OXFORDSHIRE COUNTY COUNCIL

Cabinet
Tuesday, 19 October 2021

Supplementary Documents

10. Local Transport and Connectivity Plan (LTCP) (Pages 1 - 306)

The draft Plan (Annex 1) is included in the main agenda pack. The other documents (Annexes 2-7) are published separately here due to their size and number.

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Local Transport and Connectivity Plan – Baseline Report

October 2021

OXFORDSHIRE COUNTY COUNCIL

Contents

Executive Summary

This baseline report has been published in support of Oxfordshire County Council's Local Transport and Connectivity Plan (LTCP).

The LTCP sets out an overarching vision for transport in the county and the policies that will be required to deliver the vision. This approach will ensure that we have outlined a clear long-term ambition for transport in the county.

The new LTCP takes a more holistic approach than previous Local Transport Plans and recognises the broad range of factors affected by transport such as the environment, the economy, public health and place shaping. This approach seeks to ensure we deliver a plan that not only creates an efficient transport network but also a county that is a better place to live in.

As part of the LTCP development process, Oxfordshire County Council has collected a range of evidence to identify the current situation, challenges and opportunities for Oxfordshire's transport network. This document builds upon the baseline report that was published in support of the LTCP vision document.

This evidence has been used to inform development of the LTCP vision and underpins the policies identified in the full LTCP document. A detailed analysis of the evidence is conducted in this report. A summary of the key points from this analysis is provided below.

Chapter 1 – Policy context

- There are a range of strategies at the national, sub-national and local level that have informed and will be supported by the LTCP.

Chapter 2 – Road and rail links

- Oxfordshire lies on a well-connected and busy transport corridor, but it lacks links to and from the East and is reliant on the A34 for internal journeys.
- Planned rail invesment such as East-West rail will help improve longer-distance connectivity, but further investment in public transport is also likely to be needed if such transport movements are to be more sustainably enabled in the future.

Chapter 3 – Private car

- There are high levels of car ownership across the county, except for Oxford.
- Since 1952 there has been a significant increase in car usage in the UK. This trend has been reflected in Oxfordshire, with vehicle miles increasing.
- Congestion is affecting journey times across Oxfordshire. Steps are required to address this and ensure the county remains thriving and attractive.
- COVID-19 significantly reduced vehicle miles and associated data. Further monitoring is required; however, we expect vehicle usage to return to pre-pandemic levels.
- 30mph roads generally have the lowest levels of speed compliance.

- For 20mph roads the average speed is above the speed limit for all vehicle types, but below the average speeds seen on the 30mph roads.
- The number of Ultra-low emission vehicles in Oxfordshire is continuing to grow rapidly and so provisions for these vehicles will be required.

Chapter 4 – Public transport

- Although bus usage in the county has increased overall since 2010, it has been declining since 2013/14. Work is therefore needed to address existing issues and further encourage bus use.
- COVID-19 has resulted in a decrease in bus journeys over the last year, it is unclear what the long term impact will be.
- Bus costs have increased significantly in the last 15 years.
- Bus reliability remains an issue in the county. Measures are required to address this and make bus travel more attractive.
- Rail usage has been increasing in the county and there are opportunities to further improve this.

Chapter 5 – Walking and cycling

- Whilst Oxfordshire is in a good starting place with regards to current walking and cycling levels, more still needs to be done to encourage usage.
- The needs of different demographics need to be considered to ensure that Oxfordshire's transport system benefits all residents.
- In order to encourage further cycling work is needed to address cyclist safety.
- Access to food retailers by foot is poor outside of Oxford. Work is needed to create more walkabale neighbourhoods and support car free lifestyles.

Chapter 6 – Road safety

- Road safety has improved but there have been some upward trends since 2018 and no level of casualties is acceptable. Further work to improve road safety is therefore required.

Chapter 7 – Air quality

- Air pollution is the largest environmental health risk in the UK and is negatively affecting Oxfordshire residents.
- Transport is responsible for the largest proportion of greenhouse gas emissions in the county. Addressing vehicle usage is therefore critical to reducing emissions and improving air quality.

Chapter 8 – Freight

- Solutions will need to be found that balance freight issues with the need for an efficient network.
- How freight is moved is changing and LGV growth is projected to significantly increase. The impacts of these changes will need to be considered.

- There are opportunities to increase the use of rail freight and provide environmental benefits.

Chapter 9 – Highway maintenance

- The county has a lower proportion of roads in 'good' condition than the national average, but less in 'poor' condition. The high proportion of C and unclassified roads and limited funding makes highway maintenance a challenge.

Chapter 10 – Health

- Obesity is below the national average but remains over 50%. Encouraging more walking and cycling is one way the LTCP can help address this.
- Oxfordshire has above average levels of physical activity but there is still a need to further improve this through measures to encourage waking and cycling.

Chapter 11 – Natural and historic environment

- Oxfordshire has a rich and varied natural and historic environment, but certain habitats have been in decline in recent years. Increases in Oxfordshire's population and economic activity mean that this will need to be carefully manged for the future.

Chapter 12 – Rivers and canals

- Oxfordshire is home to a range of water resources which offer opportunities for the LTCP but are also negatively affected by the impacts of transport.

Chapter 13 – Population

- Oxfordshire's population is growing and with further growth proposed more effective solutions will be needed to transform transport in Oxfordshire.
- Oxfordshire has a high life expectancy but there are significant inequalities across the county that transport can help to address.

Chapter 14 – Young people

- Young people currently travel less than previous generations, particularly by car. It is uncertain how these trends will progress highlighting the need for the LTCP to be resilient and consider a range of future travel demand scenarios.

Chapter 15 – Deprivation

- Overall Oxfordshire has low levels of deprivation, however there are pockets of deprivation in the county.
- Many of the rural areas of Oxfordshire suffer disproportionately from Barriers to Housing and Services deprivation.

Chapter 16 – Urban vs rural

- Oxfordshire has both urban and rural areas which will require different approaches.

Chapter 17 – Economy

- Oxfordshire has one of the UK's strongest economies, however housing and economic growth are placing strain on the existing transport network.
- Employment is high across Oxfordshire and the economy supports 417,000 jobs but pockets of deprivation exist that transport can help to address.
- Work is needed on Oxfordshire's transport network to relieve the existing pressure and accommodate future growth while responding to concerns around climate change.

Chapter 18 – Digital connectivity

- Digital connectivity is good in Oxfordshire and can play a role in reducing travel demand. However, there is a need to expand full-fibre and gigabit broadband coverage.

Chapter 19 – Future housing and jobs

- There is a significant amount of housing and employment growth proposed in the county which the LTCP will take account of and seek to influence.

Introduction

This baseline report has been published in support of Oxfordshire County Council's updated Local Transport Plan. We are calling ours the Local Transport and Connectivity Plan (LTCP), to better reflect our strategy both for digital infrastructure and for connecting the whole county.

The LTCP sets out an overarching vision for transport in the county and the policies that will be required to deliver the vision. This approach will ensure that we have outlined a clear long-term ambition for transport in the county.

We have developed and consulted upon the LTCP in 3 stages. This process began in March 2020 and has allowed for ongoing public engagement and feedback at each stage of the project.

The stages of development that we have conducted are:

- Stage 1 – Topic Paper Engagement
- Stage 2 – Development of Vision Document
- Stage 3 – Development of LTCP and supporting documents

As part of the LTCP development process, Oxfordshire County Council has collected a range of evidence to identify the current situation, challenges and opportunities for Oxfordshire's transport network. This has informed the LTCP development process helping us understand why the vision and key themes are necessary for Oxfordshire and informing the policies identified.

We published a first version of this baseline report in support of the vison document in March 2020. We have updated the report to reflect feedback received and incorporate further evidence, however some sections remain unchanged.

The COVID-19 pandemic has had a significant impact on transport patterns and data collected in the last year. We have included this data where available and provided some analysis of it throughout the document. However, owing to the exceptional circumstances surrounding it and uncertainty about long term trends, we have opted to omit it when discussing long term trends.

A key overall conclusion from this analysis is the need for more sustainable ways of travelling, particularly people choosing to walk and cycle. This is required to address the high levels of car usage and the associated negative impacts this is having on the county such as air pollution, congestion and physical inactivity.

Whilst the evidence shows that Oxfordshire is in a good starting point for achieving this, more work is required to ensure the county remains a thriving, attractive and healthy place to live.

Chapter 1 – Policy context

It is important to recognise the policy context within which the LTCP sits. This section provides an overview of the policies and strategies influencing the LTCP at a national, sub-national and local level. This list has been expanded following the LTCP vision document consultation. Whilst this is not an exhaustive list, it does highlight the key policies at each level.

National

Local Transport Act 2008

Local Transport Plan's (LTP) are statutory documents required under the Transport Act 2008. LTP's are forward looking plans that outline a clear plan for achieving transport aspirations within a local transport authority's administrative area. Whilst the Transport Act requires the production of an LTP, there is not up to date prescriptive guidance regarding how an LTP is produced or what it should include.

Industrial Strategy

The UK Industrial Strategy aims to create an economy that boosts productivity and earning power throughout the UK. As part of this the strategy sets out four Grand Challenges to put the United Kingdom at the forefront of the industries of the future. Two of these challenges, Clean Growth and Future of Mobility, have strong links to the LTCP.

Transport Investment Strategy

The Transport Investment Strategy sets out how the government's investment decisions will respond to today's challenges, driving progress towards fulfilling the aims of the Industrial Strategy. This document provides context for the levels of funding available and the rationale behind government investment in transport.

Transport Decarbonisation Plan

The government published the Transport Decarbonisation Plan in July 2021. It sets out the government's commitments and the actions needed to decarbonise the entire transport system in the UK. This includes the pathway to net zero transport in the UK, the wider benefits net zero transport can deliver and the principles that underpin the government's approach to delivering net zero transport.

It also sets out a role for revitalised LTP's to set quantifiable targets in carbon reductions in transport for local areas. Guidance for designing sustainable transport solutions through LTP's will also be published and it is stated that this will be linked to funding for schemes.

The LTCP has been developed to consider the commitments in the decarbonisation plan and how it can contribute to delivery of them.

Gear Change

The Gear Change plan describes the vision to make England a great walking and cycling nation. It sets out the actions required at all levels of government to deliver this vision, grouped under four themes. The plan highlights that the UK needs to see

a step-change in cycling and walking in the coming years. The LTCP will build upon the direction set by the government and will help to deliver this change.

Future of Mobility: Urban Strategy

The Future of mobility: urban strategy outlines the government's approach to maximising the benefits from transport innovation in cities and towns. It sets out the principles that will guide government's response to emerging transport technologies and business models. This understanding is helpful for framing the County Council's response to innovative technology in the LTCP.

Government's 25 year Environment Plan

Launched in January 2018, the government's 25 Year Environment Plan sets out how the government will improve the environment. The main goals of this strategy are creating richer habitats for wildlife, improving air and water quality and reducing plastic in the world's oceans. Transport will contribute towards achieving these aspirations.

National Bus Strategy

The National Bus Strategy was published in March 2021. The strategy sets out the vision and opportunity to deliver better bus services for passengers across England. As required by the strategy, the county council entered into an enhanced partnership with Oxfordshire's bus operators in June 2021. We have also published our bus service improvement plan alongside the LTCP.

UK Carbon Budget

The UK government have set a legally binding target to achieve net-zero carbon emissions by 2050. The government published the sixth carbon budget in April 2021 to ensure Britain remains on track to end its contribution to climate change while remaining consistent with the Paris Agreement temperature goal.

The carbon budget sets the legally binding target to reduce emissions by 78% by 2035 compared to 1990 levels. The LTCP will align with and help to deliver these legally binding targets.

Sub-National and regional

England's Economic Heartland Transport Strategy

Oxfordshire County Council is a part of England's Economic Heartland (EEH) sub-national transport body. EEH covers 11 Local authorities, including all of the Oxford to Cambridge arc.

EEH published a transport strategy for the region in February 2021. The strategy sets out that a step-change in approach is required to address the challenges our transport system already faces and to realise the region's economic potential and deliver sustainable growth.

The transport strategy sets out how the region will deliver this step change. The transport strategy will also be supported by a programme of connectivity studies and through an investment pipeline. The LTCP has been developed to reflect these priorities and will also help to deliver EEH's aspirations for the region.

OxCam Arc Spatial Framework

In August 2021, the government started a public consultation seeking views on the first stage of the Oxford-Cambridge Arc Spatial Framework. This will have national planning and transport policy status, meaning it will carry significant weight in the planning process.

Neighbouring local authorities

Oxfordshire borders the local authorities of West Berkshire, Swindon, Gloucestershire, Warwickshire, Northamptonshire and Buckinghamshire. Developments and policies in these counties can have an impact on Oxfordshire. We have therefore engaged with our partners in these local authorities when developing the LTCP and will continue to monitor cross boundary proposals.

Local

Oxfordshire Strategic Vision

The Oxfordshire Growth Board have developed a Strategic Vision for Oxfordshire. The Strategic Vision will establish a common and shared ambition to guide the focus of plans, strategies and programmes for Oxfordshire. The vision identifies an overarching vision statement as well as seven outcomes that if we are successful, will have been achieved in Oxfordshire by 2050.

The LTCP will play an important role in helping to deliver the Strategic Vision and has been developed in accordance with it. Key 2050 outcomes from the Strategic vision that the LTCP will help to deliver are:

- We will already be carbon neutral and accelerating towards a carbon negative future
- Our residents will be healthier and happier, and overall wellbeing will have improved
- Our county's connectivity will be transformed in ways that enhance wellbeing

Local Plans

All of the Oxfordshire district councils have produced local plans which outline future development proposals to the 2030's. These strategies guide future growth and outline future sites that are permitted for housing and employment development.

The LTCP has been developed to consider the impacts of these proposals and we will work with the district councils to inform future work on the local plan's such as through local plan review's and supplementary planning documents.

Oxfordshire Plan 2050

In support of future growth, the district councils in Oxfordshire are working together to produce a Joint Statutory Spatial Plan known as 'the Oxfordshire Plan'. The Oxfordshire Plan will provide a strategic planning framework for Oxfordshire to 2050, setting out housing, employment and infrastructure needs.

The LTCP has been developed in line with the Oxfordshire Plan to inform its content, consider its outputs and identify the relevant transport schemes that may be required in response.

Oxfordshire Infrastructure Strategy (OxIS)

The Oxfordshire plan will be supported by the Oxfordshire Infrastructure Strategy (OxIS). OxIS provides a long-term framework to identify strategic infrastructure investment priorities.

Oxfordshire County Council Climate Action Framework

In October 2020 the County Council approved a Climate Action Framework. The document sets out the county council's plans to make itself a carbon neutral organisation by 2030, and to enable Oxfordshire as a whole to become net-zero by 2050. The LTCP will be essential to delivering these commitments and outlines in more detail how transport will contribute to these ambitions.

Local Industrial Strategy

The Local Industrial Strategy (LIS) sets out an ambitious plan to build on Oxfordshire's strong foundations and world-leading assets, to deliver transformative growth which is clean and sustainable. The Oxfordshire Investment Plan and Economic Recovery Plan are key strategies supporting the LIS. The LTCP will help to deliver these aspirations and will ensure there is the transport network required to support growth aspirations.

Joint Health and Wellbeing Strategy

The Joint Health and Wellbeing Strategy sets out how the NHS, Local Government and Healthwatch will work together to improve resident's health and wellbeing. The LTCP can help to deliver some of these improvements and specifically takes forward priorities around Healthy Place Shaping.

Oxfordshire Digital Infrastructure Strategy and Delivery Plan

The Digital Infrastructure Strategy and delivery plan set out our vision for Oxfordshire to be enabled with smart infrastructure and our strategy for achieving this. They are scheduled to be updated in 2022.

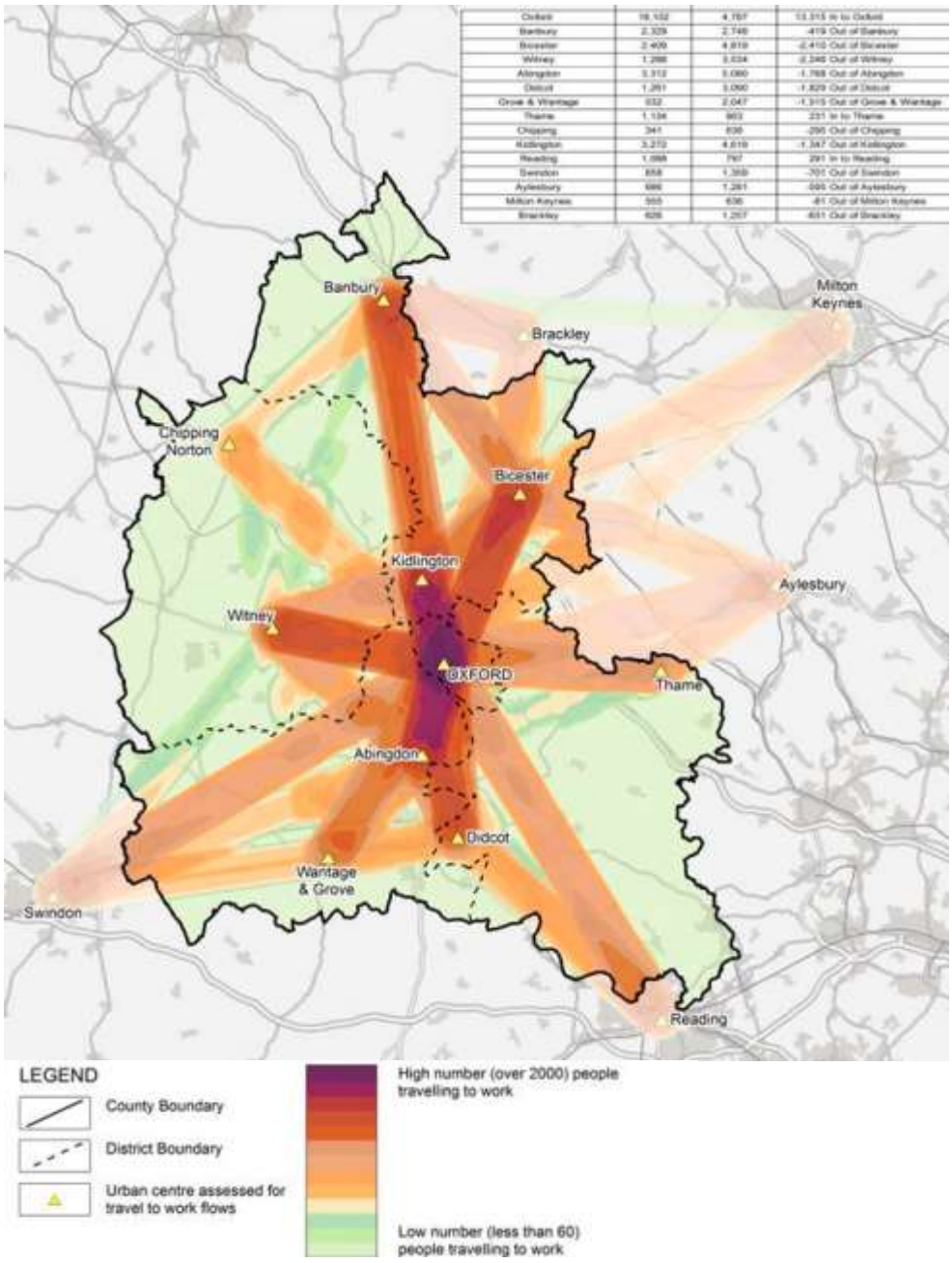
Summary

- There are a range of strategies at the national, sub-national and local level that have informed and will be supported by the LTCP.

Chapter 2 – Road and rail links

Oxfordshire sits on the busy road and rail transport corridor between the south coast ports, the Midlands and the north and enjoys easy links to London and the West Midlands via the M40. However, it suffers a lack of connectivity to and from the east, in particular to the areas around Milton Keynes and Cambridge.

The existing road links between Oxfordshire and London, Birmingham, Heathrow Airport and Southampton are currently used by a high volume of through traffic which can result in long delays to journeys by road. The M40 carries the most traffic, particularly between junctions 9 and 10, which links the A34 via the A43 to the M1.



Main travel to work flows in Oxfordshire[1]

[1] Census 2011

The county relies heavily on the A34 for internal trips and carries up to 70,000 vehicles per day, including a large proportion of lorries as it is a key route to the southern ports. It is particularly vulnerable to disruption due to incidents, because of the lack of alternative north-south routes for journeys both within and through the county. Congestion suffered on the A34 is damaging to both the national and local economy due to its importance.

Oxfordshire occupies a pivotal point in the UK rail network, with rail lines heading north, south, east and west passing through the county. Connectivity from Oxfordshire is shown on the map below. The railway is a national network but a vital local asset helping to transport both people and goods.

The rail network is a vital component in supporting Oxfordshire's economic development by linking key locations in the Oxfordshire Knowledge Spine both with each other and with the rest of the United Kingdom and the world. Rail is a genuine alternative to roads and has the potential to become part of the backbone of Oxfordshire's transport network.

Map of rail connectivity from Oxfordshire[2]

[2] Oxfordshire County Council: Connecting Oxfordshire Volume 3: Rail Strategy

The main rail corridor is focused on the central spine of Oxfordshire, running between Didcot, Oxford and Banbury. Rail connections with London, Birmingham and Bristol are relatively good with frequent services. Direct links with cities making up the northern powerhouse of England are less frequent, often no more than hourly.

Connectivity with eastern England and with international gateways is currently convoluted or non-existent. However, Oxfordshire is due to benefit from on-ward rail connectivity towards Milton Keynes and Bedford once the next stage of East-West Rail is built. The Oxfordshire Rail Corridor Study has shown Oxfordshire could also benefit from further rail investment linked to new development, such as operating services on the Cowley Branch Line.

Summary

- Oxfordshire lies on a well-connected and busy transport corridor, but it lacks links to and from the East and is reliant on the A34 for internal journeys.
- Planned rail invesment such as East-West rail will help improve longer-distance connectivity, but further investment in public transport is also likely to be needed if such transport movements are to be more sustainably enabled in the future.

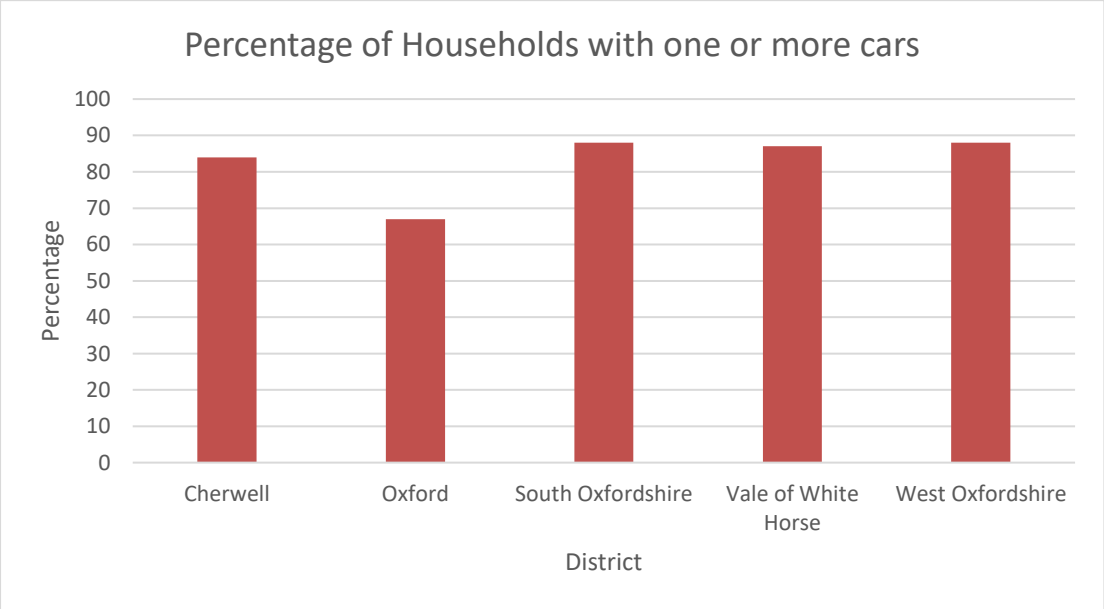
Chapter 3 – Private car

Ownership

Car ownership is high across Oxfordshire, particularly outside of Oxford. In total 83% of households in Oxfordshire have access to 1 or more cars or vans. This is significantly higher than the average for England which is 74%[3].

Within Oxfordshire itself there is significant variation in the percentage of households that have access to 1 or more cars. In Oxford only 67% of households own 1 or more car, whereas the other 4 districts all have ownership levels over 80%. South Oxfordshire and West Oxfordshire have the highest levels of car ownership with 88% of households owning 1 or more car.

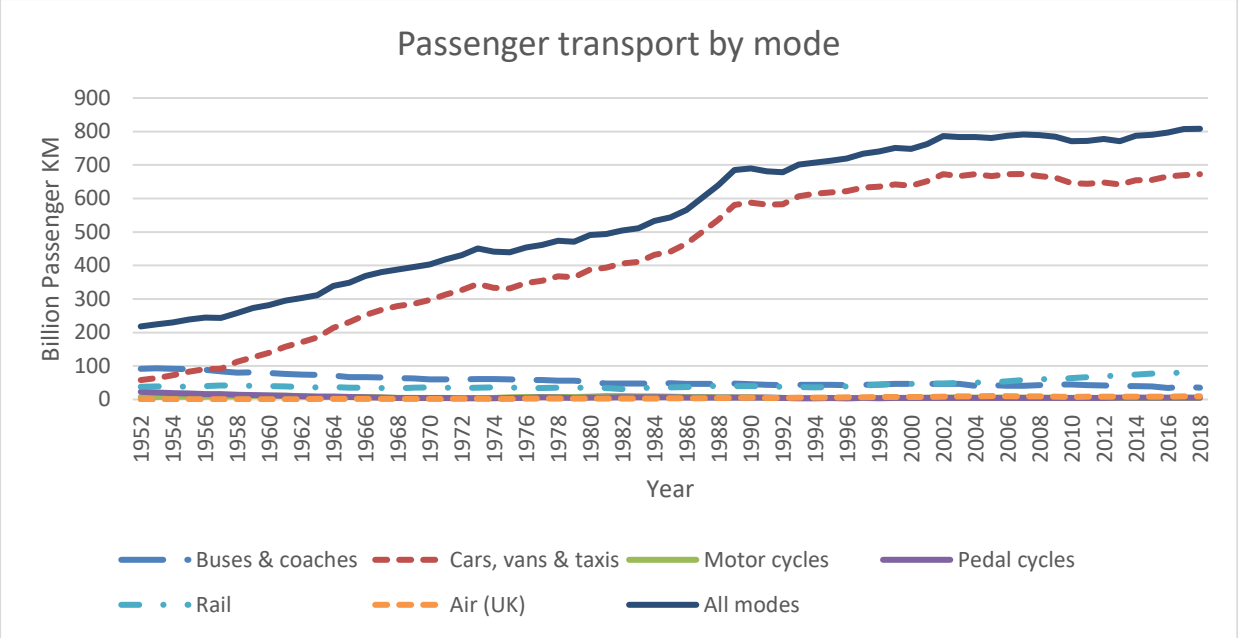
These patterns of ownership highlight the challenges that face Oxfordshire in terms of reducing private car usage and that much stronger measures will be required to facilitate this change. However, it is also important to consider those households that do not have access to a car in order to improve socioeconomic equality.



Usage

Since 1952 we have seen a significant rise in mobility, driven by the private car in England. Individual car usage has tripled since 1952, from 2500 miles per person each year, to 7500 miles[4]. As seen on the chart below, there has been a gradual reduction of bus use down to 4% of our distance covered. However, since the mid-90s there has been a growth in railway usage, now up to 10% of our mileage.

[3] 2011 Census: Car or van availability, local authorities in England and Wales
[4] Department for Transport: Passenger transport: by mode, annual from 1952



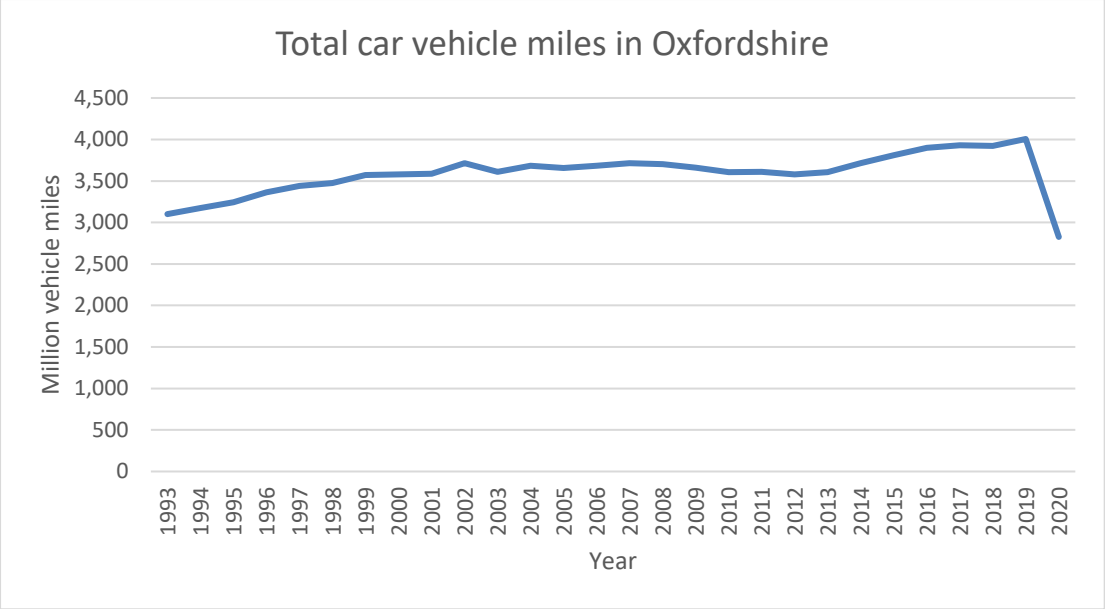
Whilst the trend of increasing car use has slowed since 1990, the total vehicle miles driven continues to increase. In England, total vehicle miles driven have increased by 32% between 1993 and 2019[5]. This trend has also been reflected in Oxfordshire where total vehicle miles driven have increased by 29% between 1993 and 2019. In 2019 total vehicle miles driven in Oxfordshire passed 4 billion for the first time, the 18th most out of the 209 Local Authorities in the Department for Transport's statistics.

This continued increase in private car usage is not sustainable and will further compound existing issues such as congestion, parking and air quality. It is therefore essential that a plan is set out to address this trend.

COVID-19 had a significant impact on car travel. There was a drastic 29% decrease in car vehicle miles in Oxfordshire from 2019 to 2020. This decrease was higher than both the national average (25%) and the average for the south east (26%).

It remains to be what the long term impact of the COVID-19 pandemic on travel will be. However, initial studies have found that the total amount of miles driven in the UK between lockdowns (August – October) exceeded 100% of normal levels, peaking at 110% of normal levels in September[6]. We therefore expect that car vehicle miles will quickly return to and potentially exceed 2019 levels.

[5] Department for Transport: Car vehicle traffic (vehicle miles) by local authority in Great Britain, annual from 1993
[6] INRIX Global Traffic Scorecard 2020



As highlighted previously, we have opted to omit the 2020 data from the long term analysis of congestion data. The 2020 data is impacted by the COVID-19 pandemic and so is discussed separately. As discussed, we believe many of the 2020 trends to do with vehicle mileage will not continue.

The increase in the vehicle miles travelled and a growing population have created issues with congestion across the UK. On average British drivers lose 115 hours per year to congestion, costing the UK economy an estimated £5.2 billion[7].

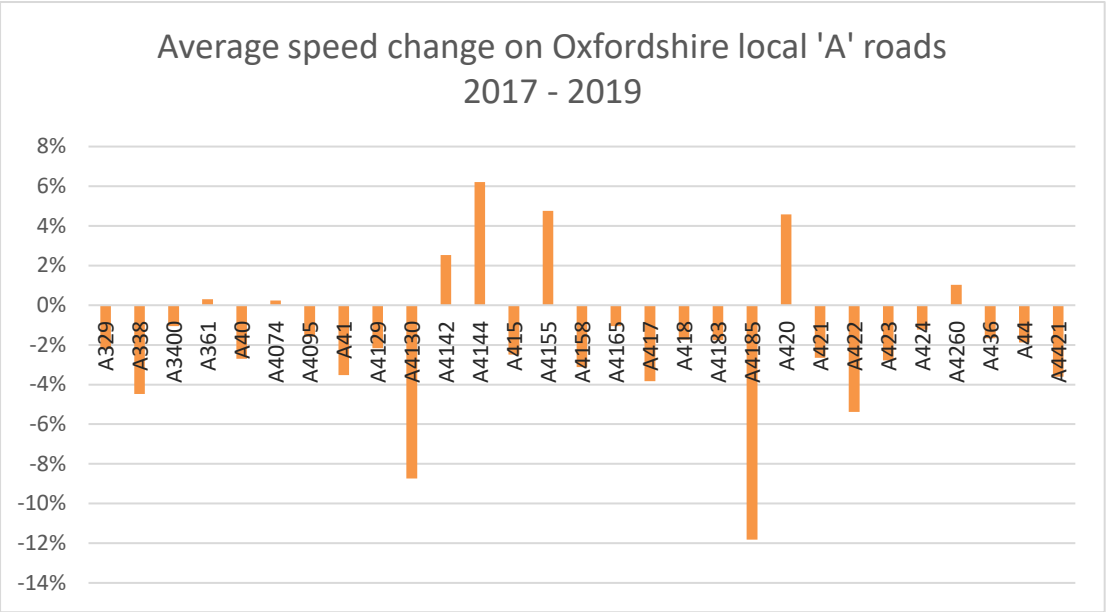
Average speeds on both the Strategic Road Network (SRN) and Local 'A' Roads decreased between 2014 and 2019 across the UK. Average speeds on the SRN decreased by 1%[8], with the average delay increasing by 7%[9].

Within Oxfordshire only the M40 and A34 are part of the SRN. These roads saw average speeds decrease by 0.3% between 2017 and 2019. Notable areas that saw above average speed decreases were the M40 Southbound between J10-J9 and the A34 Northbound between the A44, B4027 and B430. Similarly, Oxfordshire's SRN roads saw average delays increase by 1.2% between 2017 and 2019.

Average speeds on local 'A' roads saw a larger decrease in average speeds between 2014 and 2019. Across the UK speeds on urban local 'A' roads decreased by 6% and speeds on rural 'A' roads decreased by 3% since[10]. Average speeds on Oxfordshire's local 'A' roads reflected this trend with a 2% decrease in average speeds between 2015 and 2019. Average speeds on the A4185, A4130 and A422 decreased by the most over this period.

[7] INRIX 2019 Global Traffic Scorecard
[8] Department for Transport: Average speed on the Strategic Road Network in England: monthly and year ending from April 2015
[9] Department for Transport: Average delay on the Strategic Road Network in England: monthly and year ending from April 2015
[10] Department for Transport: Monthly and 12 month rolling average speeds on local 'A' roads in England

Congestion is having an impact on journey times across the UK, with these trends being reflected in Oxfordshire. We expect that these issues will continue following the COVID-19 pandemic and so it is essential that long term steps are taken to remedy this situation and fight congestion at its cause to ensure the county remains a thriving and attractive place to live.



Congestion 2019 - 2020

The reduction in congestion due to the COVID-19 pandemic resulted in UK drivers saving £2.6 billion. Congestion cost the average UK driver £291 in 2020 compared to £904 in 2019[11]. Tackling congestion can therefore play a significant role in supporting the UK economy.

As expected, a result of the COVID-19 pandemic was an increase in average speeds and decrease in delays on the SRN when comparing 2020 to 2019. Average speeds increased by 3%, with the average delay decreasing by 34%[12]. Oxfordshire's SRN roads reflected this trend with average speeds increasing by 6% and delays decreasing by 11% between 2019 and 2020[13].

Similarly, average speeds on local 'A' roads increased between 2019 and 2020. Nationally, average speeds on urban 'A' roads increased by 10% and speeds on rural 'A' roads increased by 4%. Oxfordshire's local 'A' roads reflected this trend with an 8% increase in average speeds[14].

The impacts of COVID-19 demonstrate the benefits that can be delivered by reducing the number of vehicles on the road.

[11] INRIX Global Traffic Scorecard 2020
[12] Department for Transport: Average speed on the Strategic Road Network in England: monthly and year ending from April 2015
[13] Department for Transport: Average delay on the Strategic Road Network in England: monthly and year ending from April 2015
[14] Department for Transport: Monthly and 12 month rolling average speeds on local 'A' roads in England

Vehicle speed compliance

The Department for Transport publish estimates of car compliance with speed limits in free-flowing conditions on roads in Great Britain. These are based on speed data from a sample of Department for Transport's Automatic Traffic Counters. Whilst not specific to Oxfordshire, these statistics provide us with an insight into speeds at which drivers choose to travel when free to do so. This helps to inform our policies on road safety, notably our proposals on 20mph zones.

The analysis found that in 2020, under free-flowing traffic conditions, 56% of cars exceeded the speed limit on 30mph roads compared to 53% on motorways and 12% on national speed limit single carriageway roads[15].

This trend was reflected for all vehicle types, with speed compliance tending to be highest on National Speed Limit (NSL) single carriageways and lowest on 30mph roads as shown on the table below.

Road	Cars	Vans	Articulated HGV	Rigid HGV	Short buses	Long buses	Motorcycles
Motorways	53	55	2	-	-	-	58
NSL single carriageways	12	-	35	41	45	48	29
30mph roads	56	58	46	49	29	24	67

Percentage of vehicles exceeding the speed limits by road class, 2020

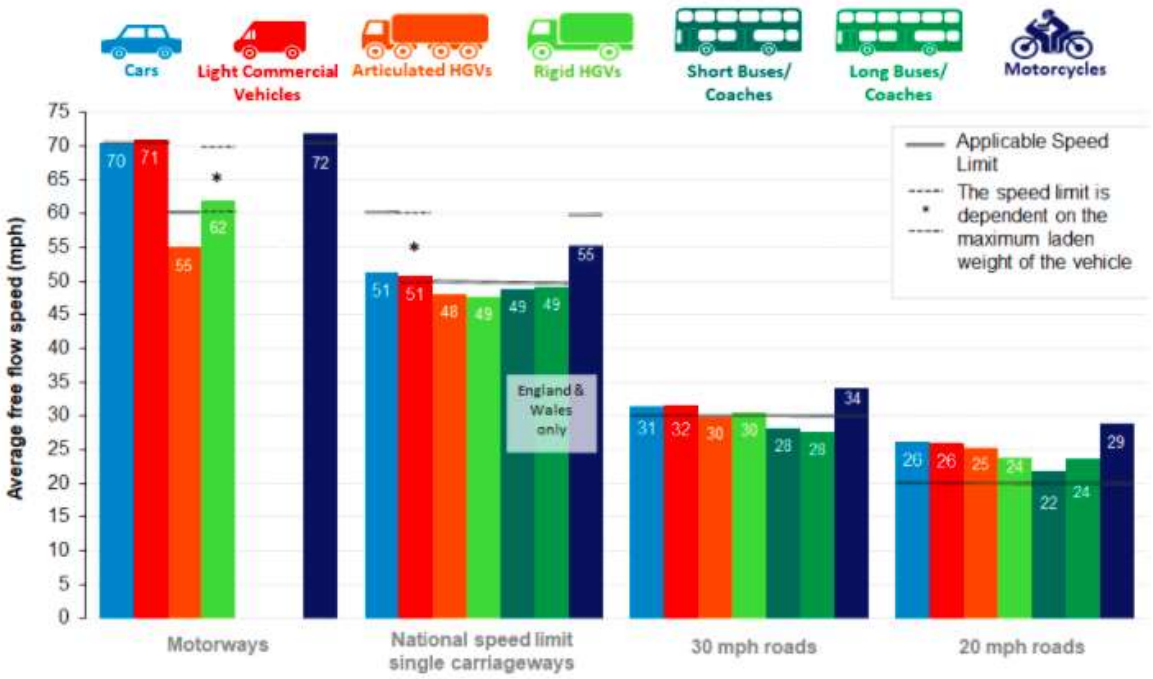
The proportion of cars exceeding the speed limit by over 10mph on 30mph roads was 6%. On NSL single carriageway roads and motorways the proportion was 2% and 13% respectively.

The average free-flow speeds at which drivers choose to travel as observed at sampled locations is also included. This analysis found that for motorways and national speed limit single carriageway sites, the average free-flow speed is at or below the designated speed limit for each vehicle type.

For 30mph sites the average free-flow speed is slightly above the speed limit for 3 vehicle types (cars, motorcycles and vans), with averages for all vehicle types ranging from 28mph to 34mph overall.

For the 20mph sites sampled (the DfT state that these are not thought to be representative of all 20mph roads), the average speed is above the speed limit for all vehicle types, ranging from 22mph to 29mph but below the average speeds seen on the 30mph roads.

[15] https://www.gov.uk/government/statistics/vehicle-speed-compliance-statistics-for-great-britain-2020/vehicle-speed-compliance-statistics-for-great-britain-2020



Average free-flow speeds by vehicle type and road type in Great Britain, 2020[16]

Ultra-low emission vehicles

An Ultra-low emission vehicle (ULEV) is defined as one which emits less than 75g of carbon dioxide from the tailpipe per kilometre travelled. It typically refers to Battery Electric Vehicles (BEVs) and hybrid vehicles.

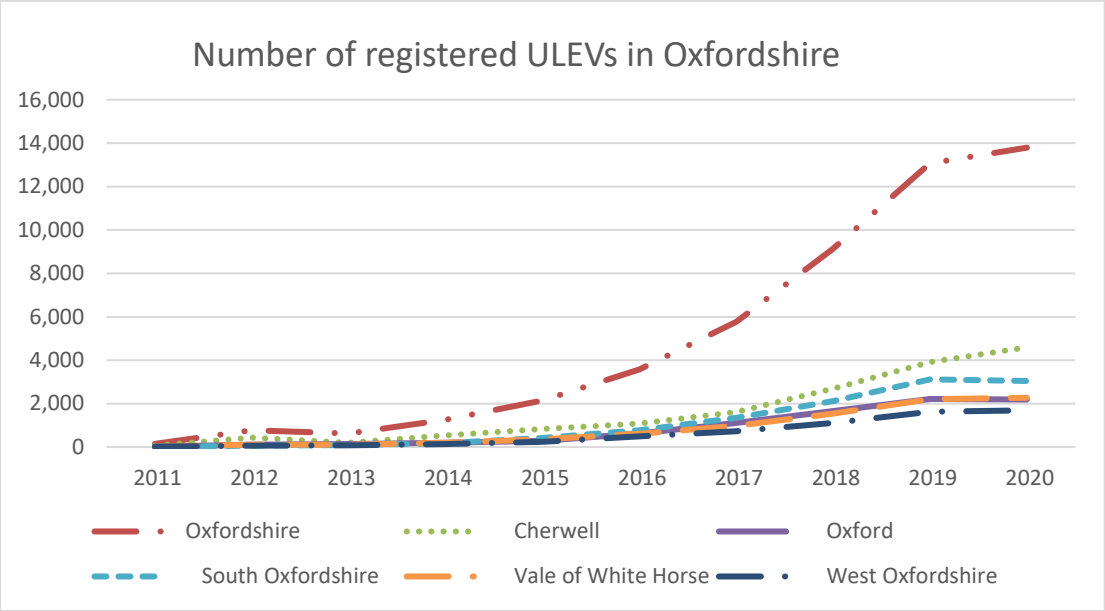
BEVs include cars, motorcycles, scooters, buses and trucks. Large BEVs such as buses and medium/large trucks are less common, but development is ongoing, and vehicles of this type are likely to become more common on Oxfordshire's roads over the coming years.

The number of registered ULEV's has grown rapidly in the last 10 years, particularly in the last 5 years since the publication of LTP4. ULEV's have the potential to reduce the environmental impact of car travel as they produce significantly fewer emissions. However, it should be noted that they do not address all issues. ULEV's still produce particulate matter from tyre and brake pad wear and will not address congestion issues.

There has been an increase in the number of registered ULEV's of over 9700% in England since 2011. This trend has been replicated in Oxfordshire with a growth in the number of registered ULEV's of over 9000% since 2011[17].

[16]https://www.gov.uk/government/statistics/vehicle-speed-compliance-statistics-for-great-britain-2020/vehicle-speed-compliance-statistics-for-great-britain-2020
[17] Department for Transport: Ultra low emission vehicles (ULEVs) licensed at the end of the quarter by upper and lower tier local authority, United Kingdom from 2011

In Oxfordshire there has been an increase in the number of registered ULEV's of 285% since 2016, notably higher than the national average of 210%. West Oxfordshire currently has the lowest number of registered ULEV's and the lowest growth rate, however the percentage increase of 242% since 2016 is still above the national average.



These statistics highlight that ULEV growth in Oxfordshire is very strong and so it will be necessary for the LTCP to consider provisions for both supporting these vehicles and encouraging further uptake.

Summary

- There are high levels of car ownership across the county, except for Oxford.
- Since 1952 there has been a significant increase in car usage in the UK. This trend has been reflected in Oxfordshire, with vehicle miles increasing.
- Congestion is affecting journey times across Oxfordshire. Steps are required to address this and ensure the county remains thriving and attractive.
- COVID-19 significantly reduced vehicle miles and associated data. Further monitoring is required; however, we expect vehicle usage to return to pre-pandemic levels.
- 30mph roads generally have the lowest levels of speed compliance.
- For 20mph roads the average speed is above the speed limit for all vehicle types, but below the average speeds seen on the 30mph roads.
- The number of Ultra-low emission vehicles in Oxfordshire is continuing to grow rapidly and so provisions for these vehicles will be required.

Chapter 4 – Public transport

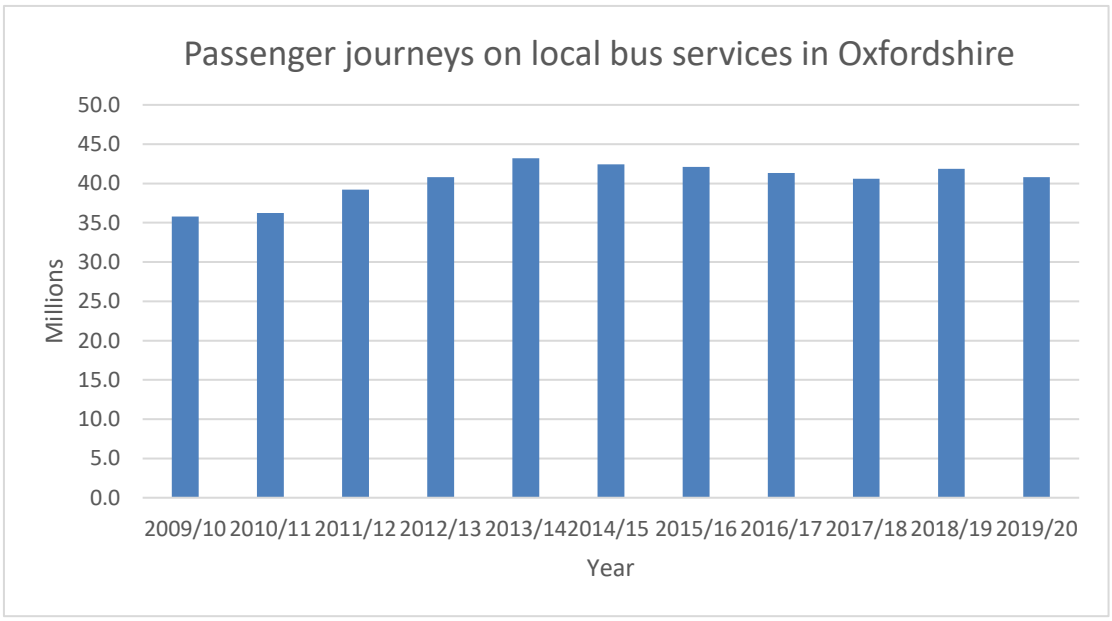
Buses

Bus usage

The number of passenger journeys on local buses has been falling over the last decade in England. The number of journeys in England (outside London) has fallen by 11.8% since 2009/10. Total local bus passenger journeys in England were 4.07 billion in England in 2019/20, a 5.5% decrease from the previous year. This decrease can largely be attributed to the COVID-19 pandemic[18].

Bus mileage has also seen a decreasing trend across England. Vehicle miles on local bus services in England have decreased by 13.9% since 2009/10 and are now at 1.13 billion vehicle miles. This was a 3.1% decrease when compared to the previous year.

Despite these national trends, bus usage in Oxfordshire has increased over the last 10 years. Oxfordshire has seen a 13% increase in the number of passenger journeys since 20010/11[19]. Similarly, Oxfordshire has seen the number of passenger journeys on local bus services per head of the population increase from an average of 56 per year in 20010/11 to 59 in 2019/20, a 6% increase[20].



A lot of this success can be attributed to Oxford, where there is a mature and well-used network of commercial bus services, including regular services to the city centre from five park and ride sites on the edge of the city. However, within Oxfordshire's towns, commercial bus networks are relatively less well developed.

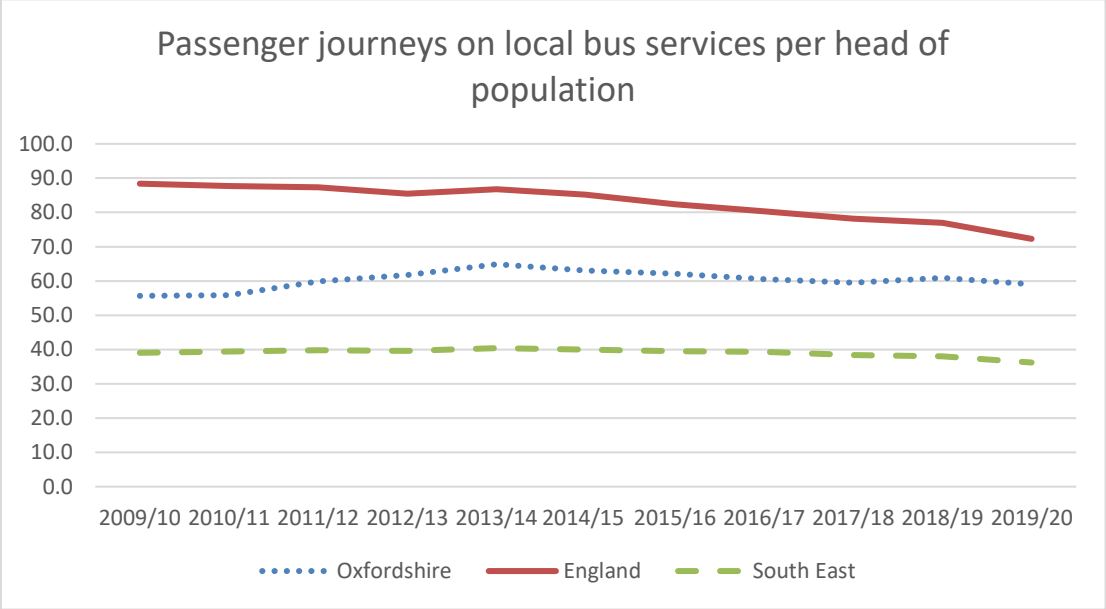
Despite a network of bus and rail services from the county's main towns to Oxford, the proportion of car journeys between these towns and Oxford remains stubbornly

[18] Department for Transport: Annual Bus Statistics: England 2019/20
[19] Department for Transport: Passenger journeys on local bus services by local authority: England, from 2009/10
[20] Department for Transport: Passenger journeys on local bus services per head by local authority: England, from 2009/10

high. In rural areas, reductions in central government funding has led to the removal of many subsidised local bus services.

Despite an overall increase in bus usage in Oxfordshire since 2009, there has been a declining trend in recent years. As seen on the graph, the total number of passengers has decreased by 6% since 2013/14, in line with the national trend. Similarly, the number of journeys per head of the population has declined by 9% since 2013/14.

Whilst Oxfordshire's journeys per head of the population remains above the average for the South East, it is still considerably below the average for England. Work is therefore needed to rectify these trends, encourage bus usage and improve connectivity across the county.



Bus affordability

The cost of transport is also a key determining factor affecting its use. We do not have statistics relating to bus fares in Oxfordshire, however national data provides a helpful overview of changes.

In the year to March 2020, local bus fares in England have increased by 2.5%, faster than the annual all items Consumer Prices Index rate of inflation (1.5% increase), meaning bus fares have risen in real terms[21].

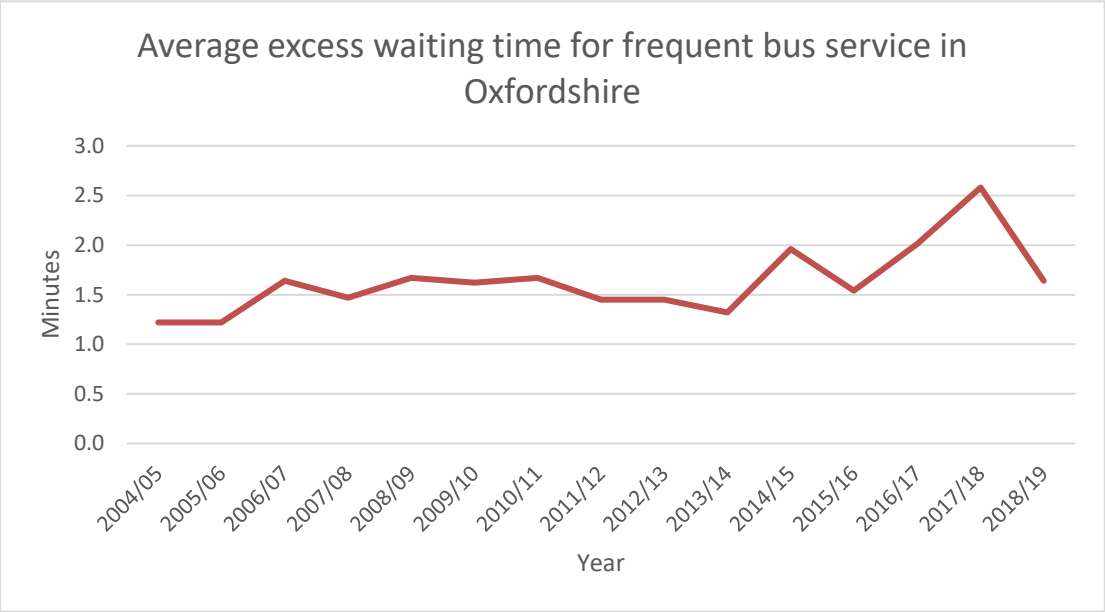
Local bus fares in England increased by 77% between March 2005 and March 2020. The all items Consumer Prices Index (CPI) has increased by 40% over the same period. Travel costs are therefore likely to now make up a larger proportion of residents spending. Unaffordable travel costs could act as a further deterrent to bus use and make it harder for residents to travel around the county by public transport.

[21] Department for Transport: Annual Bus Statistics: England 2019/20

Bus reliability

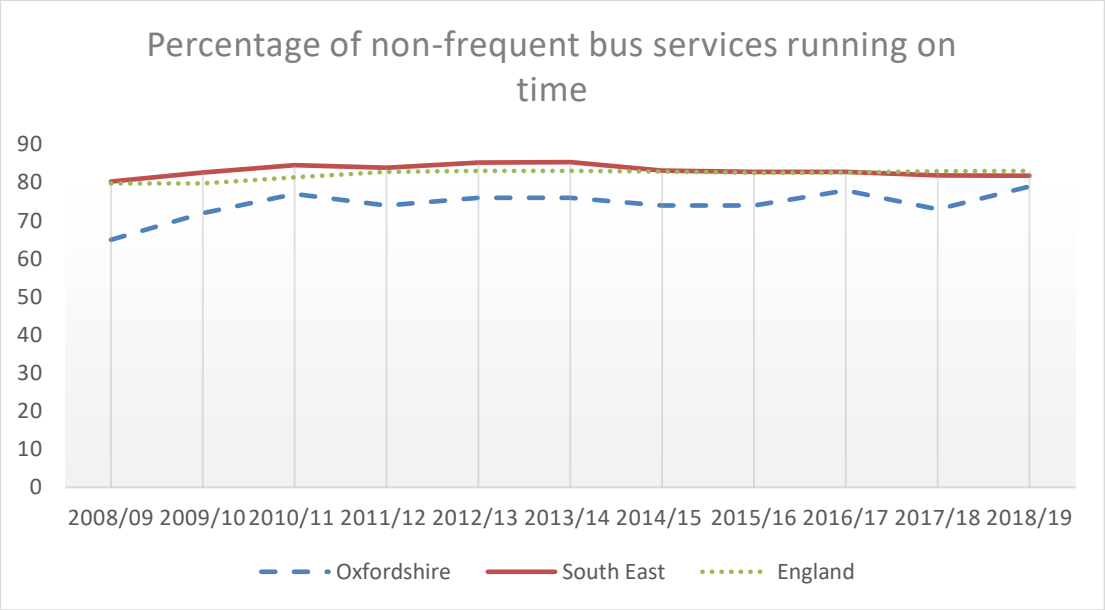
Reliability is another factor that plays an important role in bus patronage. Case studies have shown that improving bus service times and reliability will deliver increased patronage.

The reliability of frequent bus services in Oxfordshire has been decreasing in recent years. This is shown by the increase in average excess waiting time from 1.2 to 1.6 minutes on the graph below[22]. Averages for the South East and England are not available, however in the same time period the average excess waiting time for buses in London and Southampton have decreased. The primary cause for this change is increased levels of traffic congestion across the county.



The percentage of non-frequent bus services running on time has been increasing over the last 10 years. There has been an 11% increase in the number of these services running on time since 2005 to 79% of services in 2018/19[23]. However, despite this increase Oxfordshire remains below the average for the South East (82%) and England (83%). Residents want to know how long their journey will take and for their journeys not to be delayed or disrupted and so further work is needed to address congestion and improve bus priority.

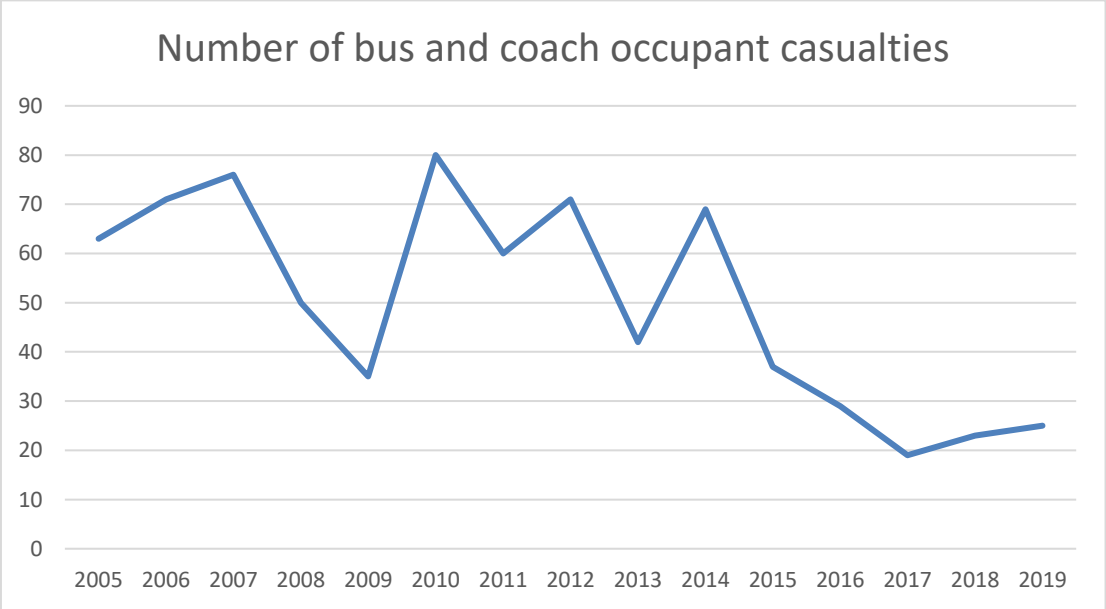
[22] Department for Transport: Average excess waiting time for frequent services by local authority: England, annual from 2004/05
[23] Department for Transport: Non-frequent bus services running on time by local authority: England, annual from 2004/05



Bus safety

Buses remain a safe mode of transport for occupants. There were 25 bus and coach occupant casualties in 2019, approximately 2% of all road traffic casualties in the county[24].

The number of bus and coach occupant casualties has increased slightly in the last 4 years from a low of 19 in 2017. However, the total number has significantly declined over the last 10 years as shown on the graph below.



