it was targeted.

Table 6 - Walking results: additional stages generated between 2017 and 2025

Scenario	£400m per year	£600 million per year	£ 1 Billion per year	Benefit cost ratio (BCR)	Value for money (VfM)
Biggest Bang per Buck	12	17	26	3.8	Very High
Geographical Equity	11	15	22	3.3	High
Social Equity and Health	10	13	20	2.6	High

5.17 The modelling found that in the period to 2025, scenarios that include both capital and revenue investment performed better, than scenarios that only had capital investment. This is partly because the effect of capital schemes is assumed to take time to build up.

5.18 The walking model includes two revenue interventions aimed at encouraging greater bus travel ('kick-start' funding for new or more frequent bus services, and fare concessions for a wider range of the population). These interventions increase walking because some of the new bus trips replace journeys that would otherwise have been made by car (or not made at all), and each new bus trip has some walking at either end. The modelling found that these measures have the potential to play a significant role in increasing levels of walking, as they are highly cost-effective at increasing walking and could be delivered on a fairly large scale.

5.19 Other revenue interventions (such as walking promotion and workplace travel initiatives) may also make a useful contribution. At the scale of funding that is needed in order to have a significant impact (i.e. around £600m per year) they would represent a small but important part of the total budget (e.g. of the order of 5-8%). With smaller budgets, the proportion that it would be appropriate to allocate to these types of intervention could be significantly higher.

Effect of land use planning factors

5.20 The Walking Investment Model has been used to model the effects of levels of walkability of new housing developments. This has been tested by applying different counterfactuals, which vary by the assumption on how walkable of new housing developments are. The three different scenarios tested are, new housing developments are less walkable than the existing housing stock, are as walkable as the average for existing housing stock, or are as walkable as the 'best in class' for the type of local authority where it was located.

5.21 Table 7 shows the estimated impact of these different land use planning outcomes. The two more Favourable Land Use Planning Scenarios, where new housing is as walkable as the average housing stock or as walkable as the 'best in class', deliver an extra 2-4 walking stages pppy between 2017 and 2025. For a walking budget of £600m, the uplift in walking is 19-21 stages pppy, compared to an uplift in the Biggest Bang per Buck Scenario of 17 stages pppy.

Table 7 - walk stages pppy under different housing development scenarios

Counterfactual	2017	2025	2030
New housing ***less*** walkable than existing housing stock	341	344	No further change
New housing as walkable as ***average*** existing housing stock	341	346	No further change
New housing as walkable as ***'best in class'***	341	349	No further change

5.22 Results suggest that changes to land use planning policy to avoid development of housing in car-dependent locations and to encourage it in urban areas, coupled with policy to encourage highly ‘walkable’ design, could be a highly effective way of achieving any future walking target, even in relatively short timescales.

Interaction between walking and cycling interventions

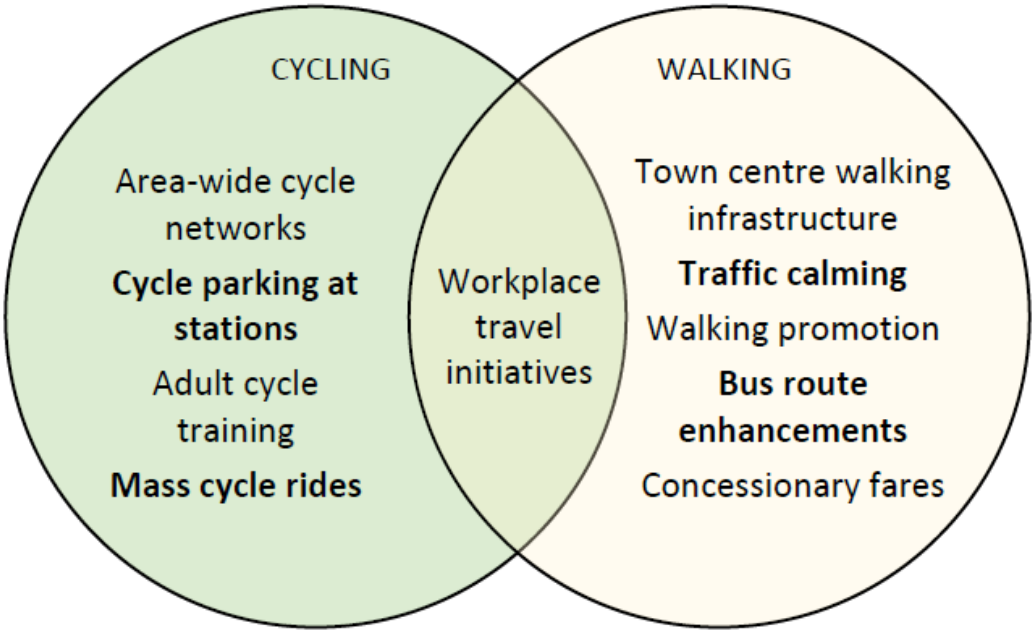
5.23 Most interventions included in the walking and cycling models are assumed to benefit either walking or cycling, but not both.