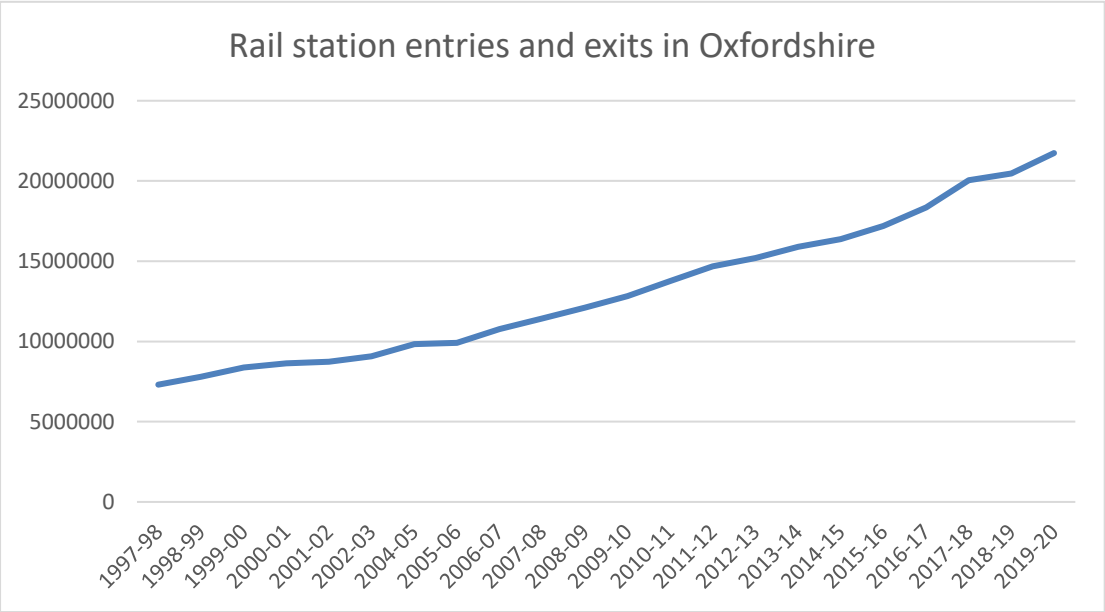
[24] Oxfordshire County Council Road Traffic Accident Casualty Data Summary 2019

Rail

Rail station usage

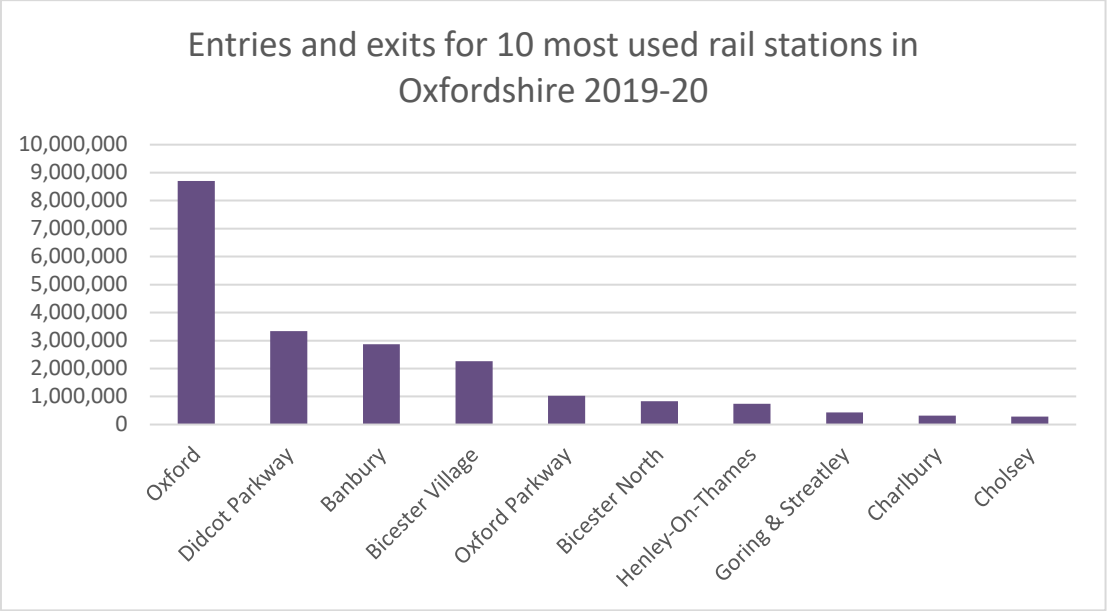
Demand for rail travel in Oxfordshire has grown rapidly and well above the UK average. Journeys to and from stations in Oxfordshire have increased by 75% in the 10 years to 2018 against a UK average increase of 44%[25].

Growth in the last 5 years has been particularly significant, averaging 5.2% annually against a national average of 2.7%. In total numbers, there were 21.7 million entries and exits to Oxfordshire rail stations in 2019-2020[26]. These figures highlight the attractiveness of rail in the county and the potential for it to further contribute to Oxfordshire's transport network.



Oxford is the most used rail station in the county with 8.7 million entries and exits in 2019-20. This is more than double the second most used station in the county, Didcot, which had 3.3 million entries and exits. The other most used statins in the county are Banbury, Bicester Village and Oxford Parkway. The graph below shows entries and exits for the 10 most used stations in the county.

[25] Network Rail: Oxfordshire Rail Corridor Study
[26] Office of rail and road: Time series of passenger entries and exits by station



There are some stations that have experienced significant growth in the last 5 years. Notable stations in this category include Bicester village (448% increase), Oxford Parkway (273% increase) and Islip (226% increase). The growth in usage of these stations can attributed to delivery of East-West Rail phase 1 which connected Oxford and Bicester. Other stations with above average increases include Combe, Culham and Oxford.

There have also been some stations that have experienced decreases in usage over the last 5 years. Most notably, Bicester North has experienced a 41% decrease in usage. However, this can largely be attributed to the improved connectivity from Bicester Village. Other stations experiencing declines include Didcot Parkway (-3%), Henley on Thames (-4%), Charlbury (-4%) and Radley (-7%).

Future rail improvements

The Oxfordshire Rail Corridor Study (ORCS), was commissioned by the Oxfordshire Growth Board and other partners. The study identified the need for a 70% increase in services as well improved calling patterns and service coverage by 2028.

Future growth will be concentrated on seven hubs in the Oxfordshire rail System: Banbury, Bicester Village, Culham, Didcot Parkway, Hanborough, Oxford and Oxford Parkway. Analysis of potential new stations also suggests that two stations on the Cowley Branch Line have a role to play in supporting growth.

A key proposal is that the majority of passenger services are extended through, rather than terminating at, Oxford station. Another key feature is provision of new direct services to Bristol and Swindon and strengthening of connections with Birmingham, Worcester, and the South Coast to support Oxfordshire's economic growth.

Network Rail have identified the Oxford Phase 2 works as the critical next step in boosting rail capacity, frequency and connectivity in the county. Delivery of Oxford

Phase 2 is critical to support the 2024 train service specification and all subsequent specifications.

A portfolio of interventions is required to deliver the 2028 specification. Some can be associated with individual service enhancements, but the majority represent a comprehensive system upgrade between Oxford North Junction and Didcot.

Rail operator customer satisfaction

Whilst Oxfordshire County Council do not have direct influence over the railways, we work with rail stakeholders and it is helpful to understand customer satisfaction to inform this partnership working.

The primary rail operators in Oxfordshire are Chiltern Railways, Great Western Railway and Cross Country. Overall customer satisfaction with these operators in Spring 2020 is shown on the table below[27].

Operator	Satisfied or good (%)	Change vs Spring 2019
Chiltern Railways	88%	-2%
Great Western Railway	86%	-1%
Cross Country	85%	-1%

Generally, passengers are satisfied with the primary rail operators in Oxfordshire. We will continue to work with rail operating companies, to ensure residents are provided with a consistently good quality service that adapts to customer expectations.

Summary

- Although bus usage in the county has increased overall since 2010, it has been declining since 2013/14. Work is therefore needed to address existing issues and further encourage bus use.
- COVID-19 has resulted in a decrease in bus journeys over the last year, it is unclear what the long term impact will be.
- Bus costs have increased significantly in the last 15 years.
- Bus reliability remains an issue in the county. Measures are required to address this and make bus travel more attractive.
- Rail usage has been increasing in the county and there are opportunities to further improve this.

[27] Transport Focus National Rail Passenger Survey 2020

Chapter 5 – Walking and cycling

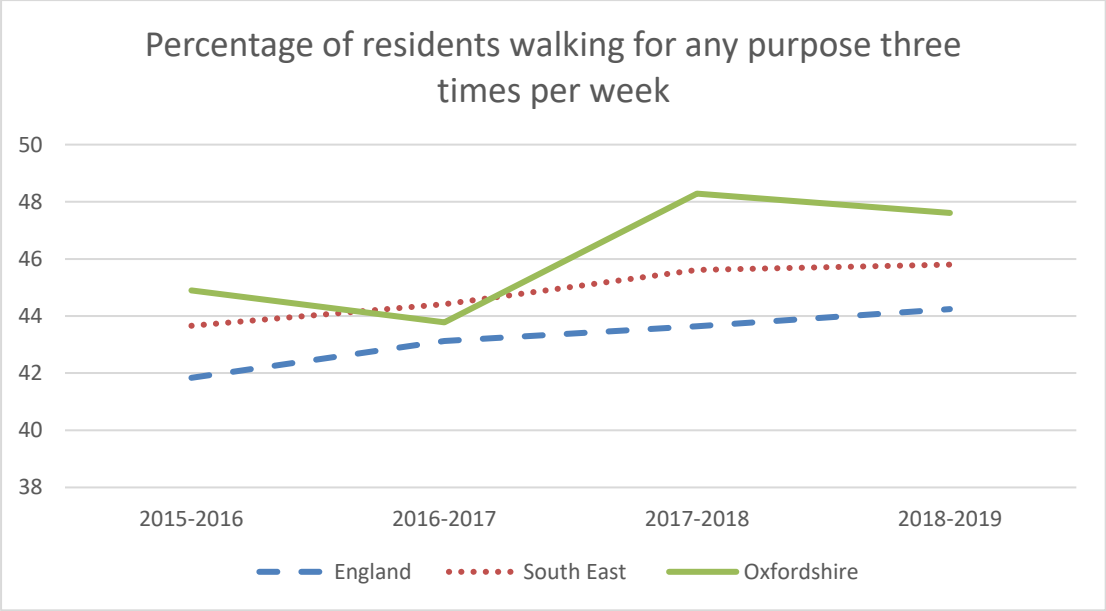
Oxford data

For data analysis in this section we have sometimes provided countywide figures with Oxford removed. Oxford is of a very different nature to many other areas of the county and its inclusion in countywide data sometimes obscures trends in walking and cycling that we are seeing elsewhere. More detailed analysis regarding walking and cycling in Oxford can be found in the Oxford LCWIP document.

Walking levels

The percentage of residents that do any walking is above the national average in Oxfordshire and has increased over the last 5 years. The percentage of residents that walk once per month for any purpose has increased from 82% to 86% since 2015 and is above the national average of 80%[28]. This trend is fairly consistent across the county with a high of 88% in the Vale of White Horse and a low of 84% in Cherwell.

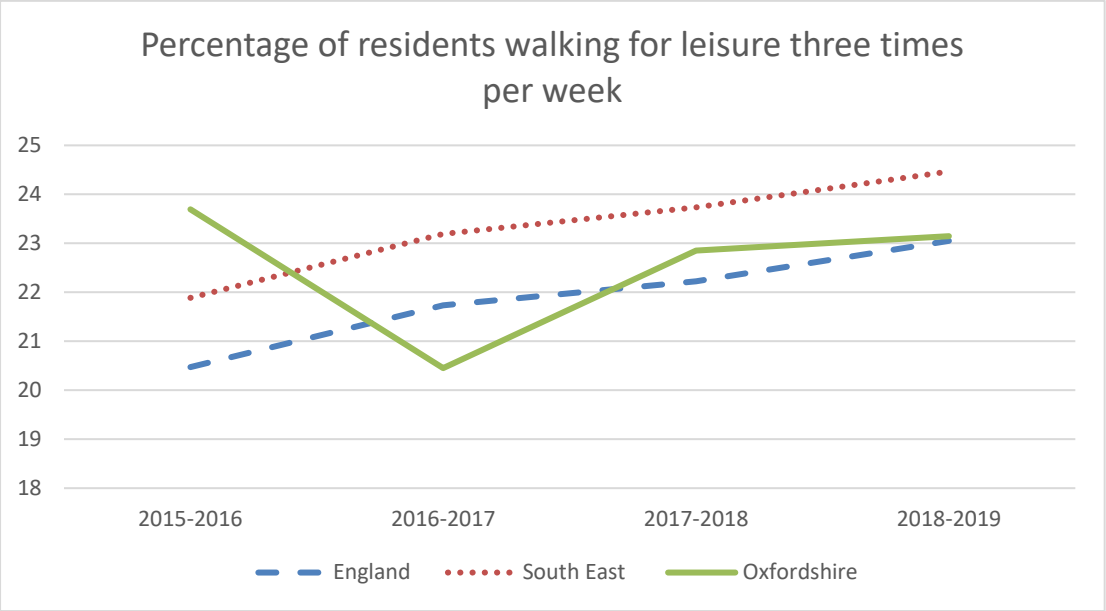
Similarly, the percentage of residents that do any walking three times per week has increased from 45% to 48% since 2015. This is also above the national average of 44%. However, there have been some negative trends in the proportion of residents regularly walking in Oxford since 2017.



In terms of walking for leisure and walking for travel, Oxfordshire has seen an increase over the last 5 years and remains above the national average. The percentage of residents walking for leisure once per month has increased by 5% since 2015 to 73%, above the national average of 64%. The percentage of residents walking more regularly for leisure has largely remained the same over the last 5 years and is more aligned with the national average.

[28] Department for Transport: Proportion of adults that walk, by frequency, purpose and local authority, England, 2018-2019

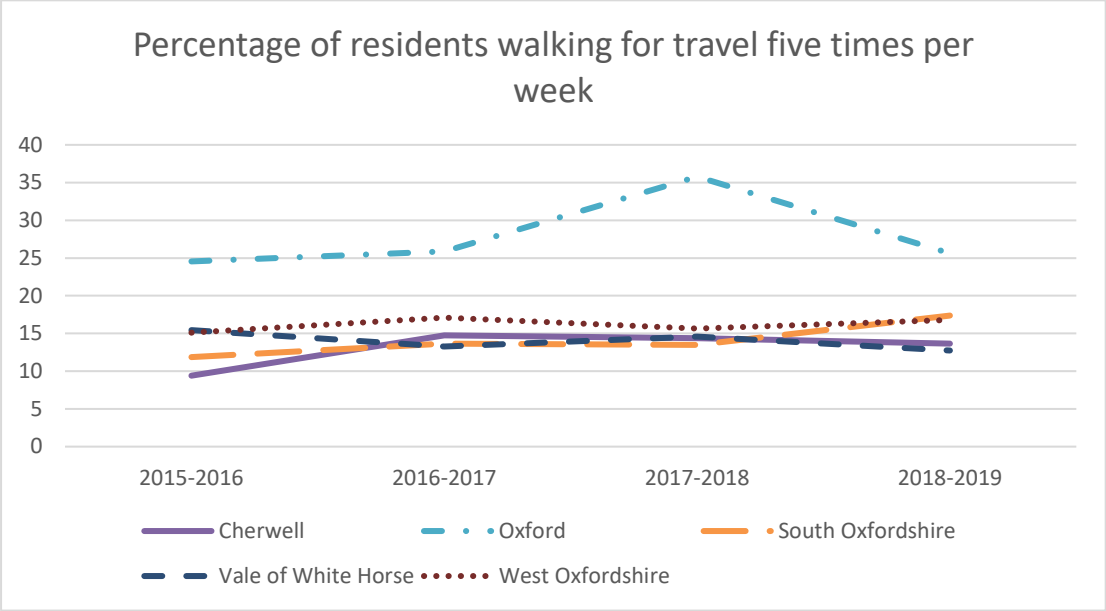
Oxford has the lowest proportion of resident's that walk for leisure. 65% of Oxford residents walk for leisure once per month compared to the countywide average of 73%. Similarly, 14% of Oxford residents walk for leisure three times per week compared to the countywide average of 23%. The proportion of residents walking for leisure three times per week in the other districts varies between 23% (Cherwell) and 30% (West Oxfordshire).



As highlighted the percentage of residents walking for travel in Oxfordshire is above the national average. In Oxfordshire 54% of residents walk for travel once per month and 25% walk for travel three times per week compared to the national averages of 49% and 23% respectively.

However, these averages are heavily influenced by Oxford. 71% of Oxford residents walk for travel once per month compared to next high of 52% in the Vale of White Horse. With Oxford removed, 49% of residents walk once per month for travel and 22% walk for travel three times per week. These figures are more in line with or slightly below the national average.

Within Oxford, we have seen the percentage of residents walking for travel decline since 2017. Notably the percentage of residents walking for travel five times per week has decreased by 10% since 2017, although this is still higher than the other (more rural) districts in Oxfordshire.



Whilst Oxfordshire is in a good starting place with regards to walking, there is still a need for further work. Recent declines in the percentage of people walking in Oxford could be part of a longer-term trend that would need to be addressed. As noted, the relatively high percentage of residents walking in Oxford also obscures the fact that walking levels in some districts are at or below the national average.

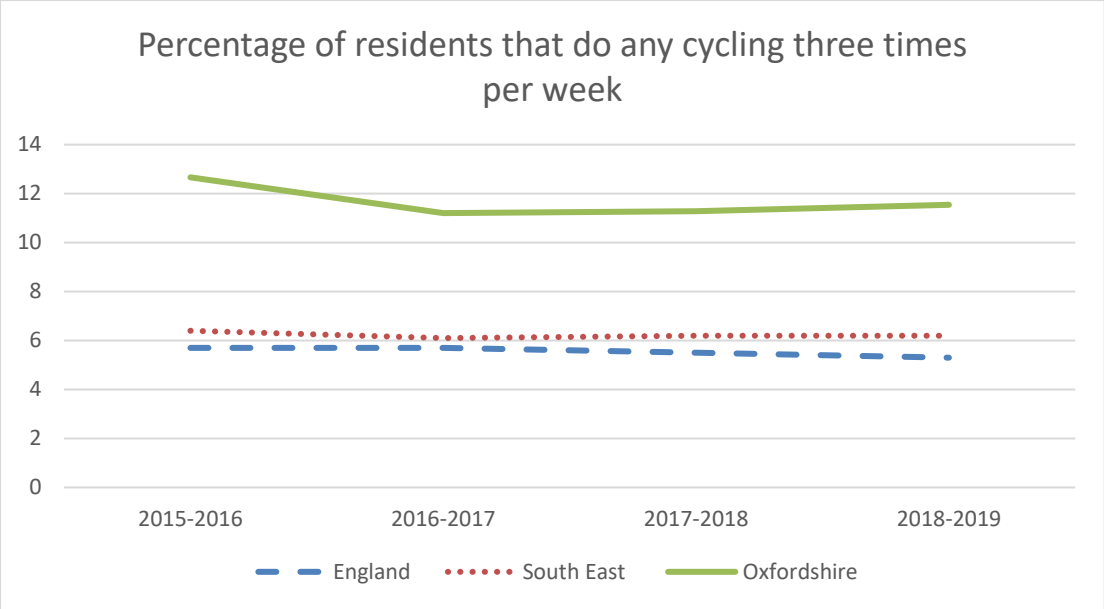
Current walking levels are also nowhere near the levels required to reduce private car usage, improve air quality and address public health issues. Therefore, further and more extensive work is required to encourage walking across Oxfordshire.

Cycling levels

Cycling accounts for just 2% of all trips made nationally and 1% of all distance travelled[29]. The number of trips made has remained largely steady since 2002 but the distance travelled has increased by 41%. However, approximately 2 thirds of all trips in England are 5 miles or under, with other 40% being 2 miles or under[30]. There is therefore significant potential to increase the proportion of residents that cycle.

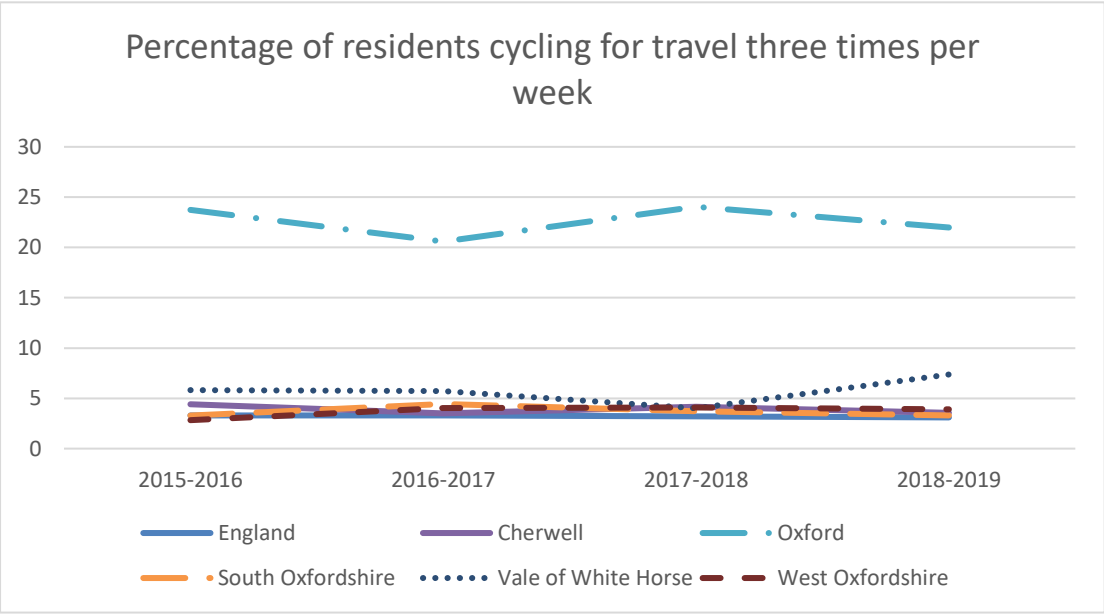
In line with national trends, the percentage of Oxfordshire residents that do any cycling has remained steady across the last 5 years. However, the percentage of residents cycling in Oxfordshire is notably higher than the national average. For example, in Oxfordshire the percentage of residents cycling once per month (27%) and three times per week (12%) are significantly higher than the national averages of 16% and 5% respectively.

[29] Department for Transport: Walking and Cycling Statistics, England: 2019
[30] Department for Transport: National Travel Survey; Average number of trips by trip length: England, from 2002 - 2019



It should be noted that Oxford has one of the highest proportion of residents cycling in the country which contributes significantly to the countywide figures. When Oxford is removed, the proportion of residents cycling once per month and three times per week fall to 22% and 8% respectively. Whilst these figures are reduced, they remain higher than the national averages.

These trends are much the same for the other cycling journey purposes of leisure and travel. Across both journey purposes the percentage of Oxfordshire residents cycling has remained largely consistent over the past 5 years and is significantly higher than the national average for all frequencies.



The proportion of residents cycling for leisure is fairly consistent across the county. However, the proportion of residents cycling for travel is heavily influenced by Oxford. The countywide averages for residents cycling for travel once per month or three times per week are 17% and 9% respectively. This is over double the national averages of 8% and 3%. When Oxford is removed, the proportion of residents

cycling once per month and three times per week for travel fall to 11% and 5%. These figures remain higher than the national averages but are significantly reduced.

As with walking, Oxfordshire is in a good starting point with regards to cycling. However, there are similar issues and opportunities that need to be addressed. The percentage of residents cycling has not seen a significant increase across the county and there have been some decreases over the last 5 years, notably in Oxford for overall travel and Vale of White Horse for leisure.

Similarly, as highlighted the very high percentage of residents cycling in Oxford obscures average or below average rates elsewhere in the county. Therefore, further work is required to encourage cycling across Oxfordshire.

Cycling safety

Road safety is a significant barrier to cycling. This has been highlighted in the National Travel Survey where road safety was cited by 24% of respondents as to why they do not cycle more and too much traffic was also cited by 16% of respondents[31].

Furthermore, when assessing the proportion of respondents agreeing that it is too dangerous to cycle on the road, we see that the percentage of respondents that agree has increased since 2011. Notably, the percentage of cyclists that agree has increased by 13% since 2011 to 57%.

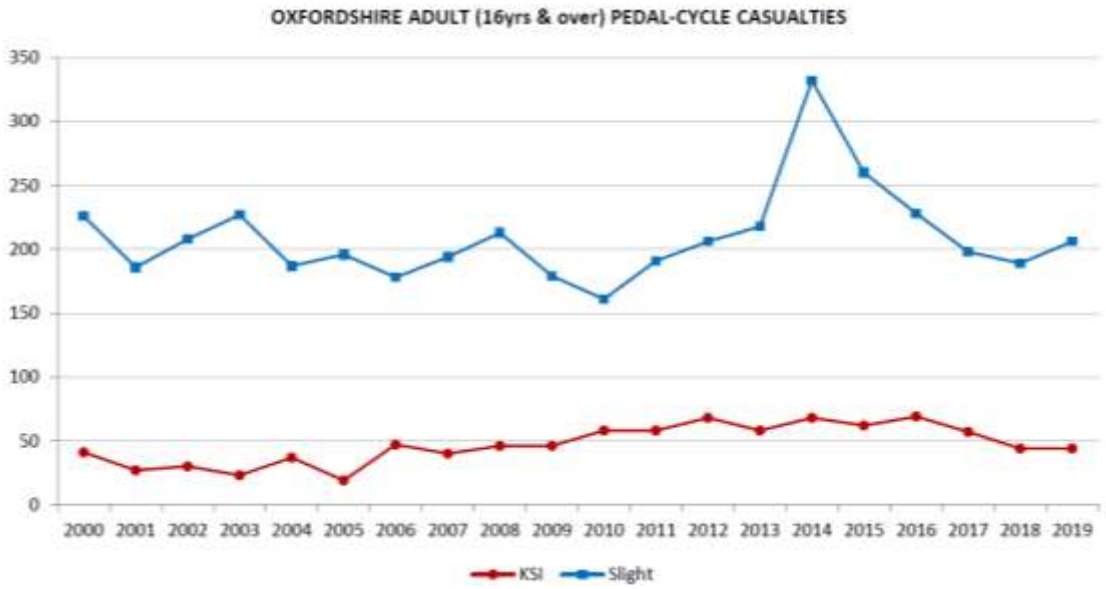
Whilst the number of non-cyclists that agree has only increased by 1%, this figure remains high at 70%[32], highlighting the perceived safety issues associated with cycling on road. In order to encourage further cycling, significant work is therefore needed to address cyclist safety.

Within Oxfordshire there were 270 pedal cyclist casualties in 2019. This made up 19% of all casualties, the second highest proportion of all road users[33]. Of these 270 casualties, 250 were adult cyclists and 20 were children. There were 45 casualties that were killed or seriously injured (KSI), 1 of these being a child and the rest being adults.

The number of child pedal cycle casualties has remained steady over the past 6 years following a period of declining casualty numbers. The number of adult pedal cycle casualties has remained fairly constant since 2000. There has however been a declining trend in recent years from a peak of 332 in 2014. This is despite an increase in the number of pedal cyclists over the same time.

Whilst there have been some improvements in cyclist safety in recent years it is clear that further work is needed to improve cyclist safety. This is particularly important to support our aspirations for increased cycling in the county.

[31]Department for Transport: Walking and Cycling Statistics, England: 2019
[32] Department for Transport: Proportion of respondents agreeing that it is too dangerous to cycle on the road, England, 2011 to 2020
[33]Oxfordshire County Council Road Traffic Accident Casualty Data Summary 2019



Walking and cycling demographics

Transport affects all residents and it affects them in different ways. It is important that we investigate and recognise these impacts to create a transport system that is inclusive and benefits all Oxfordshire residents.

Whilst there is not any local data regarding walking and cycling demographics, there is extensive national data which can help to inform our understanding of the different impacts and different needs of various groups.

In terms of walking, White British residents generally walk a lot more than other ethnicities. As shown on the table below, South Asian and Black residents walk significantly less than White British residents. There has also not been an increase in the percentage of South Asian and Black residents that walk over the last 5 years. Further consideration of the underlying factors for this and the needs of these residents is therefore required.

Ethnicity	2015-2016	2016-2017	2017-2018	2018-2019
White British	69%	71%	71%	73%
South Asian	61%	60%	61%	61%
Black	59%	59%	58%	59%
Chinese	66%	65%	69%	69%

Percentage of residents that do any walking once per week

The percentage of residents that cycle once per week, is also highest amongst White British residents. Whilst the differences between White British and other ethnicities are not as large as those for walking (4%), there is again a need to consider the factors contributing to these differences.

With regards to cycling, there is a stark gender difference. The percentage of men cycling once per week (16%) is over double that of women (7%). These figures have remained steady over the past 5 years. Consideration is therefore needed to address these differences and ensure cycling is accessible for all residents.

Finally, both walking and cycling follow a similar trend with regards to deprivation. Residents from the most deprived quartile have the lowest walking and cycling rates, with residents from the least deprived quartile having the highest walking and cycling rates. This trend is reflected across all journey purposes and frequencies, highlighting that there is a link between deprivation and walking and cycling levels Once again, these trends need to be considered as part of the LTCP to ensure Oxfordshire's transport system benefits all residents.

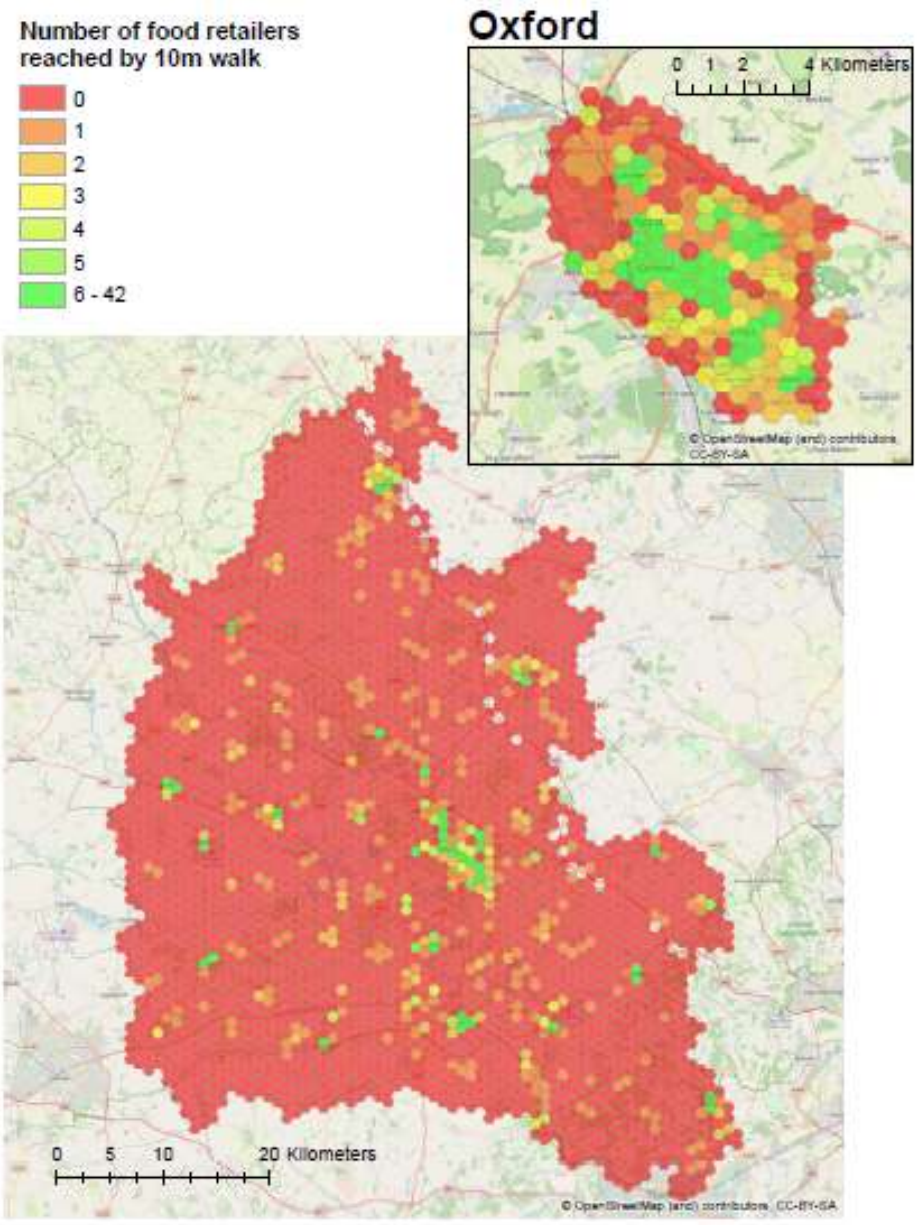
Level of Deprivation	Any Walking	Any Cycling
Least deprived quartile	75%	13%
Second least deprived quartile	73%	12%
Second most deprived quartile	72%	11%
Most deprived quartile	66%	10%

Percentage of residents that do any walking or cycling once per week 2018-2019

Access to services

Spatial planning can also help to encourage walking and cycling. By locating shops, services and leisure facilities near residential developments walking and cycling is a feasible option for residents. The LTCP has identified a 20 minute neighbourhood policy to help encourage this practice.

We have conducted an initial analysis of the number of food retailers reached within a 10 minute walk of an area in support of the 20 minute neighbourhood policy. This analysis is shown below and highlights the scale of the challenge. Outside of Oxford there are currently few towns that offer good access to food retailers by foot. There will be an opportunity to further analyse this work through the area transport strategies.



Number of food retailer reached by a 10 minute walk in Oxfordshire

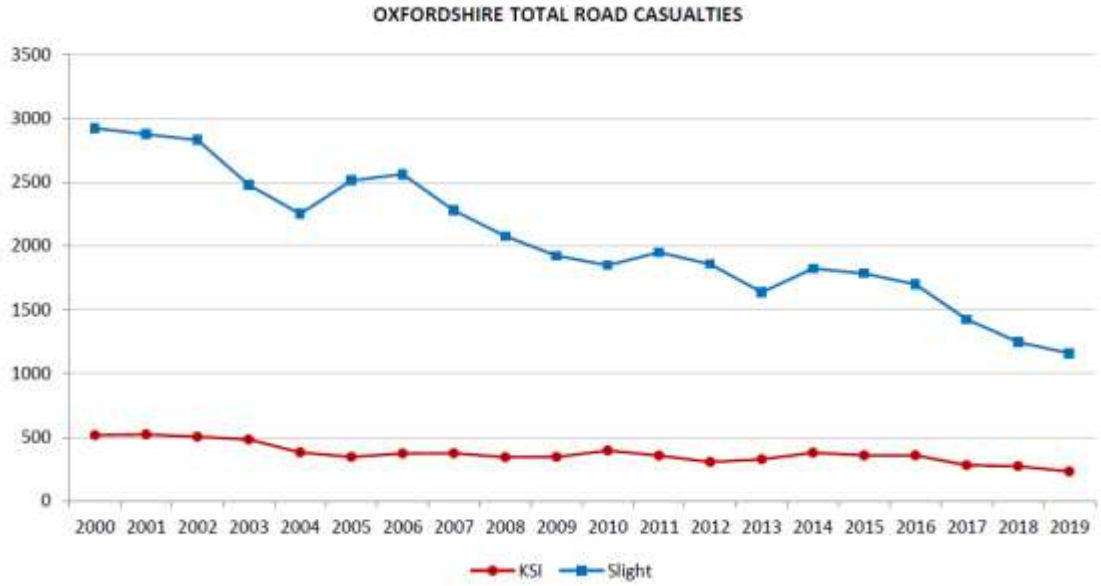
Summary

- Whilst Oxfordshire is in a good starting place with regards to current walking and cycling levels, more still needs to be done to encourage usage.
- The needs of different demographics need to be considered to ensure that Oxfordshire's transport system benefits all residents.
- In order to encourage further cycling work is needed to address cyclist safety.
- Access to food retailers by foot is poor outside of Oxford. Work is needed to create more walkabale neighbourhoods and support car free lifestyles.

Chapter 6 – Road safety

Road safety is a serious issue that can affect many residents directly. The County Council publish an annual Road Traffic Accident Casualty Data summary report[34] which provides more detail about the number and nature of casualties sustained as a result of road traffic collisions reported on Oxfordshire's roads. Headline statistics from that report are included below to highlight the current situation in Oxfordshire:

- In 2019 there were 1389 total casualties, an 18.5% decrease from 2018 and a 56% decrease since 2005.
- In 2019 there were 231 Killed or Seriously Injured (KSI).
- There has been a gradual decrease in the number of KSI since 2014.
- There were 98 child casualties in 2019, a decrease of 4.9% from 2018 but the number of KSI increased from 13 to 19.
- Car drivers were the road user group with the highest number of casualties in 2019, making up 39.7% of all casualties. Pedal cyclists (19.4%) and car passengers (15%) had the next highest number of casualties.
- There were more male casualties (58.4%) than female casualties (41.6%).
- The 16-24 and 25-34 age groups had the highest number of casualties (565).



Generally, reductions have been seen in the number of road casualties for all user groups since 2010. This trend has continued in 2019 with most user groups showing a declining number of casualties compared to 2018 numbers.

However, pedal cyclist casualty numbers have seen an upward trend over the last year. There has also been an increase in the number of child KSI casualties after a period of declining figures.

[34] Oxfordshire County Council Road Traffic Accident Casualty Data Summary 2019

When compared to its statistical neighbours Oxfordshire's performance is ranked somewhere in the middle with regards to total casualties per 1,000 of the population. This figure is similar to that of the overall national picture. Oxfordshire has reduced the number of KSI casualties per 1,000 of the population and is now performing better than many of its statistical neighbours.

All casualties	Fatal	Serious	KSI	Slight	Total	% of total
Pedestrian	3	28	31	88	119	8.6
Pedal cycle	1	44	45	225	270	19.4
Two-wheel motor veh	3	42	45	86	131	9.4
Car driver	9	52	61	490	551	39.7
Car passenger	2	30	32	176	208	15.0
Bus occupant	0	3	3	22	25	1.8
Goods veh occupant	4	6	10	59	69	5.0
Other	1	3	4	12	16	1.2
Total	**23**	**208**	**231**	**1158**	**1389**	**100**

Total casualties by road user group

Whilst these trends are positive, there are still areas that require improvement, particularly improving safety for when people are walking and cycling and rectifying the increase in child KSI's. Therefore, there is a need for ongoing work to address road safety in Oxfordshire, which the LTCP will recognise.

Summary

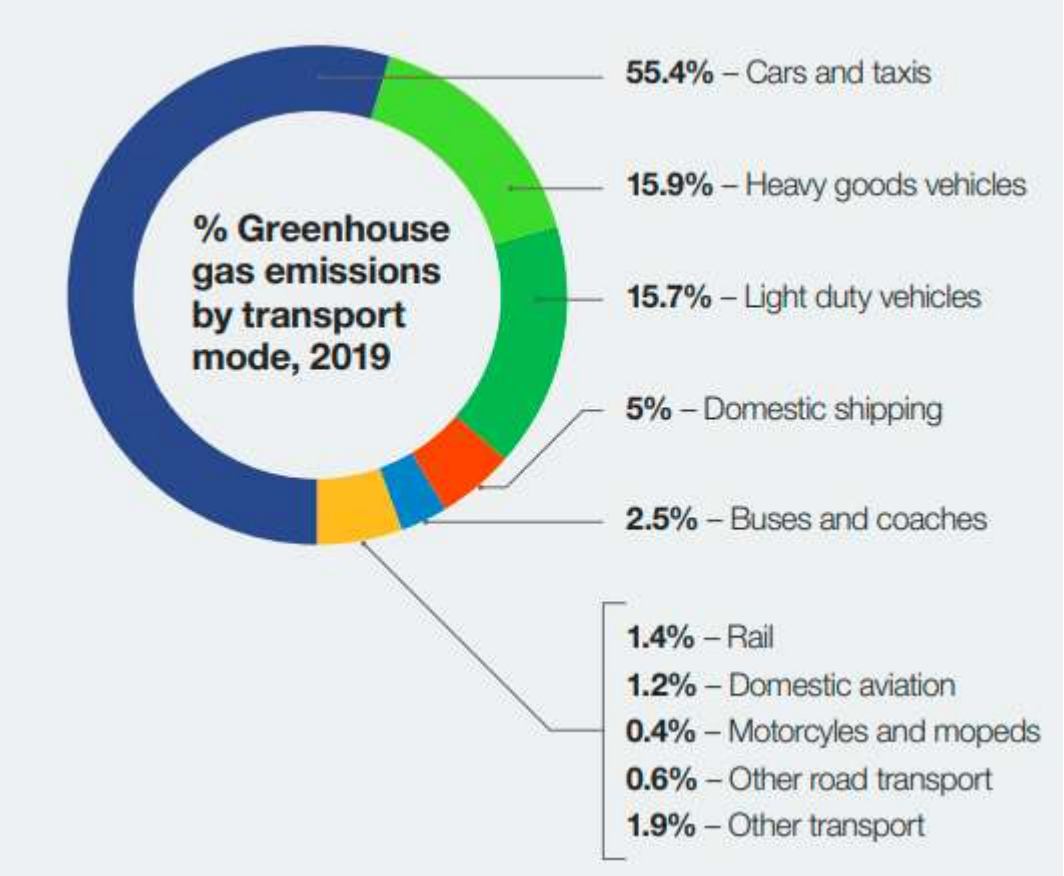
- Road safety has improved but there have been some upward trends since 2018 and no level of casualties is acceptable. Further work to improve road safety is therefore required.

Chapter 7 – Air quality

Transport emissions

Transport is now responsible for the largest proportion of UK greenhouse gas emissions. In 2019 transport was responsible for 27% of total UK greenhouse gas emissions, with road transport responsible for 91% of transport emissions. Within this passenger cars produce 55% of road transport emissions[35].

UK Greenhouse Gas emissions by transport mode[36]



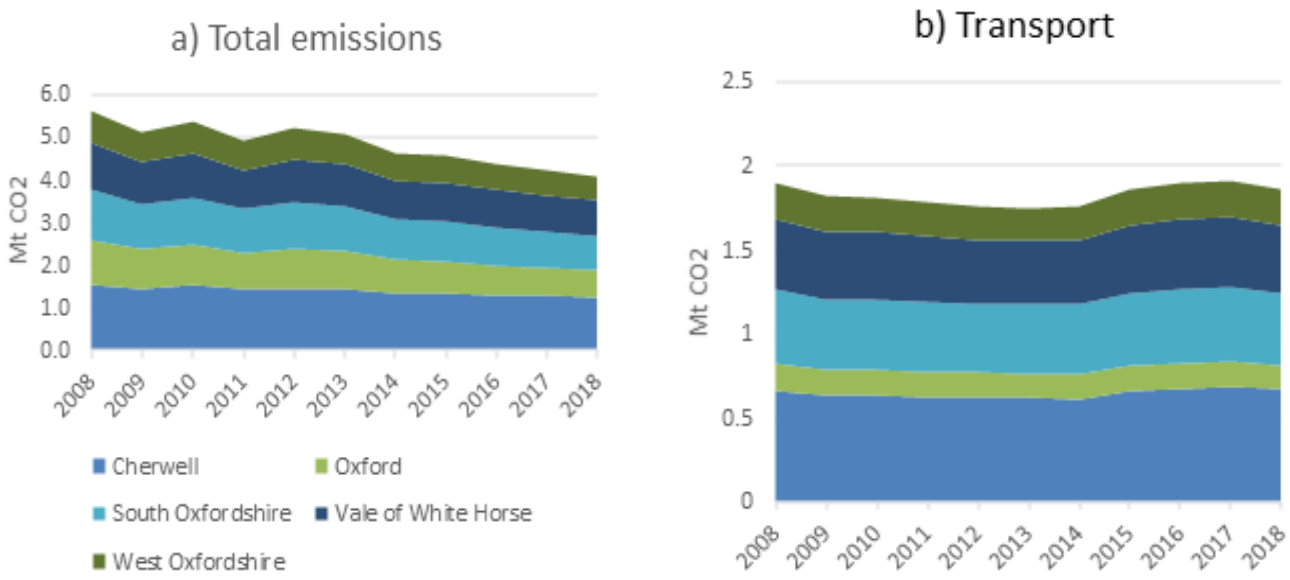
These national trends are reflected in Oxfordshire where transport is the biggest source of emissions. In Oxfordshire transport is responsible for a larger proportion of greenhouse gas emissions than the national average, producing approximately 36% of all emissions in the county[37].

Total CO_2 emissions in the county have declined by 27% since 2008, despite a 7.6% population increase over the same period. However, transport emissions have only declined 1.9% across the same time period.

The figures below show recent trends in carbon emissions, broken down by district in Oxfordshire. Total emissions in all parts of the county have fallen since 2008, but transport emissions remain high. The transport figure includes emissions from

[35] UK Government: Transport Decarbonisation Plan
[36] UK Government: Transport Decarbonisation Plan
[37] University of Oxford Transport Studies Unit: Pathways to a zero-carbon Oxfordshire

motorways, which contributes to the relatively high figures from Cherwell and South Oxfordshire.



Graphs showing total emissions and transport emissions in Oxfordshire

Air pollution

Air pollution is a mix of particles and gases of both natural and human origin. The main components of urban air pollution are particulate matter (PM) and nitrogen dioxide (NO_2). Road transport is the largest source of NO_2 and fourth largest source of PM[38]. Currently, there is no clear evidence of a safe level of exposure.

Air pollution is the largest environmental health risk in the UK. It causes more harm than passive smoking. Conditions exacerbated by air pollution include asthma, chronic bronchitis, chronic heart disease (CHD), and strokes. In Oxfordshire, it was estimated that 3,578 years of healthy life were lost due to air pollution in 2017[39].

Oxfordshire's air pollution comes from a variety of sources, and the mix of sources varies by location. Across Oxford road transport accounts for approximately 40% of NOx emissions and 10% of particulate matter emissions. At roadside locations in the county with heavy traffic, road transport accounts for as much as 75% of NOx and 20% of particulate matter emissions.

Research by King's College London has highlighted some of the impacts of air pollution in Oxford[40]:

- Each year on average, higher air pollution days in Oxford are responsible for:
  - 6 more cardiac arrests outside hospital
  - 4 more hospital admissions for stroke
  - 5 more people to hospital for cardiovascular disease than lower air pollution days.

[38] https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution
[39] Oxfordshire Health and Wellbeing Joint Strategic Needs Assessment 2020
[40] Kings College London: Personalising the Health Impacts of Air Pollution – Summary for Decision Makers, 2019

- Roadside air pollution in Oxford stunts lung growth in children by 14.1%.
- In Oxford, an extra 1 adult and 1 child are hospitalised with asthma on days where air pollution is high compared to days where air pollution is low on average each year.
- On high air pollution days, 4 more children with asthma in Oxford experience asthma symptoms than on lower pollution days.
- Cutting air pollution in Oxford by one fifth would result in:
    - 83 fewer cases of coronary heart disease each year
    - 28 fewer cases of lung cancer each year
    - 77 fewer children with low lung function each year
    - 38 fewer asthmatic children with bronchitic symptoms each year
    - 31 fewer children with a chest infection (acute bronchitis) each year
    - 1 less baby born underweight each year
    - An increase in children's lung capacity by around 2.8%

Oxfordshire also has 13 designated Air Quality Management Areas where air quality objectives are not being met. Over the past 5 years, the sites with the highest readings for Nitrogen Dioxide in Oxfordshire have generally seen a declining trend, but most are still above the target.

Summary

- Air pollution is the largest environmental health risk in the UK and is negatively affecting Oxfordshire residents.
- Transport is responsible for the largest proportion of greenhouse gas emissions in the county. Addressing vehicle usage is therefore critical to reducing emissions and improving air quality.

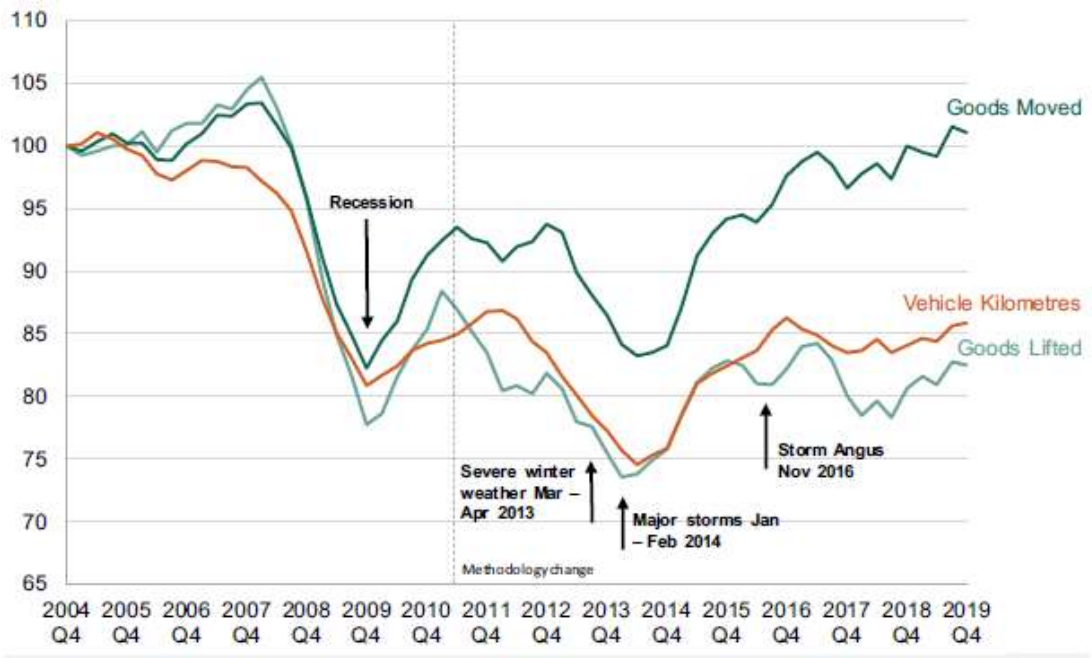
Chapter 8 – Freight

As with many sectors, freight movements were disrupted by the COVID-19 pandemic in 2020. We have therefore noted trends from 2020 but have focused on data from 2019 which was consistent with long term trends. We will continue to monitor future data to assess whether any trends from 2020 are part of a longer term shift.

Freight movement in the UK

In 2019 domestic road freight activity increased in the UK. There were 154 billion tonnes of goods moved, a 1% increase from 2018 and 19.1 billion vehicle kilometres travelled, a 2% increase from 2018. The amount of goods moved has increased by 23% since 2009[41].

In 2020 the amount of goods moved decreased by 12% when compared to 2019 levels[42]. As noted, this is largely due to the impacts of the COVID-19 pandemic. Further analysis shows that the amount of goods moved increased by 31% between quarters 2 and 3 of 2020. The industry is therefore recovering, and we will continue to monitor whether the amount of goods moved returns to pre-pandemic levels.



Trend in goods moved, goods lifted and vehicle kilometres by GB-registered HGVs, rolling 4 quarter totals, 2004 Q4 to 2019 Q4[43]

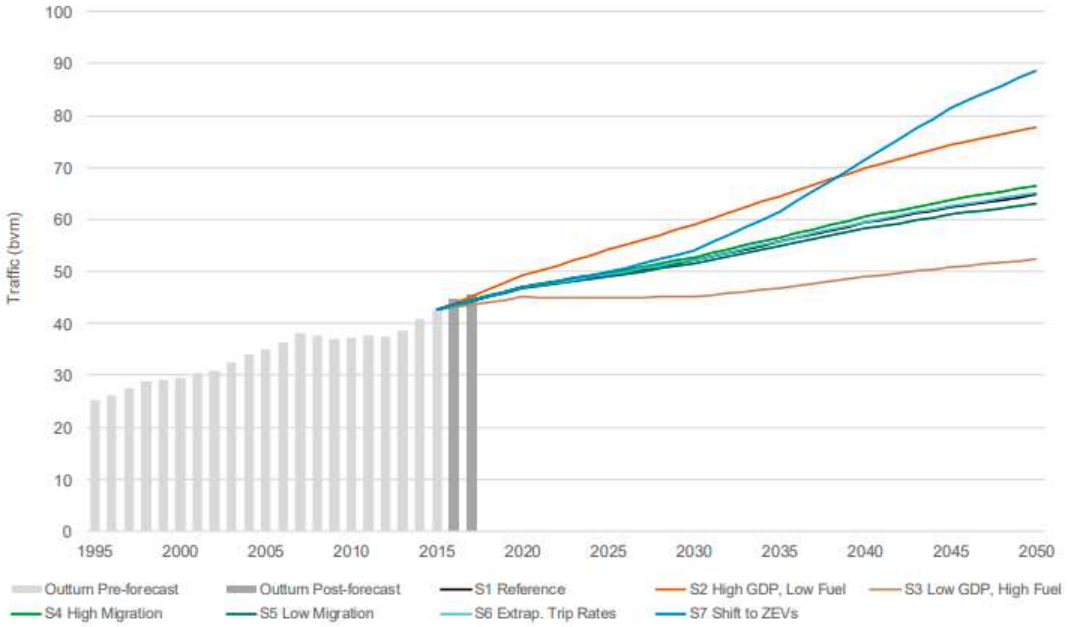
Freight vehicles in the UK

The growth of Light Goods Vehicle (LGV) traffic has been a significant change to freight movement in recent years. The number of LGVs increased by 29% between 2004 and 2014, compared to a 5% decrease in the number of Heavy Goods

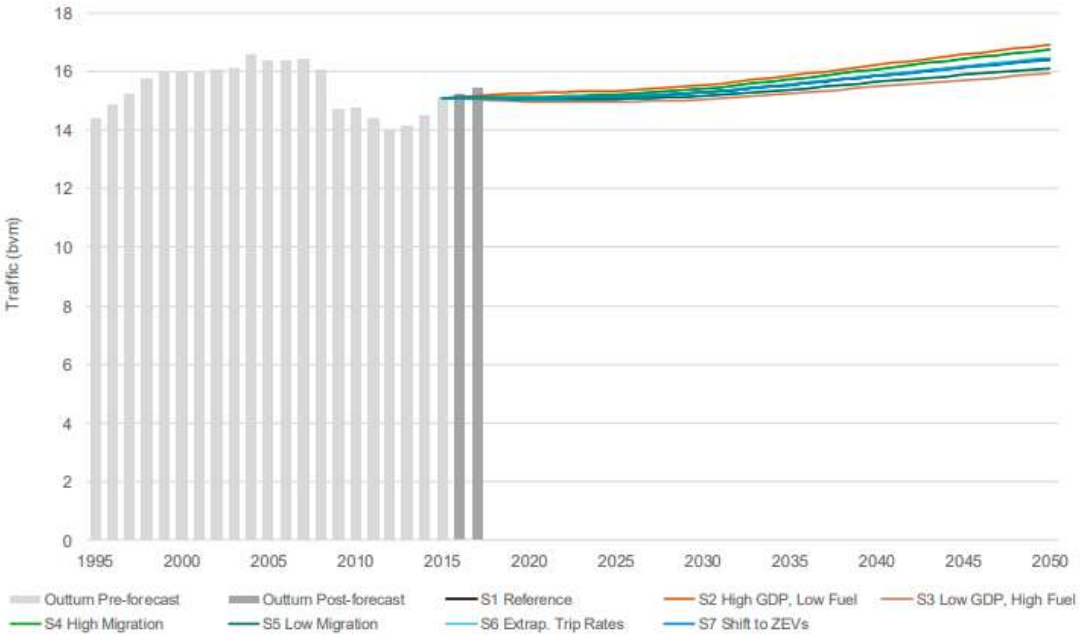
[41] Department for Transport: Domestic Road Freight Statistics, United Kingdom 2019
[42] Department for Transport: Road freight activity for the United Kingdom and internationally from October 2019 to September 2020
[43] Department for Transport: Domestic Road Freight Statistics, United Kingdom 2019

Vehicle's (HGV) over the same period[44]. LGV traffic has increased by 67% over the last 20 years and currently makes up 15% of all traffic, with HGVs making up 5%.

LGV traffic is forecast to continue to grow significantly between now and 2050. The Department for Transport has forecast LGV traffic to increase by between 23% and 108% by 2050, depending on the scenario. Whereas HGV traffic growth is forecast to be lower than other vehicle types with growth ranging from 5% to 12% by 2050[45]. The graphs below demonstrate the current levels of LGV and HGV traffic and the forecasts for growth under different scenarios.



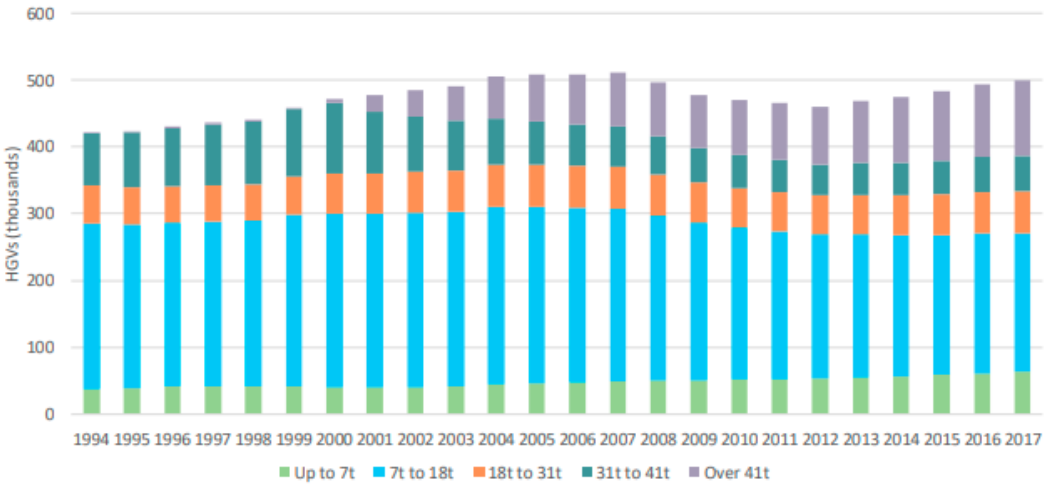
LGV road traffic forecasts



HGV road traffic forecasts

[44] RAC Foundation: Van Travel Trends in Great Britain
[45] Department for Transport: Road Traffic Forecasts 2018

Some of these changes may be attributable to the fact that freight is increasingly carried in larger HGVs. The share of freight carried in smaller rigid HGVs (under 17 tonne) decreased from 11% in 2000 to only 2% in 2017. The share of freight carried in larger rigid HGVs increased from 13% to 18% over the same period[46]. Whilst these changes may help to reduce the number of HGVs on the road, they present challenges at the local level, particularly in many of the rural villages in Oxfordshire.



Proportion of UK freight carried by HGV weight class[47]

Other factors that may be changing the way freight is moved are the rise of online shopping and changing customer expectations. In 2018 online sales comprised 18% of total UK retail sales, up from 16% in 2017[48]. This growth has likely contributed the rise in LGVs and will continue to drive the number of LGVs in Oxfordshire.

Similarly, customer expectations have also changed, with there now being more demand for deliveries to be made in tight timescales. This presents a challenge for delivery services and can require more vehicles to be able to meet demand[49].

Pollution

As previously highlighted, transport is responsible for 27% of total UK greenhouse gas emissions. Road transport is responsible for 91% of transport emissions, with HGVs and vans producing 35% of road transport emissions[50].

With forecasts predicting an increase in freight miles, there is a need to address the impacts of freight on air quality in Oxfordshire. If unaddressed, this could lead to CO_2 emissions from freight transport increasing by around 20% by 2050[51].

[46] The Value of Freight, Vivid Economics, 2019
[47] The Value of Freight, Vivid Economics, 2019
[48] Office of National Statistics (2018) Retail sales, Great Britain: October 2018
[49] McKinsey & Company (2014) Same-day delivery: The next evolutionary step in parcel logistics
[50] UK Government: The Road to Zero
[51] The Value of Freight, Vivid Economics, 2019

Congestion

Freight is both impacted by and contributes to congestion. It is estimated that congestion delays HGV journeys by around 23% today, potentially rising to 35% by 2050[52]. Overall, it is estimated that the total cost of congestion to the UK freight system today is more than £6 billion.

Freight also contributes to congestion and this contribution could increase due to the projected rise in LGV and HGV miles. Options for reducing congestion are more limited for freight than for passenger vehicles. However, a range of options exist that we have explored as part of the Freight and Logistics Strategy.

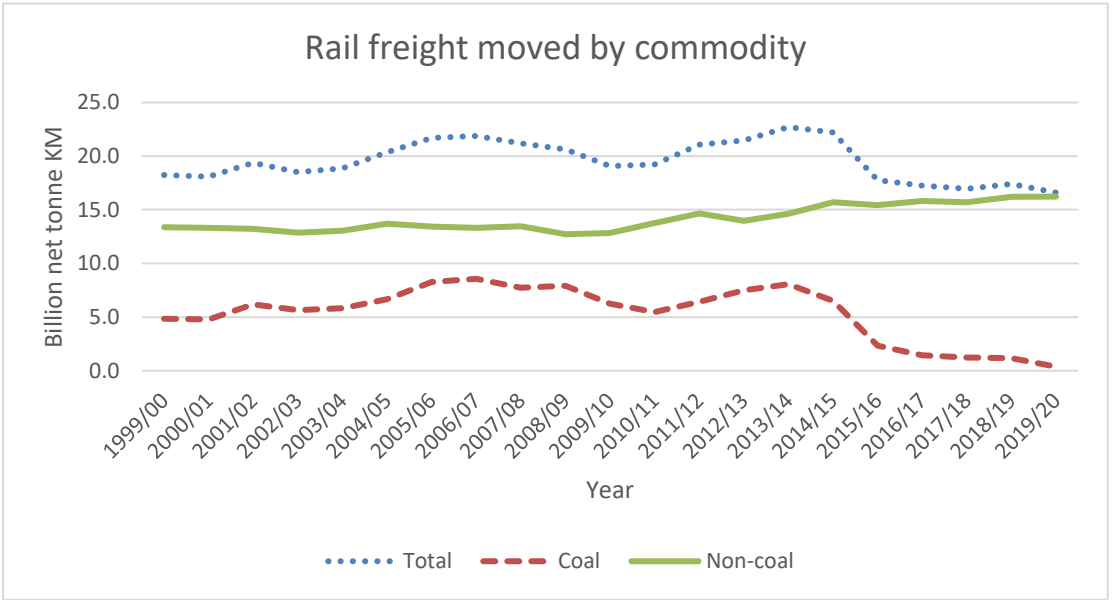
Freight movement in Oxfordshire

Evidence on freight movements and activity in Oxfordshire shows concentration of HGVs on several main corridors, particularly the A34, A420, A40 and A41. There is also a higher proportion of HGV traffic on other routes including main roads around Banbury, Bicester and Didcot.

There are existing issues with freight vehicles that need to be addressed and new issues stemming from the growth of LGVs that need to be mitigated. These issues include congestion, road safety, air quality and impacts on the wider environment. However, efficient movement of freight is important to residents' everyday lives, the local economy and the national economy. Solutions will therefore be required that balance these considerations and create an efficient transport network for all.

Rail freight

Rail currently accounts for approximately 9% of UK Freight movements[53]. There has been a 25% decline in the amount of freight moved by rail since a peak in 2014/15. However, this can largely be attributed the Department for Business, Energy and Industrial Strategy's policy to phase out coal-based energy in 2015.



[52] The Value of Freight, Vivid Economics, 2019
[53] UK Rail Factsheet 2019

The amount of non-coal commodities moved by rail freight has been steadily increasing since 2013/14. There has been an 11% increase in non-coal commodities carried by rail freight in this time period[54]. This demonstrates the potential for increased rail freight movement for all commodities.

In 2018/19, 7 million road haulage journeys were avoided as a result of rail freight movements[55]. This is equivalent to 1.6 billion road vehicle kilometres. Rail freight therefore helps to provide environmental benefits and reduce road congestion.

Summary

- Solutions will need to be found that balance freight issues with the need for an efficient network.
- How freight is moved is changing and LGV growth is projected to significantly increase. The impacts of these changes will need to be considered.
- There are opportunities to increase the use of rail freight and provide environmental benefits.

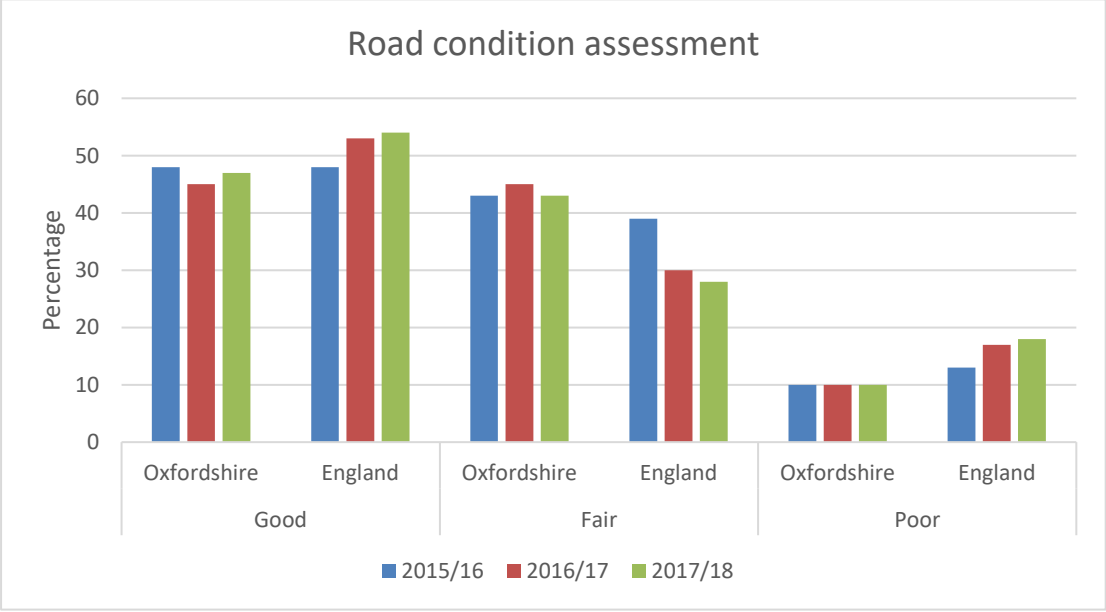
[54] Department for Transport: National Railways freight moved by commodity, annual from 1996/97
[55] Department for transport: Number of freight train movements, impacts on road haulage and Freight Performance Measure: annual from 2005/06

Chapter 9 – Highway maintenance

Oxfordshire County Council manage 2,994 miles of road network in the county. The network is made up of A roads (15%), B roads (10%) and C or unclassified roads (75%)[56]. The high proportion of C and unclassified roads, which are often not built to modern standards and in rural areas, makes highway maintenance a challenge. The A34, M40 and A43 are managed and maintained by National Highways.

The funding directed to highway maintenance capital works is £18 million per annum[57]. It is estimated that it would cost around £240m to bring the network to an acceptable standard and would then require an annual investment of £21m to keep them at that standard. In addition, £5m a year is required for regular maintenance.

47% of roads in Oxfordshire are assessed as being in 'Good' condition, this is lower than the national average of 54%. However, Oxfordshire has fewer roads in 'Poor' condition than the national average (10% compared to 18%) and significantly more roads in 'Fair' condition than the national average (43% compared to 28%). The graph below shows this comparison and highlights that road conditions in Oxfordshire have generally remained steady in recent years.



Increased heavy vehicle usage and exceptionally wet weather have led to rapid deterioration of road surfaces in recent years. The impacts of climate change could lead to increased frequency and severity of extreme weather, making maintenance of the highway network even more challenging.

Summary

- The county has a lower proportion of roads in 'good' condition than the national average, but less in 'poor' condition. The high proportion of C and unclassified roads and limited funding makes highway maintenance a challenge.

[56] Oxfordshire County Council: Highway Maintenance Factsheet Summer 2018
[57] Oxfordshire County Council Highways Asset Management Plan 2020 - 2021

Chapter 10 – Health

Obesity

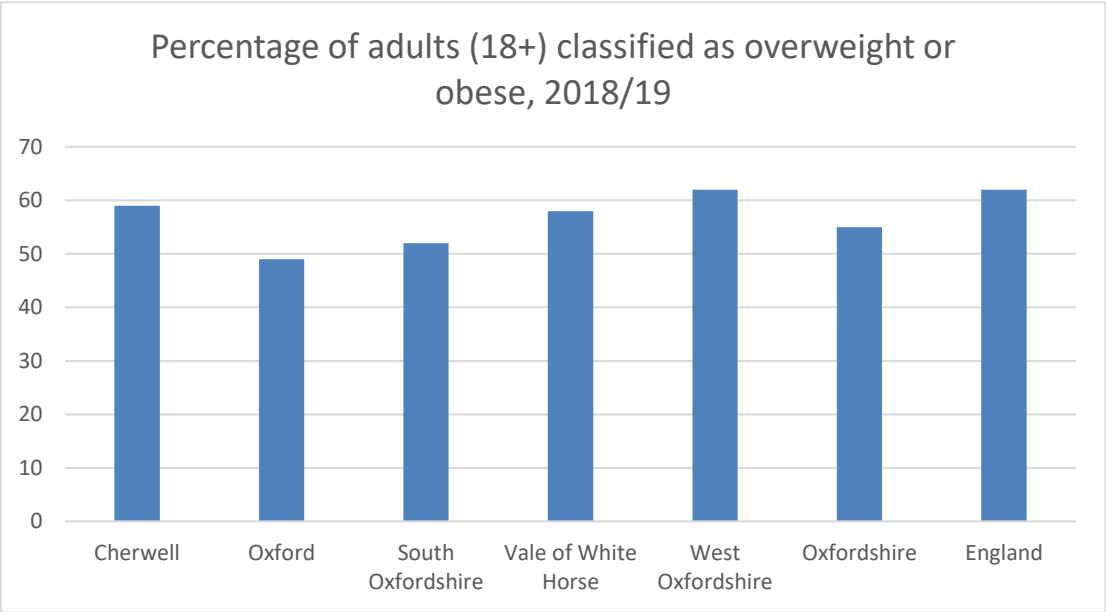
It is recognised that obesity is caused by a complex range of factors and is not directly related to transport. However, walking and cycling is one factor that can help to tackle obesity. It is therefore important that the LTCP recognises the challenges surrounding obesity in the county and encourages these modes.

Obesity is a serious issue in England costing wider society £27 billion and the NHS an estimated £6.2 billion on related ill health in 2014/15[58]. It is a complex problem with multiple causes and significant implications for health and beyond. It is recognised as a major determinant of premature mortality and avoidable ill health.

In Oxfordshire an estimated 55% of people aged 18 or over are classified as overweight or obese (2018/19), lower than the average for England (62%)[59]. The percentage of adults classified as overweight or obese has remained similar in Oxfordshire since 2015.

However, the figures indicate that over half of adults are overweight or obese. There are also significant variations across the county, for example West Oxfordshire district is above the national average with an estimated 63% of adults classified as overweight or obese.

The majority of children in Oxfordshire are a healthy weight and the prevalence of childhood obesity has remained stable in Oxfordshire since 2007. In 2019/20 19% of reception children and 29% of Year 6 children were classified as overweight or obese[60]. This suggests that overweight and obesity prevalence increases over the course of Primary School.



[58] Public Health England
[59] Public Health England Profiles
[60] Public Health England Profiles

Physical inactivity

In general, the more time spent being physically active the greater the health benefits. In 2019, Low Physical Activity caused 121 (2.2% of total) deaths and 676 years lived with disability (YLDs) in Oxfordshire, due to cardiovascular diseases, diabetes and kidney disease, and neoplasms[61].

The percentage of adults in Oxfordshire meeting physical activity recommendations (73.6%) is higher than the national average (67.2%)[62]. Despite this 1 out of 4 adults are still not meeting the recommendations. There are also variations across the county, with West Oxfordshire having the lowest percentage (69.9%).

The number of children and young people meeting physical activity recommendations is also higher than the national average. In Oxfordshire 58.4% of children meet the 60 minute per day recommendation compared to 44.9% nationally[63]. However, this figure means that approximately 37,600 children are not getting enough physical activity.

As highlighted in the obesity section, the LTCP can help to encourage physical activity through measures to support walking and cycling.

Summary

- Obesity is below the national average but remains over 50%. Encouraging walking and cycling is one way the LTCP can help address this.
- Oxfordshire has above average levels of physical activity but there is still a need to further improve this through measures to encourage walking and cycling.

[61] Institute for Health Metrics and Evaluation (IHME), GBD Compare
[62] Public Health England Profiles
[63] Sport England, Active Lives Children and Young people Survey 2019/20

Chapter 11 – Natural and historic environment

Oxfordshire has a rich and varied natural and historic environment, which makes it an attractive place to live, visit and work. The county contains the golden limestone villages of the Cotswolds, the escarpments of the North Wessex Downs and the Chilterns and valleys and flood plains of the River Thames.

Areas of Outstanding Natural Beauty

There are three Areas of Outstanding Natural Beauty (AONB) located wholly or partly within Oxfordshire (covering approximately 25% of the LTCP area):

- North Wessex Downs AONB (southern section of Oxfordshire, within the Vale of White Horse District and South Oxfordshire District)
- The Chilterns AONB (within the south eastern section of Oxfordshire, within South Oxfordshire District)
- The Cotswolds AONB (north western section of Oxfordshire, within West Oxfordshire District and Cherwell District).

Green Belt

The Revised NPPF (February 2019) states that the Green Belt is to prevent urban sprawl by keeping land permanently open. A large area encircling Oxford is designated as Green Belt.

There is approximately 1,287ha of Green Belt within Oxford City which equates to 28% of the administrative area of Oxford.

International and European designated sites

The Convention on Wetlands of International Importance (the Ramsar Convention) is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources.

Special Areas of Conservation (SACs) are designated under the European Habitats Directive (92/43/EEC) for containing habitats and species listed in Annex I and II of the Directive.

There are seven internationally designated conservation sites (all SACs) wholly or partly within Oxfordshire. These are:

- Aston Rowant SAC: One of the best remaining examples in the UK of lowland juniper scrub on chalk.
- Chilterns Beechwoods SAC: Beech forests on neutral to rich soils, stag beetle (Lucanus cervus), dry grassland and scrublands on chalk.
- Cothill Fen SAC: Largest surviving example of alkaline fen in central England, alder woodland on floodplains.
- Hackpen Hill SAC: Significant population of early gentian (Gentianella anglica), dry grasslands and scrubland on chalk.
- Hartslock Wood SAC: Yew woodland and chalk grassland supporting one of only three UK populations of monkey orchid (Orchis simia).

- Little Wittenham SAC: One of the best studied great crested newts (Triturus cristatus) sites in the UK.
- Oxford Meadows SAC: Lowland hay meadows including the larger of only two known sites in the UK for creeping marshwort (Apium repens).

Nationally designated sites

Sites of Special Scientific Interest (SSSI) are protected by law to conserve their wildlife or geology. Natural England is a statutory consultee on development proposals that might impact on SSSIs. There are 111 SSSIs wholly or mainly within Oxfordshire.

SSSIs are divided in to one or more monitoring 'units'. Oxfordshire has 162 such units which contain habitats that support unusual or endangered flora, fauna or geological features. Of these sites 45% are listed as in 'Favourable' condition, 53% 'Recovering' and 2% 'Unfavourable'.

National Nature Reserves (NNRs) were established to protect some of England's most important habitats, species and geology, and to provide 'outdoor laboratories' for research. There are four NNRs located wholly or partly within Oxfordshire, specifically: Aston Rowant; Chimney Meadows; Cothill; and Wychwood.

Locally important sites

Local Nature Reserves (LNRs) may be established by Local Authorities in consultation with Natural England under Section 21 of the National Parks and Access to the Countryside Act 1949 and are habitats of local importance. There are 15 LNRs located wholly or partly within Oxfordshire:

- Abbey Fishponds (Vale of White Horse)
- Magdalen Quarry (Oxford)
- Adderbury Lakes (Cherwell)
- Mowbray Fields (South Oxfordshire)
- Bure Park (Cherwell)
- Rock Edge (Oxford)
- Crecy Hill (West Oxfordshire)
- Saltway (West Oxfordshire)
- Cuttle Brook (South Oxfordshire)
- The Slade (Cherwell)
- Ewelme Watercress Beds (South Oxfordshire
- Tuckmill Meadows (Vale of White Horse); and
- Kirtlington Quarry (Cherwell)
- Watlington Chalk Pit (South Oxfordshire)
- Lye Valley (Headington)

There are many other important sites identified for their ecological and geological interest including 362 Local Wildlife Sites and 46 Local Geological Sites, 38 Conservation Target Areas, and 35 Road Verge Nature Reserves.

There are a variety of Biodiversity Action Plan (BAP) Priority Habitats located within or within proximity to Oxfordshire, primarily areas of deciduous woodland and ancient woodland, coastal and floodplain grazing marsh, and good quality semi-improved grassland.

The Thames Valley Environmental Records Centre contains records of protected or notable species within Oxfordshire[64]. A total of 146 UK legally protected species have been recorded in the county with more than 260 species recognised as being a priority for conservation.

International heritage sites

Oxfordshire also has a rich heritage and archaeological resource. A World Heritage Site is a landmark or area which is selected by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as having cultural historical, scientific or other form of significance.

Oxfordshire contains one World Heritage Site, Blenheim Palace, which is located south of Woodstock in West Oxfordshire.

Listed buildings

Listing marks and celebrates a building's special architectural and historic interest, and also brings it under the consideration of the planning system, so that it can be protected for future generations.

A significant number of nationally listed buildings are present in the Oxfordshire. The number of Grade I, Grade II and Grade II listed buildings in each Local Planning Authority area is as follows:

Local planning authority area	Grade I	Grade II	Grade III
Cherwell	39	102	2195
Oxford	199	80	906
South Oxfordshire	61	180	3054
Vale of White Horse	44	128	2014
West Oxfordshire	42	214	2948

Scheduled monuments

A scheduled monument is an archaeological site of national importance which is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. There are 311 scheduled monuments in Oxfordshire.

Other designated sites

There are a range of other nationally and locally designated sites in the county. This includes 55 Registered Parks and Gardens, 242 Conservation Areas and 2 historic battlefields.

[64] TVERC (2021): 'Thames Valley Environmental Records Centre', [online] available to access via: http://www.tverc.org/cms/

Summary

- Oxfordshire has a rich and varied natural and historic environment, but certain habitats have been in decline in recent years. Increases in Oxfordshire's population and economic activity mean that this will need to be carefully manged for the future.

Chapter 12 – Rivers and canals

Water resources

The water resources located within and within proximity to Oxfordshire include the River Thames and its tributaries (Leach, Windrush, Evenlode, Glyme, Cherwell, Ray (Oxon), and Ock), small streams and brooks, along with several drainage ditches and small pools located within and adjacent to field margins.

Oxfordshire also has two canals: Oxford Canal (which is navigable and fully open) and Wiltshire & Berkshire Canal (which is in the early stages of restoration from a derelict state).

The Oxford Canal runs from Banbury to Oxford where it connects at two points with the River Thames. At intervals along its course it uses the River Cherwell as the navigational route.

The Wiltshire & Berkshire Canal runs from Abingdon to the county border near Shrivenham and will eventually link with the navigable Kennet and Avon Canal at Semington, near Trowbridge. Both canals form linear habitats linking natural or managed wildlife areas.

The rivers themselves, particularly the Thames, offer a wealth of opportunities for leisure activities, including the Thames Path National Trail, but flood most winters with increasing severity and regularity, affecting the transport network and homes.

Water quality

Oxfordshire is within the Thames River Basin District, including the following Management Catchments: Cherwell and Rey (northern Oxfordshire); Cotswolds (north western Oxfordshire); Gloucestershire and the Vale (central and western Oxfordshire); Kennet and Trib (southern Oxfordshire); and Thames and Chilterns South (eastern Oxfordshire). A summary of the water quality within the River Basin District is provided below:

	Ecological status or potential					Chemical status	
Number of water bodies	Bad	Poor	Moderate	Good	High	Fail	Good
498	19	116	333	30	0	498	0

Summary

- Oxfordshire is home to a range of water resources which offer opportunities for the LTCP and are also negatively affected by the impacts of transport.

Chapter 13 – Population

Population growth

Oxfordshire has a population of 691,667 according to the latest Office for National Statistics mid-year estimates[65]. The population is distributed relatively evenly across the 5 districts, as seen on the table below, with Oxford having the largest population at 152,457 and West Oxfordshire having the smallest population at 110,643.

Area	2019 Population
Oxfordshire	691,667
Cherwell	150,503
Oxford	152,457
South Oxfordshire	142,057
Vale of White Horse	136,007
West Oxfordshire	110,643

The population has been increasing in Oxfordshire since 2001. This population growth has been reflected in all of Oxfordshire's districts. Since 2001, Oxfordshire's population has increased by 14%, with all districts experiencing population growth of over 10% since 2001. The Vale of White Horse has seen the largest population growth since 2001 with an increase of 17%.

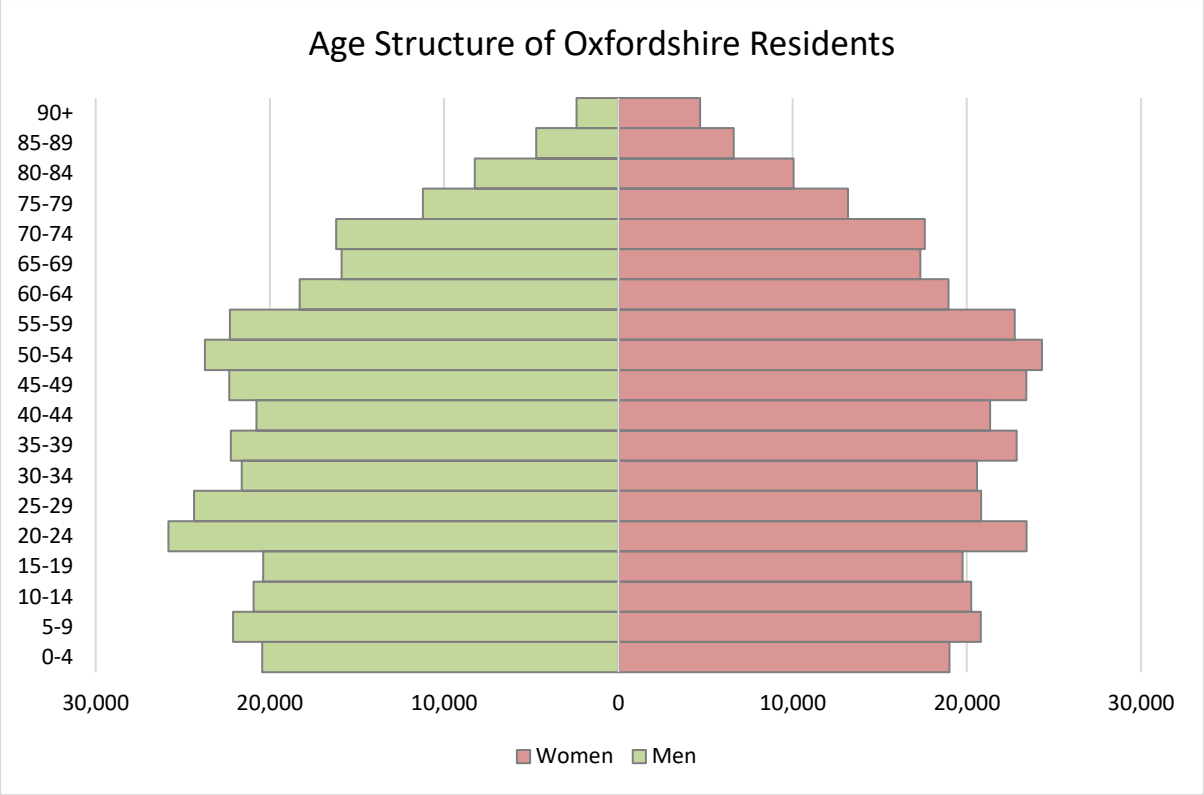
With plans for a further 100,000 new homes in the county by 2031, there is going to be increased pressure on the existing transport network. Given the scale of growth, more effective solutions are therefore needed to transform transport in Oxfordshire.

Demographics

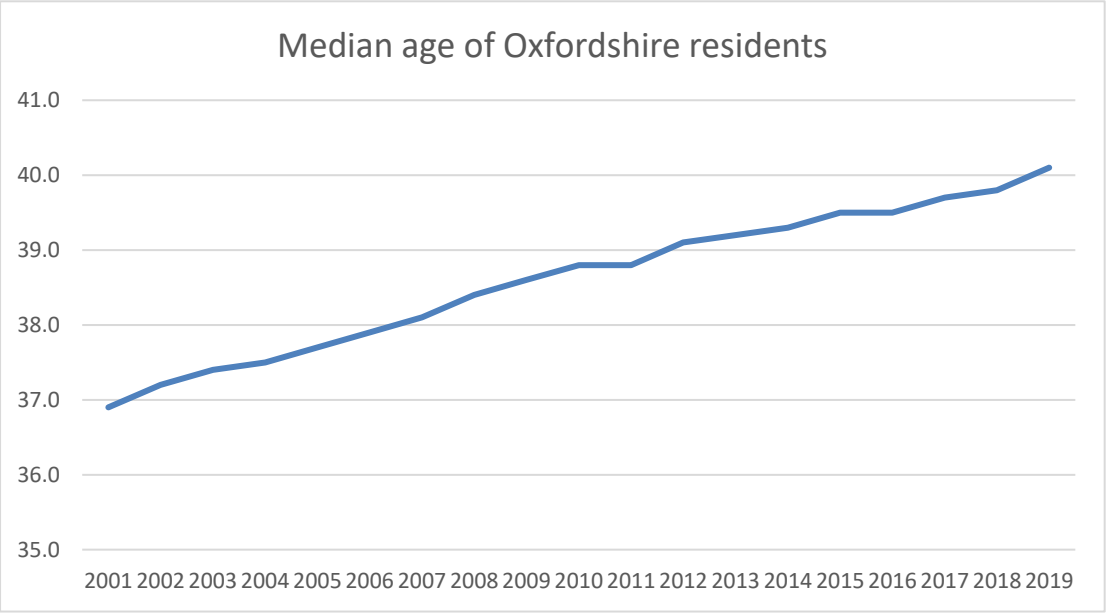
Oxfordshire's population has a relatively equal gender distribution with 344,030 males[66] and 347,637 females[67]. There is also a relatively equal age distribution in the county as seen on the age structure diagram overleaf.

Those aged 20-24 make up the largest age group in the county with 49,251 residents (14.2% of the population). However, despite this group being the largest single age group, Oxfordshire has an ageing population. The 50-54 age group makes up the second largest age group with 48,042 residents and those aged between 46 and 55 make up the largest proportion of residents (27.4%). Similarly, the narrower bottom to age structure diagram highlights that there is an older population with long life expectancy, low death rates and low birth rates.

[65] Office for National Statistics: Mid-year Population Estimates
[66] Office for National Statistics: Population estimates: Males by single year of age and sex for local authorities in the UK, mid-2019
[67] Office for National Statistics: Population estimates: Females by single year of age and sex for local authorities in the UK, mid-2019



Furthermore, the median age of Oxfordshire residents has increased by 3.2 years since 2001[68]. The median age of Oxfordshire residents is now 40.1, compared to 36.9 in 2001. There have been notable increases in South Oxfordshire and West Oxfordshire, where the median age for both is over 44, an increase of over 5 years since 2001. We will need to consider the impacts of this ageing population on future transport provision, particularly in terms of accessibility requirements.



[68] Office for National Statistics: Median age of population for local authorities in the UK, mid-2001 to mid-2019

As highlighted in the Walking and Cycling Demographics section, transport affects all residents and it affects them in different ways. The below table shows the different demographics in Oxfordshire. Oxford is a particularly diverse and multi-cultural city, however there is a range of ethnicities in all districts. We therefore need to ensure all groups needs are considered at every stage of the LTCP development.

Area	White British	Other White	Mixed / Multiple Ethnic Groups	Asian / Asian British	Black / African / Caribbean / Black British	Other Ethnic Group
Oxfordshire	82	8	2	4	2	2
Cherwell	85	7	1	3	3	N/A
Oxford	65	13	3	12	3	5
South Oxfordshire	90	6	1	1	N/A	1
Vale of White Horse	83	7	2	2	3	2
West Oxfordshire	93	6	1	1	N/A	1

Population in Oxfordshire by Ethnic Group (percentage)[69]

Life expectancy

Life expectancy in Oxfordshire is higher than the national average for both men and women. The average life expectancy at birth for men is 81.7 compared to the national average of 79.8 and has increased by 1.6 years since 2009[70]. For women the life expectancy at birth is 85 which is again higher than the national average of 83.4 and has increased by 1.1 years since 2009.

However, there are clear inequalities in life expectancy across Oxfordshire with people in more deprived areas having significantly lower life expectancy compared with the less deprived. Data for the combined years 2017 to 2019 shows that for males there was a gap of almost 7 years between the most and least deprived areas. For females the gap was just under 5 years[71].

Therefore, despite a relatively high life expectancy in the county there is still significant work to do in terms of health inequalities. Transport can play a significant role in helping to tackle these inequalities.

Summary

- Oxfordshire's population is growing and with further growth proposed more effective solutions will be needed to transform transport in Oxfordshire.
- Oxfordshire has a high life expectancy but there are significant inequalities across the county that transport can help to address.

[69] Office for National Statistics: Population in England and Wales by ethnic group: 2016
[70] Office for National Statistics: Health state life expectancy, all ages, UK
[71] Public Health England: Health inequalities dashboard

Chapter 14 – Young people

Evidence collected by the Department for Transport (DfT) shows that young adults in Great Britain and other countries are driving less now than in the early 1990s. A review of the evidence around this subject was conducted by the Centre for Transport and Society (UWE, Bristol) and the Transport Studies Unit (University of Oxford) in 2018.

The percentage of young people (aged 17-29) with driving licenses peaked in 1992-94, with 48% of 17-20 year olds and 75% of 21-29 year olds holding a driving licence. The number of young people holding a driving licence had decreased to 29% of 17-20 year olds and 63% of 21-29 year olds in 2014[72].

Similarly, there was a 36% decrease in the number of car driver trips per person by people aged 17-29 between 1995-99 and 2010-14. The number of trips per person fell by 44% for men and 26% for women. In terms of the total number of trips per person, young people generally travel less now. The total number of trips per person made by young men fell by 28% between 1995-99 and 2010-14 and by 24% for young women.

Analysis of the factors behind these changes suggests that the causes lie largely outside transport. It is not possible to quantify the extent to which each factor has influenced travel behaviour, but they can be viewed as interconnected. Key factors that have been identified as contributing to these changes are:

- Changes in young people's socio-economic situations e.g. increased higher education participation and the rise of lower paid, less secure jobs
- Changes in young people's living situations e.g. less home ownership
- Social changes such as increased digital interaction
- High driving costs, especially car insurance

It is not known how these trends will affect future travel demand. It is possible that future generations travel less but there is also the possibility that car usage increases throughout young people's lives. Changes to broader socio-economic factors will also have an impact on future trends.

Whilst it is uncertain how these trends will progress; it highlights the need for the LTCP to be resilient and consider a range of future travel demand scenarios when identifying the policies and schemes. It also shows the potential opportunity to 'lock-in' more sustainable travel choices from an early age if high quality choices are made available as this part of the population ages.

Summary

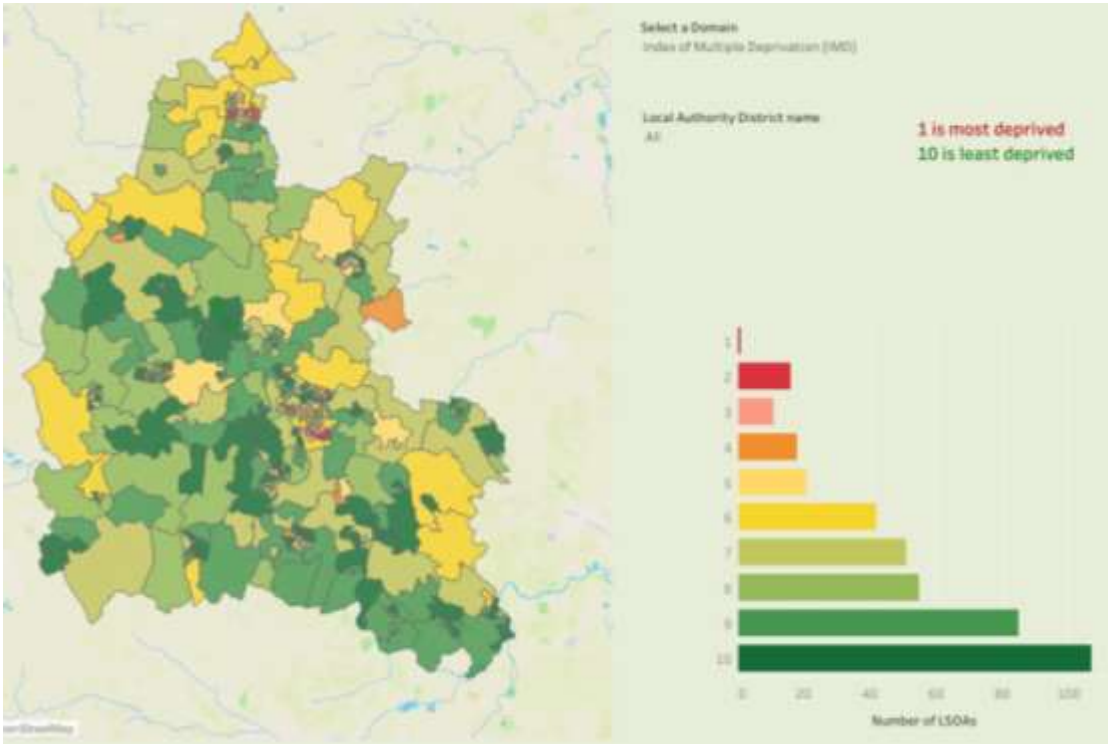
- Young people currently travel less than previous generations, particularly by car. It is uncertain how these trends will progress highlighting the need for the LTCP to be resilient and consider a range of future travel demand scenarios.

[72] Chatterjee, K., Goodwin, P., Schwanen, T., Clark, B., Jain, J., Melia, S., Middleton, J., Plyushteva, A., Ricci, M., Santos, G. and Stokes, G. (2018). Young People's Travel – What's Changed and Why? Review and Analysis. Report to Department for Transport. UWE Bristol, UK.

Chapter 15 – Deprivation

According to the Indices of Multiple Deprivation (IMD) Oxfordshire is the 10th least deprived of the 151 upper tier local authorities in England. The ranking of Oxfordshire's districts shows that, since the last release in 2015, Cherwell has become relatively more deprived and Oxford has become relatively less deprived. South Oxfordshire, Vale of White Horse and West Oxfordshire districts have remained similarly ranked[73].

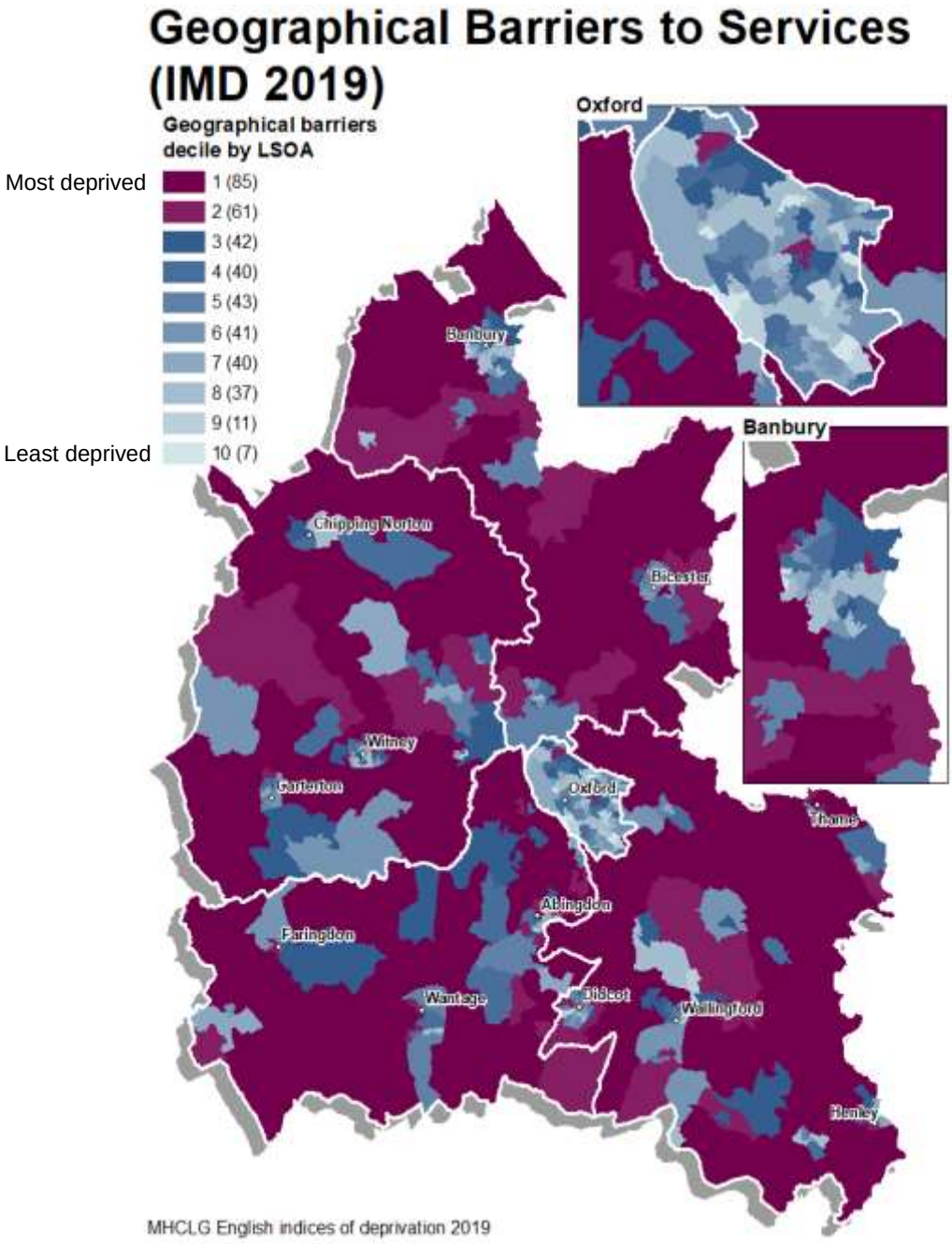
However, Oxfordshire's overall prosperity masks some stark contrasts, particularly within urban areas. Oxfordshire has one area in Oxford within the 10% most deprived areas nationally, down from two areas in this decile in 2015. A further 16 areas are among the 20% most deprived nationally (compared with 13 in 2015). These areas are in Banbury, Abingdon and Oxford. This deprivation is reflected in the health inequalities across the county previously highlighted.



Deprivation across Oxfordshire (green is least deprived, red most deprived)

Of close relevance to the LTCP is the Geographical Barriers to Services deprivation domain, which considers the accessibility of residents to local services. As highlighted by the deprivation map below, many of the rural areas of Oxfordshire suffer disproportionately from this type of deprivation. Oxfordshire currently performs poorly in this respect. Overall, 21% of the total population live within areas that are ranked within the worst 10% of areas nationally.

[73] Ministry of Housing, Communities & Local Government: English indices of deprivation 2019



Deprivation across Oxfordshire: Geographical Access to Services domain[74]

Summary

- Overall Oxfordshire has low levels of deprivation, however there are pockets of deprivation in the county.
- Many of the rural areas of Oxfordshire suffer disproportionately from Barriers to Housing and Services deprivation.

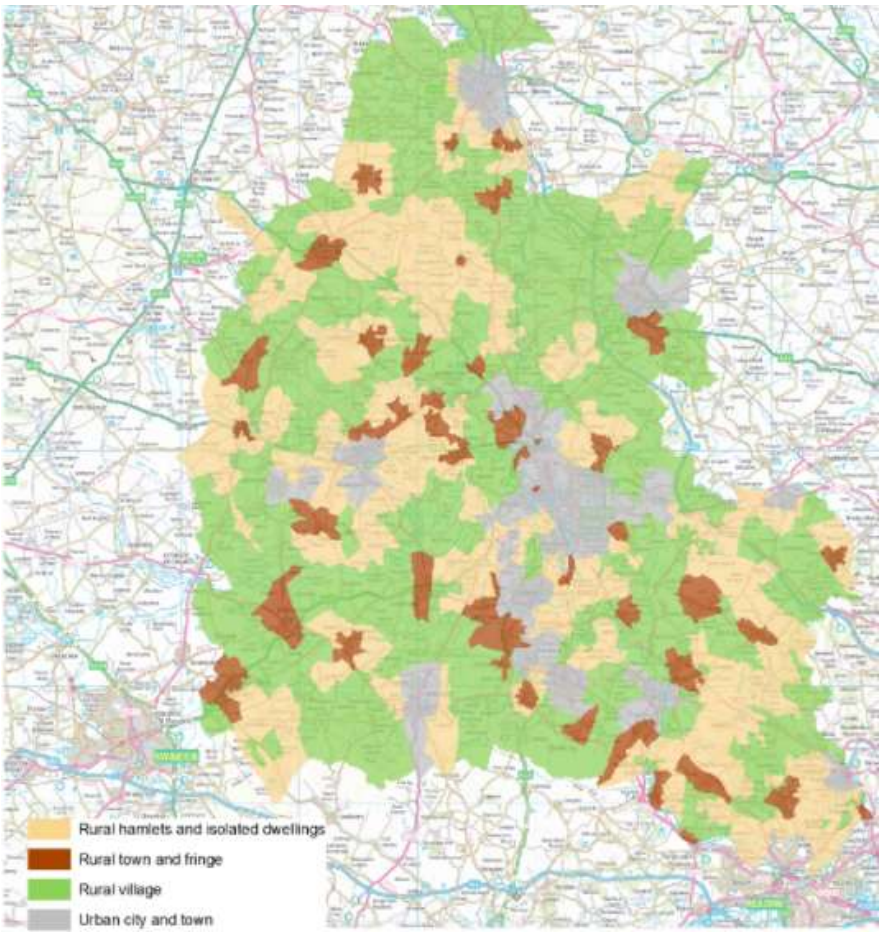
[74] English indices of deprivation 2019 - GOV.UK (www.gov.uk)

Chapter 16 – Urban vs rural

Oxfordshire has a relatively notable rural urban divide. Approximately 55% of the county's population live in rural areas and hub towns with the remaining 45% living in the county's urban areas[75]. Oxfordshire is the most rural county in the South East with 2.6 people per hectare compared with the regions average of 4.8 people per hectare.

The map below illustrates the rural urban classification from the 2011 census[76]. The map shows that the majority of Oxfordshire is classified as being rural, with very few urban city/town areas. In total 39% of wards are classed as being urban.

Map of Rural Urban Classification in Oxfordshire



There are significant variations in the rural population between districts in Oxfordshire. The below table shows the amount of each districts population which was classified as rural related in the 2011 census.

[75] Office for National Statistics: Rural Urban Classification (2011) of counties in England
[76] Local Enterprise Partnership detailed rural urban maps: Census 2011

District	Total rural population	Total hub town population	Total rural related population	Percentage of total population
Oxford	1,872	0	1,872	1.2%
Cherwell	43,542	15,829	59,371	41.8%
Vale of White Horse	46,866	21,548	68,414	56.5%
South Oxfordshire	67,005	59,469	126,474	94.2%
West Oxfordshire	59,312	45,467	104,779	100%

As highlighted in the previous section, rural areas of Oxfordshire suffer disproportionately from Barriers to Housing and Services deprivation. They therefore suffer from poorer access to services.

The urban and rural areas of the county have very different needs and challenges which the LTCP will need to recognise and address in order to create an effective transport network for all residents.

Summary

- Oxfordshire has both urban and rural areas which will require different approaches.

Chapter 17 – Economy

Oxfordshire has one of the strongest economies in the UK, contributing £23bn Gross Value Added (GVA) to the UK exchequer in 2017. The economy of Oxfordshire is also rapidly growing at an average of 3.9% growth year on year since 2006[77]. The county's economic output is 22% higher than the national average.

The county has significant assets in Research and Development (R&D) which includes the top performing university in the world, the University of Oxford. Many of the county's innovation assets are at the forefront of global innovation in transformative technologies and sectors.

Oxfordshire is home to nearly 30,000 businesses and generates the highest number of university spin-out companies in the UK. The county also has a track record of growing these businesses with a market value of over US $1bn. Tourism is also important to the economy of Oxfordshire. The city of Oxford and the county's rich natural and historic environment attract over 27 million visitor's worth over £2 billion[78].

Oxford is particularly important to the county's economy and is home to 35% of the county's jobs. However, the average house price in the city is £390,000 and was ranked as the least affordable UK city for housing by The Centre for Cities. This leads to more people commuting into the city than are working residents.

Whilst Oxford is the largest centre of gravity in the county, there are other critical economic assets and areas of growing economic importance. A summary of critical economic assets is provided below[79].

Location	Key Sectors
Begbroke Science Park	• Advanced engineering • Medical tech
Harwell Campus	• Health sciences • Space applications • Energy
Motorsport Valley	• Advanced engineering • Battery technology • High performance motorsport
Upper Heyford Creative City	• Creative industries
Williams Innovation and Technology Campus	• Advanced engineering
Milton Park/Didcot Garden Town	• Life sciences • Creative industries
Oxford City Science Area	• Life sciences • AI technologies • Digital health • Quantum computing

[77] OxLEP: Oxfordshire Local Industrial Strategy 2019
[78] Oxfordshire County Council Corporate Plan
[79] OxLEP: Oxfordshire Local Industrial Strategy: The Investment Plan

	• Global CBD
Culham Science Park	• Fusion energy • Robotics and autonomous systems

However, Oxfordshire has low productivity relative to other South East regions. Whilst the region's productivity per hour worked is above average for England, in recent years it has fallen below the south east average.

Furthermore, as Oxfordshire's economy grows there is an increased strain on the county's infrastructure. Housing and economic growth means that the existing transport network is not sufficient to meet demand. Work is therefore needed to ensure the transport network is effective and supports Oxfordshire's economy.

Jobs

The Oxfordshire economy supports 417,000 jobs, 7% of which are in the four science and technology sectors. Employment is very high across the county with a participation rate of 82% compared to the national average of 75%[80] and unemployment among the working age population is 1.3%.

Oxfordshire has also created 50,000 new jobs since 2011/12. Spin out companies from the county's universities supported 2,421 of these jobs between 2014 and 2015 alone. Oxfordshire is also effective at generating good jobs, with wages for the bottom 10% among the best in the country, second to inner London in 2017. 82% of residents have jobs within the county boundaries.

However, as highlighted previously, there are pockets of deprivation and inequality in the county. Transport is one factor that can help tackle these issues by improving access to employment opportunities for all residents.

Growth

The projection for the Oxfordshire economy is for it to double in size and create an additional 108,000 jobs by 2040[81]. This means that more people and goods will need to use Oxfordshire's transport network, increasing pressure on it. As highlighted in the Local Industrial Strategy, work is therefore needed to relieve the existing pressure and accommodate future growth, while responding to concerns around climate change.

Summary

- Oxfordshire has one of the UK's strongest economies, however housing and economic growth are placing strain on the existing transport network.
- Employment is high across Oxfordshire and the economy supports 417,000 jobs but pockets of deprivation exist that transport can help to address.
- Work is needed on Oxfordshire's transport network to relieve the existing pressure and accommodate future growth while responding to concerns around climate change.

[80] OxLEP: Oxfordshire Local Industrial Strategy 2019
[81] OxLEP: Oxfordshire Local Industrial Strategy 2019

Chapter 18 – Digital connectivity

Digital connectivity in Oxfordshire has significantly improved in recent years. The Better Broadband for Oxfordshire programme has increased superfast broadband availability from 69% to over 96% of premises across the county[82].

Currently 10% of premises have full fibre connectivity which is double the national average but significantly lower than many of the region's global competitors. The digital infrastructure program aims to achieve 99% superfast coverage and 16% Full-fibre coverage by 2021.

Full-fibre broadband offers speeds of 1Gb/s today and will be capable of much higher speeds in the future. In particular, the potential for gigabit levels of internet service is something that is seen as important to enable through future investment.

This same fibre is also the backbone for backhauling 5G mobile. It will therefore be essential for future connectivity, particularly with the move to cloud storage, the Internet of Things, Artificial Intelligence and global internet traffic doubling every two years.

Delivering high quality digital coverage to rural and urban areas will help to improve Oxfordshire's quality of life for residents and its attractiveness as a location. It will also reduce the need to travel through enhanced digital connectivity, helping to tackle existing transport challenges.

Summary

- Digital connectivity is good in Oxfordshire and can play a role in reducing travel demand. However, there is a need to expand full-fibre and gigabit broadband coverage.

[82] Oxfordshire Digital Infrastructure Strategy

Chapter 19 – Future housing and jobs

Local Plans

In 2014 the evidence showed we needed an additional 100,000 homes by 2031. In support of this, each Oxfordshire district committed through the Oxfordshire Housing & Growth Deal to submitting a Local Plan for examination.

Local plans guide future growth and outline future sites that are permitted for housing and employment development. The districts are at different stages of this process; however, each authority is well on the way to producing a Local Plan covering the period up to between 2031 and 2036.

Current development proposals as identified in the district councils' local plans are summarised in this section.

Oxfordshire Plan

In support of this future growth, the district councils in Oxfordshire are also working together to produce a Joint Statutory Spatial Plan known as 'the Oxfordshire Plan'. The Oxfordshire Plan will provide a strategic planning framework for Oxfordshire to 2050, setting out housing, employment and infrastructure needs.

The Oxfordshire Plan builds on the foundations set by the current and emerging Local Plans and looks beyond them, at the strategic planning issues for the period up to 2050. It will give districts a framework for future planning policies and help determine planning applications where appropriate.

The Plan will not allocate sites for housing or employment. Instead, it will identify key areas for sustainable growth with associated housing / employment numbers, while considering how to help tackle climate change, improve water efficiency and mitigate flood risk. Districts will then use this to produce future Local Plans which will provide a detailed view of how housing and infrastructure will be delivered, and how they will address the climate emergency.

Cherwell District Council Local Plan[83]

Strategic employment sites

Site	Employment area (gross) (ha)
Bicester	
North-west Bicester eco-town	10
Gravern Hill	26
Bicester Business Park	29.5
Bicester Gateway	18
Employment land at North East Bicester	15
South East Bicester	40
Banbury	

[83] https://www.cherwell.gov.uk/info/83/local-plans/376/adopted-cherwell-local-plan-2011-2031-part-1

Employment land west of M40	35
Employment land north-east of junction 11	13
Rural areas	
Former RAF Upper Heyford	Approx. 120,000 sq. metres

Proposed strategic housing allocations

Site	Total number of homes 2014-2031
Bicester	
North West Bicester (Eco-Town)	3,293 (further 2,707 after 2031)
Graven Hill	2,100
South West Bicester Phase 2	726
South East Bicester	1,500
Gavray Drive	300
Banbury	
Canalside Banbury	700
Southam Road	600
West of Bretch Hill	400
Bankside Phase 2	600
North of Hanwell Fields	544
Bolton Road	200
South of Salt Way - West	150
South of Salt Way - East	1,345
Drayton Lodge Farm	250
Higham Way	150
Other notable sites	
South West Bicester Phase 1	1,742
Bankside Phase 1	1,090
Former RAF Upper Heyford	2,361

Overall Distribution of Housing in the Local Plan

	2011-2031	2014-2031
Bicester	10,129	9,764
Banbury	7,319	7,106
Rest of Cherwell	5,392	4,864
Total	**22,840**	**21,734**

West Oxfordshire District Council Local Plan[84]

Strategic employment sites

Site	Employment area (gross) (ha)
Witney	
West Witney urban extension	10
Downs road	8
Carterton	
Land at Ventura Park	4.5
Land east of Monahan Way	15
Chipping Norton	

[84] https://www.westoxon.gov.uk/localplan2031

Land East of Chipping Norton Strategic Development Area	5
Oxfordshire Cotswolds Garden Village	
Campus-style 'science park'	40
Rural areas	
Existing commitments	5

Proposed strategic housing allocations

Site	Total number of homes 2011-2031
Witney	
Land to the east of Witney	450
Land to the north of Witney	1,400
Chipping Norton	
Land to the east of Chipping Norton at Tank Farm	1,200
Eynsham	
Land west of Eynsham	1,000

Overall Distribution of Housing in the Local Plan

	2011-2031
Witney	4,702
Carterton	2,680
Chipping Norton	2,047
Eynsham-Woodstock	5,596
Burford-Charlbury	774
Total	**15,950**

South Oxfordshire District Council Local Plan[85]

Strategic employment sites

Site	Employment area (gross) (ha)
Didcot	
Southmead Industrial Estate	2.92
Milton Park	6.5
Henley-on-Thames	
Sites to be identified in the NDP	1
Thame	
Sites to be identified in the NDP	3.5
Wallingford	
Sites to be identified in the NDP	3.1
Hithercroft Industrial Estate	1.09
Crowmarsh Gifford	
Sites to be identified in the NDP	0.28
Culham	
Culham Science Centre	7.3
Chalgrove	
To be allocated in accordance with STRAT7	5

[85] https://www.southoxon.gov.uk/south-oxfordshire-district-council/planning-and-development/local-plan-and-planning-policies/local-plan-2035/adopted-local-plan-2035/

To be allocated in accordance with EMP9	2.25
Berinsfield	
To be allocated in accordance with the regeneration strategy	5
Grenoble Road	
Extension to Oxford Science Park	10

Proposed strategic housing allocations

Site	Total number of homes 2011-2035
Chalgrove	
Chalgrove airfield	2,105
Culham	
Land adjacent to Culham science centre	2,100
Berinsfield	
Land at Berinsfield Garden Village	1,700
Grenoble Road	
Land south of Grenoble Road	2,480
Northfield	
Land at Northfield	1,800
Bayswater Brook	
Land north of Bayswater Brook	1,100
Wheatley	
Land at Wheatley Campus	500

Overall Distribution of Housing in the Local Plan

	2011-2035
Didcot	6,339
Oxford (unmet needs)	5,380
Chalgrove	2,105
Culham	2,100
Berinsfield	1,700
Thame	1,518
Henley-on-Thames	1,285
Wallingford	1,070
Wheatley	500
Nettlebed, Sonning Common, Woodcote	257
Total	**23,550**

Vale of White Horse District Council Local Plan[86]

Strategic employment sites

Site	Employment area (gross) (ha)
Milton	
Milton Park	28
Harwell	

[86] https://www.whitehorsedc.gov.uk/vale-of-white-horse-district-council/planning-and-development/local-plan-and-planning-policies/local-plan-2031/

Harwell Campus (enterprise zone)	93
Harwell Campus (outwith enterprise zone)	35
Grove	
Monks Farm	6
Didcot	
Didcot A	29
Faringdon	
South of park road	3

Proposed strategic housing allocations

Site	Total number of homes 2011-2031
Abingdon-on-Thames	
North of Abingdon-on-Thames	800
North-West of Abingdon-on Thames	200
Kingston Bagpuize with Southmoor	
East of Kingston Bagpuize with Southmoor	280
Radley	
North-West of Radley	240
South of Kennington	270
Wantage	
Crab Hill	1,500
Grove	
Grove airfield	2,500
Monks Farm	885
Harwell and Milton Parishes	
Valley Park	2,550
North-west of Valley Park	800
West of Harwell	200
Milton Heights	400
Sutton Courtenay	
East of Sutton Courtenay	220
Faringdon	
Land South of Park Road, Faringdon	350
South-West of Faringdon	200
Great Coxwell Parish	
East of Coxwell Road Faringdon	200
South of Faringdon	200
Shrivenham	
North of Shrivenham	500
Stanford-in-the Vale	
West of Stanford in-the-Vale	200

Overall Distribution of Housing in the Local Plan

	2011-2031
South-East Vale (including Wantage, Grove, Harwell, Milton)	12,450
Abingdon-on-Thames and Oxford Fringe	5,438
Western Vale (including Faringdon, Shrivenham, Stanford-in the-Vale)	3,173
Total	**20,560**

Oxford City Council Local Plan[87]

Employment sites for development

Site	Site area (gross) (ha)
Unipart	30.63
MINI Plant Oxford	82.13
The Oxford Science Park	27.1
Oxford Business Park	35.4
Churchill Hospital Site	22.73
Littlemore Park	5.44
John Radcliffe Hospital site	27.75

Proposed site allocations

Site	Total number of homes 2016-2036
West End and Osney Mead area of change	
Sites in the West End	734
Osney Mead	247
Cowley Centre District Centre area of change	
Cowley Centre	226
Blackbird Leys area of change	
Blackbird Leys Central Area	200
Summertown District Centre area of change	
Summer Fields School Athletics Track	120
Diamond Place and Ewert House	160
Cowley Branch Line area of change	
Sandy Lane Recreation Ground and Land to the Rear of the Retail Park	120
Northfield Hostel	30
Edge of Playing Fields, Oxford Academy	20
Kassam Stadium Sites	150
Knights Road	80
Marston Road area of change	
Government Buildings and Harcourt House	70
Headington Hill Hall and Clive Booth Student Village	200
Sites released from Green Belt	
Marston Paddock	39
St Frideswide Farm	125
Hill View Farm	110
Land west of Mill Lane	75
Park Farm	60
Pear Tree Farm	122
Land East of Redbridge Park & Ride	162
St Catherine's College Land	31
Other sites	
Banbury Road University Sites	60
Bertie Place Recreation Ground and Land Behind	30

[87] https://www.oxford.gov.uk/info/20067/planning_policy/1311/oxford_local_plan_2016-2036

Wytham Street	
Cowley Marsh Depot	80
Faculty of Music, St Aldates	40
Former Barns Road East Allotments	25
Former Iffley Mead Playing Fields	84
Grandpont Car Park	22
Jesus College Sports Ground	28
Land at Meadow Lane	29
Lincoln College Sports Ground	90
Littlemore Park	270
Thornhill Park	534
Oriel College Land at King Edward Street and High Street	7
Oxford Brookes University Marston Road Campus	59
Oxford University Press Sports Ground	130
Pullens Lane	11
Radcliffe Observatory Quarter	48
Summertown House, Apsley Road	20
Union Street Car Park	20
University of Oxford Science Area and Keble Road Triangle	20
Valentia Road Site	12
West Wellington Square	18
Bayards Hill Primary School Part Playing Fields	30
William Morris Close Sports Ground	82

Summary

- There is a significant amount of housing growth proposed in the county which the LTCP will take account of and seek to influence.

Oxfordshire County Council - Freight and Logistics Strategy

October 2021

Contents

Executive Summary

Freight is the general term for goods transported from one place to another by any means. Freight can therefore be moved in a variety of ways including by Heavy Goods Vehicles (HGV), Light Goods Vehicles (LGV), rail, cargo bikes and emerging modes such as drones. This strategy covers all modes of freight movement in Oxfordshire.

Traditionally we have focused on just the mode responsible for transporting goods. However, it is increasingly important that we consider broader factors. We have therefore incorporated considerations about logistics. Logistics refers to the overall process of managing how resources are acquired, stored, and transported to their final destination.

The movement of goods is essential to supporting many aspects of our lives at both the local and national level. However, there are a number of complex challenges surrounding the freight system, particularly at the local level.

This strategy addresses some of the challenges associated with the movement of goods in Oxfordshire and sets out the actions required to deliver appropriate, efficient, clean and safe movement. Addressing the movement of goods is essential if we are to meet broader air quality and zero-carbon objectives.

This strategy has been published in support of Oxfordshire County Council's Local Transport and Connectivity Plan (LTCP). The LTCP outlines our long term transport ambitions for the county and the policies required to achieve them. This is one of a number of more detailed supporting strategies that addresses complex topics.

Why is a new freight and logistics strategy needed?
Following review of our Freight Strategy published in 2016 and analysis of the broader context, it was concluded that a new freight and logistics strategy for Oxfordshire is required. This is for several key reasons:

- The amount of goods being moved, and vehicle miles driven have been increasing.
- The way goods are moved, and customer expectations have been changing.
- Technological changes to how goods can be moved.
- Changing policy context, particularly the increased focus on environmental goals and zero-carbon emissions since 2016.

What are the key principles?
Based on our analysis, we have identified a set of key principles which our Freight and Logistics Strategy will be structured around. Our key principles are:

- Appropriate movement
- Efficient movement
- Zero-tailpipe emission, zero-carbon movement
- Reducing local air pollutants
- Safe movement
- Monitoring movement
- Partnership working

It should be noted that whilst the movement of goods is related to a range of issues such as congestion, road safety and air quality, it is also important to the national and local economy. Solutions will therefore be required that balance these considerations and create an efficient, sustainable transport network for all.

How will the freight and logistics strategy deliver the key principles?
Each key principle has its own chapter which outlines why it is important, key considerations and the actions we believe are required to deliver it. A summary of the actions is provided below. For further details please use the contents to navigate to the relevant section of the strategy.

Appropriate movement	**Action 1** – Promote considerations about reducing the need for freight movement
	Action 2 – Develop appropriate HGV route map
	Action 3 – Create a map of existing weight restrictions
	Action 4 – Conduct review of road classifications
	Action 5 – Promotion of HGV route map
	Action 6 – Establish a clear process for how any action to address inappropriate HGV movement is decided and funded
	Action 7 – Develop more detailed guidance for inappropriate HGV movement action request process
	Action 8 – Consider the establishment of area based weight restrictions
	Action 9 – Lobby for enforcement of moving traffic offences under Traffic Management Act part 6
	Action 10 – Explore implementation of road user charging schemes to reduce commercial vehicle flows, emissions, and encourage use of the appropriate routes
	Action 11 – Explore technology to aid enforcement
	Action 12 – Review best practice
	Action 13 – Seek to influence the location and design of new development
	Action 14 – Ask developers of major sites to prepare Construction Logistics Plans
Efficient movement	**Action 15** – Monitor the use of water freight
	Action 16 – Promote rail freight
	Action 17 – Support the provision of strategic rail freight interchanges
	Action 18 – Work with stakeholders to increase rail network capacity
	Action 19 – Enhance network management
	Action 20 – Improve data gathering and usage
	Action 21 – Improve data sharing
	Action 22 – Review current rest stops and lorry parking facilities
	Action 23 – Promote the creation of rest stops and lorry park facilities
	Action 24 – Support the development and trialling of drone technology
	Action 25 – Monitor truck platooning progress and opportunities
	Action 26 – Consider future technology requirements
Zero-tailpipe emission, zero-carbon movement	**Action 27** – Support battery electric vehicle charging infrastructure requirements
	Action 28 – Monitor alternative HGV fuel requirements and options
	Action 29 – Strategically locate refuelling infrastructure

	Action 30 – Monitor electrified road systems study
	Action 31 – Promote cycle freight in Oxford
	Action 32 – Promote cycle freight across Oxfordshire
Reducing local air pollutants	**Action 33** – Engagement around Clean Air and Zero Emission Zones
	Action 34 – Freight consolidation feasibility study
	Action 35 – Safeguard land for freight consolidation
Safe movement	**Action 36** – Reduce conflicts between freight vehicles and people
	Action 37 – Promote road safety education resources and campaigns
	Action 38 – Support expansion of 20mph speed limits
	Action 39 – Establish a code of conduct with food delivery operators
Monitoring movement	**Action 40** – Delivery of the LTCP monitoring policy
	Action 41 – Analyse HGV data by axles and weight
	Action 42 – Analysis of freight data
	Action 43 – Monitoring of freight schemes
Partnership working	**Action 44** – Engagement, cocreation and problem solving
	Action 45 – Cross boundary working
	Action 46 – Explore establishment of freight steering group
	Action 47 – Work with stakeholders to reschedule journey times
	Action 48 – Work with stakeholders to encourage alternatives to road freight

How will the freight and logistics strategy be funded and implemented?
Some of the actions identified in the strategy will require funding to deliver. However, councils no longer receive funding directly to spend on transport improvements. We will therefore work hard to identify alternative funding sources. Key potential funding sources are; funding bids, developer contributions, partnership working, charging schemes and enforcement revenues.

We are committed to delivering the range of actions identified in this strategy, however it is necessary to prioritise them. This will help to guide future work on delivery of the strategy and make best of use of the resources available. In order to do this, we have grouped the actions into those we anticipate to deliver by 2025 and those that will be delivered between 2025 and 2030.

Introduction

Freight is the general term for goods transported from one place to another by any means. Freight can therefore be moved in a variety of ways including by Heavy Goods Vehicles (HGV), Light Goods Vehicles (LGV), rail, cargo bikes and emerging modes such as drones. This strategy covers all modes of freight movement in Oxfordshire.