5.24 There are three interventions with sufficient evidence to estimate an effect on both modes. These are flagship walking and cycling links (e.g. pedestrian / cycle bridges), personalised travel planning (aimed at households) and workplace travel initiatives.

5.25 There are two other interventions for which there could be an effect on both modes, but for which there is insufficient evidence at present for inclusion in both models. These are traffic calming (which is included in the Walking Model only) and workplace personalised travel planning (which is included in the Cycling Model only).

5.26 There is likely to be some saving on a combined budget for both walking and cycling from interventions which benefit both modes. For example, in the Biggest Bang per Buck Scenarios for walking and cycling, there is one 'overlap' intervention, workplace travel initiatives, as shown in Figure 2. However, this accounts for a small proportion of total expenditure, and in this and other scenarios, the saving on the total investment required is fairly modest, at about 1-2% of the total cost.

Figure 2 - Interventions in the Biggest Bang per Buck Scenario for cycling and walking



5.27 Walk to school interventions will also generate adult walking (and cycling) trips from adults accompanying primary school-age children. This effect has not been considered in the modelling, given the added level of complexity, but additional walking and cycling stages could be generated through investment in walk to school interventions.

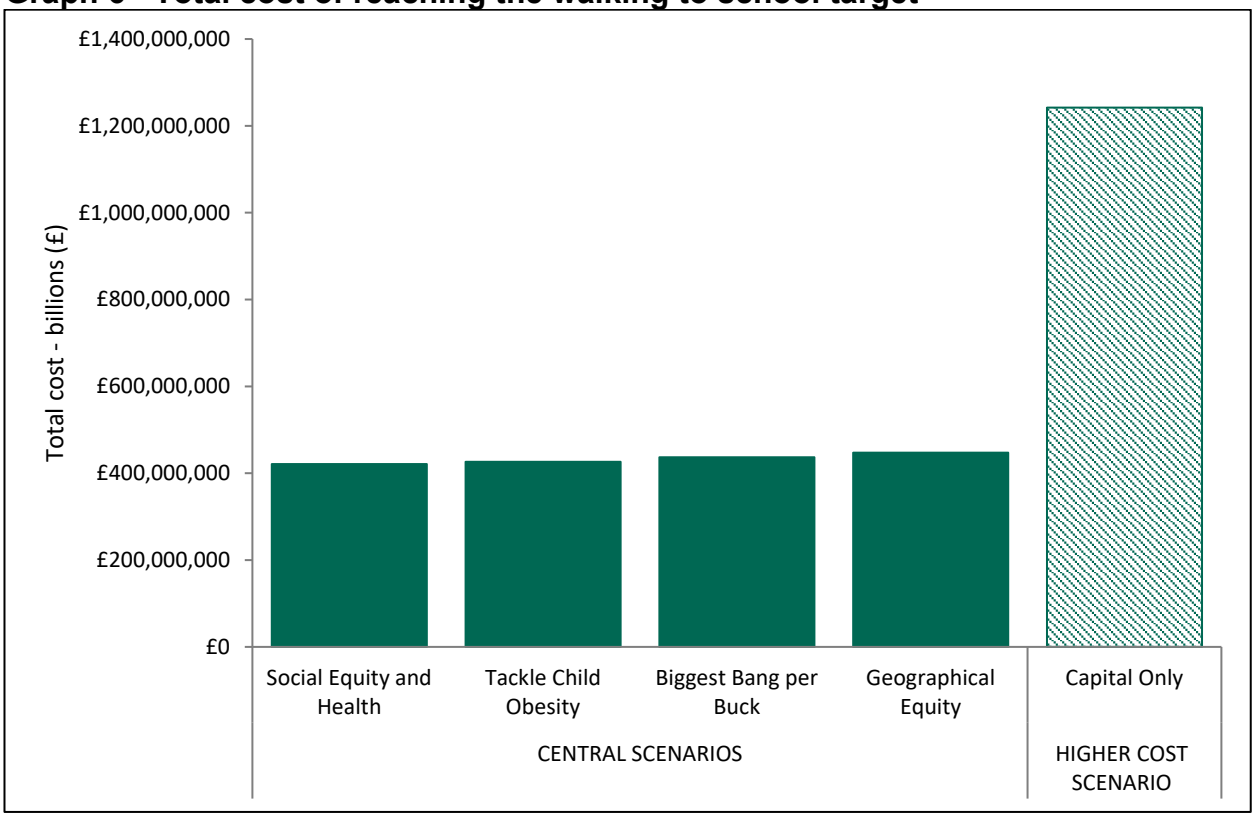
Walking to School Model

5.28 The CWIS walking to school target is to increase the percentage of primary school children that usually walk to school from 49% to 55% in 2025. In the central scenarios, the total cost to reach the target ranges between £420 - £450 million, as shown in graph 6 and table 8. In all modelled scenarios, it is feasible to reach the target by the 2025.

5.29 Central scenarios are the most likely way to reach the target. They combine infrastructure (Links to Schools) with revenue interventions (walking promotion campaigns) and traffic restraint (School Streets).

5.30 In the Capital Only Scenario, in which the only investment is in Links to Schools, the total cost is significantly higher at £1.2 billion. Investing only in capital, is not reflective of the nature of walk to school interventions, but this scenario illustrates the impact of shifting the balance of capital and revenue investment.

Graph 6 - Total cost of reaching the walking to school target



5.31 Revenue interventions such as School Streets and walking promotion campaigns stand out as offering particularly good value for money, in practice these interventions would need to be accompanied by infrastructure improvements (capital investment) at some primary schools.

5.32 Table 8 show the cost to meet the target under each of the central scenarios and outlines value for money for each of the scenarios is expected to be at least high. As explained in section 5, BCRs alone significant underestimate the value for money of walk to school investment.

Table 8 - Central Walk to Scenarios

Scenario	Year target can be met	Total cost	Value for Money (VfM)
Social Equity and Health	2025	£421 million	At least High
Tackle Child Obesity	2025	£426 million	At least High
Biggest Bang per Buck	2025	£437 million	At least High
Geographical Equity	2025	£447 million	At least High

5.33 The model results indicate that the most likely investment cost needed is between £84-89m per year, depending on the chosen central scenario. These scenarios combine investment in infrastructure ('Links to Schools') with revenue funding for school travel initiatives (such as 'Walk Once a Week' programmes) and capital funding for 'School Streets' (road closures outside schools during school start and finish times). In these scenarios, about a quarter (23%) of investment is revenue.

5.34 Results suggest that where investment is placed does not make a significant difference to the total quantum cost. However, cost does vary when the balance of capital and revenue is adjusted.

Optimum walk to school scenario to increase physical activity

5.35 The Social Equity and Health Scenario is intended to increase physical activity amongst children who would be most likely to benefit. It involves the same mix of interventions as the Biggest Bang per Buck Scenario, but investment is concentrated in a smaller number of local authorities with a high or mid-high Index of Multiple Deprivation (IMD). These areas are chosen because there is a strong positive correlation between IMD and the proportion of children who are overweight or obese.

5.36 The Tackle Child Obesity scenario, a variant on the Social Equity and Health Scenario, involves investment in local authorities with high or medium child obesity. This includes around 50 less deprived areas (i.e. local authorities with lower IMDs) where child obesity is high or medium, as well as areas with both high / mid-high IMD and high / medium child obesity. the cost of meeting the 2025 target is similar in both these scenarios, at just over £420 million.

5.37 Areas with higher IMD tend to also have higher Intrinsic Walk to School Potential (IWTSP), and so most of the local authorities included in the Social Equity and Health Scenario have relatively high or mid-high IWTSP. In fact, the proportion of local authorities that have high IWTSP is greater in the Social Equity and Health Scenario (25%) than in the Biggest Bang per Buck Scenario (14%). This is why the cost of achieving the target for 2025 is counterintuitively slightly lower in the Social Equity and Health Scenario than in the Biggest Bang per Buck Scenario.