Traditionally we have focused on just the mode responsible for transporting goods. However, it is increasingly important that we consider broader factors. We have therefore incorporated considerations about logistics. Logistics refers to the overall process of managing how resources are acquired, stored, and transported to their final destination.

The movement of goods is essential to supporting many aspects of our lives at both the local and national level. The freight system plays a key role in supporting the national economy transporting raw materials and products to factories, finished goods to retailers and goods to ports. More locally the freight system plays a key role in delivering goods to our shops, products to our homes, and serving the manufacturing and construction industries.

The UK freight system moved 154 billion tonnes of goods in 2019[1] supporting almost £400 billion in manufacturing sales and transporting 140 million tonnes of goods to ports for export[2]. However, there a number of complex challenges surrounding the movement of goods, particularly at the local level.

This strategy has been published in support of Oxfordshire County Council's (OCC) Local Transport and Connectivity Plan (LTCP) and seeks to outline our approach to addressing these challenges.

The LTCP is the County Council's statutory Local Transport Plan, required under the Transport Act 2008. It outlines our long term transport ambitions for the county and the policies required to achieve them. This is one of a number of more detailed supporting strategies that addresses complex topics in more detail.

This strategy addresses some of the challenges associated with the movement of goods in Oxfordshire and sets out the actions required to deliver appropriate, efficient, clean and safe movement. The strategy also outlines how the freight system is essential if we are to meet broader air quality and zero-carbon objectives, as outlined in the main LTCP.

As part of developing this strategy we have engaged with relevant partners including our district councils and the Road Haulage Association. We have engaged with these partners as we recognise the need for action at various levels to address the existing issues with goods movement in the county. We plan to continue working with a range of partners as we move forward to deliver this strategy.

[1] Department for Transport: Domestic Road Freight Statistics, United Kingdom 2019
[2] The Value of Freight, Vivid Economics, 2019

LTP4 Freight Strategy

OCC's existing Freight Strategy was produced in 2016 and was an approved strategy as part of the Local Transport Plan 4 (LTP4). The strategy sought to address the specific challenges associated with freight in Oxfordshire.

The LTP4 Freight Strategy provides an overview of freight and outlines an approach based around 6 principles. These principles were:

- Understand
- Inform
- Encourage
- Deter
- Manage
- Plan

The strategy is complemented by the LTP4 Route Hierarchy which outlines 6 different road classes, the definition and characteristics of each. The hierarchy identifies which Oxfordshire routes are in each class and whether the class is suitable for restrictions on access or permanent weight restrictions.

Using the route hierarchy, the Oxfordshire lorry route map was produced. The map identified suitable through routes in the county and suitable roads for accessing Oxfordshire's towns. It also highlighted where existing restrictions are and environmentally sensitive areas that should be avoided if at all possible.

As part of the development process for this strategy, we have conducted a critical review of the LTP4 freight strategy to understand strengths, weaknesses and identify areas to carry over. This has helped to inform and refine the content of this strategy.

LTP4 Freight Strategy actions

As part of our critical review, we have also reviewed the actions identified in the LTP4 Freight Strategy and progress made on delivering them. These are shown below and help to demonstrate progress made.

Action	Progress
Reviewing cycling and HGVs in order to understand how cyclist casualties can be reduced.	Ongoing road safety work and casualty reporting conducted.
We will improve our understanding of freight transport, the needs of freight operators and their customers as well as the impacts on local communities.	Established regular contact with the Road Haulage Association.
We will take advantage of new technology and best practice to help manage freight movements, notably through our recent adoption of Freight Gateway.	Freight gateway adopted but has since ceased to operate.
We will support the provision of appropriately sited rail freight facilities.	Ongoing work to identify suitable locations.
The county council will consider environmental weight restrictions across the County,	Burford weight restriction trial ongoing – note that this was funded by 3rd parties as no funding

particularly areas which are subject to significant levels of HGV traffic, prioritising the towns of Burford, Chipping Norton and Henley-on-Thames.	was available. Chipping Norton work ongoing.
In Oxford we will review signing on the ring road to ensure that lorries are directed to their destinations within the city by the most appropriate routes.	Not completed.
We will integrate neighbourhood weight watch with the LorryWatch online reporting facility.	LorryWatch available but OCC no longer have access.
We will engage with freight and logistics operators and other stakeholders, reflecting our resource levels and prioritising practical solutions to problems raised.	Ongoing engagement with operators and stakeholders however limited resources and funding has limited ability to implement solutions.
We will influence the location and design of new development, particularly employment sites and any related transport infrastructure so that these can function well, with efficient freight access to and from the strategic transport network.	Ongoing consideration that OCC seek to influence.
We will ask developers of major sites to prepare Construction Logistics Plans and Delivery and Servicing Plans.	Ongoing requirement for developers of major sites.
We will seek developer contributions to mitigate the impact of freight traffic on the environment and on the local and strategic road network.	Ongoing negotiation with developers for contributions to mitigate a range of impacts including freight traffic.

Why we need a new strategy

Following review of the LTP4 freight strategy and analysis of the broader freight context, it was concluded that a new freight and logistics strategy for Oxfordshire is required. This is for several key reasons:

- The amount of goods being moved, and vehicle miles driven have been increasing.
- The way goods are moved, and customer expectations have been changing.
- Technological changes to how goods can be moved.
- Changing policy context, particularly the increased focus on environmental goals and zero-carbon emissions since 2016.

The freight related factors are expanded upon during our data analysis in the freight context section. The broader changes to policy context are summarised in the main LTCP document and supporting baseline report.

LTCP vision and key themes

This strategy has been developed to support the LTCP for Oxfordshire. The strategy will therefore align with and help to deliver our overarching aims for the county's transport system. An overview of the vision and key themes is provided in this section for context and to help guide the strategy.

LTCP Vision

The LTCP vision has been developed to set out the overarching direction for transport in Oxfordshire. The vision will ensure that we have outlined a clear long-term ambition for transport in the county.

> "Our Local Transport Plan Vision is for a zero-carbon Oxfordshire transport system that enables all parts of the county to thrive.
>
> Our transport system will enable the county to be one of the world's leading innovation economies, whilst supporting clean growth, tackling inequality and protecting our natural and historic environment. It will also be better for health, wellbeing, social inclusivity and education.
>
> Our plan sets out to achieve this by reducing the need to travel and discouraging unnecessary individual private vehicle use through making walking, cycling, public and shared transport the natural first choice."

LTCP Key Themes

In support of the vision we have identified five proposed key themes. These are the specific areas we are seeking to transform through implementation of the vision. We have also identified the outcomes we hope to deliver for each key theme.

Environment

Outcome: Sustainable communities that are resilient to climate change, enhance the natural environment, improve biodiversity and are supported by our zero-carbon transport network.

Health

Outcome: Improved health and wellbeing and reduced health inequalities enabled through active and healthy lifestyle and inclusive, safe and resilient communities.

Place shaping

Outcome: Sustainable and resilient communities which provide healthy places for people and a high-quality environment capitalising upon the exceptional quality of life, vibrant economy and dynamic communities of our county.

Productivity

Outcome: A world leading business base that is sustainable, has created new jobs, products and careers for all communities and is supported by an effective, zero-carbon transport network.

Connectivity

Outcome: Communities are digitally connected, innovative technologies are supported and there is improved connectivity and mobility, across the county, enabling greater choice and seamless interchange between sustainable modes.

Headline Targets

In order to track delivery of the vision and key themes we have identified two headline targets. These will help us to quantify progress made on delivering the vision and ensure that we are on track to deliver the vision.

By 2030 our target is to:

- Replace or remove 1 out of every 4 current car trips in Oxfordshire

By 2040 our targets are to:

- Deliver a zero-carbon transport network
- Replace or remove 1 out of every 3 current car trips in Oxfordshire

By 2050 our target is to:

- Deliver a transport network that contributes to a climate positive future

Freight Context

This section provides an overview of current freight conditions. This helps us to understand the importance of freight, how it currently moves, its impacts and potential future changes. This understanding has informed how we propose to manage freight.

Where possible we have identified Oxfordshire specific statistics. However, owing to the extensive and sophisticated nature of the freight network this is not always possible and so we have also included nationally published statistics. Whilst these are not specific to Oxfordshire, they help us to understand current impacts and future changes that will affect the county.

As with many sectors, freight movements were disrupted by the COVID-19 pandemic in 2020. We have therefore focused on data from 2019 which was consistent with long term trends. Further analysis can be found in the LTCP baseline report which notes 2020 trends. We will continue to monitor future data to assess whether any trends from 2020 are part of a longer term shift.

Economic Value of Freight

The UK freight system moved 154 billion tonnes of goods in 2019[3] supporting almost £400 billion in manufacturing sales and transporting 140 million tonnes of goods to ports for export. In total, the cost of the UK freight system is equivalent to around 4% of Gross Domestic Product (GDP)[4].

The freight system therefore plays a critical role in supporting the national economy and is a significant financial sector. It is estimated that the UK spends up to £80 billion per year on road freight, rail freight and warehousing. Of this, road freight accounts for around £38 billion; rail freight for around £1 billion; and warehousing for £20-38 billion. The efficient movement of freight is therefore important for both the national and local economies.

Freight Movement

The amount of freight moved, and the vehicle miles driven have been increasing over the last 15 years. In 2019 there were 154 billion tonnes of goods moved, a 1% increase from 2018 and 19.1 billion vehicle kilometres travelled, a 2% increase from 2018. In total the amount of goods moved has increased by 23% since 2009[5].

[3] Department for Transport: Domestic Road Freight Statistics, United Kingdom 2019
[4] The Value of Freight, Vivid Economics, 2019
[5] Department for Transport: Domestic Road Freight Statistics, United Kingdom 2019

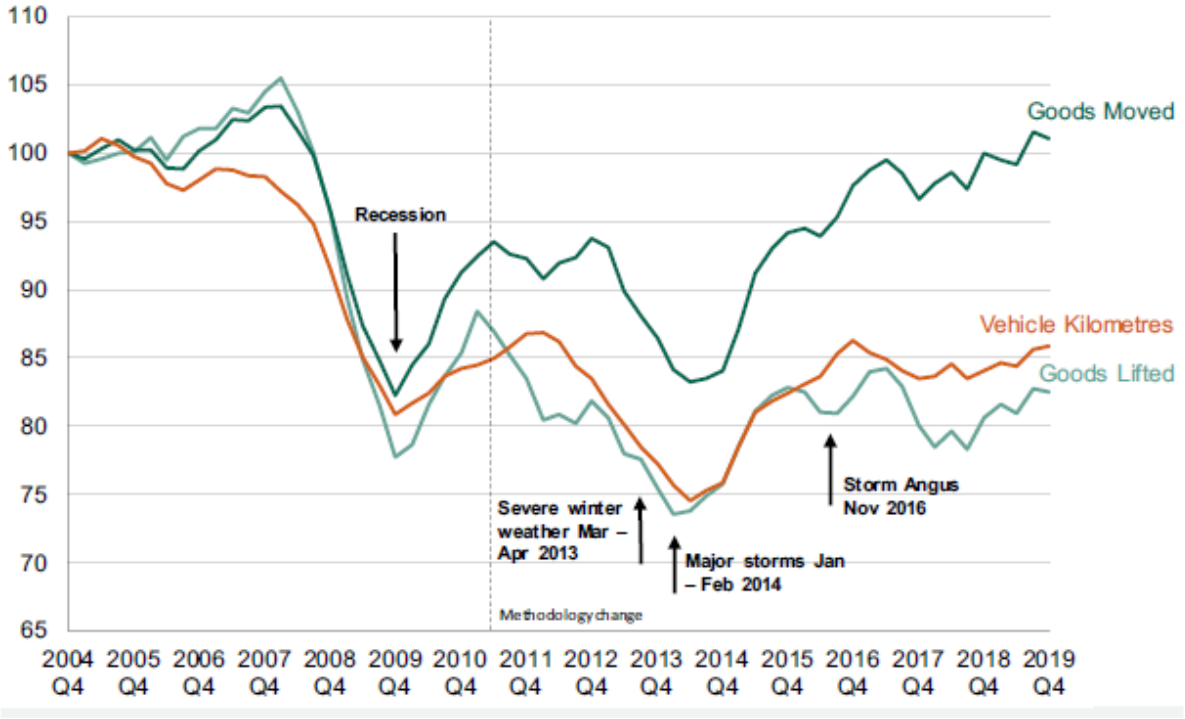


Figure 1 - Trend in goods moved, goods lifted and vehicle kilometres by GB-registered HGVs, rolling 4 quarter totals, 2004 Q4 to 2019 Q4[6]

The way in which goods are moved has also been changing over the last 20 years. There has been a significant growth in the number of LGVs, vans of no more than 3.5 tonnes, with the number HGVs falling. In total, the number of LGVs increased by 29% between 2004 and 2014, compared to a 5% decrease in the number of HGVs over the same period[7]. LGV traffic has increased by 67% over the last 20 years and currently makes up 15% of all traffic, with HGVs making up 5%.

Some of these changes may be attributable to the fact that freight is increasingly carried in larger HGVs. The share of freight carried in smaller rigid HGVs (under 17 tonnes) decreased from 11% in 2000 to only 2% in 2017. The share of freight carried in larger rigid HGVs increased from 13% to 18% over the same period[8]. Whilst these changes may help to reduce the number of HGVs on the road, they present challenges at the local level, particularly in many of the rural villages in Oxfordshire.

Other factors that may be changing the way freight is moved are the rise of online shopping and changing customer expectations. In 2018 online sales comprised 18% of total sales across all retail in the UK, up from 16% in 2017[9]. The COVID-19 pandemic has likely contributed to an increased demand for online shopping and home deliveries.

[6] Department for Transport: Domestic Road Freight Statistics, United Kingdom 2019
[7] RAC Foundation: Van Travel Trends in Great Britain
[8] The Value of Freight, Vivid Economics, 2019
[9] Office of National Statistics (2018) Retail sales, Great Britain: October 2018

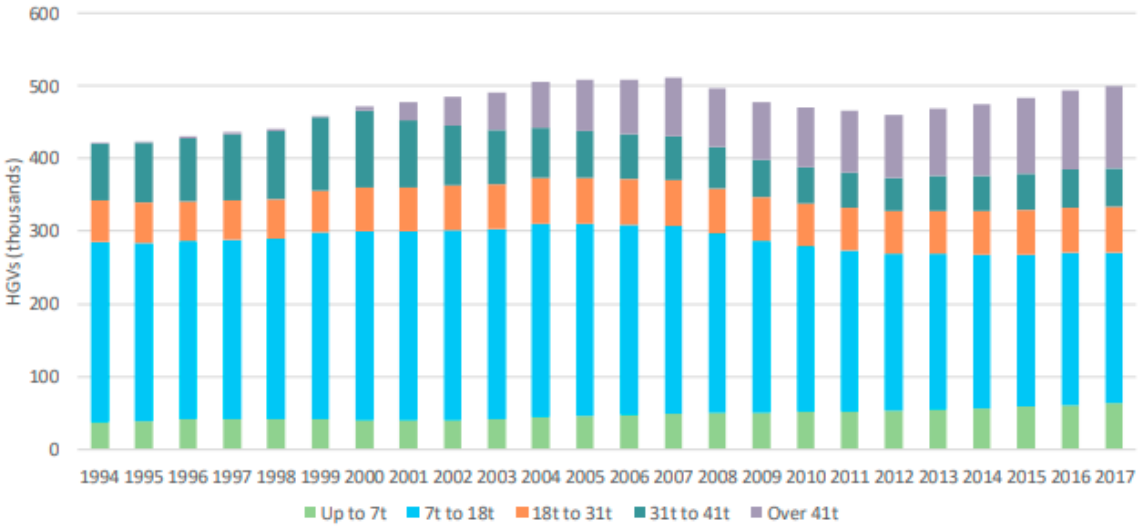


Figure 2 – Proportion of UK freight carried by HGV weight class[10]

Similarly, customer expectations have also changed, with there now being more demand for deliveries to be made in tight timescales. This presents a challenge for delivery services and can require running more vehicles to meet demand[11].

Climate Change

Transport is now responsible for the largest proportion of UK greenhouse gas emissions. In 2016 transport was responsible for 27% of total UK greenhouse gas emissions, with road transport responsible for 91% of transport emissions. Within this HGVs and vans produce 35% of road transport emissions[12].

In Oxfordshire transport is responsible for a larger proportion of greenhouse gas emissions than the national average, producing 36.5% of all emissions in the county[13]. Road transport is responsible for the majority of these emissions, 33.3%, making it the largest source of emissions in Oxfordshire.

With forecasts predicting an increase in freight miles, there is further need to address the impacts of freight on climate change. If unaddressed, this could lead to carbon dioxide emissions from freight transport increasing by around 20% by 2050[14].

Action is needed to address emissions from all modes of road transport in Oxfordshire in order to achieve our goal of a zero-carbon transport system by 2040.

[10] The Value of Freight, Vivid Economics, 2019
[11] McKinsey & Company (2014) Same-day delivery: The next evolutionary step in parcel logistics
[12] UK Government: The Road to Zero
[13] University of Oxford Transport Studies Unit: Pathways to a zero-carbon Oxfordshire
[14] The Value of Freight, Vivid Economics, 2019

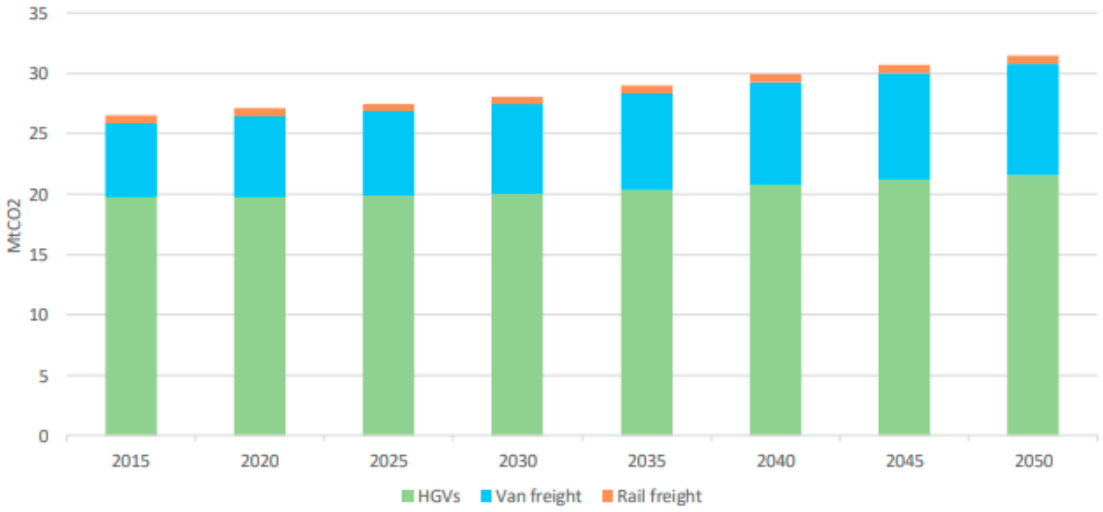


Figure 3 – Projected emissions from freight if unaddressed[15]

Local Air Pollution

Air pollution is a mix of particles and gases of both natural and human origin. The main components of urban air pollution are particulate matter (PM) and nitrogen dioxide (NO_2). Road transport is the largest source of NO_2 and fourth largest source of PM[16]. Currently, there is no clear evidence of a safe level of exposure.

In Oxfordshire, it was estimated that 3,578 years of healthy life were lost due to air pollution in 2017[17]. Research by King's College London also found that roadside air pollution in Oxford stunts lung growth in children by 14.1%[18]. Immediate action is therefore required to protect resident's health.

Congestion

The increase in vehicle miles travelled and a growing population have created issues with congestion across the UK. On average British drivers lose 115 hours per year to congestion, costing the UK economy an estimated £5.2 billion[19].

Freight is both impacted by and contributes to congestion. It is estimated that congestion delays HGV journeys by around 23% today, potentially rising to 35% by 2050[20]. Overall, it is estimated that the total cost of congestion to the UK freight system today is more than £6 billion.

Freight also contributes to congestion and this contribution could increase due to the projected rise in LGV and HGV miles. Options for reducing congestion are more limited for freight than for passenger vehicles. However, a range of options exist that we will seek to explore with freight operators. Technology is also creating new opportunities for more efficient freight movement.

[15] The Value of Freight, Vivid Economics, 2019
[16] https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution
[17] Oxfordshire Health and Wellbeing Joint Strategic Needs Assessment 2020
[18] Kings College London: Personalising the Health Impacts of Air Pollution – Summary for Decision Makers, 2019
[19] INRIX 2019 Global Traffic Scorecard
[20] The Value of Freight, Vivid Economics, 2019

Future Projections

As highlighted, the amount of freight movement is forecast to increase. The Department for Transport (DfT) has forecast LGV traffic to increase by between 23% and 108% by 2050, depending on the scenario. Whereas HGV traffic growth is forecast to be lower than other vehicle types with growth ranging from 5% to 12% by 2050[21]. The graphs below demonstrate the current levels of LGV and HGV traffic and the forecasts for growth under different scenarios.

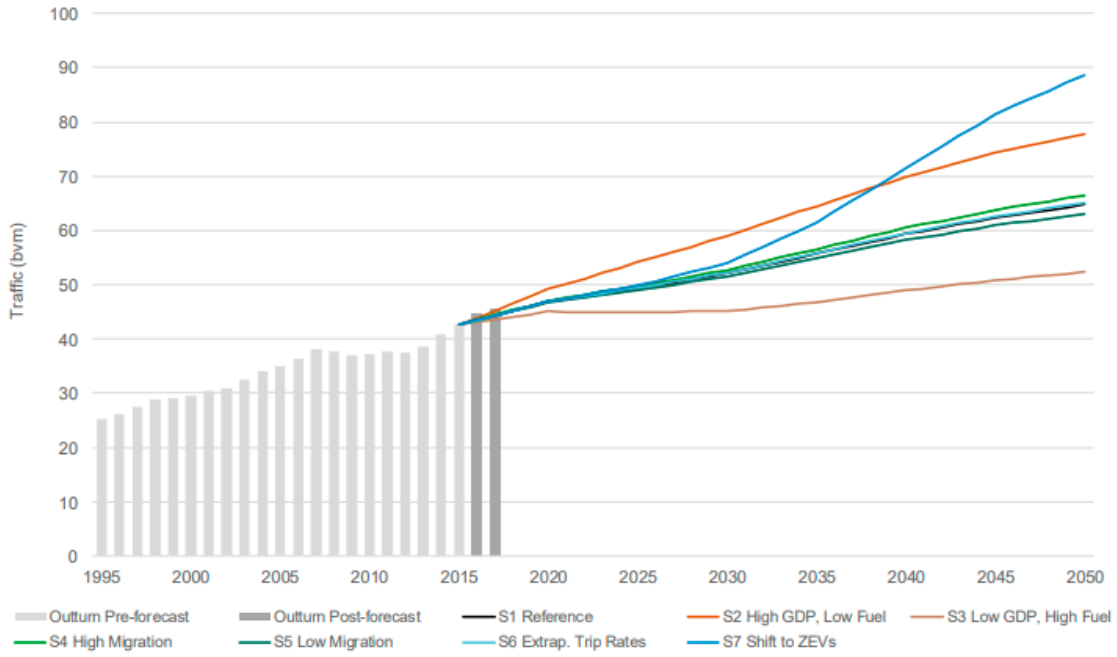


Figure 5 – LGV road traffic forecasts[22]

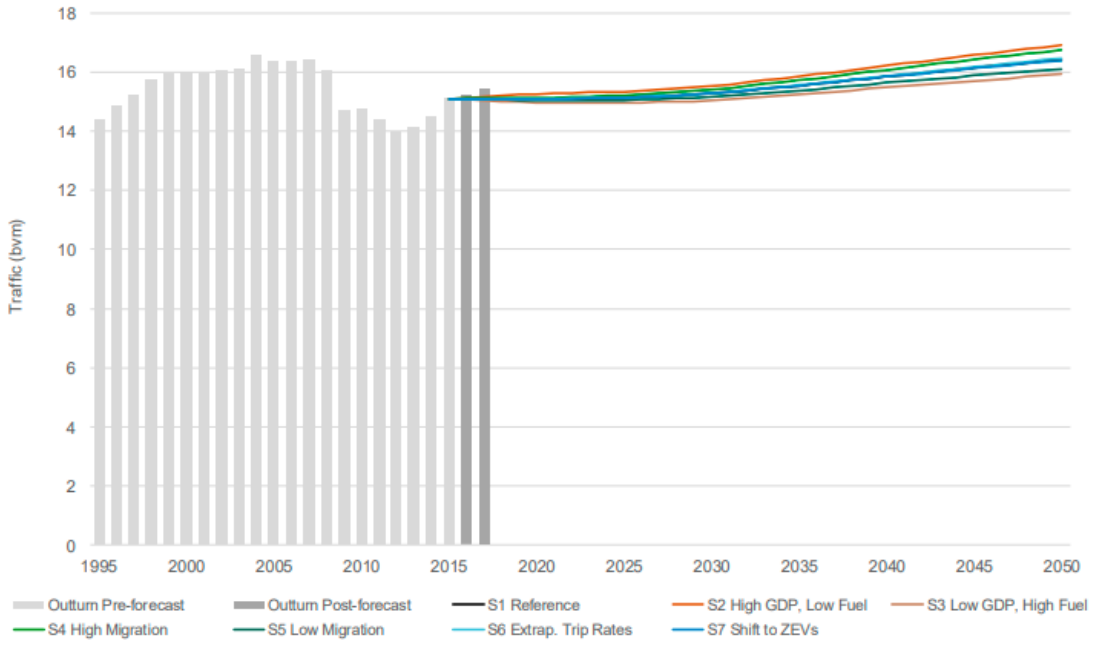


Figure 6 – HGV road traffic forecasts[23]

[21] Department for Transport: Road Traffic Forecasts 2018
[22] Department for Transport: Road Traffic Forecasts 2018
[23] Department for Transport: Road Traffic Forecasts 2018

Increased freight traffic will have knock on impacts for congestion and air quality in the county. The impacts of this projected growth and potential mitigating measures will be considered as part of this strategy.

Future fuel type

In November 2020 the UK government announced that from 2035, all new cars and vans must be Zero Emission Vehicles (ZEV). A delivery plan for how this will be achieved was published in July 2021. Zero emission LGVs are largely Battery Electric Vehicles (BEVs), utilising the same technology as electric cars.

However, there is some uncertainty regarding the future fuel type of HGVs. The uptake of zero-emission HGVs has been much slower than other vehicle types owing to a range of challenges. It remains to be seen which fuel type, be it electric, hydrogen or another, will emerge as the dominant fuel.

Future projections for the uptake of these vehicles therefore vary and are unreliable. It is predicted that both battery electric and hydrogen powered HGVs will be adopted to replace Internal Combustion Engine (ICE) HGVs.

Battery electric HGVs are predicted to be adopted at scale between 2022 and 2030, exceeding ICE HGVs from approximately 2032. Hydrogen powered HGVs are predicted to be adopted at scale between 2024 and 2040, exceeding ICE HGVs from approximately 2036[24].

Owing to this uncertainty, in Summer 2021 the government consulted on when to end the sale of new non-zero emission HGVs. This was conducted following publication of the Department for Transport's decarbonisation plan. The possible dates included were 2035 and 2040.

Local Context and Issues

Many of the issues in this section have been high level. However, owing to the complex nature of the UK freight system, there are also very local challenges that affect residents across Oxfordshire. Some specific challenges for Oxfordshire in relation to freight are:

- Resilience and congestion issues on the A34 which is an important road for movement between the Midlands and southern ports.
- Inappropriate vehicles and levels of freight movement through towns.
- Road safety issues, particularly with people cycling.
- Contribution to local air quality issues.
- Last mile delivery, particularly in Oxford.
- Construction and logistics movements associated with the large number of housing development sites.
- The strong rural economy in Oxfordshire which is often away from the 'A' road network.
- Capacity of rail network through Oxfordshire for freight movement.

[24] Shell: Decarbonising Road Freight: Getting into Gear

Key principles

We have analysed the trends and issues identified in the previous section in order to develop our strategy. Based on our analysis, we have identified a set of key principles which our strategy will be structured around. The following chapters include the proposed actions required to support delivery of our key principles. Our key principles are:

- Appropriate movement
- Efficient movement
- Zero-tailpipe emission, zero-carbon movement
- Reducing local air pollutants
- Safe movement
- Monitoring movement
- Partnership working

The proposals identified for each key principle are evidence based and have been developed with input from a range of stakeholders, including the freight industry. We will continue to work in partnership with stakeholders to deliver these proposals and improve the movement of goods in Oxfordshire.

Barriers

Before outlining the actions required to support delivery of our key principles, it is important to reflect on some of the key barriers. These provide context for why certain actions have been identified and the broader context that we are working in.

These barriers have highlighted that whilst the movement of goods is related to a range of issues such as congestion, road safety and air quality, there are a set of complex considerations required. Solutions will therefore be required that balance these considerations and create an efficient, sustainable transport network for all.

Complexity of the freight system

The freight system is extremely complex and much of it is beyond the county council's control. We can influence some areas of freight and logistics, but many issues will require regional, national or international developments to truly address.

Need for goods

The movement of goods is critical to the national economy, local economy and residents' everyday lives. Therefore, we need to facilitate the efficient movement of goods and carefully consider the impacts of any restrictions.

Amount of goods transported

There is a significant amount of goods that need to be moved each day. Figures for the amount of goods moved are not readily available. The best estimate we have is that approximately 400,000 tonnes (t) of goods per day are needed to resupply London[25]. The majority of this is moved by road freight.

[25] Transport for London, 2014

When scaled according to population, this equates to approximately 31,000t of goods per day to resupply Oxfordshire. This would require between 1,700 and 4,000 HGV trips. Whilst we recognise this is not an accurate figure, it provides an indication of the scale of the challenge.

Modal shift

The different modes for transporting freight are part of wider system. Rail freight and emerging modes such as e-cargo bikes can help to complement road freight but cannot replace it entirely. Further detail about this is provided later in the strategy.

The volume of goods that need to be transported each day highlights why we need a combination of modes and cannot rely solely on one mode. Encouraging modal shift also takes a significant amount of time, especially to have a fundamental impact on the volumes of freight currently moved.

Market forces

Freight and logistics are ultimately part of the private sector. This means that companies already operate in the most cost effective way. Solutions, such as freight consolidation centres, are not viewed as cost effective and therefore will not be developed by market forces.

This affects our ability to deliver some solutions and highlights the need to carefully consider supporting policy and potential impacts on local businesses and residents.

Impacts on businesses and consumers

As highlighted in the previous barrier, freight and logistics is a commercial sector. On average the industry operates on very small profit margins of around 2%[26]. Actions therefore need to consider potential impacts on local businesses which support the economy and residents' jobs.

Similarly, any increases to operators' costs have a knock on affect for consumers in Oxfordshire in the form of higher delivery costs.

[26] Statista 2021

Appropriate Movement

Within Oxfordshire there are issues with HGVs passing through our towns and villages on inappropriate roads. This has negative impacts on resident's health and wellbeing due to noise, air pollution and vibration. It also causes disruption to resident's everyday lives.

Inappropriate movement impacts on our historic environment. The roads in historic county towns were not designed to accommodate HGVs and so there is limited space for the vehicles to manoeuvre. This poses a road safety risk to people walking and cycling.

It also has negative impacts on freight operators. Any small increase in delay could drive a large increase in freight costs. Maintaining efficiency is important to both keep costs down and meet customer expectations. Ensuring vehicles are using the most appropriate roads is therefore of benefit to freight operators.

Ongoing changes to technology and the freight industry may make these issues worse. The shift to larger HGVs will increase the likelihood of inappropriate vehicles passing through Oxfordshire's towns. The increased use of smart phones as navigation devices has likely also contributed to vehicles using inappropriate routes.

Beyond this, changes to technology may allow for the platooning of semi-autonomous freight vehicles. This could compound the issue if not managed effectively. However, full automation also offers the potential to ensure vehicles only use appropriate routes.

Increasingly there are also issues with inappropriate last-mile freight delivery. As highlighted previously, the rise of internet shopping has led to the growth of LGVs. This is causing increasingly inappropriate levels of LGV traffic on local roads. We have also seen issues with inappropriate parking of both LGVs and motorcycle food delivery services.

Reducing the need to travel

We believe the first way of encouraging appropriate movement is to challenge whether the journey is needed at all. Reducing the need to travel is included in the main LTCP document and recognises that it can play an important role in tackling vehicle use and the associated negative impacts such as congestion and emissions.

Reducing the need to travel will be delivered in two primary ways. The first is through improved digital connectivity. Digital connectivity can reduce the need to travel by providing residents with the ability to work, shop and access services from home. This is primarily related to private vehicle usage rather than the movement of goods.

The second way we can reduce the need to travel is through planning such as the location of services within walking distance of residents. This is relevant to the movement of goods and may help to improve last-mile delivery by tackling inappropriate levels of LGV traffic on local roads.

In the LTCP we have included policies which address reducing the need to travel. This is primarily through promotion of the 20-minute neighbourhood concept and our guidance for new developments.

We will work with our District and City Councils to ensure that regeneration schemes and new developments support application of these policies and incorporate considerations about reducing the need for freight movement. For example, the development of freight lockers or hubs near to developments to minimise the need for delivery vehicles to travel on local roads.

Action 1 – Promote considerations about reducing the need for freight movement
We will work with our District and City Councils to support application of the 20-minute neighbourhood and guidance for new developments LTCP policies and incorporate considerations about reducing the need for freight movement.

HGV route map
However, it is important to recognise that there will always be a significant number of freight trips required to service Oxfordshire. These trips are essential to support the local economy and residents' everyday lives. There are also fewer ways in which we can reduce the need for HGV trips.

Therefore, when trips are required it is important these are on the most appropriate routes. This is particularly important for HGVs which sometimes pass through our towns and villages on inappropriate roads.

In order to address this issue, we believe it is important to have a clear map to show appropriate HGV routes in Oxfordshire. This has been developed following a review of the LTP4 lorry route map and will help to inform stakeholders of appropriate routes.

Action 2 – Develop appropriate HGV route map
Following review of the LTP4 lorry route map, we have developed an appropriate HGV route map. This map is shown below and identifies suitable HGV routes across the county. We have also created a digital version of this map which can be shared with stakeholders and will be used by a range of council teams.

Action 3 – Create a map of existing weight restrictions
To complement the HGV route map, we will create a digitised and up to date map of all existing weight restrictions in the county. This is part of a broader project to review, map and make available a range of transport information.

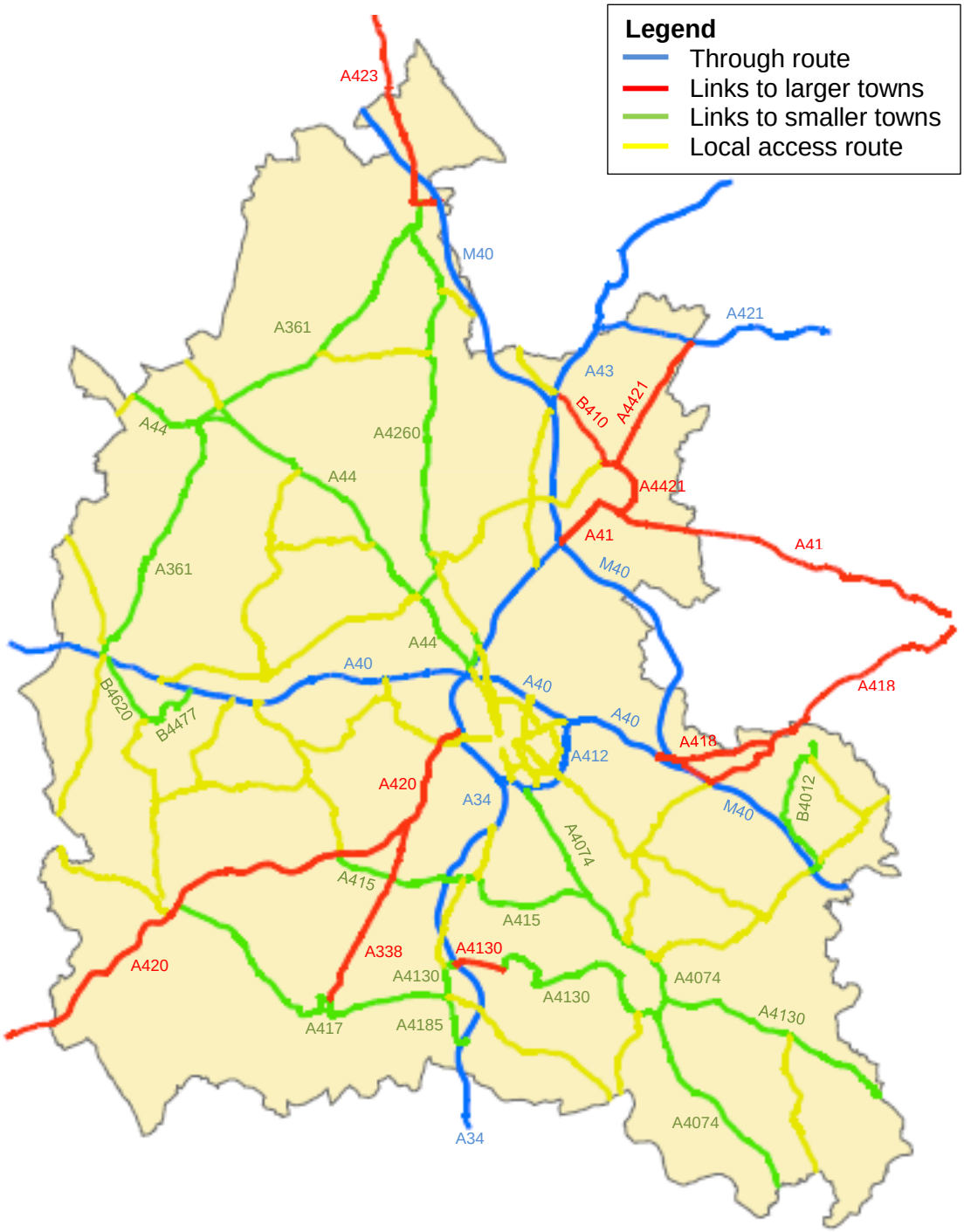


Figure 7 - HGV route map

The HGV route map is supported by our road classification table. This establishes the characteristics of each road class, whether restrictions are appropriate and the Oxfordshire routes in each class.

It also identifies which roads are a part of the nationally identified Strategic Road Network (SRN) managed by National Highways and Major Road Network (MRN) a middle tier of the country's busiest and most economically important local authority 'A' roads. The road classifications table is shown below.

Class	Definition	Characteristic	Oxfordshire Routes
Class 1: Motorway	• A road suitable for high speed long distance national traffic • Responsibility of Highways England (HE)	• Dual carriageway with limited access and type-restricted use • No weight restrictions	• M40 (SRN)
Class 2a: Strategic Primary Routes	• Strategic road suitable for longer-distance and inter-regional traffic • Main connections between defined primary destinations. • Responsibility of either HE or the County Council	• Able to cater for high volumes of traffic • Predominantly dual carriageway • No restrictions on access or permanent weight restrictions • Presumption against at-grade pedestrian crossings • Presumption against speeds below 50 mph	• A34 , A43 (SRN and HE) • A40 (M40 J8 to Witney) (MRN) • A41 (A34 to Bicester) • A44 (A40 to A4095) • A423, A4142 (Oxford S / E bypass)
Class 2b: Other Primary Routes	• A road suitable for longer distance and inter-regional traffic • Main connections between defined primary destinations • Responsibility of the County Council	• Able to cater for high volumes of traffic • Either dual carriageway or single carriageway • No restrictions on access or permanent weight restrictions, may be some height restrictions	• A40 (west of Witney) (MRN) • A41 (Bicester to Aylesbury) (MRN) • A44 (north of A4095) • A420 (west of A34) (MRN) • A422 (east of A423) (MRN) • A423 (north of A422)
Class 3a: County Principal (A) Classified Roads (major)	• A road suitable for important cross- and inter-county traffic but not longer-distance travel • Should be able to cater for all types of vehicles • Responsibility of the County Council	• Usually good standard single carriageway • Weight restrictions may be considered where there is a suitable alternative route of the same or better standard available	• A338 (Wantage to A415) • A415 • A417 • A418 (MRN) • A421 (MRN) • A4074 • A4130 • A4260 (north of A40)
Class 3b: County Principal (A) Classified Roads (minor)	• Road suitable for important cross- and inter-county traffic where there are relatively lower volumes of mostly local traffic • Minor A-roads would serve to link larger settlements with major A-roads and provide missing links • Responsibility of the County Council	• Predominantly single carriageway; some sections might be of a lower standard • Weight restrictions can be considered where there is a suitable alternative route available	• A40 (east of A418) • A329 • A338 • A361 • A420 (through Oxford) • A422 (west of Banbury) • A424 • A436 • A3400 • A4095 • A4129 • A4144 • A4155 • A4158 • A4165 • A4183 • A4185 • A4260 (south of A40) • A4421
Class 4: Non-principal roads (B/C Classified)	• A road suitable for other shorter cross and inter-county movements where volumes are relatively low and no principal road is available • Responsibility of the County Council	• Weight restrictions can be considered providing diversions are not excessive and do not prevent access to properties	• All B, C and unclassified roads

Figure 8 – Oxfordshire road classification table

Moving forward, we propose to conduct a review of the road classification table. This will identify whether any road classifications should be changed. It should be noted that this is a complex process which also includes considerations beyond freight. For

example, road classifications also affect maintenance, signage and neighbouring local authorities.

Where any changes are made, this could have an effect on our HGV map and which roads are suitable for restrictions. Following review of the road classifications we will update the HGV map accordingly.

Action 4 – Conduct review of road classifications
We will conduct a review of the Oxfordshire road classification table. As part of the review, we will engage with a range of stakeholders and consider a range of factors. Following review, we will reflect any changes on our HGV route map.

As discussed previously, we published a lorry route map in the 2016 LTP4 freight strategy to show appropriate routes. However, we have learnt that few drivers and freight operators use individual local authority maps so the impact on route choice is limited. Therefore, as part of this strategy we have thought about what actions can support our aspirations.

Action 5 - Promotion of HGV route map
We will promote use of the Oxfordshire HGV route map by:

- Seeking to work with HGV GPS system developers, sat nav providers and digital navigation providers such as Google Maps to incorporate our appropriate route information.
- Exploring opportunities to use online portals similar to ‘freight gateway’.
- Engaging with operators, businesses and trade associations.
- Engaging with other local authorities and regional partners.

Encouraging use of HGV routes
We recognise that promotion alone will not be sufficient, and some action may be required to encourage use of appropriate HGV routes. There are a range of ways in which this can be achieved including signage and engagement with local operators.

In exceptional circumstances it may be necessary to restrict HGV traffic. This is primarily done by establishing environmental weight or width restrictions to discourage HGVs from entering an area.

It is important that any action taken to address inappropriate HGV movements is supported by evidence and tailored to the local area. Surveys are therefore required, and engagement is needed with a range of stakeholders.

In order to guide this process, we have produced guidance so that communities affected by inappropriate HGV movements know how to request intervention. It should be noted that the county council has no funding available for the delivery of any measures and so external funding would need to be identified for all stages of the process and implementation.

Action 6 – Establish a clear process for how any action to address inappropriate HGV movement is decided and funded

HGVs are permitted to use all types of road. However, there may be situations where action is required to address an issue. To guide the process for where action is required and the type of action taken, we have produced the below guidance.

Decision making process

1. Formal applications for action to address HGV movement can be made by parish or town councils with support of the relevant local County Councillor.
2. County Council officers will review the application against initial criteria:
    a. Action will not be considered on appropriate routes identified in our HGV route map or where there is not a clear alternative route that is suitable for HGVs.
3. Surveys will need to be conducted in the area to establish the extent and nature of the problem.
    a. The County Council do not have funding or resource for survey work. Surveys will need to be paid for and conducted by external partners.
    b. Where surveys are being progressed, the scope should first be agreed with the county council, including the types of survey conducted.
4. Solutions will then be investigated by County Council officers in conjunction with local communities and stakeholders before any action is taken.
    a. Weight restrictions will only be considered for vehicles over 18t.
5. Final solutions will be subject to agreement by the County Council's cabinet and or relevant cabinet members.

Funding

- The county council do not currently have any funding available for work to address inappropriate HGV movement.
- External funding would therefore be required and would need to be identified by the applicant for all stages, including implementation of any action.

Summary

In order to support communities and stakeholders we will produce more detailed guidance in support of the process above. For example, this will include more detail about the types of survey required and rationale for these, supported by evidence from past work. We will update the guidance once it is published to reflect any changes and incorporate new learnings.

Action 7 – Develop more detailed guidance for inappropriate HGV movement action request process
In support of the inappropriate HGV movement action request process, we will develop more detailed guidance to support communities and stakeholders.

As outlined in our action request process, 18t environmental weight restrictions will only be considered in exceptional circumstances. This is because restrictions require significant resource and funding, are challenging to enforce and can have negative impacts on the efficient movement of goods and local businesses. There are a range of actions that we will explore with stakeholders before weight restrictions.

We will only consider 18t environmental weight restrictions owing to challenges around enforcing 7.5t weight restrictions, see action 40 for further information. Evidence from analysis of existing weight restrictions also indicates that 18t vehicles have the most environmental impact.

However, there may be circumstances where environmental weight restrictions are being investigated. During this process there are variations to the traditional one road approach that will be considered.

There are also weight restrictions where multiple roads are covered to create an area based or 'zonal' restriction. This seeks to prevent any through movement of HGVs in an area and encourage use of appropriate routes.

This type of restriction is particularly effective where there are multiple potential through routes that HGVs are known to take. This approach is flexible in terms of size and could cover one town or a collection of settlements.

Buckinghamshire Council consulted on a proposed freight zone in the Ivinghoe area in May 2021[27]. Similarly, OCC established the Burford experimental traffic regulation order (ETRO) in August 2020. We are continuing to monitor the effects of the Burford ETRO and will use this data to inform potential future schemes.

Case Study - Burford ETRO
The Burford ETRO was established in August 2020 to prevent goods vehicles that exceed 7.5t passing through Burford. The restrictions prevent goods vehicles from using the A361 (The Hill & High Street), Barns Lane and Tanners Lane.

Permit applications for exemptions are available for HGV owners/operators that are locally based. This is managed by Burford Town Council.

[27] https://www.buckscc.gov.uk/services/transport-and-roads/transport-plans-and-policies/freight-strategy/ivinghoe-area-freight-engagement/

When comparing the traffic monitoring data from 2019 before the Burford ETRO was implemented and in 2021 after implementation, on average there is the same number of HGVs (of all classes) passing through A361 Burford.

However, Burford has seen a significant 56% decrease, in HGVs over 18t between 2019 and 2021, likely due to implementation of the ETRO. A further monitoring period is planned for September / October 2021 in order to report the findings by the end of the eighteen month ETRO period, in February 2022.

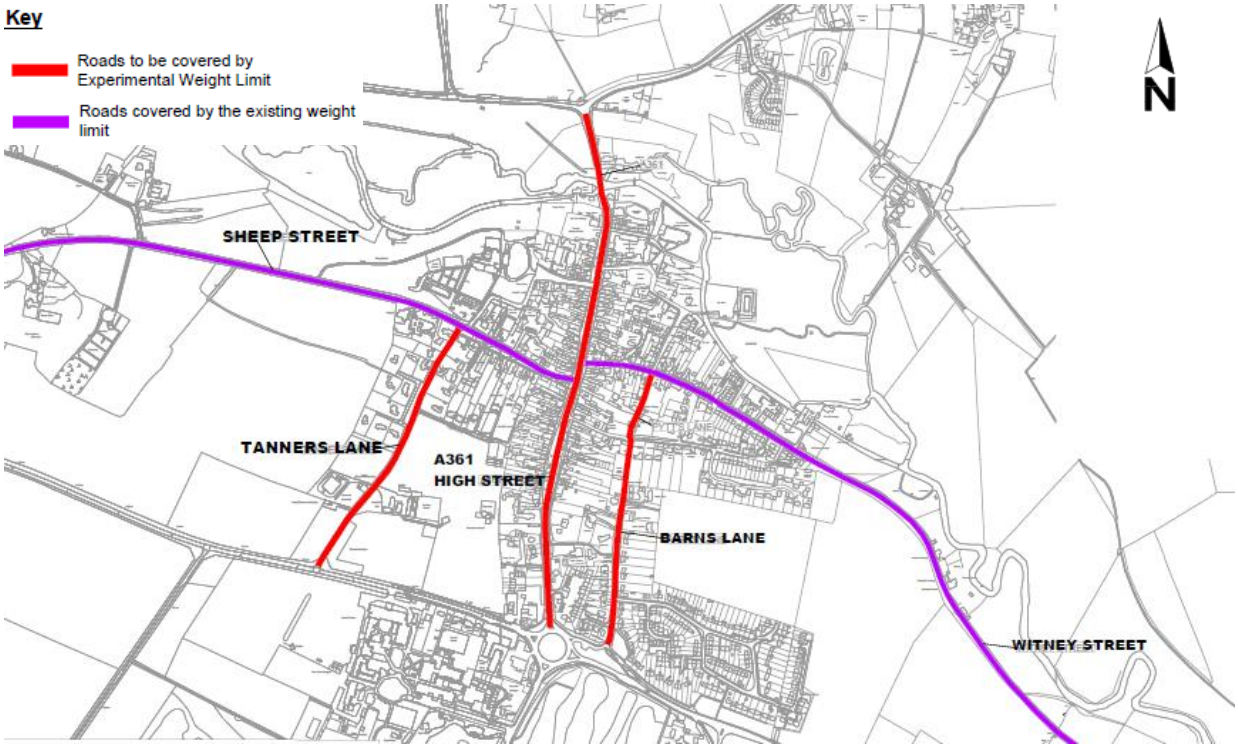


Figure 8 – Map of Burford ETRO area

Action 8 – Consider the establishment of area based weight restrictions

Where 18t environmental weight restrictions are deemed necessary and there is funding available, we will also consider the establishment of area based weight restrictions. This will cover multiple roads in an area and will help to prevent through movement of HGVs. We will continue to monitor the Burford ETRO and will use this data to inform any potential scheme.

Enforcement

Where existing action has been taken to address inappropriate HGV movement, the county council conduct enforcement. Primarily, this has been through the enforcement of existing weight restrictions.

Whilst resources have reduced in recent years, we have become more efficient allowing for an increase in activity since 2007 when enforcement began. However, we recognise that owing to the time involved for enforcement and the sheer quantity of HGV traffic on the road, breaches of weight restrictions are difficult to reduce.

We are therefore keen to explore new opportunities to improve enforcement and increase the use of our identified HGV routes. A key factor in enabling this would be if the Department for Transport (DfT) granted local authorities enforcement powers under Part 6 of the Traffic Management Act 2004.

Traffic Management Act 2004 - Part 6

Under Part 6 of the Traffic Management Act (TMA) local authorities can apply for powers to take on further enforcement themselves, rather than relying on the police. Whilst councils can enforce parking and bus lane contraventions, the provisions relating to moving traffic offences have not been activated.

If secondary legislation is passed, local authorities would be granted powers to enforce and issue penalty charges for offences such as disregarding one-way systems, failing to give priority to ongoing traffic, or disregarding box junctions.

Part 6 of the TMA enabled the introduction of the London Lorry Control Scheme (LLCS). The LLCS controls the movement of heavy goods vehicles over 18t at night and at weekends on specific roads in London. This helps to manage the environmental impact of HGV vehicles and minimise noise pollution. Enforcement is carried out in residential areas during unsociable hours through restricted use of these roads.

Action 9 – Lobby for enforcement of moving traffic offences under Traffic Management Act Part 6

We will continue to lobby for the government to pass secondary legislation allowing local authorities to enforce moving traffic offences under the Traffic Management Act Part 6.

Ahead of the Traffic Management Act Part 6 there are other options to improve enforcement of weight restrictions that we will explore. The primary option that we are seeking to explore further is the implementation of road user charging schemes.

Road user charging involves charging drivers for the use of the roads they drive on. Traditionally this has involved charging vehicles based on the emissions they produce. Examples of this include the London Ultra-low Emission Zone (ULEZ) and Oxford city Zero-Emission Zone (ZEZ).

Using the same principles and technology, it is possible to charge vehicles based on their weight category for use of a road. Where restrictions are in place, but issues persist, this type of charging could be implemented to act as a deterrent and help us to encourage use of the identified appropriate routes.

Action 10 – Explore implementation of road user charging schemes to reduce commercial vehicle flows, emissions, and encourage use of the appropriate routes

We will explore the implementation of road user charging schemes to reduce the impact of commercial vehicles, including supporting weight restrictions and appropriate routeing.

There are also changes to technology that may help us to improve our enforcement. Technology continues to develop rapidly and there have been a number of innovations in the transport industry in recent years. It is therefore important that we consider these changes and how to harness them.

For example, there has been the development of cameras and sensors that can be used to identify different vehicles. These could be deployed at multiple locations, tracking HGVs in and out of weight restriction entrances and exits. This would allow for cross matching and identification of those that stopped in the area.

Action 11 – Explore technology to aid enforcement
We will monitor and explore technology that could help us to improve the enforcement of weight restrictions.

Finally, we will seek to improve our enforcement by reviewing best practice nationally and internationally on freight transport management. This includes engaging with other local authorities to understand work they are doing and the effectiveness of it and our sub-national transport body England's Economic Heartland (EEH).

Action 12 – Review best practice
We will seek to improve our enforcement by reviewing best practice nationally and internationally on freight transport management.

Influencing new development

Another key way in which we will encourage appropriate movement is by seeking to influence new development. Current forecasts are for over 85,000 new jobs and 100,000 new homes in the county between 2011 and 2031. It will be important to ensure that these developments are located and designed to facilitate appropriate freight access.

The district councils are responsible for planning functions in Oxfordshire. However, there are opportunities for us to seek to influence development. For example, we will ensure that we consider freight management measures when responding to consultations on planning policy and relevant planning applications.

This also includes seeking to ensure new developments incorporate the needs of emerging technologies like drones that may be used for last mile delivery in the future. We plan to do this through our Innovation Framework.

The framework, which is a supporting document of this LTCP, sets out a series of principles which should be applied to the integration of innovation into new development and infrastructure, so that innovation is used to further policies and strategies such as those within this document.

Action 13 – Seek to influence the location and design of new development
We will seek to influence the location and design of new development, particularly employment sites and any related transport infrastructure, so that these can function well, with appropriate freight access to and from the strategic transport network without adverse impacts on local communities, other road users and the environment. This includes ensuring new developments incorporate the needs of emerging technologies.

We will also ask developers of major sites to prepare Construction Logistics Plans (CLPs). CLPs provide the framework for understanding and managing construction vehicle activity into and out of a proposed development[28].

CLPs provide us with an overview of the expected logistics activity during the construction programme. This will help to reduce the impact construction traffic has on local communities in relation to congestion, pollution and noise[29].

Case study – Croydon Growth Zone
The London Borough of Croydon put in place Construction Logistics Planning guidance for the Croydon Growth Zone project. Any failure to follow the guidance meant the project being rejected[30].

Some key aspects of the guidance included:

- Site traffic was not allowed between 7:30 – 9:30am and 4:00 – 6:30pm except concrete deliveries.
- Developers had to commit to using specific signed routes for designated Growth Zone traffic.
- Developers had to commit to using the Growth Zone Navigation App which directs vehicles via approved access routes.

A full CLP assessment should include detail such as the amount of construction traffic generated, the routes the construction vehicles will use and any traffic management that will be in place. They therefore help us to encourage use of appropriate routes, whilst also contributing to several of our other objectives.

There are a number of innovations in this area, for example the Croydon Growth Zone navigation app, that we will continue to monitor and explore as appropriate.

Action 14 – Ask developers of major sites to prepare Construction Logistics Plans
We will ask developers of major sites to prepare Construction Logistics Plans to minimise the impact of the large scale residential and business development planned for Oxfordshire.

[28] https://www.arup.com/projects/construction-logistic-plan
[29] https://ccsbestpractice.org.uk/entries/construction-logistics-plan/
[30] https://www.clocs.org.uk/casestudies/clocs_case_study_lb_croydon_aug_2020.pdf

Efficient movement

As highlighted previously, the UK freight system supports £400 billion in manufacturing sales. It is therefore important that goods can move efficiently through Oxfordshire to support the economy. Efficient movement will also support local businesses, help attract new businesses and facilitate economic growth.

Changes to customer expectations have further enhanced the need for the efficient movement of goods. The rise of online shopping and next day delivery have made it more challenging for operators to meet demand and customer expectation. The impact of delays and congestion therefore have a greater impact than before.

Similarly, in order to meet expectation some operators may increase the number of vehicles. This further increases the total number of vehicles on the county's roads and contributes to both pollution and congestion.

With forecasts for over 85,000 new jobs and 100,000 new homes in the county between 2011 and 2031 there will be greater demand on the transport network. We will therefore need to take steps to manage the road network to ensure it operates efficiently for all users.

However, efficient goods movement must support the LTCP vision and help to create healthy, attractive environments for people. In line with the LTCP transport user hierarchy, we will focus on prioritising walking, cycling, public and shared transport before other modes.

Prioritising these modes will actually help to deliver a more efficient transport network for all users, including the freight industry. Prioritising these modes and making them more attractive will help to reduce private vehicle usage, tackling congestion and freeing up road space for the efficient movement of goods.

Alternative modes

One of the main ways in which we can increase the efficiency of goods movement is by encouraging the use of alternative modes. Primarily, freight can also be moved by rail. This is safer, helps to reduce emissions and reduces impacts on our roads.

Whilst we believe there are opportunities for rail freight to help improve the efficiency of goods movement, it is part of a wider system and cannot replace road freight entirely. The pros and cons of the main modes are outlined below to help demonstrate why we cannot replace road freight.

As outlined in the key barriers, significant levels of modal shift will take a number of years. Therefore, we recognise that this will be a gradual progress and we will need to continue to address road freight in the short to medium term.

It should also be noted that the county council only have a limited ability to influence the freight industry. A large amount of partnership working will therefore be required. More details about this can be found in the partnership working section.

Mode	Pros	Cons
Rail	• Reduced emissions • Environmental benefits • Reduced road congestion • Improved safety • Better journey time reliability	• Lack of capacity on network • Less flexible than road • Not suitable for first/last mile • Not economically viable for short distances
Water	• Good for heavy cargo • Lower cost than road and rail • Reduced road congestion • Reduced emissions • Journey time reliability	• Slow speed • Less flexible than road • Not suited to first/last mile • Lack of facilities and knowledge
Road	• Cost effective • Can be used for all distances • Full door to door movement • Easier to track cargo • Freight can be moved quickly	• Limitations on cargo size and weight • Slower than rail over long distances • Negative environmental and air quality impacts • Contribute to congestion and road safety issues

Water Freight

In total, approximately 95% of UK imports and exports are transported by water[31]. The majority is international traffic, however 13% of domestic freight is currently moved by water[32]. Of relevance to Oxfordshire is the 7% of water freight (1% of total freight movement) that is moved on inland waterways[33].

Inland waterway traffic is carried by barge or sea going vessels on the inland waterways network (rivers and canals). The River Thames, which passes through Oxfordshire, is the most used inland waterway for freight movement in the UK. The majority of this movement is to or from terminals within London[34].

Waterways are not congested providing benefits for the efficiency of freight movement. Barges are also capable of carrying up to 1000 tonnes compared to approximately 20 tonnes for HGVs[35]. They can therefore help to move goods more efficiently and reduce the number of HGVs.

There are currently a number of challenges around the use of inland waterways for freight movement in Oxfordshire. These include a lack of knowledge, a lack of suitable facilities and potential environmental challenges.

However, we do not view water freight in isolation and instead recognise that it could play a role in the future freight system. We will therefore continue to monitor potential opportunities in this area.

[31] Freight transport association: Growing the UK inland water freight sector: lessons from the Thames
[32] Department for transport: Domestic freight transport, by mode: 1953 to 2019
[33] Department for transport: Waterborne transport within the United Kingdom: goods lifted and goods moved by traffic type from 2001
[34] Transport for London: Freight and Servicing Action Plan
[35] Freight transport association: Growing the UK inland water freight sector: lessons from the Thames

Action 15 – Monitor the use of water freight
We will continue to monitor potential opportunities for increasing the use of water freight in the county.

Rail freight

As noted previously, the main mode which could contribute to improving the efficiency of freight movement is rail. Rail currently accounts for approximately 9% of UK Freight movements[36].

There has been a 25% decline in the amount of freight moved by rail since a peak in 2014/15. However, as shown on the graph below, this can largely be attributed to the Department for Business, Energy and Industrial Strategy's policy to phase out coal-based energy in 2015.