6. Benefits of Active Travel

6.1 The Government recognises that the benefits of cycling and walking are substantial. For people, it means cheaper travel and better health. For businesses, it means increased productivity and increased footfall in shops. And for society as a whole, it means lower congestion, better air quality, and vibrant, attractive places and communities.

6.2 Evidence is sufficient to monetise some of the benefits of the active travel scenarios, enabling the development of the associated benefit cost ratios (BCRs) of the scenarios. This gives an initial indication on value for money category, as outlined in the DfT's value for money guidance[11], where 'High' Value for Money is equivalent to a BCR between 2 and 4 and 'Very High' is equivalent to a BCR above 4.

6.3 Benefits driving the BCRs are:

- Reduced mortality for adults – Increased physical activity leads to a reduced risk of premature death.
- Reduced Absenteeism – Increased physical activity can lead to reductions in short term absence from work, enabling employers to benefit from reductions in lost productivity.
- Benefits from Mode Shift – Reducing journeys made by other modes such as car trips will reduce: congestion, damage to existing infrastructure, car accidents, noise, greenhouse gases and improve air quality.

A full explanation of how these benefits are quantified can be found in TAG unit A5-1 Active mode appraisal[12] and TAG Unit A4.1 Social impact appraisal[13].

6.4 There are also established methods to quantify benefits from improved journey quality. However, this has been omitted from the appraisal of scenarios, due to uncertainty in the assumptions needed. This is the value new and existing place on better infrastructure, improving perceived safety and overall experience of the journey.

6.5 Current active travel appraisals are also expected to underestimate the benefits of increased active travel due to non-monetised benefits. We are unable to quantify these with current appraisal methods, but they are real benefits which further increase the value for money of cycling, walking and walk to school investment. Non-monetised benefits include savings to the NHS, safety benefits and wider health benefits (Morbidity impacts and improved mental health).

[11] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/630704/value-for-money-framework.pdf
[12] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/712970/tag-unit-a5-1-active-mode-appraisal-may-2018.pdf
[13] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/805253/tag-4.1-social-impact-appraisal.pdf

6.6 Non-monetised benefits are particularly prominent for Walk to school investment, as key benefits such as health benefits to children, the impact on education and improved safety when walking to school is not captured by appraisal methods.

6.7 Value for Money judgements for each of the scenarios presented have taken the non-monetised benefits into account. For walk to school scenarios the value for money judgement has been adjusted to recognise that the appraisal omits a significant proportion of benefits, and for walking and cycling scenarios non-monetised benefits strengthen the case that investment will offer at least the value for money presented.

7. Uncertainties

7.1 The model parameters used to generate the results presented in this paper represent the best estimate, based on evidence. As outlined in table 9 there remains some uncertainties in the model parameters. The impact of these uncertainties will be explored and tested in the next stage of the analytical programme.

Table 9 - Key uncertainties

Uncertainty	Reasons for uncertainty
Whether the estimated stages in 2025 without any further investment is higher or lower than calculated	• Exclusion of factors that could not be included in the modelling. Such as change in the perceptions of cycling and walking. • Impact of existing policies such as the removal of the £1,000 cap on bikes purchased through salary sacrifice, or action expected through clean air
Whether interventions have a greater or smaller impact than evidence suggests	• Dependent on the standard of individual schemes being of the same quality as those evidence is based on. The impact could be expected to be higher with local authorities developing Local Cycling and Walking Infrastructure Plans (LCWIPs). • Delivering interventions at a larger scale may have a different impact to past interventions, for instance evidence suggest there could be a network effect when concentrating investment. • Uncertainties in the evaluation evidence, underpinning the models, could mean the impact of future investment differs from what has been forecasted. • Decay of impact could be different from what has been assumed.
Whether the proposed maximum deliverable investment is appropriate	• In earlier years there may be constraints on the level of investment that could be delivered. The cycling and walking model currently assume a maximum of £40 per person per year in each local authority area. For walking to school, the maximum level of investment is assumed to be £200 per pupil per year. • The spending caps could be higher in later years.
The appraisal period	• The benefits generated from capital infrastructure could be greater if the life of the scheme is longer. Other road scheme typically has an appraisal period of 60 years.