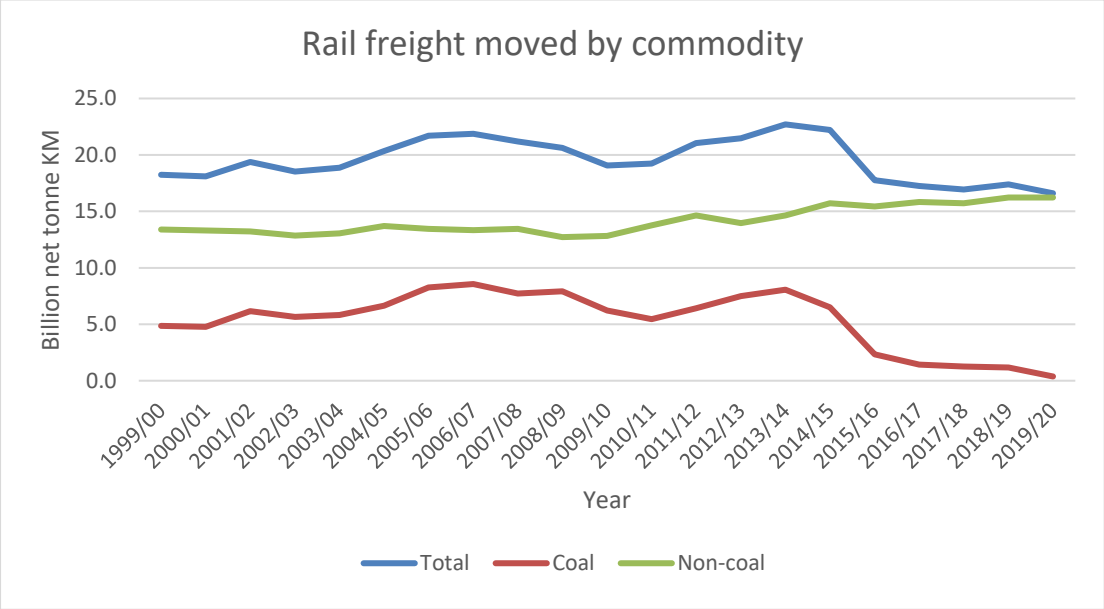


Figure 9 - Rail freight moved by commodity[37]

The amount of non-coal commodities moved by rail freight has been steadily increasing since 2013/14. There has been an 11% increase in non-coal commodities carried by rail freight in this time period[38]. This demonstrates the potential for increased rail freight movement for all commodities.

The Oxfordshire Rail Corridor Study (ORCS) forecast rail freight growth across Oxfordshire and identified the need for a 50 % increase in capacity by 2033[39]. This highlights that rail freight is forecast to increase in the county and work will be required to support this.

In 2018/19, 7 million road haulage journeys were avoided as a result of rail freight movements[40]. This is equivalent to 1.6 billion road vehicle kilometres. Rail freight

[36] UK Rail Factsheet 2019
[37] Department for Transport: National Railways freight moved by commodity, annual from 1996/97
[38] Department for Transport: National Railways freight moved by commodity, annual from 1996/97
[39] Network Rail: Oxfordshire Rail Corridor Study
[40] Department for transport: Number of freight train movements, impacts on road haulage and Freight Performance Measure: annual from 2005/06

therefore helps to reduce road congestion and create a more efficient transport network for all users.

Rail freight currently produces 76% less carbon dioxide per tonne of cargo relative to road haulage[41]. It can contribute to broader environmental benefits and with the electrification of the rail network will contribute to achieving zero-carbon transport emissions by 2040.

For these reasons we support the mode shift of freight from road to rail. This will capitalise on the rail network in Oxfordshire. It will also help to reduce the number of HGVs, free up road space, tackle congestion and emissions and create a more efficient road network for all users.

Action 16 – Promote rail freight
We will encourage the mode shift of freight from road to rail. We will work with stakeholders to encourage this shift and understand what measures are required to further encourage the use of rail freight.

As with water freight, rail freight cannot be viewed in isolation and is instead part of a wider system. Some road movement is still required to move goods on the first and last miles of their journey.

We know that in order to encourage rail freight, more strategic rail freight interchanges (SRFI) are required. A SRFI is a large rail served distribution and warehouse park linked into both rail and the strategic highway network. These facilities are key to enabling the first/last mile road movement and encouraging use of the rail network.

In order to encourage the mode shift of freight to rail we will support the provision of appropriately sited SRFI's, subject to funding being available and having regard to the impacts on local communities and on the road and passenger rail networks.

For example, SRFI's may not be suitable in locations where capacity on the existing road and/or rail networks is not available, capacity of the road or rail cannot be enhanced, or in locations with particular environmental sensitivities and/or other planning constraints.

Action 17 – Support the provision of strategic rail freight interchanges
We will support the provision of appropriately sited strategic rail freight interchanges, subject to funding being available and having regard to the impacts on local communities and/or any other relevant planning considerations, and on the capacity and suitability of impacted road and rail networks.

Whilst we support the mode shift of freight to rail, it is important that this does not affect our passenger rail network. The lack of spare capacity on Oxfordshire's rail network is currently a key constraint that will need to be addressed to enable more rail freight.

[41] Network Rail (2017) Freight Network Study

Upgrades to the rail network are beyond OCC's control. We will therefore need to lobby and work with the DfT and Network Rail to upgrade Oxfordshire's rail network and free up capacity for freight. In particular, we will take account of the recommendations in the Oxfordshire Rail Corridor Study.

Action 18 – Work with stakeholders to increase rail network capacity
We will work with Network Rail and the Department for Transport to seek improvements which optimise capacity on the existing rail network for freight and passenger services.

Network management
OCC as the Highway and Streetworks authority are responsible for a range of management functions. This includes working to manage congestion through network management.

The core purpose of network management is to tackle congestion and ensure the safe, free-flowing movement of traffic, people and freight across the Oxfordshire road network. It also has the potential to influence travel choices and prioritise public transport, walking and cycling.

The Traffic Management Act (2004) places a duty on the Council to reduce and manage congestion and to collaborate effectively with other traffic authorities to achieve this. OCC is also responsible for ensuring a co-ordinated approach to maintaining public safety through approval of all works on the public highway.

Our key network management objectives are to:

- Promote economic activity in and through the county.
- Enable access to employment, leisure and educational facilities for all.
- Reduce traffic congestion, air and noise pollution.
- Reduce accidents and promote public safety.

Effective network management will be an essential part of delivering efficient goods movement in Oxfordshire. Enhanced network management can reduce the impact of roadworks, accidents and incidents on the network, therefore improving productivity and road safety for all road users.

Action 19 – Enhance network management
We will work to improve our network management to allow efficient goods movement by managing congestion and reducing the impact of roadworks, accidents and incidents on the network. More detail about how we will do this can be found in the LTCP network management policy.

In support of our network management functions, data has become available from a range of different sources and at larger quantities. New data sources include edge devices (devices that provide data between a local network and a wide network, such as routers), big data and the Internet of Things (IoT).

We are seeking to improve our approach to data because it can be leveraged to ensure we're meeting residents' needs, measure progress, understand future needs and improve our awareness of changes.

Better real time data will enhance our network management by allowing near real time adaption to changes on transport networks, helping to minimise disruptions to journeys and improve air quality. This will support the efficient movement of goods.

Action 20 – Improve data gathering and usage
We will work to enhance our network management by implementing a consistent approach to gathering and using data. More detail about this can be found in the LTCP data policy.

There has also been a shift towards providing open data. The provision of open data allows transport data to be more widely available. It can then be used for innovations in the private sector and combined with data from other sectors to improve our understanding of transport user's needs.

Open data is data that is available to everyone to access, share and use[42]. Open data should be easy to use and in a standardised format. Open data is a government priority and is seen as a key enabler for the government's digital transport strategy. Transport Systems Catapult estimate that not sharing, and not making transport data open, could result in £15bn in lost direct and indirect benefits to the UK between 2017 and 2025[43].

Sharing our data will help navigation software providers to update their software and will enable freight transport operators to improve the efficiency of their operations.

Action 21 – Improve data sharing
We will implement a consistent approach to data sharing in order to help freight transport operators improve the efficiency of their operations. More detail about this can be found in the LTCP data policy.

Parking facilities
Appropriate parking facilities are an important consideration to ensure safe and efficient movement. Appropriate parking facilities allow journeys to be made without major detours and prevent HGVs from disrupting other road users. As highlighted previously, even small detours can have a large effect on operators' costs and journey times.

Strategically located rest stops can also help to encourage the use of appropriate routes. Facilities could be located on our identified appropriate HGV routes, contributing to delivery of our appropriate movement principle.

Currently parking facilities in the South East are at 84% utilisation[44]. This is only 1% below the 'critical' utilisation level. The Welcome Break Oxford services were

[42] https://theodi.org/
[43] The case for government involvement to incentivise data sharing in the UK Intelligent Mobility sector —Transport Systems Catapult 2017
[44] National Survey of Lorry Parking, 2017

identified as being at 114% utilisation highlighting the pressures on lorry parking in the county.

In order to inform future work on this topic, we will review current rest stops and lorry parking facilities. This will identify what facilities are currently available and where there are gaps in the current network.

Action 22 – Review current rest stops and lorry parking facilities
We will review current rest stops and lorry parking facilities in order to improve our understanding and inform future work.

Following this review, we will promote the development of lorry parking facilities. The county council do not currently have any funding for the delivery of new facilities. As a result, external funding will be required and we will work with a range of stakeholders such as developers, neighbouring local authorities and the freight industry to understand the potential for any such facilities.

The A34 and M40 are part of the strategic road network and so are managed by National Highways. Therefore, working with National Highways will be essential to delivering any facilities on these corridors.

As part of this we will work to ensure that any facilities are located in accordance with our HGV route map. Similarly, it will be important to consider potential future fuel requirements at these facilities such as electric vehicle charging or hydrogen refuelling stations.

Action 23 – Promote the creation of rest stops and lorry park facilities
We will work with a range of stakeholders to promote the creation of rest stops and lorry park facilities. We will seek to ensure that any facilities are located in accordance with our HGV route map and that they consider the need for future refuelling requirements.

Technology
There are also a range of technological developments which may help to improve the efficiency of goods movement. We recognise that technology alone will not solve many of the challenges identified. However, we believe it can play a role in addressing some issues and improving the efficiency of movement.

One notable technological development which can help to improve the efficiency of goods movement is deliveries by robots or Unmanned Aerial Vehicles (UAV). UAVs, sometimes referred to as drones, are remote-controlled aircraft or small aerial devices which do not have an on-board pilot.

Currently, most drones are remote controlled by a human, but in the short to medium term, it is anticipated that automated UAVs will improve and facilitate wider autonomous drone usage. They also currently have a short range, due to battery constraints. Again, this is anticipated to improve over the short term, to allow longer distance flights.

Drones are already being used in various practical applications, such as cargo delivery. In the near future, it's anticipated they could also be used for heavy lift facilitation.

Delivery drones will bring about benefits such as faster delivery of small items, due to the lack of congestion in the skies. This will benefit both residents and freight transport operators.

Cargo delivery by drones is also, potentially, between 20% and 35% more cost effective than traditional methods according to research from PWC, helping to reduce costs and meaning potentially cheaper delivery charges for people. Drones could also reduce the need for freight vehicles, helping to lessen congestion and the associated negative impacts of LGVs.

Action 24 – Support the development and trialling of drone technology
We will continue to promote and support the trialling of delivery drone technology in order to improve the efficiency of goods movement. This will include working with stakeholders, monitoring progress and seeking to trial schemes in the county.

Another technological development that could improve the efficiency of goods movement is the development of connected and autonomous vehicles (CAV).

Connected vehicles can be defined as those equipped to exchange information between vehicle and the surrounding environment, either through local wireless networks or the internet[45]. Autonomous vehicles operate in a mode which is not being controlled by an individual[46].

The primary application of CAV technology to freight is via truck platooning. Platooning is the linking of two or more trucks in convoy, using connectivity technology and automated driving support systems[47].

The vehicles automatically maintain a set, close distance between each other when they are connected for certain parts of a journey, for instance on motorways. The truck at the head of the platoon acts as the leader, with the vehicles behind reacting and adapting to changes in its movement. In the first instance lead vehicle will be driven by a human but in time this could become fully autonomous.

[45] Lengton et al., 2015
[46] Automated and Electric Vehicles Act 2018
[47] https://www.acea.auto/uploads/publications/Platooning_roadmap.pdf

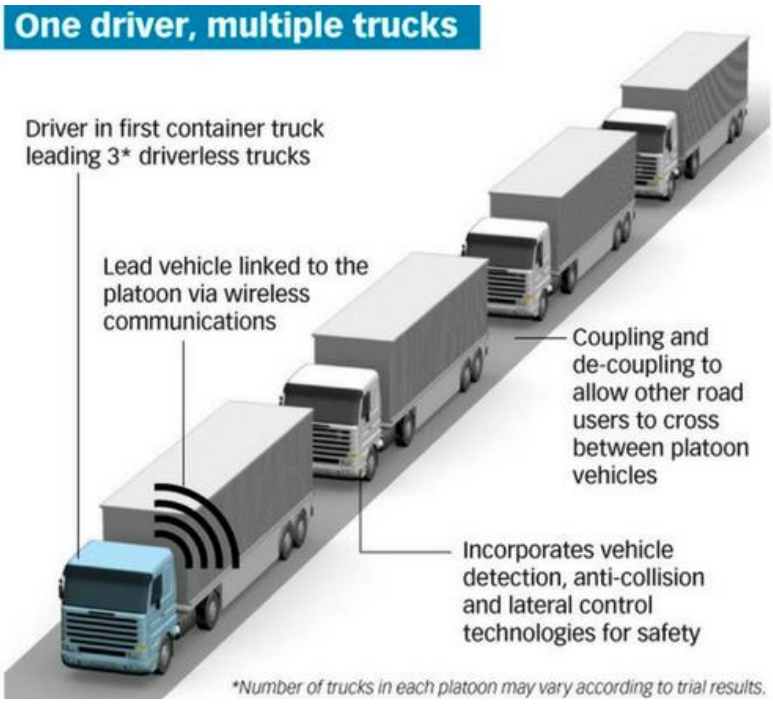


Figure 10 – Truck platooning[48]

The benefits of platooning are:

- Reduces air drag, lowering fuel consumption and CO_2 emissions by up to 16% for the trailing vehicles and 8% for the lead vehicle.
- Improves safety – 85% of road traffic collisions are due to human error.
- Improves efficiency by using roads more effectively.

In 2017 the DfT conducted a feasibility study into platooning. The study deemed that a trial on a UK motorway would be feasible. We will therefore continue to monitor progress in this area and opportunities to be involved in a trial. The safety benefits of automation will also support the delivery of our safe freight movement key principle.

Action 25 – Monitor truck platooning progress and opportunities
We will continue to monitor progress made on HGV platooning and any opportunities to be involved in a trial.

In order to facilitate these technological developments, there are future considerations that will be required now. For example, this may include landing areas for UAVs or docking points for robots. Considering the needs of future freight technology during construction and maintenance will help to avoid the need for potentially more costly retrofit at a later stage.

Our Innovation Framework, discussed previously, will guide both the integration of innovations within development and infrastructure, and provide a consistent approach to futureproofing for the mainstreaming of current innovations, such as CAV, UAV and 5G.

[48] Singapore Ministry of Transport

Action 26 – Consider future technology requirements

We will consider future freight technology requirements via the county's Innovation Framework. More detail about this can be found in the LTCP Innovation Framework policy or the Innovation Framework itself.

Zero-tailpipe emission, zero-carbon movement

Improving air and environmental quality across the county is essential to improving the health of Oxfordshire residents. It will also help to protect our rich and varied natural and historic environment.

In Oxfordshire transport is responsible for a larger proportion of greenhouse gas emissions than the national average, producing approximately 36% of all emissions in the county[49].

Total CO_2 emissions in the county have declined by 27% since 2008, despite a 7.6% population increase over the same period. However, transport emissions have only declined 1.9% across the same time period.

As part of the LTCP, we have set the target for delivering a zero-carbon transport system by 2040. In order to deliver this target, goods in Oxfordshire will also need to be moved by zero-carbon means.

The decarbonisation of freight is an issue beyond the control of the county council. It will require working at all levels from local through to international, to provide the necessary legislation and technology. However, there are steps that we can take at the local level to help support this shift.

Increasing the use of rail freight will also play a role in helping to decarbonise freight. This was covered in the 'Efficient movement' section but will also contribute to delivering zero-carbon movement.

Vehicle refuelling requirements

Road freight will always be part of the freight system. Zero emission vehicles (ZEVs) are therefore required to significantly reduce emissions of carbon, nitrogen oxides and other pollutants, both at the tailpipe and upstream in the energy system.

As outlined previously, there are two kinds of freight vehicles, LGVs and HGVs. Both of these vehicle types will need to be zero emission if we are to deliver a zero-carbon transport system by 2040. However, there is a significant variation in how developed alternative fuels for these vehicles are.

For LGVs there is more certainty about the technology available. Zero emission LGVs are largely Battery Electric Vehicles (BEVs), utilising the same technology as electric cars. As a result, the UK government has required that from 2035, all new cars and vans must be ZEVs.

In the short to medium term, electric vehicle charging infrastructure is the most pressing requirement to support these vehicles. To enable this, OCC along with our partners in the District and City Councils, has adopted the Oxfordshire Electric Vehicle Infrastructure Strategy (OEVIS), which sets out 17 policies and associated key actions for the short term (2020-2025).

[49] University of Oxford Transport Studies Unit: Pathways to a zero-carbon Oxfordshire

The OEVIS will guide our short term work which will support all BEVs, including the freight industry. We are also planning to develop a longer-term strategy to meet the infrastructure requirements of ZEVs of all propulsion types and classes.

Our District and City councils may also produce their own strategies and delivery plans to support ZEVs. For example, Oxford City Council are currently working an Electric Vehicle Strategy. Supporting the delivery of these strategies will also be critical to supporting the uptake of ZEVs.

Action 27 – Support BEV charging infrastructure requirements
We will work to ensure that the OEVIS supports the freight industry's electric vehicle charging requirements. We will also continue to engage with freight operators as we develop a long-term strategy to understand their electric vehicle charging requirements.

HGVs are also evolving and work is progressing to develop ZEVs. However, HGV technology is further behind and there is less certainty about when alternative fuels will be adopted at scale. The primary alternatives that are being developed are BEVs, Hydrogen Fuel-Cell Vehicles (FCEV) and electrified road systems (catenary).

Battery electric HGVs are predicted to be adopted at scale between 2022 and 2030, exceeding ICE HGVs from approximately 2032. Hydrogen powered HGVs are predicted to be adopted at scale between 2024 and 2040, exceeding ICE HGVs from approximately 2036[50].

As part of the Transport Decarbonisation Plan, the government is consulting on when to end the sale of all new non-zero emission HGVs. The dates proposed are 2035 for HGVs of 3.5t to 26t and 2040 for HGVs above 26t. We will continue to monitor the outcomes from this consultation.

Whilst electric vehicle technology is generally further ahead, there are issues associated with electric HGVs that could make hydrogen an attractive alternative. These issues include the fact that batteries for electric vehicles are heavy and take up space therefore reducing the HGVs load and making each vehicle less efficient.

Hydrogen technology is further behind and there are also issues associated with it. Hydrogen is considerably less carbon efficient than electrification and so the benefits are lower. As a result, more off-setting in other areas would be required.

We will need to monitor technological developments in the sector. This will include monitoring the outcomes of the zero emission HGV technology trials the government have committed to as part of the Transport Decarbonisation Plan. We will also incorporate findings from the Oxfordshire hydrogen strategy.

[50] Shell: Decarbonising Road Freight: Getting into Gear

Action 28 – Monitor alternative HGV fuel requirements and options
We will continue to monitor developments in zero emission HGV fuels. As more is known we will update our strategy and consider the necessary requirements. This will include consideration of the zero emission HGV technology trials and findings from the Oxfordshire hydrogen strategy.

When more is known about what fuel will be used to power zero emission HGVs, there will be an opportunity for the county council to be involved in the provision of refuelling infrastructure. This could be by providing refuelling infrastructure on the council owned highway or by identifying land for refuelling stations.

There is an opportunity to develop this infrastructure in accordance with our HGV route map. Strategically locating refuelling infrastructure on this network will help to encourage use of appropriate HGV routes and deliver the associated benefits outlined previously.

Action 29 – Strategically locate refuelling infrastructure
We will seek to strategically locate zero emission HGV refuelling facilities in accordance with our HGV route map. This will support zero emission freight movement whilst encouraging use of appropriate routes.

Electrified road systems are another alternative that could be used to power zero-emission HGVs. Electrified road systems use overhead cables to deliver energy to the vehicle. This reduces the need for energy storage via large, heavy batteries.

This system would rely on the overhead cables being delivered on key freight corridors. It is estimated that this could deliver as much as 80% reduction in the carbon emissions from a long-haul articulated vehicle[51]. Demonstrator projects have been delivered in the USA, Germany, Sweden, and the Netherlands.

Figure 11 – Electrified road system trial[52]

[51] https://www.mobility.siemens.com/global/en/portfolio/road/ehighway.html
[52] Siemens

In order to implement this a significant amount of new infrastructure would be required. The cost of this infrastructure is estimated to be £1 million per km. There are approximately 7,000 miles of suitable trunk roads in the UK setting the infrastructure costs of this approach at £7 billion[53].

Whilst there is a significant cost involved, electrified road systems are currently being explored further by Innovate UK-funded projects. We are involved in a project looking into this and will monitor the outcomes of the study.

Electrified road systems will also be included in the zero emission HGV technology trials committed to in the government's Transport Decarbonisation Plan. We will monitor the outcomes of these trials.

Action 30 – Monitor electrified road systems study
We will continue to monitor and engage with research projects reviewing the feasibility of electrified road systems in the UK and across Europe

Cycle freight

One way in which goods can be moved in a zero-carbon, efficient and safe manor is via cycle freight. This is best suited to replacing LGVs for the last mile delivery of goods in urban areas.

Cycle freight refers to the transportation and delivery of goods using bicycles or electric bicycles. It can help to reduce emissions by up to 90% compared to diesel vans and by a third compared to electric vans. It also brings benefits to operators with delivery being up to 60% faster in city centres[54].

As noted in the key barriers, cycle freight is one part of the broader freight system. We believe it has the potential to move a greater proportion of goods, but it will not have the capacity to completely replace road freight in urban areas.

It will also take a number of years before operations across the county could be scaled up. We will therefore need to support zero-emission LGVs for the majority of last-mile delivery in the short to medium term.

There are existing cycle freight services operating successfully in Oxford. We believe there is potential to expand the use of cycle freight within Oxford, particularly with introduction of the Zero Emission Zone, and in other towns.

Owing to the potential of cycle freight, we have included a high level policy within the LTCP to promote its use. Further details about how the policy will be achieved are included in this section.

[53] Government office for science: Decarbonising road freight
[54] Possible: The promise of low-carbon freight

Case Study – Pedal and Post

Pedal and Post is a sustainable courier and storage firm operating in Oxford. Pedal and Post uses cargo bikes to deliver medical supplies and samples, e-commerce parcels and other items.

Pedal and Post have various partnerships including with Baxter Healthcare and OUH Trust. As part of this partnership, more than 25,000 products were delivered between August 2020 and February 2021. This service has halved the time it takes for products to travel from Baxter's compounding facility in Cowley to the hospital site[55]. The success of pedal and post demonstrates the benefits of cycle freight in Oxford.

As of August 2021, OCC are working to purchase e-cargo bikes for Pedal and Post using funding from the Energy Savings Trust. Pedal and Post are planning to use some of these bikes to take over veg box deliveries in Oxford, replacing LGVs which currently make the deliveries. We are also involved with capturing and evaluating data from Pedal and Post.

Figure 12 - Cycle freight operated by Pedal and Post in Oxford[56]

Outside of Pedal and Post there is also work progressing to encourage cycle freight in Oxford. As part of the Energy Savings Trust funding we are purchasing a set of lease bikes for Oxford businesses to try at a low cost before they buy.

Oxford City Council are also providing some electric cargo bikes in Cornmarket. We will be involved with reviewing the results from both of these projects to get a rounded picture of usage and further inform our understanding of cycle freight.

Action 31 – Promote cycle freight in Oxford

We will continue to promote and support the expansion of cycle freight in Oxford. This includes working with Pedal and Post and others to evaluate data and leasing e-cargo bikes to Oxford businesses.

[55] http://www.pedalandpost.co.uk/pedal-post-pedal-power-drives-improved-medical-service-and-greener-deliveries/
[56] http://www.pedalandpost.co.uk/

Cycle freight could also be effective in a range of Oxfordshire towns. We are seeking to promote the use of cycle freight across the county because it will help to reduce the number of motorised vehicles. This will improve the health and wellbeing of residents by reducing emissions from HGVs and LGVs. It will also help to reduce congestion and noise pollution.

Cycle freight will deliver benefits to freight operators and local businesses through improved journey time reliability, reduced costs and more flexible pick up/drop off destinations.

Action 32 – Promote cycle freight across Oxfordshire
We will promote cycle freight across Oxfordshire by engaging with a range of stakeholders including our District and City council's, local businesses, freight operators and developers. We will also continue to monitor any funding opportunities.

Reducing local air pollutants

Reducing local air pollutants is a different issue with potentially different solutions from moving to zero-carbon transport. For local air pollution we need to consider exhaust and non-exhaust emissions.

Air pollution is a mix of particles and gases of both natural and human origin. The main components of urban air pollution are particulate matter (PM) and nitrogen oxides (NO_x). Road transport is the largest source of NO_x and fourth largest source of PM[57]. Currently, there is no clear evidence of a safe level of exposure.

Air pollution is the largest environmental health risk in the UK. It causes more harm than passive smoking. Conditions exacerbated by air pollution include asthma, chronic bronchitis, chronic heart disease, and strokes. In Oxfordshire, it was estimated that 3,578 years of healthy life were lost due to air pollution in 2017[58].

Oxfordshire's air pollution comes from a variety of sources, and the mix of sources varies by location. Across Oxford road transport accounts for approximately 40% of NO_x emissions and 10% of particulate matter emissions. At roadside locations in the county with heavy traffic, road transport accounts for as much as 75% of NO_x and 20% of particulate matter emissions.

Nationally, HGVs and LGVs produce 35% of road transport emissions[59]. Action is required to address this contribution to air pollutants.

Clean Air and Zero Emission Zones
As part of the LTCP we have committed to investigating the use of Clean Air Zones (CAZs) and Zero Emission Zones (ZEZs). CAZs and ZEZs will be important tools to reduce road transport emissions in Oxfordshire.

A CAZ is an area where vehicles with higher tailpipe pollutant emissions are restricted or charged for access. A ZEZ is an area where all vehicles except those with zero tailpipe emissions are restricted or charged for access.

In addition to the core restrictions or charges, CAZs and ZEZs may also include:

- Supporting traffic management, sustainable transport or behavioural change schemes.
- Electric vehicle charging infrastructure.
- Funding to help individuals and businesses to upgrade their vehicles.

CAZs and ZEZs improve air quality and reduce carbon emissions. They may also reduce traffic levels and noise. This makes them effective tools for reducing local air pollutants.

[57] https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution
[58] Oxfordshire Health and Wellbeing Joint Strategic Needs Assessment 2020
[59] UK Government: The Road to Zero

In terms of freight, there are various considerations about how CAZs and ZEZs could apply. For example, recognising that there are very few zero-emission HGVs, the standards for these vehicles could be set at Euro IV.

Similarly, there is a need to consider the penalty charges for non-compliance. Owing to the fact that many HGVs are operated by freight companies' non-compliance charges may need to be higher to encourage use of cleaner vehicles.

However, it is also important to consider the economic importance of freight and the needs of local businesses when planning any scheme. Local businesses, especially smaller ones, may have little influence on the vehicles used to deliver supplies.

We will therefore seek to engage with the freight industry and local businesses to inform the development of any CAZs or ZEZs in Oxfordshire and publicise proposals so that businesses have sufficient time to retrofit their fleet.

Action 33 – Engagement around CAZs and ZEZs
We will engage with the freight industry and local businesses when planning any CAZ or ZEZ scheme to inform its development. We will also ensure there is comprehensive communications and publicity about any CAZ or ZEZ proposals.

Consolidation Centres
As part of the LTCP we have also committed to reviewing and exploring the potential for freight consolidation centres. Freight consolidation is an important part of logistics.

Freight consolidation centres are operations that receive multiple small deliveries and convert them into fewer deliveries to the destination. Crucially, this is often done in zero-emission vehicles or by cargo bike. They can therefore help to reduce local air pollutants from freight.

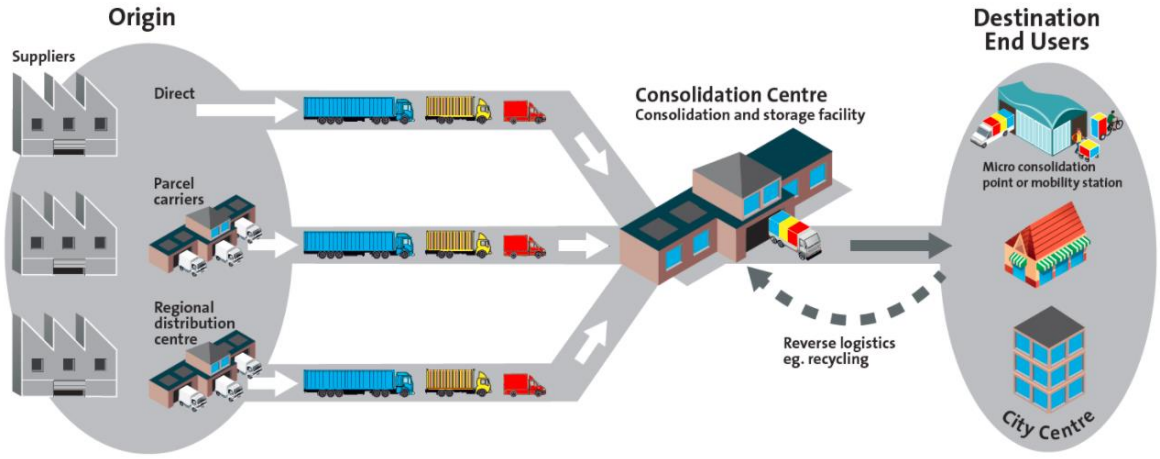


Figure 13 – Summary diagram of freight consolidation[60]

Freight consolidation centres can also provide a range of benefits such as allowing for more efficient vehicle usage and can reduce both the number of vehicles and

[60] Travel West: Bristol Freight Consolidation Centre Case Study

distance travelled. This will contribute to delivery of our objectives around efficient movement and appropriate movement.

Freight consolidation centres can vary in scale and there are several different operating models. Many consolidation centres are used by a single company to improve the efficiency of their operation. However, other models exist where centres are designed to be used by multiple operators. The most common examples are urban consolidation centres, micro consolidation centres and construction consolidation centres.

It is recognised that there are few examples of self-sustaining urban consolidation centres. However, many of those in operation have shown evidence of benefits. Examples from Monaco and Bristol are summarised below.

Case study – Freight consolidation centres

Monaco

HGVs are restricted from entering Monaco, with vehicles of more than 8.5 tonnes required to use the Monaco Consolidation Centre (MoCC). The MoCC was established in 1989 and is owned by the Principality of Monaco.

The Monaco scheme has resulted in a more efficient urban delivery system for the Principality of Monaco. Despite using diesel delivery vehicles, it was found to have reduced local air pollution by 30%, vehicle noise by 30% and traffic congestion by 38%[61].

Bristol

The Bristol Freight Consolidation Centre was initially set up as a pilot scheme in 2004 with European funding to help alleviate issues associated with freight in Broadmead, Bristol. Following the successful pilot, the operation grew, and the service extended to retailers in other parts of the central Bristol area[62].

At its peak, a 70% to 80% reduction in the number of onward trips was seen by the freight consolidation scheme. This meant that for every 10 vehicles that made a delivery to the consolidation centre, just 2 or 3 onward journeys to the central Bristol area were made. This led to a reduction of 11,034 kg of CO_2, 358 kg of NO_x and 11 kg of PM.

These examples show that locating freight consolidation centres on the outskirts of urban areas can help to reduce HGV and LGV movements and tackle the local air pollution. Utilising zero-emission vehicles for last mile delivery will further enhance these benefits.

Freight consolidation centres are generally not supported by the freight industry. This is due to increased costs and issues with contamination or loss of products. Therefore, market forces are unlikely to lead the creation of consolidation centres.

[61] SEStran (South East Scotland Transport Partnership): Freight Consolidation Centre Study
[62] Travel West: Bristol Freight Consolidation Centre Case Study

We will need to consider this in terms of how they could be delivered, the need for supporting policy to encourage use and the potential impacts on cost for local businesses and consumers.

We also need to recognise freight consolidation as a long term solution owing to the time required for the development of facilities and significant modal shift.

Action 34 – Freight consolidation feasibility study
We will work with partners to review and explore the potential for freight consolidation centres, with a priority focus on enabling zero emission last mile delivery.

Action 35 – Safeguard land for freight consolidation
The development of any freight consolidation centres will require suitable land. As part of our work we will identify potential land for these facilities and seek to have it safe guarded in local plans.

Safe movement

As part of the LTCP, we are committed to improving road safety for all road users. This includes freight and logistics vehicles and we will work with freight operators to improve road safety.

Our overarching approach outlined in the LTCP will prioritise people walking and cycling over other modes. This approach will naturally help to reduce conflicts between freight vehicles and those walking and cycling, improving road safety.

However, there may also be specific road safety issues associated with freight vehicles that need to be addressed within local communities or on our appropriate HGV routes.

In 2019, there were 69 goods vehicle occupants who were casualties in road traffic collisions in Oxfordshire[63].This was an increase from 2018, however the total number of goods vehicle casualties has decreased since a peak in 2006.

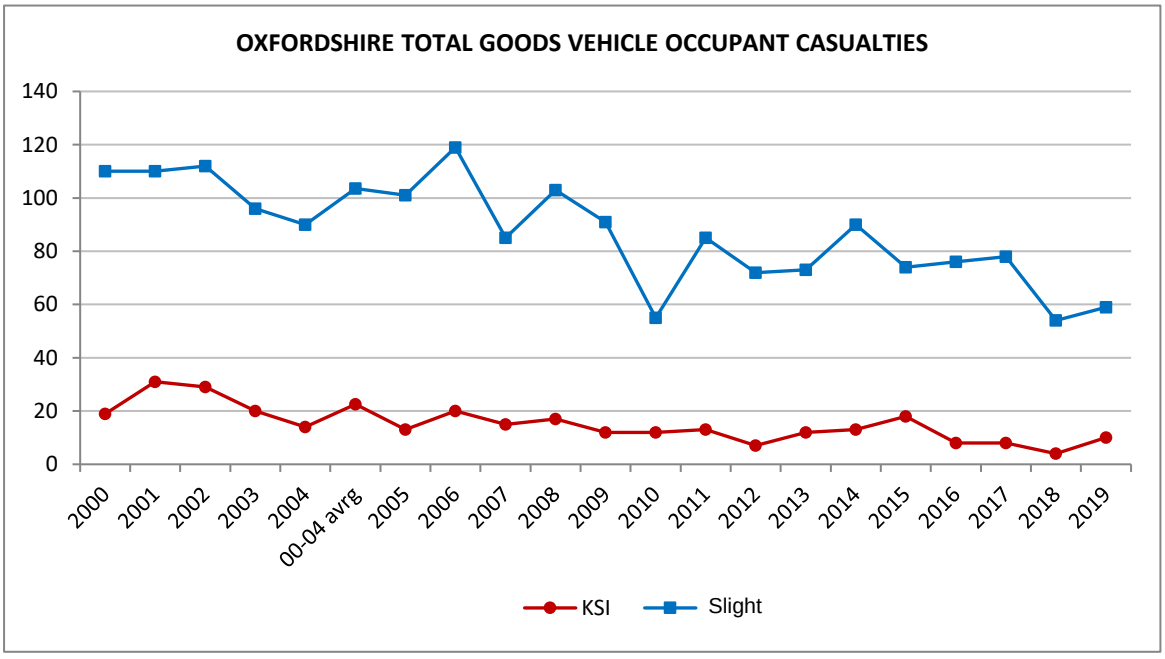


Figure 14 – Oxfordshire total goods vehicle occupant casualties[64]

Reducing conflict with people

As highlighted previously, our overarching approach in the LTCP will help to enable safe freight movement. Our transport user hierarchy sets out that we will prioritise walking and cycling first when developing future transport schemes and policies.

Application of the hierarchy will help to create attractive environments for people to walk, cycle and spend time in. It will be supported by application of the Healthy Streets Approach in Oxfordshire.

[63] Oxfordshire County Council Road Traffic Accident Casualty Data Summary 2019
[64] Oxfordshire County Council Road Traffic Accident Casualty Data Summary 2019

The Healthy Streets Approach is about a gradual shift to a system more focused on people. The Healthy Streets Approach provides a framework for making human health the central aspect of planning[65].

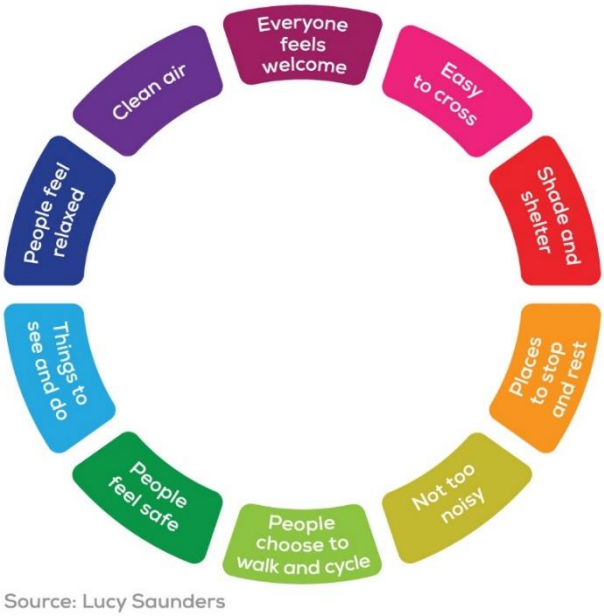


Figure 15 - Healthy streets indicators

In order to achieve this, the Healthy Streets Approach has identified 10 indicators for assessing how streets feel for human beings. There are assessment tools available that enable us to assess streets and scheme proposals against the indicators so that we can understand how appealing they are to walk, cycle and spend time in.

By embedding the Healthy Streets Approach into relevant guidance and decision making processes we can identify improvements to existing streets and seek improvements against all indicators for future proposals.

These approaches, in combination with the other LTCP policies, will reduce danger and create environments that enable goods to be moved as safely as possible.

Action 36 – Reduce conflicts between freight vehicles and people
We will reduce conflicts between freight vehicles and people walking and cycling through application of the transport user hierarchy and Healthy Streets Approach.

Education
Education can play an important role in helping to reduce road danger and enabling safe freight movement throughout Oxfordshire. OCC focus on educating vulnerable road users such as people cycling, children and motorcyclists to raise knowledge and reduce danger for all road users.

[65] https://healthystreets.com/

Oxfordshire Fire and Rescue Service (OFRS) are primarily responsible for road safety education in the county. The Fire and Rescue Services road safety policy supports the delivery of the 365alive vision that aims to save 6,000 more lives and educate 85,000 children and young adults to lead safer and healthier lives.

Over the years there has been significant investment and development of specific road safety programmes. A number of these programmes are placed into a road safety catalogue for use by area-based staff within their locality areas as and when they are needed or when specific requests are made for a specific programme.

The 365alive webpage contains road safety information for motorcyclists, pedestrians, cyclists, mobility scooter users and drivers and passengers. Key education programmes include Biker Down (motorcycle first aid) and children's cycle training (Bikeability). External education programmes are also promoted such as advanced motorcycle training courses. The OFRS also run various road safety campaigns to promote safety and key messages.

Action 37 – Promote road safety education resources and campaigns
We will continue to work with OFRS to promote road safety education resources and campaigns. This will help to raise knowledge, reduce danger for all road users and enable safe freight movement through Oxfordshire.

Speed management
Speed management in local communities will also help to deliver safe goods movement. A 20mph speed limit was introduced in Oxford in all residential areas, the city centre, and suburban shopping centres and although work is still needed to achieve better compliance, the effect on safety has been positive.

We are currently undertaking five 20mph trial sites within Oxfordshire to establish the best methodology for the implementation of a proposed countywide programme. All of the sites are amending existing 30mph limits to 20mph limits via a phased approach of initial sign only changes that are supported by further engineered designs to reduce vehicular speeds if required.

The LTCP outlines that we will promote 20mph as the default limit for roads through residential, villages and retail areas to ensure speeds are appropriate for the nature, environment and location. The expansion of 20mph speed limits will help to ensure freight vehicles are moving at safe speeds and will improve road safety in local communities across Oxfordshire.

Action 38 – Support expansion of 20mph speed limits
We will promote 20mph as the default limit for roads through residential, villages and retail areas to ensure speeds are appropriate for the nature, environment and location. This will contribute to improving road safety and ensuring freight vehicles are moving at safe speeds.

Food delivery riders
There has been a significant growth in the food delivery market over the last 6 years. This growth was further fuelled by the COVID-19 pandemic and subsequent national

lockdowns. Food delivery grew by £3.7 billion in 2020 to reach £11.4 billion, double its 2015 market value[66].

A factor in this growth has been the rise of online food delivery services such as Deliveroo, Uber Eats and Just Eat. These services work by customers placing an order through an app or website, then self-employed bicycle or motorcycle couriers transport orders from the restaurant to destination.

Whilst these services can help to support local businesses and provide residents with more choice, there are increasing numbers of safety and compliance issues associated with the delivery riders.

These issues include motorcycles using pedestrianised roads, cycling in no-cycle zones, use of pavements and inappropriate or illegal parking. These issues are particularly notable in Oxford City, but we are also seeing issues in other towns.

In order to address these issues and improve the safety of food delivery in the county, we will seek to establish and agree a code of conduct with the food delivery operators.

Action 39 – Establish a code of conduct with food delivery operators
We will engage with food delivery operators and develop a voluntary code of conduct for agreement. This will set out the restrictions and safety requirements which riders will need to adhere to.

[66] Statista

Monitoring movement

We also want to improve our monitoring to improve the understanding of goods movement in the county. This data can be used to make improvements and inform the development of future solutions. Similarly, evaluating schemes helps to identify lessons learned to guide future work.

As outlined in the LTCP, there are currently a number of issues associated with monitoring and evaluation. These include inconsistent monitoring, monitoring when it is too late to alter a scheme, lack of methodological approach and challenges associated with data collection.

These issues are particularly pronounced when it comes to freight. Owing to the commercial and complex nature of the freight system it is challenging for us to collect data about patterns of movement.

Similarly, as highlighted earlier there are a lack of resources for enforcement in the county. Whilst we conduct some effective enforcement, we are aware that it is impossible to capture data about all weight restriction breaches in the county.

As part of the broader LTCP we are seeking to improve the transport monitoring and evaluation process. We plan to achieve this through four primary actions:

- Establishing a systematic monitoring and evaluation methodology.
- Conducting a data mapping and linking exercise within the county council.
- Develop long term data strategies for all key policies.
- Development of a monitoring tool.

The monitoring policy in the LTCP and the actions outlined above, will help to improve our monitoring of freight movement. To avoid repetition, we will not repeat the full LTCP policy here but support it as part of this strategy.

Action 40 – Delivery of the LTCP monitoring policy
We will work to deliver the LTCP monitoring policy and associated actions, ensuring that freight data and associated considerations are incorporated.

There are also freight specific data and monitoring considerations that need to be addressed. One consideration is the need to analyse HGV data according to axels and weight class.

During analysis of existing weight restriction schemes, we have noted the growth in 2-axle HGVs. As shown on the figure below, 2 axle-rigid HGVs are categorised into two groups. Smaller 2-axle lorries with a UK maximum gross weight over 3.5t and up to 7.5t, and bigger 2-axle lorries over 7.5t and up to 18t. Because 2-axle lorries can weigh anywhere between 3.5t and 18t, it makes monitoring and enforcement of a 7.5t weight restriction challenging.

The weight of a 2-axle vehicle can only be determined by checking the DVLA record therefore the number plate is needed, usually collected through Automatic Number

Plate Recognition (ANPR). We will be investigating the use of cameras in future traffic monitoring to enable greater classification of 2-axle vehicles

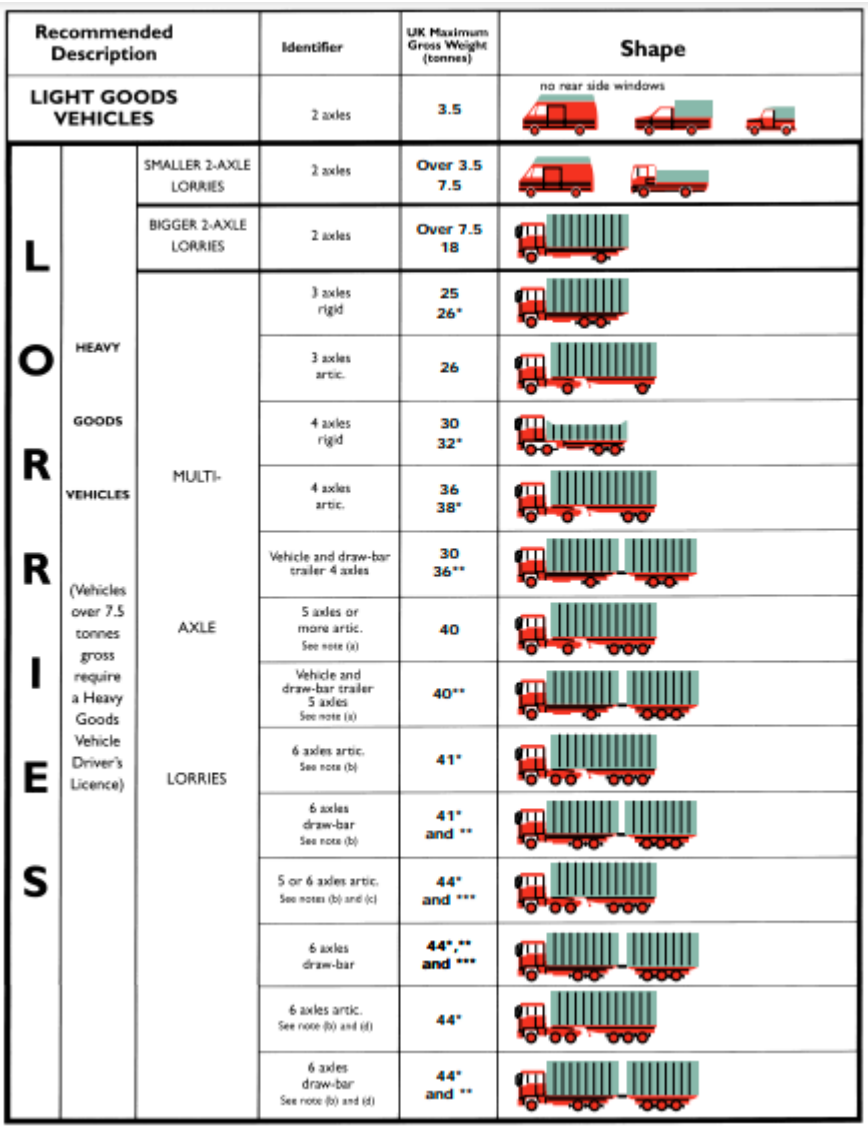


Figure 16 – Simplified guide to lorry types and weights[67]

The trends associated with 2-axle vehicles highlight the need to analyse HGV data across Oxfordshire by axles and weight. This will help us to better understand the pattern of larger vehicle use and the potential impacts of any weight restriction scheme.

Action 41 – Analyse HGV data by axles and weight
We will seek to capture and analyse HGV data by axle and weight class across Oxfordshire. We will also use this understanding to inform future survey and monitoring requirements.

[67] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/211948/simplified-guide-to-lorry-types-and-weights.pdf

Freight data has historically been more difficult to obtain, however recently freight telematics data has become more common place. Telematics is the technology used to monitor a wide range of information relating to an individual vehicle or an entire fleet. This includes vehicle location data via GPS.

It is now possible for us to obtain telematics data that combines collated information from a wide range of operators. Analysis of this data enables us to identify and understand where the main freight vehicle movements are. This will help with many aspects of this strategy such as identifying inappropriate routes where restrictions may be required.

Action 42 – Analysis of freight data
We will conduct analysis of freight data to understand movements and inform future work. This will include analysis of telematics data when available.

Finally, where we implement any freight related scheme, we will monitor it to understand impacts and evaluate its effectiveness. Improving our monitoring and evaluation will help us to learn from experiences and enable us to improve how we design future schemes.

The ongoing monitoring and review of the Burford weight restriction is an example of how we can regularly monitor and review the effectiveness of a scheme. We will conduct similar analysis of any future weight restrictions or similar schemes.

This process will deliver more effective schemes, making better use of public money and optimising schemes so that they deliver better outcomes. It will also help to avoid problems and reduce any potential negative impacts.

Action 43 – Monitoring of freight schemes
We will conduct regular monitoring and review of any scheme that is implemented in relation to freight. This process will help us to learn from experiences and enable us to improve how we design future schemes.

Partnership working

As we have highlighted throughout this strategy, the freight system is complex and much of it is beyond the county council's control. It is therefore important that we work with partners to influence areas beyond the council's control.

Partnership working will also be essential to supporting many of the actions identified in this strategy. As outlined in the LTCP, OCC champion partnership working because we recognise the value and benefits of cultivating good working relationships with surrounding Local Authorities, regional/sub-national and statutory bodies.

Partnership working and the involvement of the whole supply chain will be essential to delivering this strategy, making more efficient use of Oxfordshire's roads and minimising the impact of freight on the county. We will work in partnership with operators, businesses, public sector organisations and our District and City councils to deliver this strategy and our long-term ambitions.

Many of the actions in this section underpin the aspirations outlined in the previous sections. We have specifically included them in this section to reflect the importance of partnership working if we are to deliver this strategy.

Engagement and cocreation
Where any issues arise with HGV movement, we will work with a range of stakeholders to explore solutions. This will support the actions identified in the appropriate movement section.

Engagement and cocreation may help us to avoid the need for weight restrictions if alternative solutions can be found. Similarly, as part of the inappropriate HGV movement action request process we will engage with a range of stakeholders to explore potential solutions. This will ensure that the action taken is tailored to the local area and has been shaped by a range of stakeholder feedback.

Action 44 – Engagement, cocreation and problem solving
Where issues are arising with inappropriate HGV movement we will look to engage with local communities, commercial operators, businesses and trade associations to understand the issue and explore solutions.

We recognise that transport does not stop at county boundaries and in the case of freight, movements are particularly complex. As a result, there may be opportunities to increase engagement with neighbouring local authorities, sub-national and national bodies to create cross boundary solutions.

Cross boundary working refers to the relationships developed between neighbouring local highway and unitary authorities to achieve joint-ambitions and collaborate. Sub-national transport bodies will play a particularly important role here due to their regional oversight.

OCC are a part of England's Economic Heartland (EEH) sub-national transport body. EEH published a freight study in 2019 and we will continue to work closely with them on freight issues.

There may also be opportunities to work with national bodies such as Network Rail and National Highways on cross boundary solutions. For example, Network Rail and National Highways published the Solent to Midlands multimodal freight strategy phase 1 in June 2021. This road and rail corridor passes through Oxfordshire and so we will seek to engage and work with national bodies as part of this work.

Action 45 – Cross boundary working
We will explore opportunities to engage with neighbouring local authorities and national bodies to develop cross boundary solutions to freight issues.

We currently host the Oxfordshire Strategic Transport Forum which consists of academics, trade associations and local transport user groups. The group is used to engage with and seek feedback on a range of transport projects we are working on.

The Road Haulage Association (RHA) are a part of this meeting to provide input from a freight operator perspective. However, we believe there is an opportunity to explore the establishment of a steering group that is more focused on freight.

The steering group would consist of the county council, District and City councils and external stakeholders such as the RHA to oversee implementation of this strategy and address general issues arising around freight. The steering group could also be established at a regional level to begin.

Action 46 – Explore establishment of freight steering group
We will explore the establishment of a freight steering group to oversee implementation of this strategy and address general freight issues. We propose the group consists of the county council, District and City councils and external stakeholders.

Another area where cocreation and joint working is possible is via network management. We previously outlined how network management can be used to improve the efficiency of freight movement. There are opportunities to use our knowledge of network management to work with freight transport operators.

This joint working can be used to identify times of the day when there is more capacity on the road network. Freight operators could reschedule journeys to these times in order to improve the efficiency of their journeys.

Action 47 – Work with stakeholders to reschedule journey times
We will offer to work with freight transport operators to identify times of the day when there is more capacity on the road network.

Lobby central government
Many of the issues associated with freight require action from central government. A key issue in this category is the mode by which freight is moved. We will therefore

work with and lobby stakeholders at the regional and national level to encourage the shift of freight from road to rail.

Action 48 – Work with stakeholders to encourage alternatives to road freight
We will work with and lobby a range of stakeholders at the regional and national level to encourage the shift of freight from road to rail.

Funding and implementation

The actions in this strategy have demonstrated that it will be delivered in a number of ways. This includes through the planning process, through engagement with stakeholders and in some circumstances physical restrictions.

This section provides an overview of how some of these actions will be funded. It also provides an overview of when we expect some of these actions to be delivered, recognising that we have a limited amount of resource and some actions will be prioritised for the shorter term.

Funding

Some of the actions identified in the strategy will require funding to deliver. However, councils no longer receive funding directly to spend on transport improvements. We will therefore work hard to identify alternative funding sources. Key potential funding sources are outlined below. Owing to the linkages with the LTCP some of these are the same as those in the main LTCP.

Funding bids

From time to time, there are opportunities to submit bids to specific grant funding opportunities. These funding opportunities come from a range of sources including central government and the DfT.

With tightening local authority budgets, these opportunities are particularly valuable, allowing us to carry out work no longer affordable from Council budgets. We will seek to bid for every suitable opportunity.

Developer contributions

We will also use developer contributions to deliver the LTCP and freight strategy. Developers either contribute towards improvements to mitigate their transport impacts or carry out works themselves under S278 Agreements with the Council.

Through this approach it is possible for developers to deliver infrastructure or contribute funding towards larger schemes. We will continue to work with developers to secure contributions which align with and help to deliver our aspirations.

Partnership working

Funding or delivery opportunities may also be available to our partners such as the Local Enterprise Partnership (LEP), District and City councils. We will continue to work with these partners to take account of the various funding sources available.

Charging schemes

We have proposed investigating charging schemes including road user charging and CAZs/ZEZs. These measures could provide a funding stream which can be used to deliver actions outlined in this strategy.

Enforcement revenues

Similarly, the enforcement of any freight vehicle restrictions could provide a funding stream from the payment of penalty fines. In the first instance this would be used to

cover the cost of enforcement, however it could also be used to deliver other actions in this strategy.

Implementation
We are committed to delivering the range of actions identified in this strategy, however it is necessary to prioritise them. This will help to guide future work on delivery of the strategy and make best of use of the resources available.

In order to do this, we have grouped the actions into those we anticipate delivering by 2025 and those that will be delivered between 2025 and 2030. As part of the LTCP review, we will review and update this section.

	Up to 2025	2025 - 2030
Appropriate movement	**Action 1** – Promote considerations about reducing the need for freight movement	**Action 4** – Conduct review of road classifications
	Action 2 – Develop appropriate HGV route map	**Action 8** – Consider the establishment of area based weight restrictions
	Action 3 – Create a map of existing weight restrictions	**Action 10** – Explore implementation of road user charging schemes to reduce commercial vehicle flows, emissions, and encourage use of the appropriate routes
	Action 5 – Promotion of HGV route map	**Action 11** – Explore technology to aid enforcement
	Action 6 – Establish a clear process for how any action to address inappropriate HGV movement is decided and funded	
	Action 7 – Develop more detailed guidance for inappropriate HGV movement action request process	
	Action 9 – Lobby for enforcement of moving traffic offences under Traffic Management Act part 6	
	Action 12 – Review best practice	
	Action 13 – Seek to influence the location and design of new development	
	Action 14 – Ask developers of major sites to prepare Construction Logistics Plans	
Efficient movement	**Action 16** – Promote rail freight	**Action 15** – Monitor the use of water freight
	Action 17 – Support the provision of strategic rail freight interchanges	**Action 18** – Work with stakeholders to increase rail network capacity
	Action 19 – Enhance network management	**Action 20** – Improve data gathering and usage
	Action 22 – Review current rest stops and lorry parking facilities	**Action 21** – Improve data sharing
		Action 23 – Promote the creation of rest stops and lorry park facilities

		Action 24 – Support the development and trialling of drone technology
		Action 25 – Monitor truck platooning progress and opportunities
		Action 26 – Consider future technology requirements
Zero-tailpipe emission, zero-carbon movement	**Action 30** – Monitor electrified road systems study	**Action 27** – Support battery electric vehicle charging infrastructure requirements
	Action 31 – Promote cycle freight in Oxford	**Action 28** – Monitor alternative HGV fuel requirements and options
	Action 32 – Promote cycle freight across Oxfordshire	**Action 29** – Strategically locate refuelling infrastructure
Reducing local air pollutants		**Action 33** – Engagement around Clean Air and Zero Emission Zones
		Action 34 – Freight consolidation feasibility study
		Action 35 – Safeguard land for freight consolidation
Safe movement	**Action 36** – Reduce conflicts between freight vehicles and people	
	Action 37 – Promote road safety education resources and campaigns	
	Action 38 – Support expansion of 20mph speed limits	
	Action 39 – Establish a code of conduct with food delivery operators	
Monitoring movement	**Action 40** – Delivery of the LTCP monitoring policy	**Action 41** – Analyse HGV data by axles and weight
	Action 42 – Analysis of freight data	**Action 43** – Monitoring of freight schemes
Partnership working	**Action 44** – Engagement, cocreation and problem solving	**Action 47** – Work with stakeholders to reschedule journey times
	Action 45 – Cross boundary working	**Action 48** – Work with stakeholders to encourage alternatives to road freight
	Action 46 – Explore establishment of freight steering group	

Glossary

B

Battery Electric Vehicles (BEVs): A vehicle that uses an electric motor with energy stored in rechargeable battery packs.

C

Clean Air Zones (CAZs): An area where vehicles with higher tailpipe pollutant emissions are restricted or charged for access.

Connected and Autonomous Vehicle (CAV): Vehicles equipped to exchange information with surrounding environment and can operate in a mode which is not being controlled by an individual[68].

Construction Logistics Plans (CLPs): Provide the framework for understanding and managing construction vehicle activity into and out of a proposed development[69].

COVID-19: An infectious disease caused by a newly discovered coronavirus. Responsible for a global pandemic in 2020-21.

D

Department for Transport (DfT): The government department responsible for the English transport network.

E

England's Economic Heartland (EEH): Partnership authority group, which functions as a non-statutory sub-national transport body.

Experimental traffic regulation order (ETRO): A temporary traffic regulation order which highway authorities have the power to impose without consultation.

G

Global Positioning System (GPS): A device that is capable of receiving information from satellites and then calculate the device's geographical position.

Gross Domestic Product (GDP): Monetary measure of the market value of all the final goods and services produced in a specific time period.

H

[68] Automated and Electric Vehicles Act 2018
[69] https://www.arup.com/projects/construction-logistic-plan

Heavy Goods Vehicles (HGV): Commercial trucks that feature a gross combination mass of over 3500kg.

Hydrogen Fuel-Cell Vehicles (FCEV): Electric vehicles with a hydrogen fuel cell system instead of a battery pack.

I

Internal combustion engine (ICE): Device where the ignition and combustion of the fuel occurs within the engine itself. Presently used in petrol and diesel vehicles.

Internet of Things (IoT): System of interrelated, internet-connected objects that are able to collect and transfer data over a wireless network without human intervention[70].

L

Light Goods Vehicles (LGV): Commercial trucks that feature a gross combination mass of under 3500kg.

Local Enterprise Partnership (LEP): Voluntary partnerships between local authorities and businesses.

Local Transport and Connectivity Plan (LTCP): Oxfordshire County Council's new Local Transport Plan.

Local Transport Plan 4 (LTP4): Oxfordshire County Council's previous Local Transport Plan (2015-2031).

London Lorry Control Scheme (LLCS): Controls the movement of heavy goods vehicles over 18 tonnes at night and at weekends on specific roads in London.

N

New Roads and Streetworks Act (NRSWA): Provides a legislative framework for street works by contractors and works for road purposes.

Nitrogen Dioxide (NO_2): Nitrogen Dioxide is one of a group of gases called nitrogen oxides (NOx). NO_2 primarily gets in the air from the burning of fuel[71].

O

Office of Rail and Road (ORR): The independent safety and economic regulator for Britain's railways and monitor of Highways England[72].

Oxfordshire County Council (OCC): The county council for Oxfordshire.

[70] https://www.aeris.com/in/what-is-iot/
[71] https://www.epa.gov/no2-pollution
[72] https://www.gov.uk/government/organisations/office-of-rail-and-road

Oxfordshire Electric Vehicle Infrastructure Strategy (OEVIS): Oxfordshire's electric vehicle charging strategy which sets out 17 policies and associated key actions for the short term (2020-2025).

P

Particulate Matter (PM): Term for a mixture of solid particles and liquid droplets found in the air[73].

R

Road Haulage Association (RHA): Road haulage trade association.

S

S278 Agreements: A section of the Highways Act that allows developers to enter into a legal agreement with the council to make permanent alterations or improvements to a public highway, as part of a planning approval.

Strategic rail freight interchanges (SRFI): A large rail served distribution and warehouse park linked into both rail and the strategic highway network.

T

Traffic Management Act (TMA): Act of UK Parliament that details the street works regulations. All the parties interested in occupying streets / highways need to follow the specified guidelines.

Traffic regulation order (TRO): A legal tool which allows a local authority to restrict, regulate or prevent the use of any named road.

U

Ultra-Low Emission Zone (ULEZ): The charging low emission zone in central London.

Unmanned Aerial Vehicles' (UAV): Remote-controlled aircraft or small aerial devices which do not have an on-board pilot.

Z

Zero Emission Vehicles (ZEV): A vehicle which emits 0g of carbon dioxide from the tailpipe per kilometre travelled.

Zero Emission Zones (ZEZs): An area where all vehicles except those with zero tailpipe emissions are restricted or charged.

[73] https://www.epa.gov/pm-pollution/particulate-matter-pm-basics

OXFORDSHIRE INNOVATION FRAMEWORK FOR PLANNING & DEVELOPMENT

OXFORDSHIRE COUNTY COUNCIL

CONTENTS

1. INTRODUCTION

This Innovation Framework (IF) is a guidance document setting out the need for developers and planners to consider innovation within planning and development, ideally including putting together Innovation Plans for new developments. It covers developments of all kinds, including residential, commercial, workplace, mixed use and infrastructure development. A roadmap of forthcoming innovations and a table on futureproofing measures are also included; in addition a template for developing an Innovation Plan is available. This document outlines the need for and benefit of considering innovation within the development process, explaining how considering innovation within development and infrastructure can support existing and developing strategies and addresses key challenges, therefore futureproofing development.

A single source of information for developers and planners to consider innovation in development and infrastructure ensures that common principles are applied from both sides of the process and a consistent approach is taken to futureproofing. This will help to assure investment in this area supports continuous development, as well as consolidate benefits across different domains by having more consistency. Developing an innovation-friendly county is positive for the regional economy, as it will also help attract innovators, support growth and accelerate the societal benefits to the area. Innovation is a term which could potentially mean a number of things depending on context. For the purposes of this framework, 'innovation' refers to anything which is new, or to traditional approaches being applied in new ways or contexts – this can range from new technologies (such as 3D printing) or data analysis and visualisation tools, through to new processes or approaches (such as co-creational public engagement, new ways of creating social infrastructure, or innovative procurement financing or recruitment techniques).

This framework does not propose that totally untested innovations be put in place within development or new infrastructure (though this may be appropriate in some situations), instead, it is suggested that emerging innovations which already have some level of evidence in place to show likely efficacy could be applied where site circumstances suggest good potential for a given application. Our aspiration is to strike a balance between enabling adoption and futureproofing developments (as to avoid costly retrofitting) while minimising the risk to

DEPLOYMENT	9	ACTUAL SYSTEM PROVEN IN OPERATIONAL ENVIRONMENT
	8	SYSTEM COMPLETE AND QUALIFIED
	7	SYSTEM PROTOTYPE DEMONSTRATION IN OPERATIONAL ENVIRONMENT
DEVELOPMENT	6	TECHNOLOGY DEMONSTRATED IN RELEVANT ENVIRONMENT
	5	TECHNOLOGY VALIDATED IN RELEVANT ENVIRONMENT
	4	TECHNOLOGY VALIDATED IN LAB
RESEARCH	3	EXPERIMENTAL PROOF OF CONCEPT
	2	TECHNOLOGY CONCEPT FORMULATED
	1	BASIC PRINCIPLES OBSERVED

Figure 1
Technology Readiness Level (TRL)

the public and the development. In terms of technology, it may be useful to consider the Technology Readiness Level (TRL), as an indicator of how advanced and ready to deploy a given innovation might be. This scale indicates 9 levels of technology readiness, ranging from level 1, where basic principles have been observed, through to level 9, where the actual system has been proven in an operational environment. This framework recommends focusing on innovations with a TRL of level 5 or above. See figure 1.

The IF and supporting materials provide information on what should be considered within an Innovation Plan for the different stages of development, and how planners should consider innovation within the planning process, with examples and case studies of types of innovation within different areas. This covers innovations which could help to address key challenges facing developments and developers, ranging from catering for an ageing population and the need for resilience to climate change, to understanding the real needs of a given location. It also covers those which can help support key Oxfordshire and national aims, objectives, policies and strategies, such as achieving net zero carbon and enabling healthy and connected communities. Key aims and objectives are set out in the following section – these are the underlying principles which should lead the integration of innovative technologies and processes within development and new infrastructure. In addition, this IF covers how developments can be futureproofed for when current innovations become mainstream; this is based on thorough knowledge and research of existing innovations and their likely trajectory.

However, given the nature of innovation, new technologies and approaches or changes could disrupt the expected uptake. For this reason, forecasting future trends comes with risks. Near-term forecasting (within 5 years) is relatively reliable, but not an ideal timeframe for understanding and strategic planning for most development. On the other hand, whilst forecasting for 20 years and beyond would be a very helpful planning timeframe, due to the potential for maturation of new technology in this timescale and increased potential for unforeseeable events, forecasting for this long-term outlook is much more unreliable. The Institute for the Future (IFTF) therefore suggests around 10 years to be the best timeframe for forecasting. This medium-term forecast is sufficiently long to allow for the maturation of known emerging technologies and trends, while short enough to limit the impact of unknown factors, as well as being a sufficient window to encompass the timeline of much development. As such, this Framework focusses on future proofing for a 10 to 15 -year timeframe, although the longer term is touched on for context and completeness.

Oxfordshire County Council's Innovation Hub (iHUB) has led on the development of this framework. The iHUB was created in 2015, initially focussed on transport innovation, but has since broadened out into a wide range of other areas including energy, modelling, air quality, infrastructure, legal and procurement, new disruptive business models and health and care. The hub has been instrumental in developing links to business and academia, as well as securing external funding for projects for the county. Working with lead partners who are driving disruptive technologies, iHUB continue to challenge the status quo and drive new solutions for Oxfordshire and implementation beyond. The iHUB has been working collaboratively with world leading organisations to trial new ideas and models, enabling Oxfordshire to become a world leader in public space innovation. In 2018 and 2019 alone, the team secured more than £6m of income to the council, and more than £100m to the region. It has grown into one of the largest innovation teams in the country and helped the growth of companies such as Oxbotica, Latent Logic, Zipabout and Arrival.

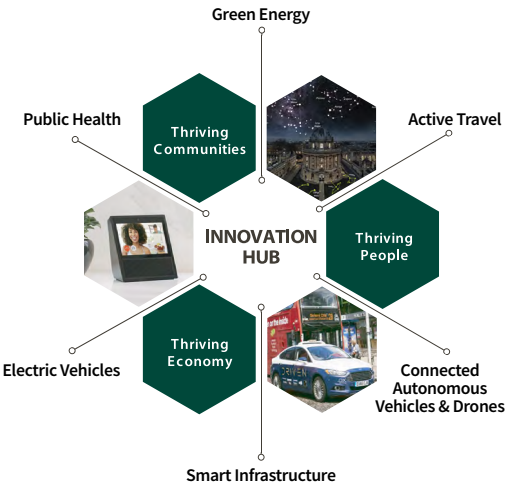


Figure 2
Oxfordshire Innovation Hub logo

1.1 Principles and aims

The Innovation Framework supports a number of key principles and policies. Innovation should not be introduced for the sake of innovation, but only where it can be shown to support these policies and aims, overcome challenges, mitigate risks, and bring benefit to the community, developer, planning authorities, other stakeholders and the environment.

There are a wide range of policies with synergies to this framework as well as other frameworks, guidance documents and strategies. This section therefore pulls together a number of principles and aims which support existing or developing policies, strategies, frameworks and guidance documents as well as introduce innovation-specific elements. The major documents with linkages to this one are covered in Appendix 1, outlining the main synergies where appropriate and providing links to the documents where available. The focus is on Oxfordshire-specific documents, rather than national or international.

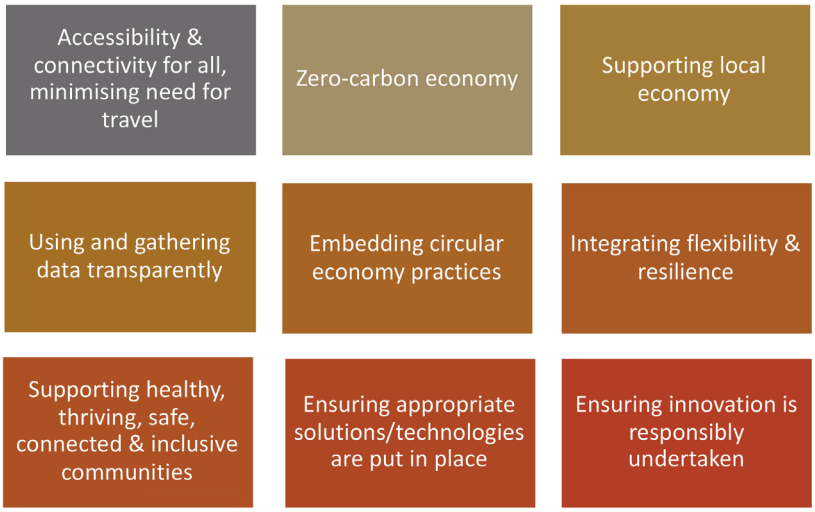


Figure 3: The 9 IF principles

This IF supports 9 encompassing principles and goals, summarised in Figure 3.

In the following pages, these principles are provided in greater detail with a number of more specific aims which feed into them and identify some of the potential ways in which the overall principle could be achieved. Not all of the specific aims will be relevant to all types of development and infrastructure, but the overarching principles should be taken account of by all types of development.

- **Deliver accessibility and connectivity for all, minimising the need for travel, taking account of differing needs including all types of disability and age, with a focus on active and sustainable transport**
  - Making walking, cycling and micromobility[1] accessible, safe and desirable for all, following the standards set out in the walking and cycling design guides, with priority for active travel modes following the user hierarchy set out in the Local Transport and Connectivity Plan (LTCP)
  - Reduce the need to travel via high quality and high speed digital connectivity and physical connectivity and proximity to services
  - Support an environmental hierarchy, where sustainable modes of transport are favoured, meaning fewer journeys by fossil fuelled private car
  - Lessening traffic generation and its detrimental impacts, including on congestion, air quality and noise
  - Consider the needs of, support and facilitate first, last and only mile transport options, for both people and goods
  - Accessible electric vehicle charging infrastructure for residents and other occupiers, sufficient to meet anticipated future demand levels

- **Working towards Oxfordshire becoming a zero-carbon economy, with zero-carbon new development**
  - Maximising energy efficiency
  - The highest fabric standards and renewables maximised on-site to minimise embodied carbon
  - Renewably sourced heat as default in new developments
  - Community ownership of energy
  - Reduce the growth and overall volume of waste and proportionally increase recycling and reuse
  - Design to support reduced overall energy demands to avoid the need for grid upgrades

1 *Micromobility technically covers a range of small, lightweight vehicles which operate a speed usually below 25km/h, and in practical terms is used here to refer to scooters, e-scooters and e-bikes, including cargo bikes.*

- **Supporting the Oxfordshire economy, with a focus on clean, sustainable growth**
  - Adopt a Living Lab approach, facilitating collaborations, data-based evaluation and decision making
  - Provision of affordable, professional and flexible working space
  - Supporting the development of an inclusive economy for Oxfordshire, embedding sustainable and circular economy[2] practices for long term economic gain
  - Support business growth, including training, incubators and accelerators for SMEs
  - Supporting the Local Industrial Strategy's aim for Oxfordshire to be one of the top three innovation ecosystems in the world
  - Provide the quality and choice of development needed to support growth and attract specialist and flexible skills at all levels, across different sectors

- **Using and gathering evidence and data transparently, ensuring ongoing monitoring systems are embedded in development**
  - Sharing data to support best practice and creating an evidence base
  - Supporting highway network management , asset owners and other operational teams (e.g. active travel and road safety)
  - Maximising the value of existing data to identify the needs of the development area, and cater to these needs
  - Integrating suitable smart monitoring approaches into development
  - Co-creating with the community
  - Using evidence to learn from experience, including the experiences of others, and integrating learnings into approaches and actions taken

- **Embedding of circular economy practices and principles into the whole development process from conception through to ongoing usage, maximising longevity of assets and minimising waste**
  - Minimising the need for maintenance, and making required maintenance as minimally invasive as possible, through design and materials use
  - Maximising use of appropriate recycled materials in construction
  - Using building practices which minimise waste production
  - Developing an environment that supports occupants to minimise waste, whilst ensuring compatibility with local authority collection methods
  - Ensuring sufficient provision of sustainable waste management on-site
  - Providing space for the sharing economy

- **Integrating flexibility and resilience into development, to cater for foreseen and unforeseen change, challenges and disruption**
  - Provision of re-purposable space
  - Provision of co-working space
  - Climate resilience, including ensuring developments are built to withstand weather extremes and flooding
  - Resilience to society's and individuals' changing needs over time
  - Building in effective emergency planning and access measures
  - Responding to changing trends in site usage identified by monitoring techniques
  - Building in resilience to public health crises
  - Futureproofing for anticipated, relevant innovations becoming mainstream

2 *Circular economy – an economic system aimed at eliminating waste and continual use of resources, minimising inputs through reuse, sharing, repairing, refurbishment, remanufacture and recycling; it is in contrast to the linear economy, which works on the lines of 'take, make, dispose'.*

- **Creating an environment to support healthy, thriving, safe, connected, diverse and inclusive communities, with a high quality of life**
  - Designing to reduce health inequalities
  - Reducing fuel poverty through building measures
  - Creating multi-generational neighbourhoods
  - Improving and designing for road safety
  - Providing green space, including space for communal food growing
  - Providing social space for the community, including promotion of the sharing economy such as community fridges
  - Engaging and co-creating with the community to address their health and wellbeing needs and promote community cohesion
  - Designing for autonomy and independence
  - Designing for social connectedness, both within new developments and between new developments and existing communities
  - Designing for security
  - Improving the ecological offer of the site, including consideration of wildlife corridors where beneficial
  - Designing for and promoting inclusivity and diversity

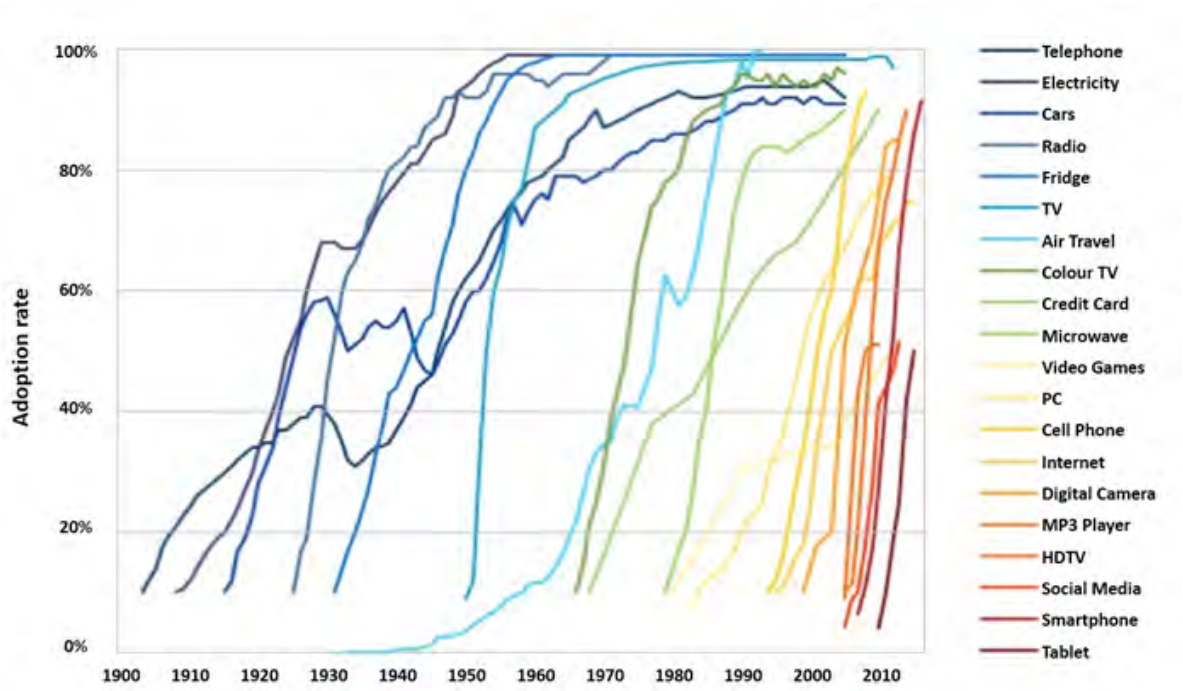
- **Ensuring appropriate solutions, software and technologies are put in place in support of the above principles, such that the solution (where relevant):**
  - Is replicable in multiple use cases or scenarios
  - Is scalable in a cost-efficient manner
  - Is platform- and vendor- agnostic
  - Facilitates data sharing
  - Has a robust cyber security design
  - Has a user-friendly interface
  - Has a simple system to system interfacing capability by design in order to avoid siloed and disjointed systems
  - Is appropriate for the specific use case and environment

- **Ensuring innovation is undertaken responsibly, maximising benefits whilst minimising foreseen and unforeseen or unintended negative consequences, following the guidance in the British Standards Institute's PAS 440:2020, Responsible Innovation Guide:**
  - Accountability for impacts on society, the environment and the economy
  - Transparency in decisions impacting on society and the environment
  - Ethical behaviour
  - Respect for stakeholder interests
  - Respect for the rule of law
  - Respect for international norms of behaviour
  - Respect for human rights
  - Balances the potential benefits against the potential risks of an innovation, considering impacts on all stakeholder groups

2. INNOVATION IN PLANNING

2.1 Setting out the need for innovation in development planning

The need for futureproofing development for new technology and for when current innovations become mainstream is well illustrated by the changing pace of technology adoption over the past century, with rates of adoption increasing (see figure 4 below).



Source: BlackRock, Asymco, Tony Seba

Figure 4: The increasing rate of uptake of new consumable items, US

Rates of innovation can also be seen to be increasing, and given the comparably long timescales involved in the development process, particularly for larger or more complex developments where gaining planning permission could take around 5 years, the need for innovation to be considered is particularly important. Whilst build-rates vary significantly depending on the market, local demand levels and the type and size of development, it will typically be around a year to 18 months between planning permission approval and the first units becoming available for use. Further, research in 2016 by Lichfields into the timelines involved in development has shown that a housing development of 1000+ units might sell at a rate of 160 units a year, meaning a full timeline of around 12 years from applying for planning permission to full completion. Once development of planning documents for larger and strategic developments, such as Area Action Plans, is also factored into this timeline, it can become even lengthier from conception to usage. Clearly, a significant amount of change in technology and innovation can be expected in this timeframe, not to mention beyond the period of occupation – by way of perspective, looking at the timeline for the internet, in under 15 years it went from inception to over 60% of US households adopting its use, whilst the smartphone a decade later went from around 10% to 90% adoption in just 5 years.

One example of the fast changes in today's world is the rate of expected adoption for connected and autonomous vehicles. There are several projects in Oxfordshire and worldwide, yet all are currently in search of the dominant

design - an operational model (both technical and financial) that can be scaled up. Once this is reached, the question is how long it would take for autonomous vehicles to become omnipresent. As a way to approximate this, the rate of adoption of the automobile is often used as a proxy. Indicatively, in the space of less than 15 years, 5th Avenue New York transitioned from a horse-and-buggy street to an automobile avenue:

Easter morning 1900: 5th Ave, New York City. Spot the automobile.

Source: US National Archives.

Easter morning 1913: 5th Ave, New York City. Spot the horse.

Source: George Grantham Bain collection.

Figure 5: 5th Avenue, New York in 1900 and 1913

Given the increased rate of uptake shown in the previous graph (figure 4), it is reasonable to expect a faster rate of adoption than this in the future, particularly given the availability of capital for SMEs to scale up more quickly than has been the case previously. Not addressing the likely future trends within development could therefore come with significant costs when it comes to the need to retrofit, either to local authorities, those occupying developments, or the developers. Consideration therefore needs to be given at all stages of the development planning system, to ensure sufficient thought for futureproofing.

There is also evidence to suggest that not futureproofing can have negative impacts on house prices. As far back as 2015, internet speeds were affecting housing values significantly, with some estimates suggesting up to 20% higher values for homes with the fastest broadband connectivity. Yet figures from early 2021 from ThinkBroadband looking at new builds up to October 2020, show there were still around 12% of new builds in the UK being built without full fibre connectivity, despite the clear government guidance towards this becoming the standard, with almost 1% of new homes with a speed of less than 10mbps for downloads. The move towards greater levels of home-working is increasing the demand yet further for good home broadband connectivity, likely exacerbating the impact on housing values.

Also in the area of connectivity, widespread use of concrete as a construction material in building walls in the 1970s is causing WIFI connectivity problems now, which were not futureproofed for. For example, the NHS have been experiencing this problem in many hospitals constructed during this period, with significant challenges in aspects such as transferring patient records, both externally and between parts of the hospital, such as from radiology to clinics.

When considering futureproofing, there are a number of questions to ask:

- What changes are anticipated during the life of the development/infrastructure?
- How likely are these changes to happen?
- What would the impact of these changes be on the development/infrastructure?
- What is the cost of futureproofing for these changes?

Answering these questions can help to identify when and how it is most useful to futureproof and avoid instances where futureproofing is undertaken for scenarios which do not ultimately occur.

There are also instances where futureproofing can be undertaken in such a way that it allows for the uncertainty of the future – for instance through flexibility by design to widen out the potential uses of a building. This might include aspects such as moveable partitions, multi-use spaces, open plan areas, or high ceilings, which can then facilitate a variety of changing functions and technologies. These kinds of flexibilities should be considered against the prevailing changes. For example, building in additional storage space may be sensible in some instances (e.g. to help facilitate the move towards greater e-commerce and the need for last-mile delivery storage solutions), but not in others (e.g. considering the move towards the down-sizing of technology, building in additional storage space for plant and machinery may not be efficient unless short-medium term business expansion is anticipated).

A roadmap of anticipated innovation is included below, but the reader is encouraged to look for the most updated version and information. This roadmap is based on research into existing roadmaps, strategies and targets set at national, European, or more local level. As such, it covers only innovations for which there is a generally high level of certainty, but it does not cover every innovation. Using this will help to answer some of the questions outlined above; in particular – what innovation might be expected within the life of a development, and how likely it is to occur. Confidence intervals have been provided for each innovation area. The reader may notice that innovations in the further future are more uncertain (shown as red), but should not be discouraged. This is to be expected in the field of innovation, and even if the precise prediction is uncertain (time, numbers), any prediction that has been included has been checked for consistency and agreement between different government, industry and academic roadmaps. Table 1, included later in this document, should be used in conjunction with the roadmap to provide advice on futureproofing measures for some of the innovations which are anticipated. Not all innovations in the roadmap need to be futureproofed for, either because they will not affect development design or infrastructure requirements, there is not sufficient confidence that they will occur, they are not relevant to a given development, or they do not support the principles guiding innovation's integration into development. Equally, the roadmap is not exhaustive and there are likely to be some innovations not included in the roadmap which should be futureproofed for in a given instance.

Case Study

DROMEDAS

The impact of COVID-19 has created citizen isolation across the county and is stretching the available human resources for patient care. This project seeks to alleviate this through the use of Unmanned Aerial Vehicles (UAVs) to deliver medications.

Figure 5: Innovation Roadmap

MOBILITY & TRANSPORT

	2021	2025	2030
Alternative fuel Vehicles - Electric & Hydrogen	Hydrogen being tested in different settings 2020 > 10.7% of new vehicles registered were electric or plug-in hybrid electric (3.2% in 2019)	By 2023 > retrofit of trains available to switch to hydrogen 2022 > Oxford Zero Emissions Zone full roll out	By 2025 > 1st UK hydrogen transport hub operational By 2025 > 90% of Oxfordshire new vehicles electric By 2025 > 15% of UK buses electrified	By 2030 > 2000km hydrogen backbone in place (National Grid) By 2030 > 100% of new car sales electric; approx. 80% of total private cars	Early 2030s > 50 hydrogen hubs for transport anticipated
Connected & Autonomous Vehicles (CAV)	Low-level automation (L1 and L2) built into some new vehicles 2019 > over 3M vehicles in UK with internet connectivity	New vehicles mostly equipped with low level automation and connectivity	By 2023 > connectivity units available to retrofit non-connected vehicles By 2025 > commercial HGV highway platooning By 2025 > up to 2% of vehicles with L4 or L5 autonomy; 1%-5% with L3 autonomy By 2026 > Short-range delivery robot/pods integrated to daily life By 2028 > automated logistics hubs rolled out	By 2030 > between 1% and 23% of vehicles with L4 or L5 autonomy By 2030 > all vehicles meet minimum connectivity standards	By 2035 > between 5% and 65% of vehicles with L4 or L5 autonomy
Unmanned Aerial Vehicles (UAV)	Civil Aviation Authority published roadmap for beyond-line-of-sight approvals, needed for autonomy 2021 > 1st beyond-line-of-sight approval given	Late 2021 > 1st UK based air-hub in operation, Coventry	Worldwide drone market expected to double between 2020 and 2025 Inspection and deliveries likely most significant drone applications	By 2030 > delivery drones are business as usual By 2030 > UK drone market share £42Bn	Longer term potential for passenger transfer beyond trials
Micromobility	50 e-scooter trials around the UK operating, inc. Oxford	2023 > potential for full legalisation of e-scooters (dependent on trial results)	2025 > global micromobility market forecast to grow by 15% from 2020	Global market size projected to almost quadruple 2020-2030	

High level of certainty (e.g. backed by laws / funding allocated for delivery)

Moderate/high certainty (e.g. backed by high profile research / government-led roadmap)

Moderate/low certainty (e.g. evidence generally in agreement on direction but inconsistencies on details or scope)

DIGITAL & COMMUNICATIONS

2021 > 2025 > 2030

Digital connectivity & communication

UK is a leading digital nation

2010-2020 > the data economy grew c. 2x faster than the rest of the economy

- Autumn 2021 > UK Government digital strategy to be published
- By 2025 > 1.12m to 1.97m data employees in Europe
- By 2027 > raised investment in R&D by 2.4% of UK GDP

5G & Next-gen mobile connectivity

2019 > 5G launched for consumer devices; coverage largely urban areas

2021 > Government review of permitted development rights for 5G equipment

- 5G bandwidth will become critical to Internet of Things data requirements
- 2025 > introduction of CAV contingent on high-bandwidth connectivity and good coverage
- By 2027 > Government ambition for most of population to have 5G access
- By 2030 > introduction of 6G networks
- By 2030 > pervasive artificial intelligence and augmented / virtual reality

Satellite communications

2019 > Global satellite communication market valued at c. $62bn

2020 > UK government acquired OneWeb (satcom company)

- By 2022 > 650 low earth orbit (LEO) satellites deployed by OneWeb
- By 2022 > superfast broadband equivalent speeds enabled worldwide through OneWeb
- By 2024 > machine learning needed to coordinate large numbers of satellites anticipated
- By 2024 > SpaceX to complete Starlink Project to provide high speed internet worldwide
- 2019-2027 > 9.2% forecast growth rate

High level of certainty (e.g. backed by laws / funding allocated for delivery)

Moderate/high certainty (e.g. backed by high profile research / government-led roadmap)

Moderate/low certainty (e.g. evidence generally in agreement on direction but inconsistencies on details or scope)

ENERGY

2021 > 2025 > 2030

Solar Energy

Price of solar photovoltaic (PV) has been falling

Currently used both on- and off-grid

- Global solar PV growth c. 115GW PA. Substantial price decreases anticipated to continue
- Increasing use of off-grid applications (e.g. for charging stations)
- By 2025 > Future Homes Standard – new homes won't be able to use fossil fuels
- By 2030 > performance to increase by c. 10% compared to 2020 level
- By 2032 > 85% of electricity from renewable sources

Hydrogen Energy

2021 > FutureGrid programme commenced, testing hydrogen as gas alternative in homes/businesses

- By 2023 > Hydrogen Neighbourhood heating trials begun
- By 2023 > up to 20% hydrogen blend in gas network
- By 2025 > Large Hydrogen Village trial commenced
- Mid-2020s > decisions about long-term strategy for hydrogen use in buildings
- By 2030 > 5GW low-carbon hydrogen production capacity
- By 2035 > fossil-fuel boilers completely phased out

Wind Energy

2019 > UK had largest capacity of off-shore wind in the world (10GW)

2010-2019 > renewables capacity grew by 5x

- 2024 > wind projects procured in 2019 start generating >5.5GW
- By 2030 > Offshore wind to produce 40GW – enough for every home
- Longer term – offshore pipeline projects alone sufficient to generate 50GW

Energy Storage

Increasing need for storage to maintain network stability as energy demand growing

- Increasing use of EVs necessitates extra flexibility. Likely to include local storage
- 2022 > CryoBattery facility to open – 1st commercial liquid air battery in UK
- Increased use of low carbon gas, hydrogen & electrochemical storage
- Increasing requirements for non-electrical storage, esp. for domestic heating systems

High level of certainty (e.g. backed by laws / funding allocated for delivery)

Moderate/high certainty (e.g. backed by high profile research / government-led roadmap)

Moderate/low certainty (e.g. evidence generally in agreement on direction but inconsistencies on details or scope)

Case Study

AIMCH

AIMCH (Advanced Industrialised Methods for Construction of Homes) is a 3-year collaborative project aiming to transform home building, using modern methods of construction (MMC). It is looking to tackle the need for additional housing set against skills and workforce shortages, poor productivity, low output and low affordability, by identifying, developing and trialling off-site construction solutions with a view to commercialisation and mass-market adoption.

The ambition is to create an approach to house building which can meet the target of 120,000 homes needed annually at the same or lower cost than traditional methods, 30% more quickly and with a 50% reduction in defects.

Further information:
https://www.aimch.co.uk/

As well as futureproofing for technological changes such as the uptake of CAVs and other technologies as described above, considering integrating innovation within planning and development can also serve to help address key challenges and support existing objectives, such as those around climate change, population health and adapting to sudden disruptions like COVID-19. Section 2.5 sets out some of the major challenges and risks developments need to address, and section 1.1 above outlined the principles which innovation should be used to support. Indeed the UK's planning system is ripe for innovation, from improved digitisation and mapping to public engagement approaches, whilst the construction industry is also lagging behind other sectors, such as manufacturing, in this area.

Potential benefits of adopting innovative solutions or technologies can be seen, with a number of significant players within property development and construction making use of approaches such as Building Information Modelling (BIM) overlaying a digital representation of a building with details about scheduling and cost to help ensure that sites are built correctly the first time. Balfour Beatty are adopting a number of innovative approaches in their work, for example using drones rather than surveyors to track the progress of infrastructure development, bringing increased accuracy and additional data collected more frequently than would otherwise be the case.[1]

According to Christian Faes at LendInvest, "technology is helping the property business to become more transparent and data-driven which in turn helps to unlock new development opportunities. From using Land Insights to assess the viability of various sites and planning permission through to Settled and ViewMyChain providing conveyancing and online agency services, new innovations are bringing greater efficiency."[2] The examples called upon here show how innovation can be effectively integrated through the whole lifecycle of a development, from the planning stage all the way through to occupation and beyond, bringing benefit to multiple players in the field.

There is also a financial case for ensuring that new technologies can be integrated into development, both from wider economic and more direct profitability perspectives. There seems, for example, to be a general consensus amongst tech experts that occupiers are willing to pay higher amounts for working spaces which are high-tech.[2] We can also see from examples such as Amazon locating in Seattle, that significant economic benefits can be brought from attracting high-profile tech companies into an area. Estimates suggest their location in the city brought around $38 billion to the city's economy, creating jobs and increasing real estate values. Companies of this kind are unlikely to seek to occupy developments which will not easily integrate the technologies they require to work effectively.

1 *Balfour Beatty (2021). Innovation 2050 - A digital future for the infrastructure industry. https://www.balfourbeatty.com/how-we-work/public-policy/innovation-2050-a-digital-future-for-the-infrastructure-industry/*
2 *Osborne Clarke (2018). Future proof real estate: is the property sector ready for the 2020s?*

Case Study

Cities-4-People

Seeking to transform mobility design, C4P aimed to provide new ways to create innovative, sustainable, and targeted mobility solutions by placing citizens at the centre of the development process. OCC partnered with C4P to solve real mobility issues in Oxford through a collaborative framework in which a community of citizens, local authorities, mobility providers and innovation experts created neighbourhood-level mobility solutions with a low environmental footprint and a sharing mentality. Partnering with University College London, Copenhagen Business School and local authorities in Hamburg, Budapest, Trikala, and Istanbul, C4P used the experiences in Oxfordshire and these municipalities to further develop People Oriented Transport and Mobility for use in urban and peri-urban environments throughout Europe.

Further information:
https://cities4people.eu/

Case Study

MaaS CAV

This project was a multi-disciplinary feasibility study that examined the integration between CAVs and Mobility as a Service (MaaS). Moreover, it studied combined business models in investing to develop and procure enabling infrastructure.

One challenge for CAV deployment in UK and in Europe in general is the need to fit new technology in historic locations. Streets in many UK towns have not been designed to meet the transport demand we have today. The study identified that new developments, where the road layouts have been designed to meet today's transport needs, could therefore present an opportunity for easier adoption of CAVs.

Infrastructure needs identified:

- good connectivity
- smart infrastructure to deliver V2N (vehicle to network) and V2I (vehicle to infrastructure) connectivity
- good road markings, with high durability and visibility
- high quality, unified signage, with consistent positioning

Beneficial Infrastructure:

- digitisation of assets and traffic information
- infrastructure to support geolocation
- simple road design
- shared-CAV lanes

Further information: http://maas-cav.info

At the same time, we need to be critical of the promises of any new technology, as there is an established psychological bias into being overly optimistic early in a technological development, followed by an overly pessimistic adjustment to expectations. This can be seen in the Hype Cycle for Technology, which illustrates these changing views towards a new technology over time (see figure 7 right). The IF can provide support into making gradual, data-based steps into sustainable long-term adoption that aligns with the IF principles, while not being overbearing in its requirements during early stages.

Figure 7: General Hype Cycle for technology

2.1.1 How innovation may affect the built environment

Innovations set to become mainstream over the coming years, such as those outlined in the roadmaps in figure 5 above, will have a significant impact on our physical and built environments. They will change people's behaviour and the way in which space is allocated and used. Further, they will facilitate mitigation and adaptation to wider changes and disruption.

Many of the innovations we anticipate to become mainstream are likely to support a move towards denser development, with fewer parking spaces. These innovations range from improvements in digital connectivity, augmented and virtual reality that will reduce the need to travel and commute for business; to the mainstreaming of autonomous vehicles, which facilitate access to vehicles without the need for local parking spaces. These changes could potentially significantly cut costs and increase profitability of development, widening design options. At the same time, with both the move towards automated vehicles and increased uptake of home delivery, curbside space is likely to become significantly more valuable, with a need for drop-off space and idling locations.

Autonomous vehicles, when used in shared-vehicle and freight scenarios (rather than private-ownership) also have the potential to free up road space, due to more efficient driving and convoying options. When paired with a move towards micromobility and UAVs and the impetus to create modal shift away from single occupancy vehicle usage taking some vehicles off the roads, infrastructure needs are likely to shift and allow for greater and more equitable space allocation towards active and sustainable modes of transport.

Changes in technology can also impact on land use designation needs. In one example, greater space will be needed for storage to accommodate continued trends towards e-commerce. In addition, the type and number of locations required by freight consolidation solutions that will be needed for the supportive technological to facilitate last mile delivery such as automated bots (Personal Delivery Devices) and UAVs will increase. In another example, the move towards home working which technology facilitates will see a reduced need for office-space – a trend increased by the impacts of COVID-19. Finally, the innovation economy itself also brings with it a need for additional land to be designated for use in research and development activities within a mixed use setting – this is already being seen in the development of Innovation Districts.

Many of the design principles applied within Innovation Districts are likely to become more universally demanded over time as other industries see the benefits of aspects such as mixed-use development, co-working space and greater social infrastructure. Providing a balance which makes the location attractive for employees is becoming more of an important factor over time, as the population ages and leaves a skilled talent shortage within the workforce. Demand for these kinds of well-designed and integrated developments is therefore set to increase over time, as employers seek competitive advantage in the 'global war for talent'.

Reliable energy supply is a key driver both for businesses and individuals which, alongside new energy models, such as local production, storage and peer-to-peer trading, will affect our built environments. Oxfordshire already has a grid capacity challenge, which taken with the need to move to net zero carbon emissions and the increased demand created by the growth in electrification of vehicles and heat, will drive developments towards facilitating local renewable energy generation and storage solutions.

Digital disruptive innovations are also likely to as an impact on development as greater information becomes available to potential buyers and occupiers of real estate. The exponential growth in big data and increasing application of the Internet of Things bring with them greater levels of transparency and potential insight. As people become more used to having these levels of information more generally and see their potential benefit (especially when paired with developments in machine learning and AI), they will become expected of all sectors. This encompasses robust, reliable and fast digital connectivity, and the means to gather data and monitor effectively.

The built environment also needs to adapt to the uncertainty inherent in innovation and more widely (e.g. economically, socio-culturally and environmentally). Whilst it is possible to make projections about likely or potential future scenarios, no projection can be 100% accurate; as such, our built environment needs to be responsive, adaptive and flexible to change. Change therefore needs to be picked up on and analysed, and systems to gather data can be built into development and infrastructure using innovations such as the Internet of Things, smart infrastructure and big data. Various innovative approaches, such as more modular design, design for disassembly, a platform approach, and designing for multiple potential uses can then facilitate flexibility or alteration, to allow for changes as they occur.

2.2 Innovation from a planning perspective

Figure 8 below demonstrates key strategic interactions with the planning process for both Local Planning Authorities and Developers.

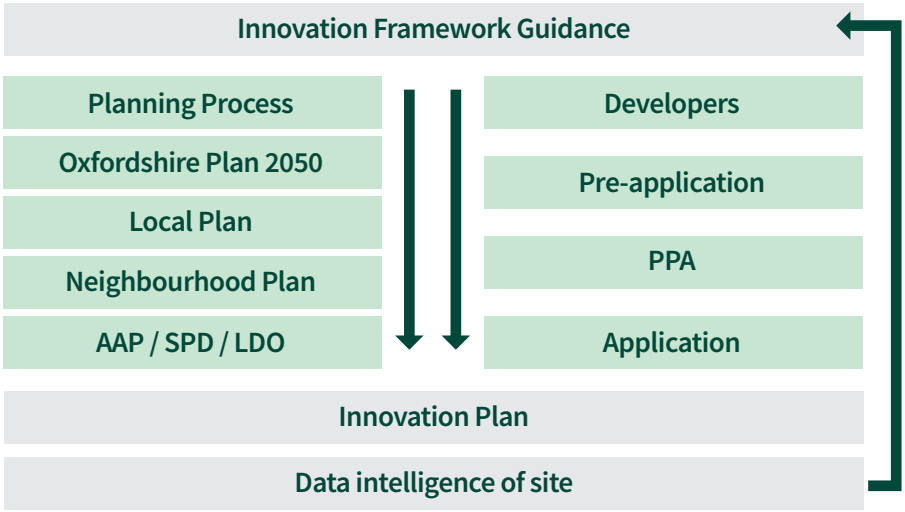


Figure 8
Strategic process flow for Innovation Framework

For planners, this means:

- ensuring developers consider innovation within their applications, ideally through the medium of an Innovation Plan (see section 2.3), by setting out the need for it within planning process documents such as Supplementary Planning Documents (SPDs) and Local Plans;
- considering innovation within infrastructure development, such as highways development, including when bidding for funding for infrastructure schemes (both in terms of futureproofing and integration);
- considering innovation within the developer funding process, and ensuring sufficient funding is secured to futureproof infrastructure impacted by development;
- on reviewing planning applications, ensuring that sufficient thought has been given by the developer to futureproofing the site, and that any innovation to be integrated into development serves a purpose to support the principles and aims, address challenges or mitigate risks;
- in assessing Health Impact Assessments submitted by developers, to ensure the impact of innovation will ideally improve health equality, but as a minimum not increase health inequalities

The iHUB is available to support integrating innovation into planning process documents such as Local Development Orders (LDOs) and into major infrastructure development design. The roadmap and Table 1 in section 2.3.2 can serve as a starting point for this, outlining key innovations to futureproof for. These are intended to act as a reference of innovations to consider within different areas, both from the perspective of futureproofing, and for the purposes of helping address any key challenges or objectives for development. It is not, however, exhaustive, and as such for more significant – strategic, or complex major – planning applications or infrastructure, it is recommended that a member of the iHUB is consulted to provide expertise.

In addition to considering innovation within the planning process, innovation can also be used to help support the planning process itself. There is significant potential to use innovative techniques within the planning process – for example, in standardisation, digitisation and digital communication and engagement approaches. Innovative

Case Study

HARMONY

"Holistic Approach for Providing Spatial & Transport Planning Tools and Evidence to Metropolitan and Regional Authorities to Lead a Sustainable Transition to a New Mobility Era (HARMONY)" is a H2020 42-month project lead by UCL, aiming to create multi-level (operational, tactical and strategic) transport models able to include the effects of emerging technologies and modes, like CAVs, drones and demand responsive transport, based on trial data.

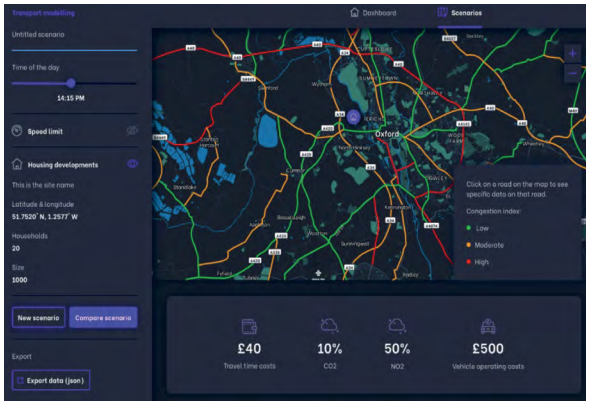
Further information:
https://harmony-h2020.eu/

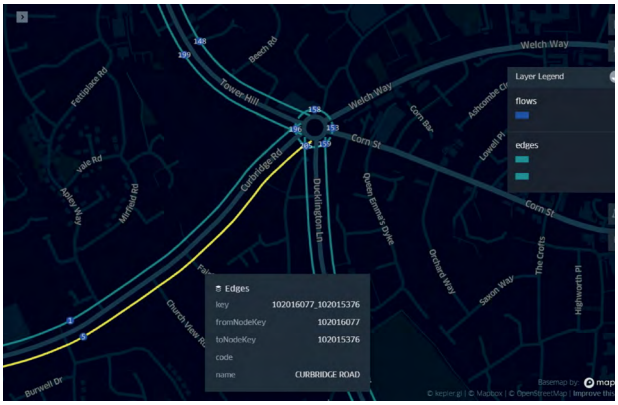
processes and tools could be extremely beneficial in securing a greater level of public participation in terms of generating more local input to the planning process, such as through developing local design guides.

In addition to digitisation, there is also potential around improved modelling approaches, to inform suitability of areas for development (e.g. in likely transport impact or expected impact of climate change on a given area such as increased flood risk).

The iHUB has led on the development of the Oxfordshire Mobility Model (OMM), MIMAS. This tool may be applied to assess the impact of development on the transport network, and its use is strongly encouraged. As well as using approaches aiming to overcome the drawbacks of more traditional modelling techniques, it has been designed to be user friendly, such that it can be applied directly by planners and transport professionals. By avoiding the need for individual requests to be run by experts in the model, each with an associated cost, this tool is considerably more accessible than predecessors. It has a number of potential applications within the planning process, as well as potential for developers to apply it, including:

- in informing Local Plans to help assess the suitability of a given area for development in terms of transport impact, particularly considering cumulative impacts;
- in supporting creating Transport Assessments for developments;
- in assessing the Transport Assessments submitted by developers, to ensure the impact has not been under-estimated by the developer;
- in assessing the level of need for developer funding to support additional transport infrastructure due to the impact of development;
- in assessing the likely impact of new infrastructure on the transport network as a whole, feeding into options appraisal and creating business cases.





2.3 For development and new infrastructure – Innovation Plans

2.3.1 Overview

An Innovation Plan is a site-specific plan produced by the developer or infrastructure planner setting out how a particular development or scheme will both integrate and plan for innovation, which helps planners and developers ensure developments that are fit for future generations. It should be considered alongside local and regional planning policy and the national planning policy framework, particularly when setting objectives for the development which innovation could help to support. For development, it should be produced as part of the planning application process and consider the different stages of development, covering the elements outlined below and guidance including the Innovation Plan template and other accompanying IF materials.

2.3.2 Contents

An Innovation Plan should cover the ways in which a site or infrastructure development will futureproof for when current innovations become mainstream, and how innovation will be integrated into the development process at each stage, in order to address challenges and risks, and achieve goals. Some of these goals and challenges will be generic, as outlined in other sections of this document; some will be specific to the site in question.

The Innovation Plan, should cover the following aspects:

- a brief outline of the development or infrastructure, with links to relevant documents containing more detailed information. This should include a site plan, design layout and/or description of the development or infrastructure;
- a section describing any specific challenges which have been identified for the development/scheme; for example, this might include aspects such as high flood risk, contaminated land, road capacity challenges, architectural or ecological impact etc;
- a section identifying any specific goals for the development/infrastructure; for example, this might include goals such as providing a higher proportion of affordable housing than usual, net biodiversity gain, increased network capacity, or reduced socio-economic deprivation etc;
- a section identifying how innovations will be applied to address the challenges and goals, including those which are more generally applicable to all development, such as climate change resilience, designing for an aging population and so on (see other sections 1.1 and 2.6 for more general goals and challenges respectively).
  - If traditional methods are (also) being used to address the above, these should be briefly noted for context.
- A section outlining how the site will address futureproofing for innovations becoming mainstream. When futureproofing, it's important to ensure that the principles outlined in 1.1 are not compromised – for example, dedicated autonomous vehicle lanes should not be installed at the expense of cycle infrastructure or walkability. The following table outlines some aspects that developments may need to futureproof for, with examples of their applications and measures which development could use to address them (for more detail, see the roadmap in Section 2.1):

Table 1: Futureproofing for innovations becoming mainstream

Technology / Innovation	Examples of application	Futureproofing measures	Main principles and aims supported
Co-creation & civic participation 	• Local design guides	• Processes to involve citizens put in place – both digital and analogue to address all types of end user	• Taking account of differing needs • Connected and inclusive communities • Using and gathering evidence and data transparently
Connected and Autonomous vehicles (CAV) – passenger 	• Privately owned vs shared (SAV) • Automated buses, shuttles, cars or pods • Semi-automated vs fully automated • Connected vehicles without automation	• Consistent road marking • SAV idling, drop-off and pick-up points • Charging infrastructure • Connected and smart roadside infrastructure (most relevant in congested and more built-up areas) • Next Generation network management support • External Localisation & navigation technology • High definition digital mapping • Resiliency when failing or operating out of its Operational Design Domain (ODD) – where it is designed to operate	• Accessibility and connectivity for all • Catering for foreseen change • Designing to support autonomy and independence • Improving road safety
CAV – freight 	• Automated lorries, trucks, vans or robots • Connected vehicles without automation • Semi-automated vs fully automated • Platooning (convoy) • Health and care applications, e.g. delivery of health services	As above, plus: • Loading & unloading points • Docking points for bots	• Supporting first- and last-mile delivery options • Improving road safety
Digital twins 	• Digital replicas of physical entities • Better network and asset management • Building Information Management (BIM)	• Digital mapping and sensors on the network • High speed connectivity • Cloud computing resource for data storage and processing (if applying directly)	• Maximising energy efficiency • Minimising embodied carbon • Supporting reduced energy demand • Ensuring ongoing monitoring systems are embedded • Catering for unforeseen change • Maximising longevity of assets and minimising waste • Minimising the need for maintenance
Electric vehicles – passenger 	• Privately owned vs shared • Wireless charging vs wired charging • Electric buses, cars, boats or pods	• All residential properties with a drive: min 1 charge point • Unallocated residential parking: min 25% of spaces • Non-residential parking (e.g. commercial): min 25% of spaces • Smart chargers to be used, minimum 7kWh AC • Fast charging points recommended for most applications, with rapid only appropriate in some specific situations (e.g. some higher density housing, and workplaces using commercial vehicles) • Provision at mobility hubs, such as P&R sites • Consideration of additional energy needs over time, building in renewable, local energy generation to development	• Accessibility and connectivity for all • Reducing fossil-fuelled car use • Catering for foreseen change

Technology / Innovation	Examples of application	Futureproofing measures	Main principles and aims supported
Electric vehicles – freight 	• Electric vans, local delivery trucks or robots (larger freight less likely to be electrified)	As above (where relevant), plus: • Charging points at commercial locations in loading/unloading areas	• Catering for foreseen change • Supporting the Oxfordshire economy • Supporting first and last mile delivery options • Reducing the need to travel
Hydrogen vehicle – passenger 	• Privately owned vs shared • Buses or cars	• Fuelling land use designation	• Accessibility and connectivity for all • Reducing fossil-fuelled car use • Catering for foreseen change
Hydrogen vehicle – freight 	• Hydrogen lorries, trucks, vans or boats • Most relevant to longer distance/heavy load trips	• Fuelling land use designation	• Catering for foreseen change • Supporting the Oxfordshire economy • Reducing the need to travel
Internet of Things (IoT) / Everything (IoE) 	• Air quality, noise or other environmental sensors and monitoring devices connected to the internet • A tool for co-creation • A tool to support the aging population (e.g. new housing models using IoT) • Asset management • Health monitoring • Waste and resources management	• Accessible communication channels (e.g. LoRaWAN) • Electricity provision • Analytics • Cyber security and resilience measures	• Ensuring monitoring systems are embedded in development • Facilitates data sharing
Micromobility – passenger 	• Privately owned vs shared • E-bikes, pedelecs, e-scooters or e-skateboards (the latter 2 are subject to legal review)	• Secure, convenient, accessible, ideally covered storage at higher volumes • Consideration of locations for storage to avoid pavement clutter • Improved cycle infrastructure • Dedicated lanes	• Accessibility and connectivity for all • Supporting first, last and only mile transport options • Support an environmental hierarchy of transport use • Catering for foreseen change
Micromobility – freight 	• E-cargo bikes • First/last mile delivery	• Designated loading areas • Charging facilities • Microdistribution hubs • Dedicated cycle lanes	• Supporting first, last and only mile delivery • Support an environmental hierarchy of transport use • Catering for foreseen change • Reducing the need to travel
Mobility as a Service (MaaS) 	• All modes • Shared transport services (Car, e-car, bike, e-bike or e-scooter) • Integrated journey planning and payment	• Mobility hubs, e.g. bus & rail interchanges • Dedicated bike and car sharing spaces at transport hubs • Cycle parking at bus stops • Charging facilities • Real time, open source, multi-modal monitoring data • High definition, digital mapping	• Accessibility and connectivity for all • Supporting first, last and only mile transport options • Support an environmental hierarchy of transport use • Catering for foreseen change
Peer-to-peer energy trading 	• Local energy networks • Vehicle to Grid (V2G)	• Appropriate infrastructure	• Supporting the zero-carbon economy • Maximising energy efficiency • Community ownership of energy • Catering for foreseen change
Satellite communication 	• Internet provision • Personal communications • Media provision (radio, television) • Asset and conditions monitoring • Universal coverage	• Suitable locations for satellite infrastructure • Use of Ground Station as a Service providers	• Creating digital connectivity (especially relevant to rural and poorly connected areas)

Technology / Innovation	Examples of application	Futureproofing measures	Main principles and aims supported
Smart energy grids 	• Dynamic pricing, grid balancing and leveraging	• Appropriate infrastructure • Energy storage locations (battery, hydrogen, kinetic etc.)	• Supporting the zero-carbon economy • Maximising energy efficiency
Unmanned Aerial Vehicles (UAV) 	• Delivery, function performance such as maintenance or monitoring, health & care applications, e.g. delivery of medicines and medical equipment • (Longer term, passenger transfer) • Likely alternative-fuel powered	• Consider line of sight • Charging point provision • Privacy from above • High definition digital mapping • Take off/landing • Monitoring infrastructure/ corridors • Network management provisions (possible integration of air traffic management with Traffic Management Control centres) • Noise abatement considerations, especially for larger drones	• Supporting first, last and only mile delivery • Support an environmental hierarchy of transport use • Catering for foreseen change • Reducing the need to travel
Virtual & augmented reality 	• Immersive tourism • Health and care applications, e.g. for occupational therapy & addressing isolation • Creative industries	• High speed connectivity • Community spaces • Digital mapping	• Inclusive communities • Engaging with the community • Reducing the need to travel
3D printing 	• More localised production • Micro consolidation centres • Modular design	• Consolidation centres • Innovation hubs	• Reducing the need to travel • Supporting the zero-carbon economy • Reducing waste generation & growth
5G (5th generation wireless technology) 	• Telehealth • Immersive technologies • Autonomous vehicles teleoperation • Smart agriculture • Emergency response • UAV communications • Vehicle to Everything communications	• Fibre backbone • Accessible assets, e.g. streetlighting for mounting and electricity • Provision of space to avoid cabinets on pavements causing obstruction	• Creating digital connectivity • Catering for foreseen change • Reducing the need to travel

Case Study

Project LEO

Local Energy Oxfordshire develops new local flexibility and energy markets, maximising the use of local generation and network assets and enabling innovative business models for investment in low-carbon and smart energy systems. OCC is developing an Energy Mapping Tool to identify opportunities to scale up local and low carbon energy generation to support integrated system planning across the county.

Further information:
https://project-leo.co.uk

The plan should also:

- outline how it has been developed and how particular innovations have been identified for the site. A participatory approach to developing the Innovation Plan is encouraged - use of innovative participatory techniques in developing the site or infrastructure design, or documents such as the Travel Plan could form part of the Innovation Plan itself;
- include targets and/or Key Performance Indicators (KPIs), which may be taken from other plans and/or set specifically for the Innovation Plan;
- include a description of how the Innovation Plan will be monitored against the targets and KPIs, covering both process monitoring and outcomes;
- include a timeline for when it will be reviewed and updated and an explanation of the process for doing this, including how monitoring information will be used to inform it; and
- outline how the plan will be transferred to others, e.g. upon transfer of ownership or where sub-contractors are expected to carry out aspects of the plan.

A full template is provided which can be used as guidance for creating an Innovation Plan. The structure suggested can be adjusted to suit the needs of the site in question – it is not intended as a rigid structure that must be adhered to. However, unless not relevant, all elements outlined within the template should be covered in the Innovation Plan as best practice.

The Innovation Plan should encompass the timeline and different aspects of the development. In addition to the technologies outlined in the table above, the roadmap in Section 2.1 includes examples of technologies, approaches and innovations that could be considered for different aspects and stages of the development process to support a number of key principles and aims and address challenges. It should therefore be used in conjunction with the template to provide guidance on what could be included with the plan. The guidance is not exhaustive and discussion with the iHUB is recommended if there are specific challenges or needs for the development in question which examples provided cannot address; this should feed into the pre-application discussions held.

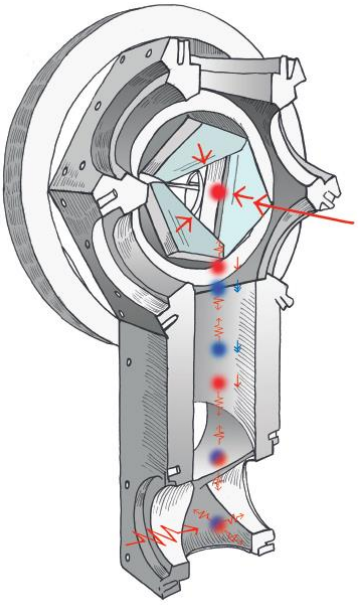
2.3.3 Benefits

An Innovation Plan should support the achievement of a variety of aims and principles common to a number of policy and framework documents as outlined in the previous section of this document (1.1) and with the documents outlined in Appendix 1. As such, it should help the developer to meet planning regulations and other obligations, for example, ensuring key legislative requirements such as the Equalities Act are efficiently met, and support planners with policy and strategy compliance. In addition, the Innovation Plan should help to futureproof developments and infrastructure to accommodate the mainstreaming of current innovations and overcome existing and forthcoming challenges, such as the requirement for housing allocations to be met whilst the construction industry faces workforce and skills shortages. This IF and supporting materials aim to provide an evidence base to show the benefits of integrating innovation into site and infrastructure development, helping developers and planners assess the suitability of different innovations for their and a site's particular needs.

Case Study

ABGRAV

The Innovate UK funded project ABGRAV aims to explore subsurface surveying using quantum gravimetry. The leading partner, M2 Lasers, will work to bring the gravimetric system to field ready state, while OCC will examine the commercial opportunity for the technology for applications related to the council's functions. These include highway maintenance, archaeology, mineral exploration and water table management. Utility mapping, sink holes detection and monitoring water table levels are some of the use cases which will be explored. Demonstration of the technology is planned for a suitable use case, determined by OCC.



Source: M Squared Gravimeter Handout

The COVID-19 pandemic is an apt example of significant disruption and societal changes with wide ranging impacts – construction output for example, fell by 35% in quarter 2 of 2020 according to the Office of National Statistics, impacting on the development sector as a whole. Use of innovative technology and approaches could serve to aid recovery following the pandemic – for example, using automated processes to a greater degree could aid social distancing, and in the process also address the workforce shortages facing the construction industry; but also help to develop sites in a more flexible way that allows a faster and more efficient response to disruptions of this nature occurring in the future. In the wake of the pandemic, now is the time to review approaches to integrate more efficient and resilient ways of undertaking development and construction, thereby supporting the re-building of the economy.

The Construction Leadership Council's Roadmap to Recovery for the Construction Industry sets out the need for transformation in order to 'sustain economic growth through the adoption of digital and manufacturing technologies to consistently deliver low carbon, sustainable and better quality outputs and outcomes'. Without this transformation the sector risks longer-term recession and further skills and capability loss, especially since Brexit has already reduced overseas workers within the industry. Particularly given the importance of the development sector to the UK economy as a whole (construction was 8.6% of GDP in 2019, and real estate was 7% of GDP), it is therefore important to ensure that recovery is sustainable; integrating innovation and futureproofing for it will help to achieve this.

2.3.4 How it fits into the planning process

Figure 8 demonstrates key strategic interactions with the planning process for both Local Planning Authorities and Developers.

Innovation should be considered at all stages of the development process, from aiding in the selection of a suitable site, to supporting its occupation and ongoing monitoring. The Innovation Plan itself should be:

- proportionate to the size and scope of the proposed development to which it relates and build on existing information wherever possible – this does not necessarily mean that larger developments should always have more wide-ranging plans than smaller ones, but that potential for innovation for a given site should be considered;
- established at the earliest practicable stage of a development proposal, ideally at the pre-application stage, in the case of development, with planners also giving consideration to innovation planning for both infrastructure and development within planning policy documents (Local Plan, SPD/AAP etc), using a co-creative approach in partnership with the community, stakeholders and developers, but otherwise within the application determination process itself;

- be tailored to particular local circumstances to ensure any innovation is appropriate to the place, with evidence to show how the local circumstances (i.e. risks, challenges and objectives) have been considered, such that any innovation being integrated is contributing to achieving the principles outlined previously (1.1);
- be brought forward through collaborative working with interested parties such as councils, communities and businesses. Engaging communities and local businesses can be beneficial in positively supporting innovation across developments, and in ensuring the plan is effectively tailored to the place and this is strongly encouraged.

2.3.5 When to create and update one

All developments and new infrastructure should integrate innovation and futureproof for when current innovations are mainstream. This holds true regardless of size, particularly the latter in order to avoid need for later retrofit. All developments and new infrastructure should integrate methods to monitor traffic that are able to distinguish different modes of transport. We recommend that for sites showing good potential for innovative techniques to be integrated and/or a particular need for futureproofing measures, an Innovation Plan is used as the medium through which innovation is planned for within new developments and infrastructure.

The innovative approaches could be integrated into the pre-application stage of the development process, in helping to assess the suitability of a site for a particular development, for example. A plan, if being produced, should be in place by the application stage of the process, to be submitted alongside the full or outline planning application, depending on the route taken. The document itself should be a dynamic and flexible document which can be updated and adapted as needed. It should therefore as best practice, be reviewed and updated at each stage of the development and occupation process (pre-application, application, reserved matters when applicable and occupation, with periodic review post-occupation), and in the case of any major disruption or change taking place, for which the plan could serve to help mitigate/support.

Consideration should be given at the pre-application stage to:

- the form and scope of the Innovation Plan;
- the outcomes sought by the Innovation Plan;
- the processes, timetables and costs potentially involved in delivering the required outcomes (including any relevant conditions and obligations);
- the scope of the information needed; and
- the proposals for the on-going management, implementation and review processes.

The above can be discussed with the iHUB, who are available to support at the pre-application and application stages of the process for larger or more complex developments. It will be possible for developers to gain some advice within the scope of an existing PPA, but for more bespoke advice, the iHUB charges for our time. The iHUB has a range of experience and expertise in innovation, including alternative fuel vehicles, connected and autonomous vehicles, health and care, community engagement, energy, data and monitoring. Some of the experience and projects the team has worked on are featured in the case studies within this document. In addition, the team has built up a wide network of partnerships, allowing potential to facilitate introductions and identify synergies. The team also has expertise in modelling and simulation, which could be provided to support site development plans. The Oxfordshire Mobility Model (OMM), MIMAS, is one modelling approach available to assess the likely transport impact of development.

At the application stage, the Innovation Plan should be submitted with the planning application for review, when the iHUB will provide feedback on the contents. A template is provided to support the creation of an Innovation Plan, but can be added to and adapted to suit the needs of the development in question. The iHUB will be able to advise on adaptations or additions to the template for specific large developments, and for types of development for which the template proves inappropriate at the pre-application stage.

Following submission with the planning application, it will be necessary to review the plan again prior to occupation of the site; in the case of large phased developments, this may require more than one review, in association with the phasing within the planning process and build-out, to ensure the plan is still relevant and encompasses the needs of the site. This will likely be a light-touch process in most instances simply to ensure continued relevancy and completeness. A process should be outlined to show how the plan will be transferred to builders (if different from the developer) and the occupier(s) of the site, to ensure that innovation continues and benefit is maximised during the build and beyond the occupation period. If the builders and occupiers have already been identified at an earlier stage, they should be included in the process of developing/updating the Innovation Plan. Synergies should be built upon with the Travel Plan and other planning-related documents, such that they support each other.

Monitoring should be an ongoing (ideally automated) process, which should also serve other monitoring requirements, such as Travel Plan monitoring, and can support network management and monitoring of travel patterns within the county, including uptake of active travel and other non-car modes.

Figure 9 below shows the process of creating and maintaining an Innovation Plan in relation to the timeline of a single-phase development.

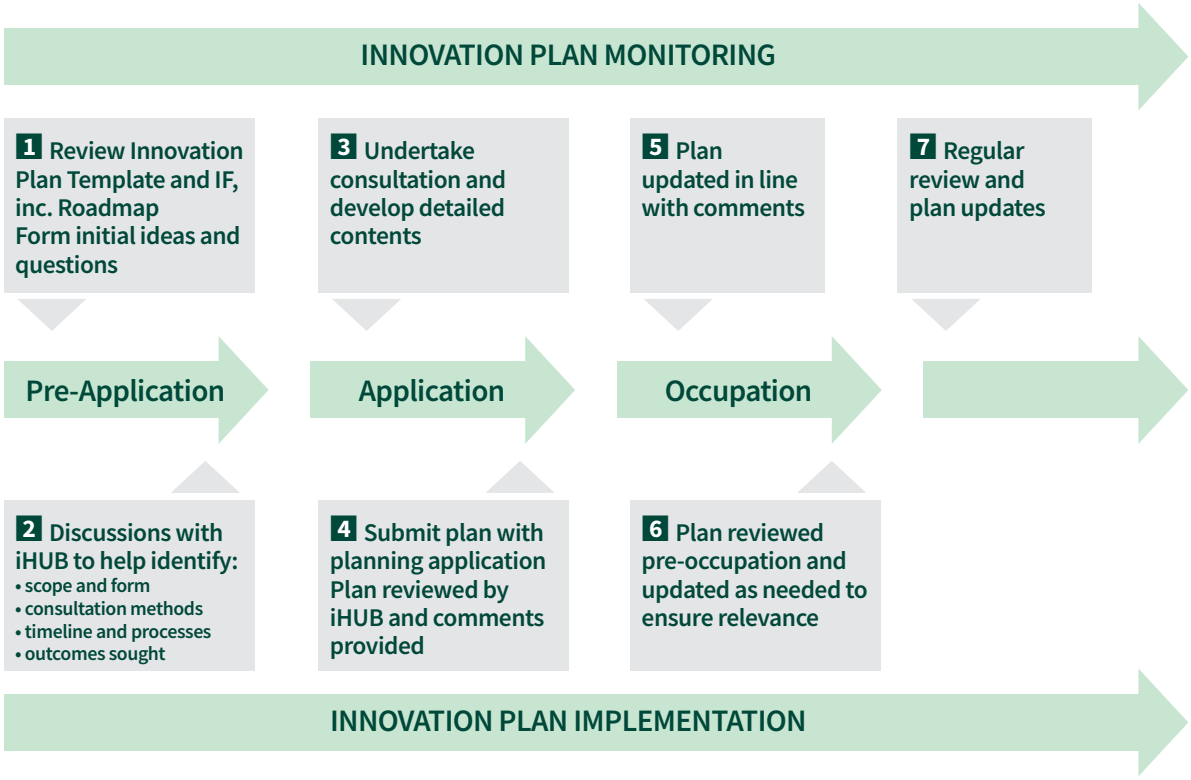


Figure 9: Innovation Plan process

2.3.6 iHUB support for developers

As outlined previously, the iHUB is available to provide support for some developments – strategic sites and more complex major developments – in considering the innovation needs of the site. Some initial support is available for sites within the scope of a Planning Performance Agreement (PPA), where agreed. Additional, more detailed and bespoke advice is also available, subject to an additional fee at the iHUB's cabinet-approved charging rates. The following packages of support are available:

Support Package	Type of Support	Level of Detail and Inclusions	Notes
1a	Site-specific Innovation SWOT (Strengths, Weaknesses, Opportunities & Threats) analysis	High level overview of site innovation needs. Includes 2 discussion meetings (pre- and post- SWOT development)	Included within PPA where agreed
1b	More detailed analysis of elements identified in SWOT	iHUB undertakes a more detailed analysis of specific parts of the SWOT carried out in 1a, as requested by the developer. Covers research and recommendations on possible approaches	1a must be concluded prior to 1b.
1c	Innovation proposal, based on outputs from SWOT	Based on the outputs of the SWOT, the iHUB reviews the potential innovation solutions and approaches for the site and creates a proposal for inclusion within the development	1a must be concluded prior to 1c.
2a	Innovation Plan Review and Suggestions	Following draft of an Innovation Plan, iHUB reviews and makes detailed comments and suggestions. Includes 2 discussion meetings	
2b	Innovation Plan Addendum or Section creation	iHUB creates a section of the Innovation Plan, and reviews other sections as per package 2a. Includes 2 to 3 discussion meetings	
3	Modelling future challenges and impacts	Using the Oxfordshire Mobility Model, combined with Innovation Roadmaps, the iHUB will assess likely future impacts and challenges for the site, and identify key issues	Can be combined with other packages for greater scope and depth

To discuss site-specific options and fees, please contact the iHUB at: cav@oxfordshire.gov.uk.

2.4 Updating this framework

By its nature innovation is a dynamic, often fast-paced process, and as such the framework document and supporting materials will also need to be updated to reflect the changing evidence base and new innovations and disruptions. As outlined above, what innovations are likely to become mainstream may be disrupted by societal changes, new technologies and approaches; each update will review changes of this kind and impact on the trajectories of innovation uptake. This IF document will therefore be reviewed and updated as necessary every 2 years. The roadmap will be reviewed dynamically, and as a minimum every 12 months, to ensure the most relevant innovations are included, and disruptions changing trajectories of uptake are integrated.

To support the process of updating Innovation Plans, dates and contents of changes made to the IF and supporting materials will be clearly identified to allow for easy review.

2.5 Change, challenge and risk

As well as supporting the principles highlighted in 1.1, innovation, in addition to being a potential source of change and challenge in itself, can serve to overcome some challenges and mitigate risks. This section sets out some of the key over-arching expected changes, challenges and risks likely to impact on development.

The following infographics set out key risks as identified by the World Economic Forum (WEF) in their annual Global Risk Report in 2020. It is split into the top risks by impact and likelihood, based on input from a variety of stakeholders to an annual survey undertaken by WEF.

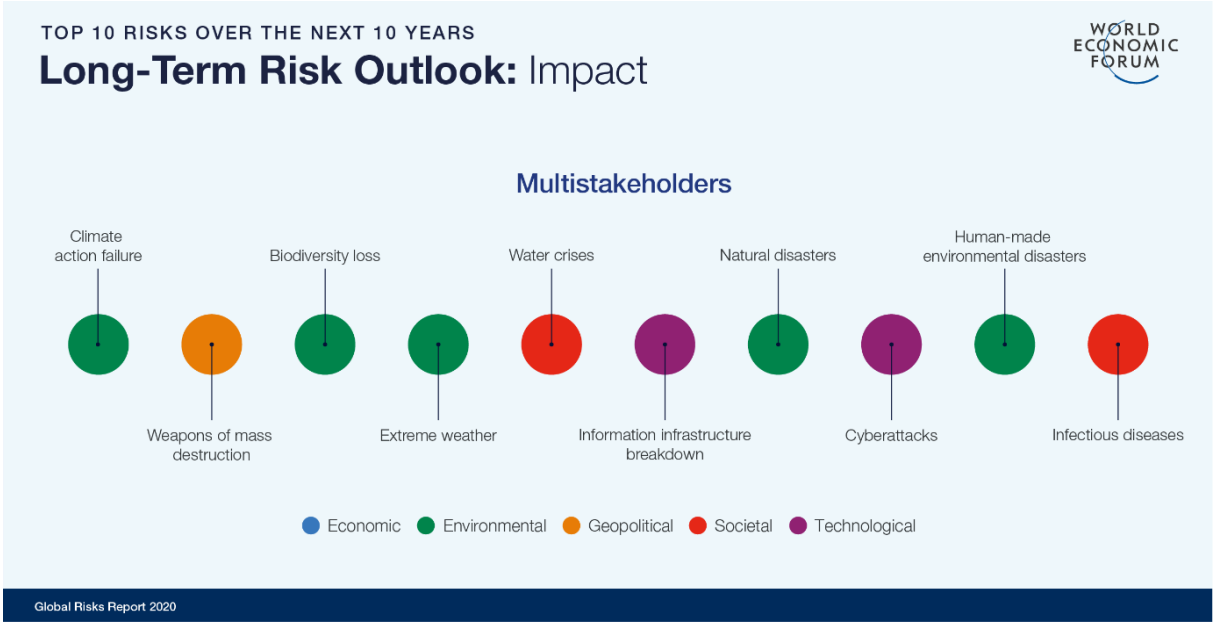


Figure 10: Top 10 risks for the next 10 years following 2020, based on impact, as rated by multistakeholders

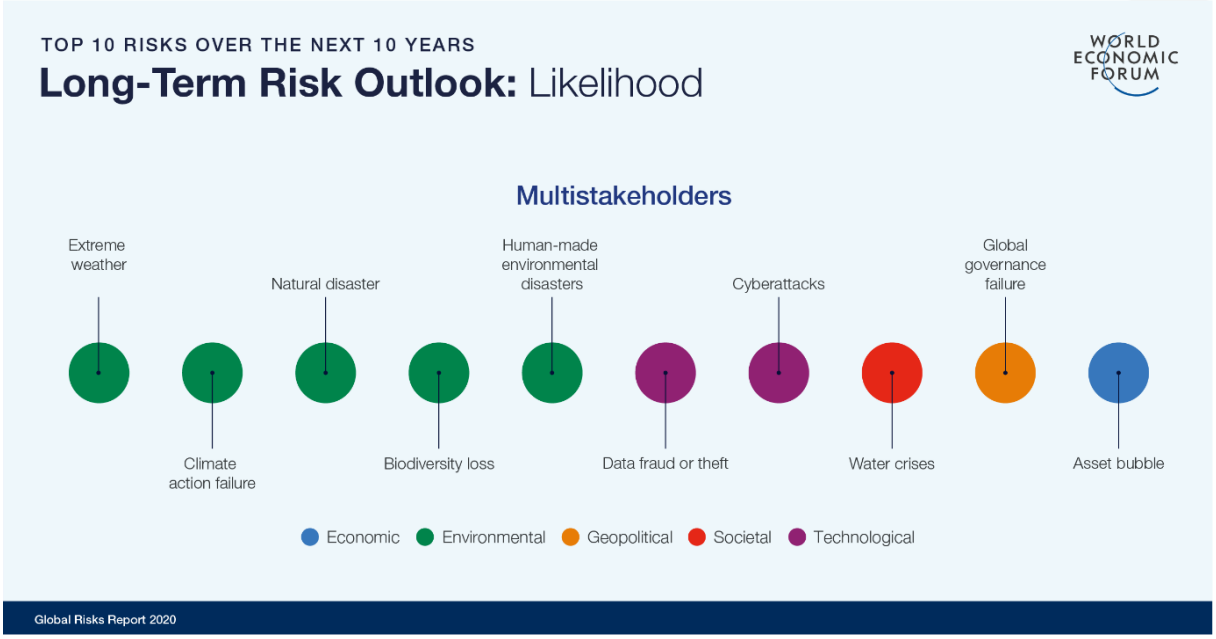
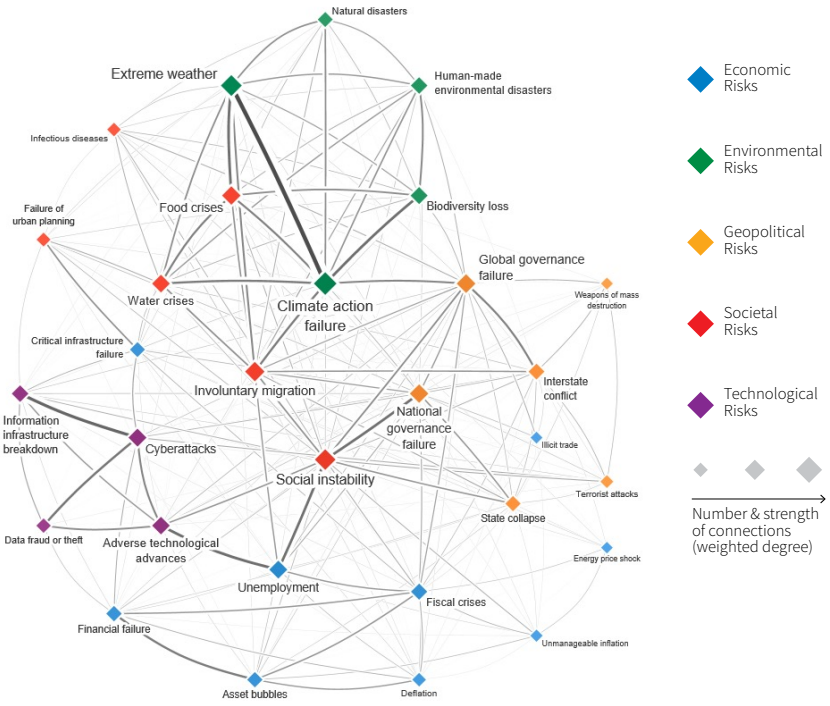


Figure 11: Top 10 risks for the next 10 years following 2020, based on Likelihood, as rated by multistakeholders



Source: WEF, Global Risks Report 2020

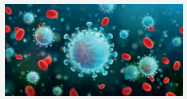
Figure 12: Connections between global risks

The graph, taken from the same report, shows the interconnected nature of these global risks. Positively influencing one risk can therefore potentially also help to mitigate connected risks and challenges.

In addition to the risks outlined above, there are also a number of encompassing challenges facing development shown in current trends, which also interplay with the above risks. These challenges and others like them need to be planned for within development to ensure it is robust and fit to meet the challenges and potential risks. If this is not done, there is potential for costly retrofit requirements at a later stage. Some of the key challenges are outlined in the following table.

Table 2: Challenges for development, planning and infrastructure by area

Area	Mobility & Transport	Health & Care	Ecology & Green Space	Waste	Digital & Communication	Energy	Buildings & Infrastructure
Climate change 	Car dominance significantly contributes to climate change, also leads to congestion, road safety, and use of space challenges. Traditionally, infrastructure and development has been primarily designed for vehicles, building in car dependency and exacerbating climate impact.	The need to design to mitigate the impacts of climate change are even greater for those in ill-health. The infirm or elderly are more significantly impacted by extreme weather events than healthy people.	Climate change is significantly impacting on ecology and biodiversity. Consideration of longer-term weather patterns and climate should be taken account of when deciding on suitable plant species for a site for example.	Climate change mitigation requires reduction of waste production and increased levels of repair, reuse and recycling. Local facilities reduce transport emissions and create local jobs.	Climate change adaptation and mitigation measures could increase demand for digital and communications services, potentially putting pressure on digital resources.	Little progress has been made in decarbonisation of heat, due to the cost of electrification.	More frequent and widespread extreme weather events (droughts, flooding, heatwaves etc) impact on design requirements and resiliency needs. Significant energy consumption from buildings Need to consider embodied carbon impact, which can be challenging to address.
Aging population 	Almost half of over-80s experience difficulty accessing amenities (supermarket, healthcare etc).	Oxfordshire's population is older than the UK average already. At the same time, the number of children and families in the county is also increasing, so the needs of the aging should not eclipse the needs of other population segments. Increased demand for (already stretched) social care services.	Over-65s are the most likely age group to be in poor health, but research also shows they may be the least likely group to benefit from green infrastructure in urban areas, due to access inequalities.	The elderly may find recycling and managing their waste challenging, especially if in poor mental or physical health and living alone. Waste storage and management approaches and locations should consider the needs of the elderly and infirm, e.g. in relation to reduced mobility.	Due to the lower levels of digital literacy amongst older generations, a higher proportion of elderly people are unable to access digital solutions. This challenge will reduce over time, however as generations which have learned how to use digital technologies become older.	The aging population could influence energy requirements, especially as it may lead to greater numbers of small households.	The construction industry is already showing an aging workforce and difficulty engaging younger entrants; this is likely to be exacerbated by the aging population.
Increasing inequalities 	Rural vs urban split –there is a high proportion of older people in rural areas with lower levels of transport amenities; combining with the aging population challenge above, this could be an increasing challenge over time. More income deprived areas often have lower transport and other amenities, further exacerbating inequalities.	There is significant segregation by multiple factors – values, education, ethnicity, power, prosperity, age etc. Housing cost drives much segregation, which in turn drives health inequalities. Those living in more deprived areas face significantly more ill health and lower life expectancy – a 15-year gap was seen between the most and least affluent wards in Oxfordshire in 2019-20.	Access to nature and green space is not equally distributed amongst social groups, with more affluent groups tending to have easier access to them. Given the mental and physical health benefits in having such access, development and transport infrastructure should aim to address this inequality.	Areas of deprivation are more likely to have lower rates of recycling amongst households. Those who are particularly well off may also be more wasteful, since they are able to keep up with changing trends more easily.	There is poor rural digital connectivity compared to urban connectivity – this exacerbates challenges faced for an aging population due to high rural concentrations of older people.	Fuel poverty is a major challenge for millions of less affluent households in the UK, due to high energy costs and poor insulation. Increasing energy demands from electrification of assets for example, could magnify this challenge.	There is a need for affordable housing – Oxfordshire's house prices are especially high compared to the national average. There is a need for integrated design to minimise social segregation (e.g. age, income, ethnicity, religion etc).
Regulatory framework and information governance changes 	E-scooter legislation. Ban on internal combustion engine new car sales from 2030. Carbon zero agenda. New forms of mobility (e.g. CAV) using new and expanding datasets. New and changing security, storage and usage governance impacts potential for deployment.	Changes in retirement age.	Potential for noise regulations.	Carbon zero agenda. Waste regulation changes following Brexit. National Resources and Waste Strategy (DRS, EPR, Plastic Tax, Consistency). Environment Bill	Data control risks – collection, storage and use requirements are changing in an increasingly digitised and sensed world. Threat of fraud or theft of data increases as more data becomes available.	Carbon zero agenda.	Planning reform. Carbon zero agenda.
Air pollution 	Traffic impact of development and new infrastructure can lead to increased air pollution.	Deaths from poor air quality were almost as high as tobacco-related deaths in 2019. There is also inequality in those most exposed to poor air quality usually being those least contributing towards it.	Poor air quality impacts on species, potentially causing decline.	Waste can contribute to poor air quality, for example through transportation requirements. Minimising waste is therefore important in reducing this impact. Provision of local facilities will also minimise the need for waste transport, helping to reduce emissions.	Greater knowledge about levels of air pollution, due to more prevalence of sensors may impact on demand in areas of poor air quality.	Domestic open fires and other fuel burning contribute to poor air quality.	Construction often has significant air quality impacts, both from particulates caused by construction dust and transport/delivery requirements.

Area	Mobility & Transport	Health & Care	Ecology & Green Space	Waste	Digital & Communication	Energy	Buildings & Infrastructure
Political changes (e.g. Brexit) 	Political change affects mobility & transport priorities and levels of support, as well as funding availability for transport infrastructure.	Brexit is exacerbating aging population challenge due to reduced migration.	Economic structures and power relations often drive environmental change, either positive or negative – political change can therefore impact on ecology.	Political changes can influence waste management options, e.g. where recycling is processed abroad.	Data storage in other countries may be impacted by political changes.	Costs of gas and other sources of energy can be affected by political changes.	Supply chain challenges already in existence could be exacerbated by political changes such as Brexit.
COVID-19 and other communicable disease 	Unpredictable mobility patterns are being caused by COVID-19 – there are some drivers towards reduced overall travel, some drivers towards increased SOV use. Long term impacts are difficult to predict.	In addition to its direct health impacts, COVID-19 has caused a significant impact on both mental and physical health due to isolation and lower levels of physical activity, exacerbating existing trends towards worsening mental health and poor activity levels.	Access to local green space has been highlighted as a key deficiency for some groups of people, particularly in more deprived urban areas, as a result of COVID-19.	Waste collection and management has been impacted by COVID-19, due to closures and social distancing. Increase in household waste levels of around 6%. Longer term impacts if we don't return to 'normal'. Changing waste composition – more card as more deliveries. Good waste disposal hygiene is important for reducing potential for communicable disease.	COVID-19 has increased need for digital connectivity to facilitate home working, and access to online services. There are particular challenges for those under-served (e.g. older, less affluent, rural etc) to access the services needed.	COVID-19 has created a higher demand for domestic energy use, against a lower demand for commercial energy use. Unpredictability of likely long-term impact on homeworking could influence levels of energy consumption.	There have been difficulties with construction slow-down during the pandemic. Consideration of land designation is needed, to respond to potential long-term shifts in demand for development and infrastructure types.
Space allocation conflicts 	Existing conflicts between different types of road user, which will be exacerbated by changing mobility trends and new modes of transport (e.g. shared mobility modes). There is a need to balance current requirements against likely future requirements as car use likely reduces long-term (e.g. in parking allocation levels).	Increasing requirements for extra care housing and retirement village provision, due to the aging population. Space allocation to non-active forms of transport supports physical inactivity, leading to massive costs to the NHS, society and business. Health is significantly affected by our environment – only 10% of well-being is determined by access to health care. Housing, green space and nature access, transport and a sense of community are large contributors.	Ecology needs to be taken account of in space allocation, to ensure than biodiversity is not reduced (and is ideally enhanced). Provision of green space can sometimes conflict with other requirements in constrained locations. Green and blue corridors for wildlife movement also need to be provided in instances where development crosses habitats (e.g. where some species might migrate for reproduction), to ensure movement of species is not impaired.	Road space allocation needs to cater for collection vehicles, and storage locations also need to be compatible with collection techniques used. These can differ between district areas and therefore need to be reviewed as part of site design. Circular/sharing economy space is needed. Consistency/ separate collection/ Extended Producer Responsibility requirements. Internal and external space needed.	There is a need for allocation of space for connectivity requirements (e.g. communications infrastructure such as 5G and satellite).	Some more sustainable modes of energy generation require specific types of location or land (e.g. solar and wind power), and can sometimes take greater quantities of space than traditional energy generation methods.	Land may be constrained, especially in urban development locations such as Oxford, making it hard to cater for all infrastructure needs and accounting for all needs outlined in the other themes.
Behavioural changes 	Changing mobility patterns – there was a decrease in shopping trips, but an overall increase in demand for transport pre-COVID-19. It may be harder to predict mobility behaviours in the future, given COVID-19 and advent of new modes of transport.	Changing mobility patterns influence levels of physical activity. People are becoming increasingly inactive, with 1/3 of the Oxfordshire population not achieving 30 minutes of activity per week.	Human behaviour can significantly impact on ecology, for example reduced use of motorised vehicles reduces risk to animals.	Behavioural change is needed to increase waste reduction, reuse and recycling of materials. Whilst recycling rates have increased significantly over past years, there is still room for improvement. Reuse and repair of items also requires support, which can potentially be facilitated by planning and development.	Uptake of new digital and communications services is increasing. New services being created will also lead to further behavioural change, impacting on the level of need for aspects such as transport infrastructure and types of development.	Increased energy demand due to uptake of electric modes of transport and heat pumps could result in grid constraints and supply constraints.	Infrastructure and development type requirements are influenced by changing behavioural patterns, which can be hard to predict and/or cater for.
Poor population health (mental and physical) 	Designing to support active travel modes is important in supporting improved mental and physical health. However, in doing so, it is important to ensure the accessibility needs of disabled users of different kinds are facilitated.	In Oxfordshire, over 1/2 of adults were classified as overweight or obese in the 2021 Joint Strategic Needs Assessment (JSNA). Growing trend in the UK towards poor mental health – loneliness is rising, general emotional state and anxiety and depression disorders are worsening. Estimated cost of physical inactivity in the UK is around £1bn a year to the NHS, and £7.4bn p/a when wider costs (e.g. loss of working days) are factored (Public Health England).	Green space and access to nature are important health determinants, both in facilitating physical activity, and supporting good mental health.	Those in poor physical and mental health, including those with disabilities, may find it hard to organise and recycle waste. Different health concerns should be taken into account in the provision of waste management infrastructure.	Increased access to digital technologies can lead to reduced physical activity and social contact, potentially exacerbating existing health concerns. However, there is also potential for improved digital connectivity, especially when paired with technologies like virtual and augmented reality to facilitate social contact for those unable to do so physically.	Energy has a number of impacts and links with health, both direct and indirect. For example, fuel poverty has been shown by several studies to impact significantly on mental health in adults and adolescents.	It is important to ensure that infrastructure and buildings are designed for a range of health concerns, which in some cases will have different requirements.

3. RECOMMENDATIONS & CONCLUSION

The case for integrating innovation within development planning is strong – it can support important objectives, help overcome major challenges and mitigate key risks; in addition, innovation brings with it the challenge of changing the status quo – it is therefore something which needs to be considered when designing for the future to ensure the need for costly retrofit is avoided as far as possible.

The recommended route for development, including infrastructure development, to ensure innovation is effectively addressed is via the medium of an Innovation Plan, which should identify both the key relevant innovation areas to futureproof for and how to do so, as well as identify any innovations which will be integrated into the development itself in order to bring about benefit.

Planners can also make use of innovative techniques and technologies in supporting a number of areas throughout the planning process, from developing Local Plans through to assessing development proposals. It is also recommended that innovation is an area of consideration when assessing planning applications, to ensure that development is being suitably futureproofed, and using appropriate innovations to support achieving specific aims and overcoming challenges and risks. The iHUB is available to support this process, alongside the use of this framework and associated supporting materials.

APPENDICES

Appendix 1 - Policy and strategy background

Policy & strategy (Oxfordshire, County):

- **Local Transport and Connectivity Plan (LTCP)**
  The LTCP is an over-arching plan which brings together the council's vision and goals within the transport and connectivity spheres, in order to ensure its systems are fit to support population and economic growth in the county. It is comprised of a series of sections and supporting documents with more specific focuses on locales including wider areas such as Oxford and corridors such as the A40, and themes and modes of transport, such as innovation, bus, and active and healthy travel.

  LTCP is currently being created, to replace LTP4, and due to be completed by early to mid- 2022.

- **Climate Action Framework**
  The Climate Action Framework sets out Oxfordshire's over-arching aim to become a zero carbon economy. New development will need to feed into this, and in particular, the framework stipulates the needs for:
  - Zero carbon new developments with:
    - The highest fabric standards and renewables maximised on-site;
    - Renewable heat as default in new developments;
    - Accessible electric vehicles charging infrastructure for residents; and
    - Community ownership of energy

  The framework also sets out the need for:
  - Climate resilience, which will be important for new developments to take on board and design in from the outset;
  - Promotion of the circular economy to minimise waste;
  - Continuous improvement as technology and national policy evolve, creating more areas for action; and
  - Designing out existing energy inequality

- Oxfordshire Plan 2050
  The Oxfordshire Plan is currently under development, and will set out the regional approach to ensure a joined up strategy for future housing and infrastructure development. It will identify key areas for sustainable growth, whilst considering how to help tackle climate change

- Oxfordshire's Strategic Vision for Long-Term Sustainable Development
  The Oxfordshire Growth Board has developed this strategic vision, aiming to realise sustainable growth and shape healthy, resilient communities. It looks towards an Oxfordshire in 2050 which:
  - Is carbon neutral, and moving towards removing more carbon than is emitted annually
  - Has improved biodiversity and supports social, economic and ecological resilience, building capacity to adapt to change
  - Has improved physical and mental health amongst the population
  - Is a globally competitive economy – sustainable, diverse and inclusive in narture
  - Has greater equality, so all have the opportunity to prosper

- Has a rich and diverse, high quality built and historic environment
- Has energy efficient, well-designed homes that meet the needs of the population
- Has greater digital and physical connectivity in ways which enhance environmental, social and economic wellbeing
- Has flourishing, diverse and vibrant communities

In particular, for development, it sets out an expectation that development is high-quality, with a positive impact on communities, using low-impact building and construction methods and materials, and is supported by necessary infrastructure. Everything built or designed should be fit for purpose in 2050, meaning it must respond to different circumstances.

- Oxfordshire Energy Strategy

  The Oxfordshire Energy Strategy sets out a framework for Oxfordshire to foster clean growth and lead in energy innovation. In line with the Climate Action Framework, it aims to first reduce countywide emissions by 50% by 2030 (on 2008 levels), and then achieve zero carbon growth by 2050. In particular for new builds, the strategy endorses:
  - The need for modern, clean and properly planned growth, aiming to achieve the planned increase in housing and employment, whilst meeting the county's commitment to reducing carbon emissions, meaning that:
    - New housing needs to meet the highest possible energy standard
  - Seeking the benefits of the low carbon transition by supporting:
    - Ambitious and innovative clean energy projects; and
    - Projects that reduce energy demand and increase energy efficiency for buildings and transport

- Local Industrial Strategy

  Oxfordshire's Local Industrial Strategy (LIS) is the Oxfordshire Local Enterprise Partnership's (OXLEP) strategy to position the county as one of the top-three global innovation ecosystems, responding to the UK Industrial Strategy, aiming to increase growth and productivity and create more prosperous communities. It responds to the grand challenges:
  - Artificial intelligence and data
  - Ageing society
  - Clean growth
  - Future mobility

- Older People's Strategy for Oxfordshire 2019-24

  This strategy focuses on prevention that helps people live well for longer, ensuring they can remain independent for as long as possible by making sure that they have access to the support that is needed at the time it is needed. Specifically, for developers, this highlights the need to:
  - Design for easy access to services
  - Consider the safety needs of older people in site-design, to support their ability to be physically active and socially engaged with the community
    - Good lighting
    - Easily maintained paths and roads
  - Oxfordshire's population is older than the UK average, which means designing for older users is particularly important in Oxfordshire

- Providing new housing and associated environment that can adapt to changing lifestyle and needs (including phasing of housing delivery against delivery of facilities to avoid lag)
  - Inbuilt technology
  - Energy efficiency
  - Communal open spaces
  - Walk and cycle links to local shops and facilities
  - Need for additional extra care housing

- Oxfordshire Market Position Statement (for care services in Oxfordshire) 2019-22

  This statement is aimed at potential providers of extra care housing, amongst others, in response to Oxfordshire's ageing population. Specifically for developers, the market position statement:
  - Encourages development of private retirement villages (outside of the definition of extra care housing)
  - Encourages increased provision of extra care housing, making Oxfordshire a "county where older people have access to high quality, affordable Extra Care Housing that is safe, inclusive, geographically spread, well-connected and integrated with local communities and where older people can access the care and support they need to thrive."
  - Ensure that the design of extra care homes is inclusive to meet the requirements of a range of different needs (including physical disabilities, dementia and learning disabilities)

- Oxfordshire Joint Health and Wellbeing Strategy (2018-2023)

  This strategy aims to:
  - prevent ill health before it starts;
  - give patients and services users a high quality experience as they use our services;
  - work with you on re-shaping your local services and tackle our chronic workforce shortages.

  The priorities can be summarised as:
  - Agreeing a coordinated approach to prevention and "healthy place shaping".
  - Improving the resident's journey through the health and social care system (as set out in the Care Quality Commission action plan).
  - Agreeing an approach to working with the public to re-shape and transform services locality by locality.
  - Agreeing plans to tackle critical workforce shortages.

  The strategy uses an approach which covers all ages and stages of life, ensuring A Good Start in Life, enabling adults to continue Living Well, paving the way for Ageing Well.

- Oxfordshire Electric Vehicle Infrastructure Strategy

  This strategy sets out the approach for ensuring that Oxfordshire's electric vehicle infrastructure is sufficiently comprehensive, accessible and efficient to enable rapid adoption of electric vehicles. It sets out a series of policies to achieve this. In particular, for new development:
  - Planning standards and guidance to include statements and policies supportive of EV charging infrastructure
  - Minimum standards to be set for quantities of EV charging to be provided in development in planning requirements, such that developments will only be given planning permission if they provide charging facilities to the levels identified in the Oxford City Council Local Plan (2016-2036) – these are summarised in Table 1 of this document

  A Technical advice note for developers and planning officers will be produced to support deployment of EV charging, sharing knowledge and best practice.

- Oxfordshire Infrastructure Strategy (OXIS)

  OXIS was produced to provide a view of infrastructure and development needs to support jobs and housing growth in the county from 2016 to 2031 and beyond. In particular, it seeks to:
  - Prioritise delivery of strategic infrastructure
  - Maximise use of available and planned infrastructure capacity
  - Make better informed choices about future growth locations
  - Align infrastructure delivery with growth and strategic planning work across the county
  - Better position Oxfordshire in funding and investment discussions with government
  - Improve context and quality of bids for external funding
  - Inform and enhance strategic developer funding negotiations
  - Facilitate dialogue with developers, stakeholders and the community on growth impact
  - Demonstrate Oxfordshire as an attractive business investment location

  OXIS is currently being updated, to be completed Spring/Summer 2021.

- Digital Infrastructure Strategy

  This strategy aims towards ubiquitous access to future-proof digital infrastructure within the county – full fibre and 5G connectivity, with 95% of premises having full-fibre and 100% with 5G connectivity by 2033. In particular, for new developments, the strategy aims to ensure that:
  - Local Plans are aligned with the February 2019 NPPF guidance in respect of full-fibre provision in all new housing developments

- Oxfordshire Joint Municipal Waste Management Strategy

  This strategy sets out the aims to:
  - Keep household waste growth to zero (per person per annum)
  - Increase the amount of recycled household waste to 70% by 2030
  - Send less than 3% of household waste to landfill by 2020 (not met)

  The strategy follows the waste hierarchy, whereby waste should be prevented first and foremost (reduce, reuse, repair); then waste that is generated should be recycled wherever possible (or composted), and where not possible burned to recover energy, with landfill being the last choice for disposal.

  Specifically for developers, the strategy looks to:
  - Provide a planning guide for property developers to ensure adequate provision for sustainable waste management in new developments
  - Work with local authorities, OxLEP and Growth Board to embed principles of circular economy into Oxfordshire's growth agenda

Policy & strategy (District, Local)

- **Local plans:**
  Local plans are set out for all of Oxfordshire's districts. Some are currently in the process of being updated (as of mid-2021), and where this is the case links to both the adopted and information on the review are both linked below; in addition, other districts are anticipated to start work on Local Plans in the near future, including a joint local plan between South Oxfordshire and Vale of White Horse District Councils:
  - Cherwell Local Plan 2011-2031
  - Cherwell Local Plan Review 2040
  - Cherwell Local Plan 2011-2031 Partial Review
  - Oxford Local Plan 2016-2036
  - South Oxfordshire 2034
  - Vale of White Horse 2031
  - Vale of White Horse 2041
  - West Oxfordshire Local Plan 2031

  The district councils also have additional planning documents providing guidance on a number of issues such as air quality, neighbourhood-level planning, design guides and more. These can be reached from the planning sections of their websites:
  - Cherwell District Council
  - Oxford City Council
  - South Oxfordshire District Council
  - Vale of White Horse District Council
  - West Oxfordshire District Council

Guidance documents:

- Streets design guide
  This guide sets out the standards that developers should use when designing streets and place within development; it replaces the previous Residential Streets Design Guide.

- Oxfordshire Cycling design standards
  This guide sets out the standards that developers and others should use to ensure attractive and functional route design for cyclists, that will help to increase uptake of cycling including amongst demographics that usually do not cycle, making cycling the preferred mode of transport more often. It comprises a section specific to development, outlining ways to make the ideal conditions to make cycling first choice for many journeys, including outlining the need for:
  - Connected and permeable street layouts
  - General accommodation of cyclists on-street rather than via completely segregated routes, with short links just for cyclists and pedestrians to maximise permeability
  - Providing convenient and secure cycle parking
  - Ensuring good connectivity to the wider network

- Oxfordshire Walking design standards
  This guide sets out the standards that developers and others should use to ensure an attractive and functional environment for walking that is available to all users, supporting the 4 key aims for walking from the Active & Healthy Travel Strategy, to:
  - Enable and encourage walking
  - Make best value for capital investments for walking, adopting good practice standards
  - Support the county council in gaining additional funding for walking measures
  - Raise awareness of physical and mental health benefits of walking

- Travel Plan guidance
  Oxfordshire has Travel Plan (TP) guidance set out for new development in this document, outlining when and how Travel Plans of different types should be developed for new and extended sites. The Innovation Plan and TP should support each other in the relevant sections, in particular with regard to monitoring and with common aims.

- **Innovative Waste Collection guidance**
  This sets out the considerations that developers must take account of when proposing innovative waste collection and management solutions/technologies. Waste management teams at all authorities welcome early discussions with developers to ensure that any system proposed brings the environmental benefits intended.

Appendix 2 - Additional resources

Alongside the previously cited policies, strategies and guidance documents in Appendix 1, there are a number of pre-existing innovation-related resources which may be of benefit to planners and developers when considering new developments and infrastructure. These fall into a series of categories, outlined below, though some fall into multiple categories:

Information, knowledge sharing, and partnership forming resources:

- Knowledge Transfer Network (KTN): https://ktn-uk.org
- Transforming Construction Network Plus (N+): https://www.ucl.ac.uk/bartlett/construction/about-us/transforming-construction-network-plus
- Catapults: https://catapult.org.uk
- Community Action Group (CAG) network: https://cagoxfordshire.org.uk/
- Digital Twin Hub: https://digitaltwinhub.co.uk/

Real world trials and evidence:

- Living Oxford: https://www.livingoxford.org/
- Mobox: https://mobilityoxford.com/
- Eco Bicester living lab: https://bicesterlivinglab.org/
- MK:Smart: https://www.mksmart.org
- Active Building Centre: https://www.activebuildingcentre.com
- ADEPT Living Labs: https://www.adeptnet.org.uk/livelabs
- Sharing cities: http://www.sharingcities.eu/

Tools:

- Oxfordshire Mobility Model (OMM): https://mimas.services/
- Co-creation tools: https://ccn.waag.org/
- Building Energy Performance Improvement Toolkit (BEPIT): https://bepit.org

Innovation & design guides:

- Construction innovation: https://www.ice.org.uk/knowledge-and-resources/best-practice/eight-steps-towards-innovation-in-construction
- Traffic free route design: https://theodi.org/article/introducing-the-odi-data-landscape-playbook/
- Data landscape playbook: https://theodi.org/article/introducing-the-odi-data-landscape-playbook/
- Resilient transport network: http://its-uk.org.uk/wp-content/uploads/2021/06/Network-Workshop-on-ITS-and-Resilience-output-document.pdf

Innovation support services and funding:

- European Commission open innovation resources: https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-innovation-resources_en
- UK Research and Innovation (UKRI): https://www.ukri.org/
- European Commission funding opportunities: https://ec.europa.eu/info/overview-funding-programmes_en
- Construction Innovation hub: https://constructioninnovationhub.org.uk/
- Plantech – Connected Places Catapult: https://cp.catapult.org.uk/opportunity/connected-places-catapult-launches-digital-planning-system-challenge/

Roadmaps:

- UK research & development: https://www.gov.uk/government/publications/uk-research-and-development-roadmap
- Electric vehicles: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/739460/road-to-zero.pdf
- Built environment: https://www.cdbb.cam.ac.uk/fourfutures
- Built environment: https://indd.adobe.com/view/f2092c85-cd16-4186-9035-e2a63adc2bf9
- Artificial intelligence: https://www.gov.uk/government/publications/ai-roadmap
- Artificial intelligence: https://www.ukri.org/wp-content/uploads/2021/02/UKRI-120221-TransformingOurWorldWithAI.pdf
- Urban mobility: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:en:PDF
- Connected and autonomous vehicles (CAV): https://smarttransportpub.blob.core.windows.net/web/1/root/connected-places-catapult-market-forecast-for-connected-and-autonomous-vehicles.pdf
- CAV: https://zenzic.io/roadmap
- Path to net-zero: https://smarttransportpub.blob.core.windows.net/web/1/root/the-sixth-carbon-budget-the-uks-path-to-net-zero.pdf
- Energy: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf
- Real estate: http://www3.weforum.org/docs/WEF_A_Framework_for_the_Future_of_Real_Estate_2021.pdf
- Transport decarbonisation: https://www.gov.uk/government/publications/transport-decarbonisation-plan
- Future of flight: https://www.ukri.org/publications/future-flight-vision-and-roadmap/

Active and Healthy Travel Strategy (AHTS)

DRAFT – v7 (October 2021)

Local Transport and Connectivity Plan – Supporting strategy

Contact: activetravel@oxfordshire.gov.uk

OXFORDSHIRE COUNTY COUNCIL

Contents

Figures

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Summary

The Active and Healthy Travel Strategy (AHTS) sets out Oxfordshire County Council's policies and plans over the next 10 years from 2022 to 2031 to make active travel the natural first choice for its residents for short journeys.

By active and healthy travel, we mean mostly cycling and walking, but the strategy also encompasses other low carbon and low impact forms of travel. Cycling policies also include e-cycles and e-scooters and walking policies include wheeling (using wheelchairs and mobility scooters).

1. Introduction

1.1. Document status

The AHTS is a supporting strategy of Oxfordshire County Council's (OCC) Local Transport and Connectivity Plan (LTCP). The LTCP is the County Council's statutory Local Transport Plan, required under the Transport Act 2008. It outlines our long-term transport ambitions for the county and the policies required to achieve them.

The LTCP identifies walking and cycling as central to delivering the vision for travel in Oxfords. The LTCP highlights the importance of physical activity for all ages – children, adults and older adults. LTCP policy 1 sets a transport user hierarchy with walking and cycling at the top, which is supported by policy 2 to develop comprehensive walking and cycling networks in all towns. Local Cycling and Walking Plans (LCWIPs) will be the way of doing this. LTCP policy 4 states that LCWIPs will be prepared for all larger towns in Oxfordshire to achieve a step change in the use of cycling and walking. LCWIPs will be developed in line with both LTCP and AHTS guidance. This AHTS supersedes the LTP4 AHTS.

1.2. Relationship between the AHTS and the LTCP

Whilst walking and cycling lies at the centre of LTCP policies, it considers all modes and the impact of other measures such as working from home and digital connectivity. The AHTS is focused only on walking and cycling and brings together and expands on LTCP policies related to active travel. The AHTS is laid out in terms of the measures needed to realise the cycling targets and improve the walking experience. The AHTS expands on the measures needed to create successful cycle and walking networks.

However, the AHTS also considers the importance of traffic management techniques such as speed, parking management and low traffic neighbourhoods because these measures are integral to successfully promoting walking and cycling.

The AHTS sets out the basic cycling and walking design requirements, but these will be set out in more detail in the updated Oxfordshire Cycling and Oxfordshire Walking Design Standards (OCDS and OWDS).

1.3. National policy

The 2015 Cycling and Walking Investment Strategy (CWIS) sets out a requirement for Government to fund active travel and includes targets to double cycling in England by 2025. In 2020 the Government issued the policy document "Gear Change", which sets out a range of policies to promote walking and cycling, backed up by new guidance (LTN 1/20) and funding for local authorities. The Government has indicated that future active travel

funding will be based on “Local Cycling and Walking Infrastructure Plans” (LCWIPs) prepared by local authorities. A new Government body “Active Travel England” will also have powers to assess all local authority transport schemes to ensure conformity with high standards of cycling schemes set out in Gear Change and LTN 1/20.

Oxfordshire AHTS policies are in conformity with Gear Change and LTN 1/20 but designed for the particular needs of Oxfordshire cyclists and pedestrians and Oxfordshire towns and culture. The AHTS also supports CWIS cycling targets and Public Health England objectives and targets on increasing physical activity and reducing obesity and reducing health inequalities.

1.4. Why active travel is important

Increasing active travel will have a significant impact on the following Government and Council policy priorities:

- Tacking Climate Emergency
- Public health priorities including
    - Improving health and wellbeing
    - Tackling the overweight and obesity crisis
    - Reducing health inequalities
- Decongestion – reducing urban traffic congestion
- Improving air quality and reducing traffic noise
- Levelling up of travel opportunities, including
    - Children, disabled and those living in areas of deprivation

2. Vision and targets by 2031

“Oxfordshire towns and villages will be places where most residents choose active and healthy travel (walking and cycling) as the natural first choice for making most of their local journeys and many of their longer journeys in tandem with train and bus. Oxford will become a world class cycling city where cycling is celebrated and open to everybody, regardless of age, background or cycling experience”.

The active travel vision supports the LTCP vision of supporting clean growth, tackling inequality and promoting better health, well-being and inclusivity.

2.1. Cycling targets

1. Oxfordshire County Council will plan to increase the number of cycle trips in Oxfordshire from 600,000 to 1 million cycle trips per week [ref] by 2031
2. Targets and monitoring will be set for each LCWIP town and for each district in support of the County-wide target
3. Existing LCWIP targets
    - Oxford LCWIP target OC3: Baseline 300,000 cycle trips a week with a target of 450,000 cycle trips by 2031 (50% increase)
    - Bicester LCWIP target BCW1: Baseline 20,000 cycle trips a week with a target of 60,000 cycle trips by 2031 (200% increase)
4. Interim targets to be calculated, allocated and confirmed in policy
    - Rest of Cherwell from 55,000 to 100,000 cycle trips per week
    - West Oxfordshire from 50,000 to 100,000 cycle trips per week
    - VOWH: from 75,000 to 150,000 cycle trips per week
    - South Oxfordshire from 75,000 to 150,000 cycle trips per week

Target data is calculated from 2015-7 Active Lives Survey (ALS). ALS is a national survey conducted on a continuous rolling basis with data published yearly for all English authorities

Actions

- Town LCWIPs will establish local targets in line with AHTS targets and measures to monitor the targets at town level
- OCC will report on progress towards targets each year

2.2. How will we realise our vision and reach our cycling targets?

Creating a culture where active travel is the natural choice is an enormous challenge. Because the challenges but also the opportunities are greater for cycling, the AHTS first

looks at cycling. However, many of the policy recommendations apply to both cycling and walking. The reasons for this are set out below.

Cycling levels in the UK and most of Oxfordshire are very low compared to most European towns. This creates a travel gap, principally between 1 and 5 miles length, which is mostly filled by car travel but is ideal for cycling [ref]. For this reason, the AHTS focuses on increasing cycling. Only a few towns anywhere in UK or Europe have achieved a substantial increase in cycling. The AHTS is based on the evidence and experience of those few successful UK and European towns that have achieved this.

The second section looks at walking. Walking levels in Oxfordshire are already high (particularly in Oxford) compared both to UK and Europe [ref]. Most trips under 1 mile are already walked. We will build on our current success by providing better connected walking routes combined with more attractive and welcoming urban spaces and village centres. There are still many gaps in the walking environment particularly in villages. There are also low levels of physical activity among some groups in our communities. The strategy will be to generally improve the experience of walking and expand walking among specific groups and in specific areas.

2.3. Increasing walking and cycling

There is no “magic bullet” or single way of increasing cycling. An increase in cycling depends on a number of key policies and practices working together. A better analogy is completing a “jigsaw”. As each new policy and practice to promote cycling is implemented, they work together to complete the picture. A review of the evidence, in particular UK, Dutch and other European evidence, identifies five broad factors which are crucial in promoting and increasing cycling:

1. **Council commitment** at all levels to increase cycling as a policy priority
2. **An urban cycle network** which is identifiable, visible, high quality, comprehensive and town-wide, including links to surrounding villages
3. **Traffic management** measures such as traffic filters, reducing traffic speeds, reducing road capacity and increasing the cost of parking, which give comparative advantage to cycling
4. A **cultural norm** among the local population which supports and promotes cycling so that people increasingly build their lives round cycling for local journeys
5. A compact **urban realm** with easy to reach destinations on foot and by cycling

Together these factors can create a society where active travel becomes the norm. The following sections expand these 5 factors in greater detail. Factors 1 to 4 are set out under the cycling section. Factor 5 is set out under the walking section. Generally, all 5 factors also apply to walking.

3. Commitment and governance

The actions that the council take are key to whether active travel is successfully supported and cycling increased. The evidence is that where a council is serious about cycling and willing to take the bold decisions necessary to promote cycling and manage car use over a timeframe of around 10 years, an increase in cycling will result.

3.1. Mainstreaming cycling within the council

Mainstreaming cycling is shorthand for cycling being central to council policies, funding decisions, scheme design and implementation. The LTCP establishes a transport user hierarchy with walking and cycling at the top. The first challenge of mainstreaming cycling is ensuring that all management processes support the LTCP and AHTS objectives. There are many teams whose decisions have an impact on the attractiveness of cycling.

- Ensure that senior management and elected members are signed up and supportive of the AHTS objectives
- Ensure that all teams whose decisions impact in any way on the transport network are aware of and supportive of AHTS objectives
- Create internal governance processes that ensure active travel is at the centre and AHTS objectives and targets at the forefront of every decision-making opportunity throughout transport policy, programming, planning and delivery.

Teams involved include those managing school travel, planning applications, setting funding priorities and allocation of staff resources, traffic modelling and traffic management, scheme designs, junction changes and maintenance regimes.

OCC has already created the Active Travel Hub to be at the centre of mainstreaming cycling in County processes and delivery. The Active Travel Programme Board has been established to oversee the AHTS delivery.

Actions

- ATH will develop a framework to monitor and report to ATPB on progress in mainstreaming cycling.
- ATH will develop processes and guidance to ensure that all teams are aware of best practice.
- ATH will arrange visits for key Councillors and Officers to understand and experience best practice delivery first-hand
- ATH will organise or undertake training programmes for other teams

3.2. Policy documents

The AHTS is embedded within the LTCP and supports the LTCP policies which set the framework for planning travel and transport in Oxfordshire. AHTS policies will be implemented via Local Cycling and Walking Infrastructure Plans (LCWIPs). The policies of the AHTS will also need to be embedded in a wide range of other neighbourhood, local, county-wide and regional planning and policy documents. For example, these include

- The Oxfordshire Plan 2050
- Neighbourhood plans
- District local plan policies
- County policies on climate emergency, new development, maintenance, scheme prioritisation etc

Actions

- ATH will work with internal teams, other councils and external agencies to ensure that AHTS policies are embedded in all relevant policies
- ATH will set up SMART targets to ensure that AHTS actions and policies are being implemented
    - (Specific, Measurable, Achievable, Relevant and Timed)
- ATH will review, report on and update AHTS policies on a yearly basis in the light of progress and new evidence

3.3. Commitment to Active Travel (CAT) scale

The Commitment to Active Travel (CAT) scale is a five-point scale from A-E for measuring the commitment to active travel i.e. the commitment to improving and increasing active travel according to best practice. The CAT scale was first set out in the Bicester LCWIP. This chart looks at the impact on cycling (rather than walking) in particular where the challenges are greater and commitment more often lacking. Evidence shows how to increase cycling, including ways that will **not** work, ways that will work **a little** and ways that will work **much better** than others.

Different areas and towns have different levels of cycling and other local cultural factors, which can make it easier or more difficult to implement the measures needed. The CAT scale identifies the readiness of an area or town to move onto more challenging forms of cycle priority and traffic management. Scale A represents commitment to the most effective ways. At the other end of the scale, E represents no commitment to active travel.

Table 1. CAT scale summary

Level	E	D	C	B	A
Mnemonic	Exclude Erode	Do minimum	Committed Comprehensive	Brave Bold	Ambitious Aspirational
Summary	Exclude needs of cyclists as marginal and unimportant	Provide basic and often inadequate cycle paths	Committed to making cycling convenient and comprehensive	Brave decisions in managing cars to promote cycling	Ambition and aspiration to put cycling at centre of travel
% of all trips by cycle	2%	5%	10%	20%	40%

On the basis of the measures adopted in the CAT scale, different travel outcomes and mode shares can typically be expected in terms of urban travel as set out in the diagram below. Note bus use is included in the walking share.

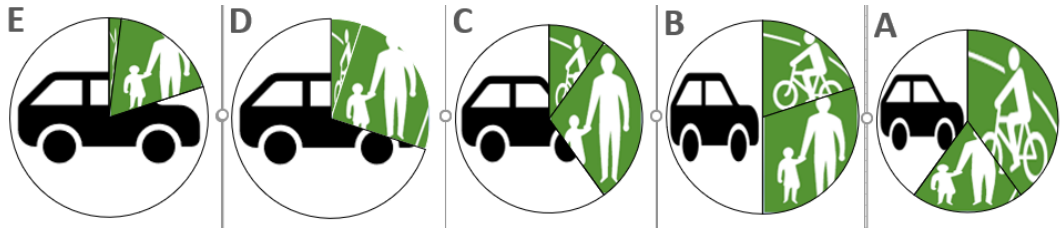

Figure 1. Typical modal share of local trips (people trips rather than vehicle trips)

As the consequence of following each CAT scale (Car % includes car passengers, taxi and motorcycle; Cycle % include e-cycles and potentially e-scooters; Walking % includes bus trips).

Policies

- Active Travel proposals, schemes and designs will be evaluated against the commitment to active travel (CAT) scale.
- As cycling levels increase locally over the AHTS period, it will be expected that schemes will become more ambitious on the CAT scale. Active Travel proposals in a town should align the LCWIP cycling and walking targets for the town with the expected CAT travel outcome.

4. Cycle network

4.1. Meeting cyclists needs

Creating a cycling culture means creating an urban environment which supports and encourages cycling. There are many and often contradictory views of what constitutes an attractive environment for cycling. To better understand what actual cyclists want, OCC conducted a survey of cyclists in Oxfordshire in 2019 (OCS19). Over 3750 cyclists made comments on the existing infrastructure and said what kind of infrastructure they liked, didn't mind, tolerated or avoided.

OCS19 responses indicated that there were two cohorts of cyclists [DATA] in terms of their infrastructure preferences. Group 1 (Confident or "Quick" Cyclists) prioritised directness and didn't mind cycling alongside motor traffic. Group 2 (Cautious or "Quiet" Cyclists) preferred routes segregated and separated from motor traffic as far as possible even at the expense of some loss of directness. There are also two other distinct groups of cyclists – Competitive Cyclist and Child Cyclists. Currently, there is very little research on the infrastructure preferences of these 2 groups, but we expect that Competitive Cyclists fall into group 1 and Child Cyclists fall into group 2.

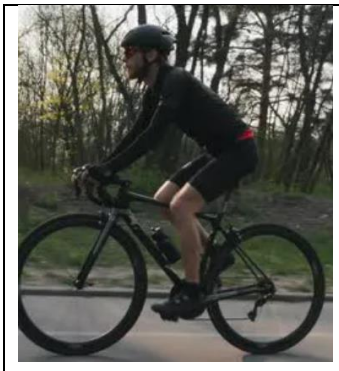			
Competitive	Confident	Cautious	Child

Figure 2. Cyclists differ in their infrastructure preferences

4.2. Design standards

Using OCS19 responses, backed up by evidence from international surveys of around 15,000 cyclists [ref], OCC developed the Oxfordshire Cycle Route Assessment Matrix

(OxCRAM) to measure the attractiveness of existing and new cycling infrastructure [ref] according to the preferences of confident and cautious cyclists.

In 2020, the Government issued LTN 1/20 Cycle Design Standards to guide local government infrastructure. LTN 1/20 sets out high quality and mandatory standards how to provide for cycling. However, its guidance is very much designed for wide roads and areas with low levels of cycling as its main focus. It is unhelpful in guiding what the best solutions are when there is insufficient space and the need is to provide for high cycle numbers, sometimes in their thousands as in Oxford. For instance, it is impossible to provide the LTN 1/20 standards along most of Oxford's main roads because the highway widths are insufficient. Inevitably compromises need to be made. LTN 1/20 also does not include more innovative designs suitable for high cycling areas, such as cycle streets and turbo-roundabouts.

Actions

- ATH will develop updated Oxfordshire Cycle Design Standards (OCDS) to meet the needs of Oxfordshire cyclists in line with LTN 1/20 and OxCRAM. The OCDS will embed LTN 1/20 guidance into local guidance suitable for Oxfordshire. OCDS will be the way LTN 1/20 standards are implemented.

Policies

- All new active travel schemes (including any schemes with an active travel element) will be designed according to the updated Oxfordshire Cycle Design Standards (OCDS) and Healthy Streets standards. The OCDS will take into account the needs of confident and cautious cyclists and ensure accessibility for pedestrians including addressing the needs of older people, parents with young children, and people with a disability.
- Where OCDS standards cannot be met, teams will submit a Departure from Cycle Standards (DCS) form and consult with ATH for a viable solution in line with all the 5 core cycle design principles (as below).

4.3. Core Cycle Design Principles (CCDPs)

The Dutch formulated five core cycle design principles (CCDPs). CCDPs underpin LTN 1/20 guidance and the updated OCDS. All 5 CCDPs are important in designing a cycle network and cycle routes. The quality of most cycle routes in the past has been poor, in large part due to a failure to incorporate all 5 principles. The AHTS requires that cycle routes are delivered to a high quality. As an analogy, for those used to planning for car traffic rather than cycling, high quality urban and inter-urban cycle routes should be delivered to the same quality as trunk roads for cars, with excellent sightlines, superb surfaces and minimal stops or delay.

The 5 CCDPs are set out below. These capture the experience of cycling. Designers need to be cyclists (LTN 1/20 requirement) and experience cycle routes both as confident and cautious cyclists to ensure that they fully understand the dynamic of cycling.

- **Coherent**: Cycle routes should work from end to end including somewhere to park your bike at both ends, be easy to follow, consistent in quality and continuous (without any breaks) and form part of a comprehensive cycle network

- **Direct**: Cycle routes should have minimal and ideally no diversion, detours, deterrents or delays and no dismount signs. The cyclist will be able to travel at their chosen design speed without having to stop or slow down, with good sightlines and sufficient width to overtake other cyclists, bypass queues of cars and not be delayed by pedestrians.

- **Safe**: This principle includes all the elements which make cycle routes safe. Slow traffic speeds, superb surfaces and safe junctions are the 3 main elements. In urban areas, sharing low traffic streets (LTNs and cycle streets) is one main measure. Separation (cycle lanes) and Segregation (cycle tracks) becomes important when traffic volumes are high and speeds are 20-30mph (on-road lanes) or over 30mph (off-road tracks). Perception of safety is covered in comfort.

- **Comfort**: This principle means that the cycling experience is easy and pleasant. It includes feelings of personal security, sociability (able to ride 2 abreast), perceptions of safety, minimising stress and psychological discomfort such as from traffic noise, air pollution, driver intimidation and complex junctions or routes. Signing is also a factor to remove the discomfort of getting lost.

- **Attractive (Advantage)**: This principle is the most important of all. It means that you want to do it, are attracted to cycle more than using other modes – it is your first choice and should be easier, quicker and more pleasant than for instance using a car. The word advantage better sums up the principle.

Actions

- ATH will develop a checklist of criteria in line with the 5 core cycle design principles as part of the OCDS for designers to evaluate their schemes, forming part of a Health Impact Assessment Tool for infrastructure improvements. This will be based on the LTN 1/20 cycling level of service and Junction Assessment Tools.

Policies

- 5 CCDPs will be used, together with a Health Impact Assessment of proposed network improvements, to evaluate schemes as a way of understanding the totality of the cycling experience in designing new and reviewing existing infrastructure.

4.4. Urban cycle networks

Single cycle routes rarely have much impact on cycling levels. The evidence is mostly that one single route attracts cyclists from other less attractive routes, but does not increase cycling levels. What is necessary is a high quality and dense cycle network which links to every neighbourhood. This means that all trip attractors (particularly town centres, major employment, healthcare facilities, shops and schools) are connected and linked to the cycle network. Another failure is that cycle designs are based on current flows on the underlying assumption that cycling levels will not increase, rather than target flows. Local cycling and walking infrastructure plans (LCWIPs) will be the way that this network is identified and prioritised. LCWIPs will identify the strategic town-wide cycle network.

Policies

- OCC will develop LCWIPs for all main urban settlements (over 10,000 inhabitants) by 2025
- All routes should be designed to the cycle design standards of the LCWIP target flows, not the current cycle flows.

4.5. Prioritising cycle infrastructure (OxCRAM)

Network prioritisation is crucial to achieving cycling targets. There is an on-going debate whether it is better to build sections of routes to a very high quality or build a wider network to a lower ‘good enough’ standard. OxCRAM provides a way of assessing whether improvements are good enough (7+) and a way of comparing value for money of the two approaches.

To meet targets in LCWIP towns, it is essential that the whole cycle network and individual cycle routes over their entire length are improved in as short a time as possible. Many cycle schemes take years to deliver short sections of a route at great cost because of the costs of traffic management and utilities in moving kerblines. Signing and lining can often provide significant improvements. By improving routes to a similar “good enough” consistent standard, a complete cycle network can be implemented in a shorter timescale and lower cost.

Policies

- OCC will plan networks and design routes that will maximise the attractiveness to both confident and cautious cyclists according to OCDS and OxCRAM
- OCC will use OxCRAM as an audit and review process for new and existing infrastructure.
- For major schemes an independent expert reviewer will be employed to review plans at the early design stage.
- Cycle routes will be improved to a consistent OxCRAM standard over their whole length (in line with the preferences of confident or cautious cyclists)

- Generally, where there is competition for funding, network improvements will be prioritised over individual route improvements.

4.6. Dual choice network

OxCRAM level 7 is the level at which cycle routes become acceptable and attractive. In many cases, it may not be possible to design for both cautious and confident cyclists along the same route at OxCRAM 7+. In such cases, it is recommended that a dual choice network is implemented. A dual choice network consists of two types of strategic cycle routes.

- Quickways are routes along main roads, which also serve essential motor traffic such as deliveries and bus services, designed to the standards and preferences of confident cyclists
- Quietways are routes along quiet residential streets or along cycle paths which meet the needs of cautious cyclists

Most cycle journeys are made by confident cyclists. High cycling levels are the most visible outcome of a cycling culture and are essential for creating a cycling culture which leads to more people cycling and greater safety. Encouraging confident cyclist journeys is key to increasing cycling levels [ref].

Policies

- Where it is impossible to design adequately for both confident and cautious cyclists, a dual choice network should be introduced allowing cyclists to choose the type of route they want to cycle on.
- There is a strong correlation between confident cycling and frequent cycling. It is essential that the needs of confident cyclists are therefore adequately met in support of LCWIP cycling targets.

4.7. Cycle Streets

A key element of a town wide cycle network are cycle streets. Cycle streets are part of the strategic cycle network along low-traffic residential roads designed for cautious cyclists. They are also be likely to be attractive to confident cyclists. These streets are designed to have the feel of cycle paths where cyclists of all abilities feel confident and happy to cycle. Low traffic speeds and low traffic volumes (typically under 1000 motor vehicles a day) are key elements.

In many towns, in part because of satnav, suitable residential streets may also be used by car and van drivers looking for a quicker alternative to the main roads. In such cases, it is necessary to introduce modal filters to prevent through motor traffic to prioritise cycling.

Additional benefits can be created by introducing modal filters as part of low traffic neighbourhoods (see section 3).

Policies

- OCC will introduce cycle streets as part town-wide cycle networks to provide high quality continuous cycle routes for cautious cyclists (Quietways)
- OCC will use modal filters and other design features to make cycle streets meet CCDPs and 7+ OxCRAM design criteria.

4.8. The importance of providing for existing cyclists

There is a prevalent but mistaken belief that existing cyclists are unimportant and can be ignored and that all efforts should be applied to new cyclists along with a view that new cyclists will inevitably be cautious. Evidence shows that there are several fundamental errors in this approach which could undermine achieving AHTS targets.

Nearly all cycle journeys are made by frequent and therefore mostly confident cyclists. National data [ref] shows that around 8% of the population who cycle 3+ times a week make 80% of all cycle journeys. If you also include the 7% of population who cycle weekly, normal cyclists (15% of the population) make 95% cycle trips, whereas 20% of the population who are infrequent (less than weekly) cyclists make only 5% of all cycle journeys.

Increasing cycling depends on more people taking up frequent cycling (3+ times a week). In Oxford, frequent cyclists make up 20% of the adult population and in Cambridge 35% of the population. This reliance on frequent cyclists in high cycling towns is found across Europe. Towns and countries with more cycle journeys have higher percentages of frequent cyclists, but often quite similar levels of infrequent cyclists.

There is also considerable churn where every year some people start cycling or cycle more and others stop cycling or cycle less [ref]. Reducing losses to cycling by improving the cycling experience for existing cyclists is likely to be as important or more important than getting new cyclists.

The increase in frequent cycling relies mostly on existing cyclists cycling more. In other words, it is easier to persuade existing weekly cyclists to cycle 3+ times a week than a non-cyclist to take up cycling [ref].

New cyclists generally have similar views to existing cyclists in terms of infrastructure choice. OCS19 found that new cyclists typically only differed in underlying categories, such as attitude, gender, age or frequency cycling rather than how recently they took up cycling. The evidence indicates as they become more regular cyclists, they take on the infrastructure choice of confident cyclists.

Cyclists also differed between Oxford and outside Oxford. Oxford cyclists by each category (such as age) were more likely to be confident cyclists than cyclists of the same

category from outside Oxford [ref], suggesting that the prevailing cycle culture has an even more important impact than personal characteristics. That means a new cyclist in high cycling culture is more likely to be a confident cyclist from the start.

Policies

- OCC will prioritise and concentrate on measures that increase the number of frequent cyclists in the short term, as a way of increasing cycling and thereby creating a visible cycling culture

4.9. People versus journeys

There is a short-term conflict between two policy objectives of public health and cycling targets on who to prioritise. On the one hand, public health priority is to encourage more people, who currently take no exercise and do not cycle, to take up cycling because of the greater health benefits compared to existing cyclists who are already mostly healthy. On the other hand, cycle research shows that increasing cycling trips is mostly dependent on persuading existing cyclists to cycle more.

Getting harder to reach groups such as children and older cyclists is dependent on living in a cycling culture [ref] and requires specific interventions to address the barriers they may experience to cycling. Good quality routes alone are unlikely to have much impact without an established cycling culture [ref], as people's choices, or parents' willingness to let children cycle, are more dependent on living in a cycling culture rather than the existence of a good cycle route (though a good cycle route is also necessary). Together with cycle route improvements, cycling activation measures are important in enabling residents who feel that cycling is not an option for them due to cost, cultural or confidence barriers to change behaviour. Activation measures focus on working with local community groups to engage residents who may experience greater barriers to enjoying a healthy lifestyle, due to a range of social factors that mean that they experience greater health inequality.

Policies

- Oxfordshire County Council will ensure that improvements to cycling and walking networks and access to green infrastructure are supported by community activation measures that enable the whole community and particularly those with greatest need to benefit from these improvements and to become more active and for healthy day-to-day behaviours to become the norm.

4.10. Stakeholders

Cycle and walking campaign groups along with other environmental groups are key partners in developing new cycle routes and promoting active travel. These include local groups, such as Cyclox and OxPA, county-wide groups and umbrella groups such as

Oxfordshire Cycling Network and COHSAT, along with national groups such as Cycle UK (formerly CTC) and Sustrans. These groups can help to identify new routes, suggest improvements, critique designs and publicise surveys and new routes. A good working relationship with local stakeholders brings many benefits to both sides.

The Council has signed up to co-production in developing new schemes. Co-production should be an equal exchange of ideas to understand different priorities and problems. When seeking to identify design solutions, plans should be shared at an early stage. At times there are likely to be differences of opinion between different stakeholders or designers. Designers have the responsibility of ensuring that the final designs accord with Oxfordshire Design Standards and core cycle design principles.

Policies

- OCC will work closely with and seek the views of stakeholders when developing and improving the active travel network in line with AHTS
- OCC will work closely with stakeholders using co-production methods to develop and improve cycle and walking designs of new infrastructure.

4.11. Strategic Active Travel Network (SATN)

Oxfordshire is a rural county with many villages. These settlements are currently mainly dependent on car travel to get to facilities such as shopping, nearby town centres and access to work or train stations. Unlike many intra-urban journeys, distances can sometimes be at the longer end of what may be comfortably cycled. The increasing availability of e-bikes makes such journeys more practical and appealing to a wider audience.

The intention is to identify and then improve an Oxfordshire-wide strategic active travel network (SATN). This will primarily be for utility cycle journeys, linking villages to towns, other centres of employment and public transport connections. The SATN will also act as a recreational network, providing urban and rural residents with ways of going for cycle rides to visit nature and other areas of recreation. This will also support the rural economy by encouraging economic tourism.

Policies

- OCC will develop an Oxfordshire-wide strategic active travel network (SATN). The SATN will be designed as far as possible to link all villages to urban areas and areas of employment by high quality and attractive cycle routes designed in conformity with Oxfordshire Cycle Design Standards and in line with core cycle design principles.

The SATN improvements will be prioritised in the following ways:

- Links to rural train stations, particularly from towns not served by a train station, such as Witney and Abingdon
- Links to urban areas and employment from nearby villages identified in LCWIPs
- Links to larger settlements where there are more potential cyclists
- In support of National Cycle Network routes

The SATN will consist of the following types of routes:

- Routes alongside rural main roads by off-road cycle tracks
- Routes (mostly on road) along rural minor roads made attractive by low traffic volumes and low traffic speeds
- Routes along upgraded public rights of way and other permissive paths (also known as Greenways)

Implementing the SATN will require significant funding and resources (such as land acquisition). Routes along rural minor roads in most cases will need significant improvement to make them attractive to cyclists. This may include modal filtering or junction changes to remove unsuitable rat running traffic, lower speed limits, speed enforcement, traffic calming measures, lighting, converting roads into Quiet Lanes and other measures. Schemes will be designed to be sensitive to the rural and village environment.

5. Managing car use

The main competitor for cycling over the distance between 1 mile and 5 miles is car use. Nearly 60% of car journeys are under 5 miles. To promote cycling it is essential that cycling is given a realistic competitive advantage over car use. Car use has many negative externalities which are not factored in by a car user and thereby car use is encouraged in an un-economic way for shorter journeys. AHTS policy is for a fairer distribution of benefits, so that cycling replaces the car as the usual way of linking residents to urban facilities – such as shopping, visiting town centres, seeing friends and such like.

There are strong and compelling reasons why it is necessary that individuals must change travel behaviour, but on the positive side, the evidence is also that such changes will ultimately and increasingly be beneficial to everyone.

Managing car use is the main challenge in promoting cycling. Its impact is often more important than providing cycle routes. In many ways this needs a fundamental cultural shift among providers and the population.

5.1. Traffic management measures by CAT scale

Traffic management is essential and crucial to promote cycling beyond a certain level. A major barrier however is the acceptability of more effective forms of traffic management. The chart below gives an idea of different traffic management schemes at different CAT scales.

Table 2. Traffic management measures by CAT scale

CAT level	A	B	C	D	E
Traffic models base on:	Multi-modal models and traffic reduction	Peak traffic flows no longer priority	Meeting only existing peak traffic flows	Meeting Increase in car use in forecasts	Meeting high future forecasts in car use
Residential areas	Car free neighbourhoods	LTNs	CPZs	No car parking restrictions	Build urban freeways
Town Centre Car parking	Minimal car parking only for disabled and deliveries	Reductions in parking and high car parking charges	Car parking charges discourage excessive car use	Car parking with minimal charges	Central and free car parks with plentiful capacity

Main road network	Main roads closed to most traffic Average speed cameras	20 mph limits Junctions and vehicle lanes narrowed	Junction changes to cater for cycling	Junction changes to meet peak traffic	Junction widening New roads
Town circulation	Town centre traffic filters	Restrictions on some main routes to give cycling advantage	Minor road filters for benefit of cycling	Main road traffic capacity maximised	Expansion of ring roads
Signalised Junctions	Signalised junctions replaced by cycle friendly junctions	ASLs and lead in lanes and removing vehicle lane	ASLs at all signals	ASLs at a few junctions	Multi-lane signals with no cycle provision
Roundabouts	Shared space schemes with minimal traffic	Dutch single lane and turbo-roundabouts	Narrowing roundabout entries	Off road cycle track	Multi-lane entries

Policies

- OCC will pursue traffic management schemes in accordance with proposed LCWIP targets and mode shift targets as shown by the CAT scale
- OCC will assess the negative and positive impact on cycling and walking in any traffic scheme or proposal to ensure that they support the active travel targets.
- OCC in tandem with District Councils will seek powers to implement traffic management measures in support of active travel targets, such as decriminalised parking powers and moving traffic offences powers.

5.2. Low Traffic Neighbourhoods (LTNs) and modal filters

Low Traffic Neighbourhoods (LTNs) are a key element in developing most town-wide cycle networks. Whilst the name is new, the concept of creating low traffic areas is well established in town planning, including Radburn design principles, cul-de-sacs and pedestrian precincts as advocated in 1960s publication “Traffic in Towns”. There are many existing LTNs throughout Oxfordshire towns, some by original design, some introduced to prevent rat-runs and some by geographical accident. The urgency to protect other residential areas from through traffic has been exacerbated by a doubling in traffic since the 1980s and satnav technology which directs drivers along residential streets as a way of avoiding traffic on main roads.

Where LTNs also differ from many existing low traffic areas is the intention to alter the balance between motor traffic convenience and active travel convenience. Modal filters give advantage (CCDP 5) to cycling over car use by making cycle journeys more direct and quicker and car travel longer and more inconvenient. LTNs also work effectively in developing Quietways and cycle streets as part of a dual choice cycle network. The benefits of LTNs in terms of promoting active travel, reducing car use and improving safety, air quality and urban liveability are now well established in the research literature.

Policies

- In developing LCWIP cycle networks, OCC will identify where LTNs can be created or improved to provide safe areas for local cycling and walking to promote strategic Quietway cycle routes.

5.3. Traffic speed

Traffic speed reduction and enforcement is essential to promote cycling. A major Government-funded research found that reducing traffic speed is the single most important element of improving cycling safety and encouraging more cycling (TRL Report PPR 580).

“Of all interventions to increase cycle safety, the greatest benefits come from reducing motor vehicle speeds. Interventions that achieve this are also likely to result in casualty reductions for all classes of road user. This may be achieved by a variety of methods, including physical traffic calming; urban design that changes the appearance and pedestrian use of a street; and, possibly, the wider use of 20 mph speed limits”.

At 20mph speeds, there are very few serious cyclist injuries and virtually no cyclist deaths except those related to lorry turning movements. In rural areas and along rural roads, traffic speed is the main deterrent for more cyclists and the main reason for the higher rate of cyclist injuries in rural cycling.

Traffic speeds are related to speed limits, traffic calming measures and enforcement. Oxfordshire research showed that traffic calming schemes reduced casualties by 50% on average. Average Speed Cameras (ASCs) are a new form of enforcement where traffic speed is measured between 2 or more points over a route. Unlike the traditional spot camera enforcement, they are almost 100% effective in monitoring and therefore enforcing speed limits.

Policies

- OCC will introduce 20 mph speed limits in all urban areas in Oxfordshire both in residential areas and along main roads as a way of promoting cycling.
- OCC will assess and reduce and enforce speeds in villages in response to local demands in support of cycling and walking.

- OCC will assess and reduce traffic speeds along rural lanes and roads as a way of encouraging more cycling and as part of the Strategic Active Travel Network proposals.
- OCC will introduce traffic calming or Average Speed Cameras (ASCs) in urban areas, villages and along the SATN to enforce speed limits.

5.4. Parking policies

The other key policy is parking. The availability of free or low-cost parking at destinations is a major factor in generating car journeys. Reducing and restricting car parking availability and introducing parking charges are essential measures to induce behaviour change.

Policies

As part of developing LCWIPs and in LTCP area strategies, the following measures will be assessed:

- Introduce parking charges in Council-managed town centre car parks
- Introduce parking costs for businesses such as through a workplace levy charge
- Introduce on-street restrictions and control such as double and single yellow lines via decriminalised parking enforcement (DPE) powers
- Control on street parking in neighbourhoods via Controlled Parking Zones (CPZs)

5.5. Cycle parking policy

Good quality sufficient and secure cycle parking should be provided at both home locations and destinations. Districts should set out detailed cycle parking policies for new developments in line with best practice for both new dwellings and workplaces. Likewise there is a need to introduce secure parking in existing housing and existing cycling destinations such as shops, workplaces and leisure facilities.

Actions

As part of the Oxfordshire Cycle Design Standards, the Council will develop cycle parking standards and guidelines as a guide for District Councils and planning.

Policies

- OCC will work with district authorities to introduce best practice cycle parking policies
- OCC will work with businesses, train operating companies, shops and leisure facilities to provide high quality cycle parking

- OCC will ensure that it provides high quality cycle parking at all its own premises such as libraries

5.6. Why traffic management is necessary

Traffic management is key to increasing active travel and cycling in particular. The alternatives of not managing and constraining traffic are many and can be summarised as:

- Increasing costs for individuals in loss of fitness and ill-health and for society in treating ill-health and premature death
- Worsening of obesity crisis leading to long term illnesses with additional cost burdens on the NHS
- Continuation of high traffic casualty rate with many unnecessary serious accidents and occasional fatalities
- Worsening of traffic congestion in both urban areas and on strategic inter-urban roads leading to individual frustration and a loss of income with economic disbenefits such as higher commodity prices
- Continuing issues of traffic noise and poor air quality leading to ill health, particularly affecting children and the elderly
- Worsening of climate emergency and failure to meet targets to reduce carbon emissions
- All of these harms falling disproportionately on those who are the most deprived in society, exacerbating inequality.

6. Cycling culture

The barriers to more cycling are mostly “normative” i.e. they represent an individuals’ ideas of whether cycling is an acceptable mode of travel for themselves in terms of the prevailing culture. Social norms are mainly formed by what other people do. This helps to explain why “critical mass” of cyclists is effective in sustaining and increasing cycling. An examination of historical trends in cycling across UK towns between census results and European countries found that the strongest correlation was between cycling levels in previous and recent surveys even over 20 year periods. In low cycling areas there is a “chicken and egg” dilemma with very few cyclists and therefore no visible cycling culture, which helps explain why it is such a challenge to increase cycling.

Social norms or normative beliefs represent what a person’s prevailing culture says is or is not acceptable. Surveys have shown that cycling still has a very low status among many sections of the population, though this has improved over the last 10 years. One negative connotation of cycling for many non-cyclists is that it is inherently dangerous, effortful and unpleasant.

An extension of this idea emanating from TRL research is that cyclists are an “out” group and car users an “in” group. This has been the prevailing culture for the last 50 years and is still reflected in a lot of media stories and complaints against cyclist behaviour.

6.1. Triggers

Most travel choices are of a habitual nature. In terms of changing behaviour, it is useful to identify barriers (real and cultural), benefits and triggers. Triggers are important in that travel is habitual and they can overturn the habit.

Triggers are events that make people consider changing travel behaviour. Triggers that have been associated with a change to cycling are London Congestion Charging, increasing parking charges at train stations, petrol price hikes in 2008 and most recently the Covid 19 lockdowns which saw a 46% increase in cycling in one year. In Ghent, the introduction of traffic filters throughout the town to make it like an LTN led to an increase in cycling from 22% to 35% of all trips over a few years. It is expected that Connecting Oxford proposals might have similar effects.

On an individual level, changes in house, job, school, life stages, loss of car or health warnings can trigger changes, but triggers can also work both ways, so for instance acquiring a driving licence or buying a car is highly likely to lead to less cycling.

Policies

- Oxfordshire County Council will support transformative changes to the highway environment to kickstart levels of cycling and walking.

Active Travel Activation

Active travel activation (ATA) will be a key element of building confidence in encouraging people to take up cycling. ATA takes many shapes and forms. These include:

- Cycle network maps – both paper and electronic
- Wayfinding routes – to promote active travel in local neighbourhoods
- Web pages to advertise and publicise new routes and other information
- Electronic rides illustrating routes e.g. on YouTube, where cyclists can experience routes before trying out in reality
- Social media websites
- Competitions with rewards to incentivise new and existing cyclists
- Buddying up where confident cyclists take new cyclists for rides together
- Support and fun groups focused on cycle rides together
- Bike libraries offering the loan of free cycles and helmets
- Free Dr Bike sessions to help low-income cyclists to maintain their bicycle

Policies

- OCC will continue to develop its ATA programme to support the AHTS targets to increase walking and cycling in line with best practice
- OCC will ensure that local cycling and walking activation plans are developed in conjunction with the development of LCWIPs so that the impact of network improvements is maximised

6.2. Children and schools

A child cyclist is more likely to become an adult cyclist. Providing opportunities for children to learn to cycle and then to be able to cycle comfortably with parents and afterwards to gain independence by cycling alone to visit friends, go to school or visit places is a fundamental element of a civilised transport system.

The number of children cycling is a good indicator of the cycle friendliness of an urban area and evidence of a cycling culture. Higher levels of cycling are most associated with higher levels of everyone cycling where there is a cycling culture. For instance, Cambridge has the highest levels of children cycling of any local authority.

Over the last 50 years, children's right to travel independently in UK has been eroded, mostly through increased motorisation and parental restrictions [ref]. The UK has some of the lowest levels of children cycling throughout Europe. For instance, 50% of children's trips to education in Netherlands are by cycle compared to around 2% in the UK [ref]. Another study (Bly 2005) found that children on average cycled 18 minutes a day in Netherlands compared to 2 minutes a day in the UK. 41% of children in Oxfordshire currently do not meet physical activity guidelines.

However, around 90% of children own a cycle [ref] and many children use their cycles at least weekly. This represents a significant potential to increase cycling among children. Cherwell School in Oxford represents best practice in Oxford with 58% of children regularly cycling to school.

Policies

- OCC will encourage active travel to schools by
    - Encouraging schools to provide adequate cycle parking
    - Reviewing and improving cycle routes to school
    - Implementing LTNs and School Streets around schools wherever feasible
    - Providing Bikeability opportunities for all children
    - Providing Footsteps training to increase understanding of road safety in young children
- OCC in partnership with district authorities will seek to ensure there are safe places for young children to learn to cycle by
    - Providing paths in parks for young children to cycle
    - Creating slow and low traffic streets in residential areas such as through LTNs

6.3. Safety perceptions and reality

There is a common popular perception that cycling is ‘dangerous’, which many surveys have shown to be one of the main reasons people give as to why they do not cycle. Furthermore, this perception of being at risk is reinforced by the actual road environment for cyclists. Research (Sissons Joshi and Aldred) found that cyclists experienced by far the highest number of “incidents or near misses” per mile travelled for any vehicle. These perceptions and experiences undermine a cycling culture.

Perceptions of safety however need to be distinguished from actual safety impacts. For Oxford, there were between 2014 and 2019 around 150 reported slight cyclist injuries and 30 serious injuries each year. Cyclist casualties are very rare events compared to the very large number of cycle trips (around 100 million cycle trips in Oxford a year). This indicates that the serious reported casualty risk for each cycle trip is 1 in a million. Put another way, a commuter cyclist would need to cycle for around 2000 years before they were likely to have a reported serious cycle accident. In other words, most people, especially non-cyclists, have a distorted idea of the risk of cycling. This is also shown in surveys comparing cyclists and non-cyclists [ref] which show that regular cyclists have a lower perception of road danger than non-cyclists.

6.4. Health benefits of cycling compared to risk

The health benefits of cycling far outweigh any casualty risk by a factor of at least 20 to 1. It has been calculated that on average every 20-minute cycle journey a day will be

recovered in extra life. Cycling reduces the risk of heart attack by around 50%, reduces certain cancer risks by about a third, improves fitness, reduces depression and mental health problems, reduces the risk of dementia and improves muscle strength and co-ordination and helps prevent weight gain and obesity.

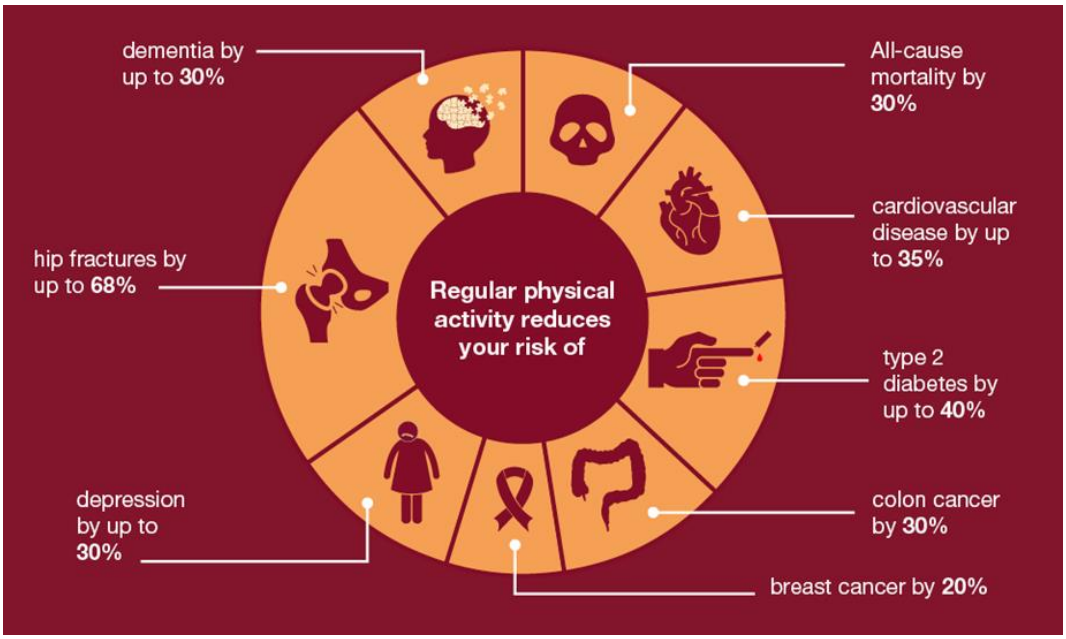

Figure 3. Health benefits of physical activity

Source: Public Health England (2019).

Cycling lies in the optimum range of physical activity [ref] and travelling is an activity that around 90% of people do for substantial length of time each day giving many people an easy way to build physical activity into their daily routine [ref]. Surveys also show that cycling is pursued over lifetimes (unlike most sports). In Netherlands, 24% of all journeys by over 75-year-olds are by cycle. Surveys show that most cyclists were sufficiently active to maintain good health [ref]. In brief, cycling prolongs a healthy life. The highest risks are not cycling but sitting for much of the day without taking any regular physical activity.

Policies

- OCC will promote the significant benefits of everyday cycling and walking to health and wellbeing, with a particular focus on encouraging inactive people to take up cycling and walking.

6.5. Assessing the real risks of cycling

Police data miss two aspects of cyclist safety. First, the Police only collect data on public highways. Cycle tracks are excluded. Secondly, they depend on the casualty being

reported so have a bias towards serious collisions involving motorised vehicles and cyclists.

The OxCam survey of cyclists in both Oxford and Cambridge found that around 33% of cyclists had had an accident (coming off your cycle whether or not there is any injury) in the last year. Scaling up responses suggests 17,000 cyclists of the 50,000 Oxford cyclists are likely to come off their bike each year, most of which would not result in any injury, 4000 would result in a slight injury and 800 in a serious injury. This suggests that a cyclist might have a serious cycling injury every 60 years of cycling, though this figure may be skewed on the high side because many respondents were younger and more likely to have cycle accidents.

The OxCam survey indicates that the majority of cyclist accidents are due to skidding [ref] because of surface problems or cyclists losing control. In contrast, Police STATS 19 data indicates that most (74%) cyclist casualties are in collision with a car. In the STATS 19, cyclists were only responsible in 11% of cyclist accidents, compared to 85% where the other vehicle driver was responsible, showing that measures to manage car traffic are likely to be most effective in reducing cyclist casualties.

Policies

- OCC will produce an annual report and analysis of cyclist and pedestrian casualties to monitor the trend in STATS 19 casualty data
- OCC will analyse the safety impacts of new and different infrastructure particularly innovative infrastructure to assess the safety impacts
- OCC will undertake measures to reduce all cyclist and pedestrian casualties, including those not reported to the Police.

6.6. Maintenance

Good quality surfaces are essential for safe and comfortable cycling. Road maintenance is an important element in ensuring that road or path surfaces on the cycle network are smooth, well drained and attractive to cycling. In addition, regular pruning of vegetation overlooking cycle paths is important to create a safe and welcoming environment for cyclists.

Road improvements, especially routine resurfacing, also present a low-cost opportunity to make significant improvements to cycle routes, particularly those which are reliant on just line-marking and especially on main roads where traffic management is a substantial element of scheme cost. Longer term road closures, such as bridge closures due to weight restrictions, will be seen as opportunities to exempt active travel and thereby encourage active travel.

Policies

- OCC will set up a maintenance regime to ensure that the cycle route surfaces are smooth, well-drained and safe, which takes into account the extra vulnerability of cyclists to potholes and rough and deformed surfaces. This will include following up re-instatement works which often deteriorate into surface un-evenness and hazards. A maintenance programme of cutting back vegetation overlooking cycle paths will also be established, working with local communities to identify problem areas.
- OCC will prioritise maintenance of cycle routes to ensure high quality surfacing to minimise accident risk. Smooth machine-laid tarmac should be the default. .
- OCC will liaise internally and with cycling stakeholders to make sure that future maintenance schemes likely to affect cycling and particularly those on LCWIP cycle and walking networks are adequately assessed to identify potential added value improvements.
- Where there are road closures or restrictions, every opportunity will be taken to see whether active travel can be exempted and thereby encouraged.

6.7. Disability, different types of cycles and barriers

Recognition of the use of cycles as a “mobility aid” is not yet widespread. This leads to the needs of disabled people using cycles not being recognised and not being catered for in changes to the urban environment (either through planning or highway changes). Around 10 million people have a limiting impairment in England and Wales (ONS).

A 2011 London survey (Attitudes to cycling) found that 62% of disabled people said they could ride a bike. A survey by Wheels for Wellbeing (Experiences of disabled cyclists) found that most disabled cyclists (52%) owned a normal standard bike, whilst 17% owned a hand cycle, 17% a recumbent bike, 13% a trike, 8% a tandem and 18% an e-bike.

Active Lives Survey shows that 7% of the adult population with a limiting impairment in England used a cycle at least monthly and 1% at least 5 times a week. In Cambridge, figures were much higher with around 40% of disabled cyclists simply using a regular two-wheeled bike. This implies that the major barrier to more disabled people cycling is not their disability, but the town cycling culture and level of cycle-friendliness of the infrastructure.

Policies

- OCC will design all new and review all cycle routes to be accessible to most types of cycles. In particular, all barriers on cycle routes should leave a clear 1.5 m width between bollards and not introduce lateral diversions unsuitable for longer bikes.
- OCC will ensure that the needs of disabled cyclists are recognised in design, particularly of Quietways and access to cycle parking.

7. Walking

Walking is the mainstay of urban areas.

Active Lives Survey data shows that Oxford is among the 10 local authorities with the highest levels of walking in England, vying with several central London boroughs. In Oxford, 65% of the adult population walk at least once a week for utility purposes, including 35% walking at least 5 times a week. In the other districts there are much lower levels, with around 40% walking at least once a week, including 15% walking at least 5 times a week.

7.1. Vision

Oxfordshire will be an area where walking is encouraged and provided for by good quality infrastructure. Town centres will have high quality urban squares and spaces to enhance the economic vitality and viability of towns. Walking routes will be improved along main urban corridors to create a pleasant and welcoming experience. Walking in villages will be safe and pleasant particularly to local shops, schools and recreation. Wayfinding will be used to enable people to use safe, attractive walking routes to access local facilities, including parks, schools, local retail centres and leisure and community facilities.

7.2. Planning for walking

Many of the policies set out under the cycling section also apply to walking. Council commitment, creating a walking network, and managing traffic are all important. Community activation measures to encourage people who are inactive to walk a little every day is important to improve their physical health and mental wellbeing. Strengthening and widening the existing culture of walking is also crucial.

This last section looks at the other key element – a compact urban realm that encourages active travel (walking and cycling) as part of policies to create 20 minute towns and neighbourhoods.

8. Urban realm

8.1. 20-minute neighbourhoods and towns

The fifth factor in encouraging cycling and particularly walking is a compact urban realm with accessible destinations. 20-minute neighbourhoods is a new expression for a design concept that plans for essential facilities within 20 minutes' walk from home. A 20 minute walk will get most people around 1.5 km or a mile. The concept is that all essential everyday facilities should be within that distance so it is easy for people to base their lives on walking rather than using a car. Facilities should include shops, recreational opportunities, parks, community facilities, access to public transport (mostly bus stops) and such like. The concept fits in with the goals of low traffic neighbourhoods (LTNs) which minimise traffic within the neighbourhood.

Another popular new concept is the 20 minute town based on a 20 minute cycle ride where a wider range of facilities is within 20 minute cycle ride, which at very moderate pace is around 3 miles or 5 km. A 20 minute town should for instance include access to public transport for interurban travel (train or coach stations), employment and comparison as well as convenience shopping.

Policies

- OCC will develop a 20-minute neighbourhood and town audit process and assess the accessibility of neighbourhoods
- OCC will audit and improve the key routes within the 20-minute neighbourhood
- OCC with the support of districts will support the provision of essential facilities within the 20-minute neighbourhood
- New developments will be audited and designed in support of the 20-minute neighbourhood concept.

8.2. Town walking networks

Local authorities have been providing for walking by footways (popularly called pavements) in towns since at least Victorian times. Generally, unlike cycling, there is typically a nearly comprehensive network of footways along most roads in towns.

The quality of the walking network however is compromised at side road entries and when there is a need to cross main roads. Whilst footways on every street is important, funding will be focused on the main routes that make up the town-wide walking network. In most cases, the town-wide walking network will overlap with the cycle network. However, the infrastructure will be different, except where they both share off-road paths. There will also be a few additional routes not suitable for cycling, typically because of design constraints.

Action

- LCWIPs will identify a town-wide strategic and neighbourhood walking networks in tandem with the cycling network.

Policies

- Funding for improvements will be focused on the town-wide walking network, particularly on routes into town centres, work and transport hubs and suburban centres.
- Walking improvements will conform to the updated Oxfordshire Walking Design Standards (OWDS) and Healthy Street Standards

8.3. Quality Pedestrian Corridors (QPCs)

Quality Pedestrian Corridors (QPCs) represents an approach to important corridors for pedestrian movement. In urban areas, the main road routes within a mile or two of the town centre typically serve the highest flows of pedestrians, along with routes within half a mile of local shopping centres. In QPRs, pedestrians are provided a smooth obstacle-free continuous footway. QPRs are designed to give all pedestrians a high degree of comfort and particularly disabled or visually impaired pedestrians the reassurance that they can be used without obstacles. This means among other design issues:

- a minimum width path (2 metres <1000 pedestrians a day and 3 metres >1000 pedestrians a day) where all obstacles (such as street lights, bus shelters or traffic poles) are relocated outside the clear width either to the inside or outside edge.
- The surface should have no upstands and no areas of ponding. Additionally. the crossfall should be constant at around 3% and driveway entries and dropped kerbs should lie outside the clear width path.
- Priority over side roads should be installed at all side roads with side road entry treatments consisting of raised footway extensions
- There should be no sharing with cyclists within the clear width.
- In preparation for hotter summers and the impacts of Climate Change, street trees should be preserved and new trees planted wherever possible to provide shade and shelter
- Many older and disabled people need to take a rest. Suitable sitting opportunities will be provided at regular intervals along the route in line with disability guidance.

Actions

- OCC will assess the feasibility of Quality Pedestrian Corridors for all main radials within 2 km of town centres and 1 km of local shopping areas, as well as main pedestrian corridors in town centres

8.4. Priority for improvements

Train stations in Oxfordshire are typically located some distance from town centres and often are compromised by poor junctions and narrow footways.

- OCC will transform the pedestrian and cyclist experience from the train station to the town centre.

Many retail parks, business parks and large supermarkets have been built in edge-of-town and out-of-town locations, focused entirely to car use, with little or no thought about access by pedestrians or cyclists. In many cases, however, they may have considerable populations within easy walking distance.

- OCC will review the routes to retail parks, business parks and large supermarkets to provide better walking and cycling access

Suburban and local shopping centres are often along main roads on the way to the town centre, but many suffer from excessive through traffic, undermining their viability and attractiveness. Research undertaken in Oxford shows how suburban shopping centres are reliant on local walking trips, which typically make up over 50% of trips, and also reduce car use and provide essential opportunities for car-free households. Summertown and Cowley Road in Oxford are good examples of the kind of measure that can be undertaken to improve the pedestrian experience

- OCC will work with districts and businesses to improve the experience of pedestrians in suburban and local shopping centres
- OCC will review the most important routes to the centres within half a mile (1 km) to ensure that they provide adequately for walkers of all abilities

8.5. Town centres

It is useful to distinguish between walking trips all the way from home and walking trips in town centres (often called footfall) where people arrive by other means – car, bus, train or cycle. In Oxford there were 24,000 walking trips a day to/from the city centre, making up around 15% all trips to the city centre. There were also around 30,000 walking trips a day in Oxford city centre per day along both Cornmarket Street and Queen Street. Many of these trips were in combination with other modes, so the flows are greatest linking to bus stops, train stations and car parks. There is less data on pedestrian flows in other towns and suburban district centres in Oxfordshire.

Actions

- OCC will measure footfall in county town centres and other suburban centre as a measure of the retail health
- OCC will concentrate on ensuring that conditions for pedestrians in town centres, particularly linking to train, bus stops and car parks are a priority for investment.

8.6. Villages and the rural network

Many villages in Oxfordshire do not have footways on many streets and very few villages have footway links between villages. Encouraging walking in villages in support of the 20 minute neighbourhood concept is therefore often very challenging.

Policies

- OCC will undertake a review and audit of walking in all villages in Oxfordshire
- OCC will introduce footways along main streets in villages wherever there are opportunities
- OCC will support the reduction of speed limits in villages so that 20mph or 30mph is the default maximum speed limit
- OCC will introduce rural traffic calming measures and speed enforcement, including average speed cameras, to enhance the character and attractiveness of villages
- OCC will introduce measures to reduce traffic through villages by network management
- OCC will seek to link villages for walking and cycling as part of the Strategic Active Travel Network, using wayfinding to promote safe, attractive routes

9. Designing for walking

9.1. Core Walking Design Principles (CWDPs)

The same 5 core design principles also apply to walking as cycling but adapted to the shorter distances. How they are measured and manifested is however typically quite different. Walking routes should be

- **Coherent**: Walking networks need to comprehensive and consistent in quality. Barriers and gaps, such as side road crossings, busy junctions and main road crossings need to have pedestrian priority.

- **Direct**: Walking is a relatively slow mode (2-3 mph). For pedestrians, desire lines are therefore even most important. Pedestrians do not divert from the most direct route. This is important at the micro-level (e.g. at crossings) as well as the over the whole journey.

- **Comfort**: In towns, level segregation from motor traffic is typically standard with footways. However, as a slower mode than cycling, pedestrians spend a longer time next to traffic and suffer more from the impact of traffic noise and air pollution Sufficient separation (distance) from traffic is therefore also important. Similarly, the speed difference between walking and cycling is considerable (with cycling 3-5 times as fast) so cycling should not share footways except where walking and cycling flows are very low such as on routes between villages. Shared off-road paths should be of sufficient width for cyclists to be able to pass pedestrians comfortably. Walking is also a sociable activity, so that sufficient width footways are essential for walking side by side. Lighting is also a key factor in people's willingness to walk at night. Shade, shelter and seating are also important.

- **Safety**: Most pedestrian reported casualties happen at the two locations where the walking network stops – at side roads and crossing main roads. Measures to ensure priority over traffic are an important step in making these locations safe. Traffic speed and volume are the other key factors.

- **Attractive (Advantage)**: Whilst walking is already perceived by some residents as the natural mode for short trips under a mile, too many people still opt to use their car even for short local trips. Walking can be improved by measures such as Low Traffic Neighbourhoods and parking restrictions to make short car trips less attractive and through community activation measures which enable inactive residents to walk as a means of improving both their physical and mental health.

9.2. Auditing the existing walking network

There are many problems on existing footways, often insufficient to deter walking for most people but potentially impossible and impassable for some less able groups to manage.

Actions

- OCC will devise a Healthy Place Shaping Audit (HPSA) system to assess the quality of streets for audit and review in liaison with colleagues in Public Health. Particular focus will be on ensuring that needs of more vulnerable groups, such as children, those with mobility or sight disabilities and older people in general, are recorded.
- The HPSA along with Core Walking Design Principles will be included in the Oxfordshire Walking Design Standards (OWDS) and used in reviewing existing infrastructure and assessing new infrastructure.
- OCC will undertake a survey of pedestrians to better understand pedestrian problems, priorities and preferences, in a similar manner to the Oxfordshire Cycle Survey.

9.3. Oxfordshire Walking Design Standards (OWDS)

Unlike for cycling, there has been no recent update on walking design guidance from Government. In fact, national walking design guidance is spread over many documents on particular topics, including planning documents such Manual for Streets.

Actions

- OCC will update the Oxfordshire Walking Design Standards (OWDS) to set out the ambitions to make walking central to local travel in Oxfordshire towns and villages.

Policies

- All new active travel schemes (including any schemes with an active travel element) will be designed according to the updated Oxfordshire Walking Design Standards (OWDS).
- Where OWDS standards cannot be met, teams will submit a Departure from Walking Standards (DWS) form and consult with ATH for a viable solution in line with all the five core walking design principles (OWDPs).

9.4. Crossings

Another key element in the pedestrian network are opportunities to cross main roads on desire lines. What is the best option for crossings? There is no single answer. Toucans, Puffins and Pelicans give the most surety but can create extra queuing and time delay to both pedestrians and vehicles and are not always safer in urban areas. Zebras allow pedestrians to cross without delay and fit in better with public realm improvements and are suitable for urban areas especially where speeds are 30 mph or 20 mph. Courtesy crossings can be used successfully in shared space schemes and areas of high-quality public realm.

Policies

- OCC will consider the crossing needs of pedestrians on main roads to minimise delay or diversion and to satisfy existing or potential flows. The crossings will be designed as far as possible on desire lines to avoid diversion and delay
- Zebra crossings will be the default option where there is a need for a pedestrian crossing in urban areas along main roads, unless other considerations take priority
- OCC will review the timings of existing free-standing signalised crossings to respond without delay when called
- OCC will install pedestrian phases on all arms of signalised junctions where there is a significant pedestrian demand
- OCC will install Zebra crossings on all arms of urban roundabouts where there is a significant pedestrian demand
- OCC will review all bus stops on main roads to ensure there is a nearby convenient crossing
- The need for community cohesion and people to cross streets will be considered on both main and residential roads, such as providing gaps in long lines of parking.

9.5. Side roads

Another gap in the pedestrian network are side roads where pedestrians, in practice if not legally, lose their priority and feelings of safety in relation to traffic. The Government has indicated that it will review the Highway Code to give pedestrians much clearer priority across side roads. However, the design of many junctions put pedestrians at risk and unable to command their legal priority. There are many design solutions to reinforce pedestrian priority at side roads.

Policies

- Wherever possible and funding is available, OCC will improve existing side road entries by
    - Extending footways across side road entries so there is a raised crossing

- Setting the Give Way lines behind the footway to give priority to the pedestrian crossing
- Narrowing kerb radii to the minimum possible whilst maintaining access for appropriate vehicles
- New developments will design side road entry treatments in accordance with updated OWDS

9.6. Pavement parking

In many urban areas and some villages, pavement parking represents the greatest hazard and barrier to walking especially for those unable to step around the parking. The urban network of footways is increasingly threatened by the spread of parking on the pavement. Pavement parking is endemic in some areas, often without any plausible justification except habit.

Pavement parking adversely affects vulnerable protected groups, including those with visual impairments, those using mobility aids, those in wheelchairs, those needing the help of carer or parents with pushchairs or walking with children. Additionally, there are costs to the authority in terms of damage to kerbs and flagstones, creating trip hazards.

The Government undertook a consultation on pavement parking in 2020 and has indicated that it will introduce legislation to make enforcement much easier. The Council responded to the consultation expressing strong support for such measures.

Policies

- OCC will support enforcement to ensure that all footways (pavements) are clear of pavement parking, except where legally marked out
- OCC with support of district authorities will apply for the powers to enforce pavement parking e.g. decriminalised parking enforcement
- OCC will take measures to reduce parking pressures on road space which result in pavement parking, by introducing parking enforcement, such as controlled parking zones (CPZs) and maximum residential parking permit numbers

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Integrated Sustainability Appraisal for the for the Oxfordshire Local Transport and Connectivity Plan

Interim ISA Report

Oxfordshire County Council

October 2021

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
Lauren Egan Graduate Consultant Laurie Marriott Environmental Consultant Nick Chisholm-Batten Associate Director	Ian McCluskey Associate Director	Alastair Peattie Associate Director	Alastair Peattie Associate Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position
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Prepared for:

Oxfordshire County Council

Prepared by:

AECOM Limited
3rd Floor, Portwall Place
Portwall Lane
Bristol BS1 6NA
United Kingdom

T: +44 117 901 7000
aecom.com

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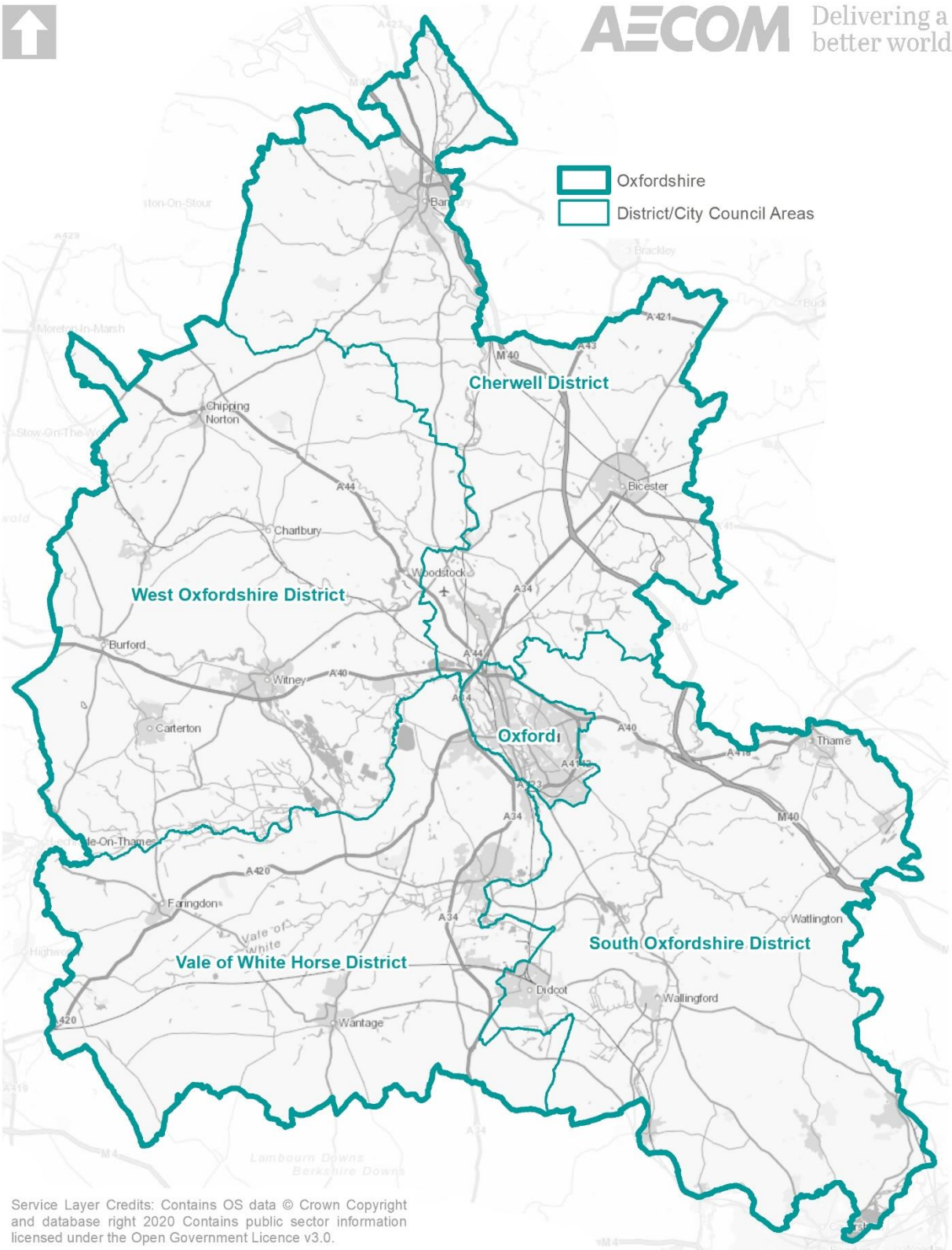

Figure 1.1: LTCP plan area

1. Introduction

Background

1.1 AECOM has been commissioned to undertake an independent Integrated Sustainability Appraisal (ISA) in support of the emerging Oxfordshire Local Transport and Connectivity Plan on behalf of Oxfordshire County Council.

1.2 Oxfordshire County Council (OCC) is the highway authority for the county of Oxfordshire. In line with the Transport Act 2000 and Local Transport Act 2008, OCC are required to produce a Local Transport Plan which sets out the county's plans and policies for transport and how these will be implemented.

1.3 OCC is currently working on producing an updated Local Transport Plan which will outline its overarching ambitions for transport in the county and how these will be achieved between now and 2050. This will be referred to as the Local Transport and Connectivity Plan (LTCP) in order to better reflect Oxfordshire's strategy both for digital infrastructure and for connecting the whole county.

1.4 There have been two rounds of public engagement on the LTCP to date. An engagement exercise was undertaken in Spring 2020, with the public and stakeholders asked to comment on a series of topic papers focused on different transport and connectivity topics. Following this, public consultation was conducted on the vision document in February-March 2021. This included seeking feedback on the draft vision, key themes and proposed policies. Feedback from this consultation has been used to refine the vision, key themes and policies in the LTCP.

1.5 A further six-week public consultation will be conducted on the LTCP and supporting strategies. This will provide members of the public and stakeholders an opportunity to feedback on the updated vision, key themes and full policies. Amendments will then be made based on the feedback received before the final versions are presented for adoption by the county council.

1.6 The ISA undertakes an integrated assessment that incorporates a Strategic Environmental Assessment (SEA), Equality Impact Assessment (EqIA), Health Impact Assessment (HIA) and Community Safety Assessment. This integrated assessment will identify the potential impacts of the LTCP on the environment, community and vitality of Oxfordshire, with a view to promoting a more sustainable plan making process.

1.7 Key information relating to the LTCP is presented in **Table 1.1** below.

Table 1.1: Key facts relating to the Oxfordshire Local Transport and Connectivity Plan

Responsible authority	Oxfordshire County Council
Title of plan	Oxfordshire Local Transport and Connectivity Plan (LTCP)
Subject	Transport plan
Purpose	The LTCP will provide a strategic framework for future transport planning across Oxfordshire.
Timescale	To 2050
Area covered by the plan	The administrative area of Oxfordshire County (**Figure 1.1** above).
Summary of content	The LTCP will set strategic transport planning policy for Oxfordshire over the next 30 years. It will set out which transport interventions the area intends to deliver during the plan period, and how these schemes will be funded.
Contact point	Joe Kay Strategic Transport Lead Oxfordshire County Council Email address: joseph.kay@oxfordshire.gov.uk

Integrated Sustainability Appraisal (ISA) explained

1.8 Integrated Sustainability Appraisal (ISA) is a mechanism for assessing and communicating the likely effects of an emerging plan, and reasonable alternatives, with a view to achieving sustainable development. ISA fulfils the requirements for Strategic Environmental Assessment (SEA) and discharges the duties for Equality Impact Assessment (EqIA), Health Impact Assessment (HIA) and Community Safety Assessment (CSA).

1.9 The ISA is being undertaken in line with the procedures prescribed by the Environmental Assessment of Plans and Programmes Regulations 2004 (the SEA Regulations) which transposed into national law the EU Strategic Environmental Assessment (SEA) Directive[1].

1.10 The aim of the ISA will be to inform plan-making both directly (i.e. through structured, systematic and evidence-based analysis), and indirectly (through providing stakeholders with information on potential plan impacts and so facilitating effective consultation).

1.11 The use of an ISA approach will help ensure consistency in the development and evaluation of the LTCP and is considered best practice – particularly given the environmental and social constraints in Oxfordshire.

1.12 Undertaken through an SEA-led methodology, the ISA will incorporate an HIA, EqIA and a CSA. In addition, a parallel Habitats Regulations Assessment (HRA) process will be undertaken to support the development of the LTCP and reported on separately.

This Interim ISA Report

1.13 This Interim ISA Report has been designed to support the current decision-making process on the draft LTCP, and has been produced voluntarily with the intention of informing this stage of preparation of the LTCP.

1.14 Specifically, this report presents an appraisal of a series of high-level approaches and alternatives which have been evaluated as part of the plan's development. This is for the benefit of decision makers tasked with approving the LTCP for consultation.

[1] Directive 2001/42/EC

1.15 The forthcoming consultation on the LTCP, which is anticipated will be undertaken in November 2021, will be accompanied by a full ISA Report. This will present to stakeholders the information required by the SEA Regulations, and include an assessment of the draft plan as consulted on.

Key stages of the ISA

1.16 This ISA follows the process required by the SEA Regulations. There is guidance published by government on undertaking SEA, specifically 'A Practical Guide to the Strategic Environmental Assessment Directive'; the 'Practical Guide'. This sets out a five-stage process for undertaking SEA. This process, in conjunction with the SEA Regulations, guides this assessment. The stages and outputs for the ISA are replicated in **Figure 1.2** below.

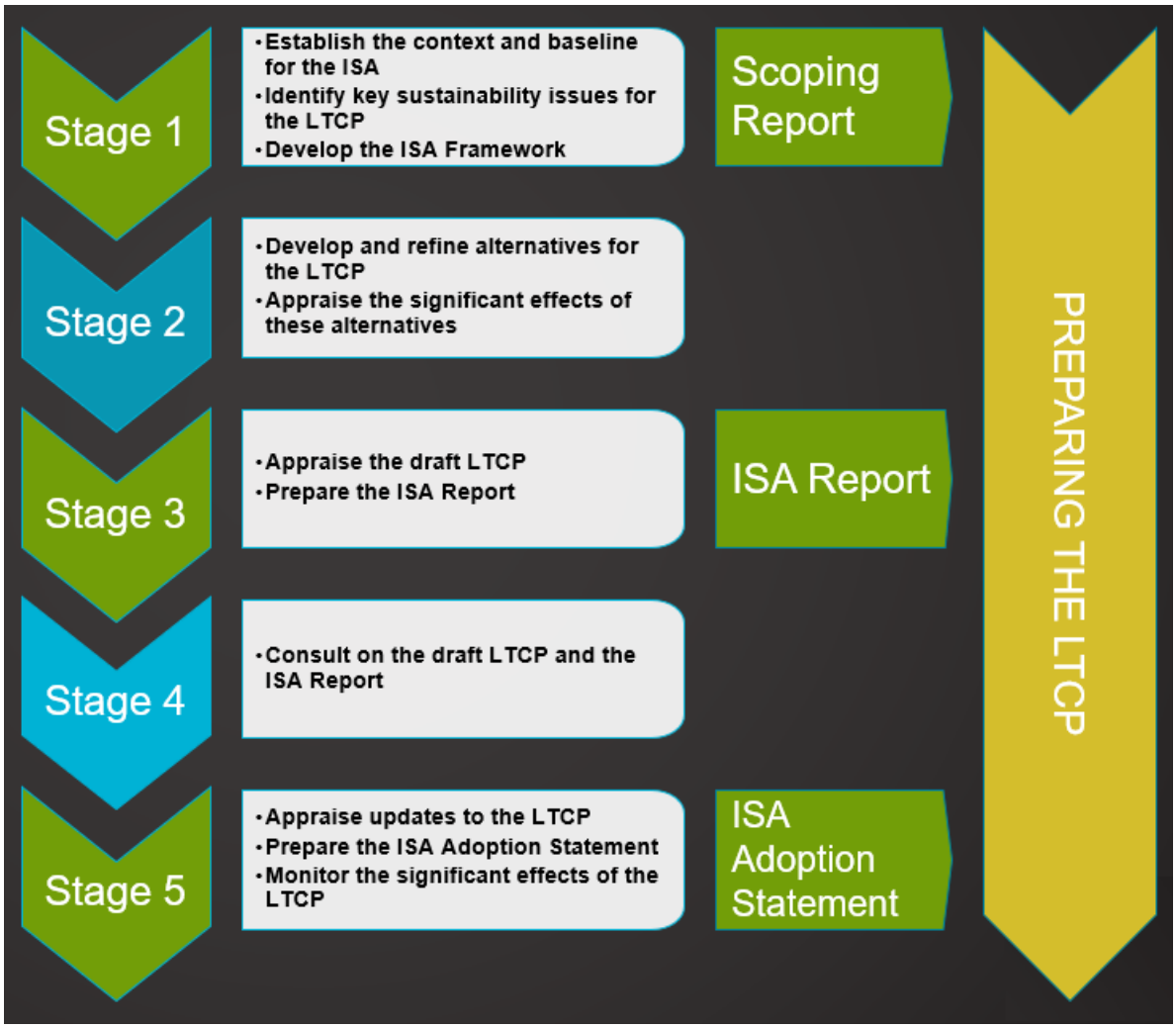

Figure 1.2: Key stages of the ISA for the LTCP, and ISA outputs

1.17 The current report presents the findings of Stage 2 above.

Current stage: Developing and appraising reasonable alternatives for the LTCP

1.18 A key element of the ISA process is the assessment of 'reasonable alternatives' for the LCTP. The SEA Regulations[2] are not prescriptive as to what constitutes a reasonable alternative, stating only that the Environmental Report (i.e. ISA Report) should present an appraisal of the '*plan and reasonable alternatives taking into account the objectives and geographical scope of the plan*'.

1.19 The ISA process has therefore assessed a range of potential options as reasonable alternatives, which 1) consider different approaches for four geographical areas within Oxfordshire and 2) different approaches for key plan issues.

1.20 These include options for:

- Greater Oxford
- Oxfordshire's Market Towns
- Well-connected rural areas
- Less well-connected rural areas

1.21 Options for the following thematic issues relating to:

- The climate emergency
- Road safety
- Freight.

1.22 **Chapters 3** and **4** describe the options considered for each of these areas and themes, and presents the appraisal of the options.

[2] Environmental Assessment of Plans and Programmes Regulations 2004

2. Scope of the appraisal

What is the scope of the ISA?

ISA Scoping Report

2.1 The SEA Regulations require that: "*When deciding on the scope and level of detail of the information that must be included in the report, the responsible authority shall consult the consultation bodies*". In England, the consultation bodies are the Environment Agency, Historic England and Natural England.[3] These authorities were consulted on the scope of the LTCP ISA in April 2021. In addition, given the coverage of the AONBs over part of Oxfordshire, the Cotswold, North Wessex Downs and Chilterns AONB management units were consulted.

2.2 The baseline information (including baseline data and context review) initially included in the ISA Scoping Report has been updated in the period since and provides the basis for the ISA process.

ISA Framework

2.3 Drawing on the review of the sustainability context and baseline, the ISA Scoping Report identified a range of sustainability issues that should be a particular focus of ISA, ensuring it remains targeted on the most important issues. These issues were then translated into an ISA 'framework' of objectives and appraisal questions.

2.4 The ISA Framework, which has been tailored for the LTCP, provides a way in which the sustainability effects of the LTCP and alternatives can be identified and subsequently analysed based on a structured and consistent approach.

2.5 The ISA Framework and the appraisal findings in this Interim ISA Report have been presented under eight ISA Themes, reflecting the range of information being considered through the ISA process.

- Biodiversity;
- Water and Soil Resources;
- Historic Environment;
- Landscape;
- Air Quality and Noise;
- Climate Change;
- Healthy and Safe Communities; and
- Equalities.

2.6 The ISA Framework is presented in **Table 2.1** below.

[3] In line with Article 6(3) of the SEA Directive, these consultation bodies were selected because *"by reason of their specific environmental responsibilities,[they] are likely to be concerned by the environmental effects of implementing plans and programme".*

Table 2.1: ISA Framework

ISA theme	Objectives	Assessment questions – will the option/proposal help to:
Biodiversity	Support the integrity of designated sites	• Protect the integrity of the SACs within Oxfordshire? • Avoid negative impacts, and where possible improve the condition of SSSIs within Oxfordshire? • Manage pressures on locally designated sites for biodiversity and geodiversity in Oxfordshire? • Maintain, and where possible, enhance the status of NNRs, LNRs, LWS, LGS, CTAs and RVNRs in Oxfordshire and people's access to these?
	Protect and enhance habitats and species	• Protect and enhance semi-natural habitats? • Protect and enhance priority habitats, and the habitat of priority species? • Achieve a net gain in biodiversity? • Increase the resilience of the Oxfordshire's biodiversity to the potential effects of climate change? • Reduce the impact of the transport network on species' severance?
	Increase habitat connectivity across the transport network	• Contribute to the creation of coherent and resilient ecological networks? (i.e. allow passage of wildlife across roads, railway lines, cycle paths through the use of animal bridges/tunnels or support green infrastructure enhancements)?
Water and Soil Resources	Minimise the impact which transport, and transport infrastructure has on water quality, associated biodiversity, and on the physical state of water bodies.	• Support improvements to water quality, including through minimising the impacts of diffuse run off from road surfaces? • Protect surface water and groundwater resources? • Minimise physical alterations to water bodies? • Minimise the impacts to, and where possible enhance the quality of water bodies of strategic significance for water supply?
	Promote the efficient use of land.	• Facilitate the use of previously developed land? • Avoid the development of the best and most versatile agricultural land (Grade 1 to 3a agricultural land)?
	Promote sustainable waste management solutions that encourage the reduction, re-use and recycling of waste during construction	• Encourage recycling of materials and minimise consumption of resources during construction, operation and maintenance of new transport infrastructure? • Encourage the use of alternative transport methods for the movement of waste in the county? • Protect the integrity of mineral safeguarding areas and mineral consultation zones?
Historic Environment	Preserve and enhance Oxfordshire's heritage resource, including its historic environment and archaeological assets.	• Conserve the outstanding universal value of World Heritage Sites? • Conserve and enhance the significance of buildings and structures of architectural or historic interest, both designated and non-designated, and their setting? • Conserve and enhance the special interest, character and appearance of conservation areas and their settings?

ISA theme	Objectives	Assessment questions – will the option/proposal help to:
		• Conserve and enhance archaeological remains and support the undertaking of archaeological investigations and, where appropriate, recommend mitigation strategies? • Reinforce the distinctive historic landscape character of Oxfordshire?
	Promote understanding of Oxfordshire's heritage resource	• Support access to, interpretation and understanding of the historic environment?
Landscape	Protect and enhance the character and quality of the Oxfordshire's landscapes, townscapes and villagescapes.	• Support the management objectives of the AONBs across Oxfordshire? • Support the five purposes of the Green Belt? • Conserve and enhance locally important landscape, townscape and villagescape features? • Improve accessibility by sustainable transport to Oxfordshire's landscape resources, including within the AONBs?
Air Quality and Noise	Deliver improvements in air quality in Oxfordshire	• Reduce emissions from transport? • Contribute to improvements in air quality within AQMAs? • Promote the use of zero emission vehicles? • Promote enhancements to green infrastructure networks to facilitate increased absorption and dissipation of nitrogen dioxide and other pollutants? • Encourage a modal shift to more sustainable transport? • Improve access to active travel networks?
	Reduce the impact on environmental noise from transportation sources	• Contribute to lowering noise levels? • Seek to mitigate the impact on areas likely to be affected by noise, and reducing the noise generated at source and/or containing the noise generated? • Utilise measures to reduce traffic noise specifically during transport planning, such as low noise road surfacing?
Climate Change	Support climate change mitigation across Oxfordshire through limiting the contribution of transport to greenhouse gas emissions.	• Limit the increase in the carbon footprint resulting from new transport infrastructure provision? • Seek to significantly reduce the emissions from existing transport infrastructure in line with a pathway to the County Council's target for net zero carbon by 2050? • Promote the use of sustainable modes of transport, including walking, cycling and public transport? • Reduce the need to travel? • Reduce energy consumption from non-renewable resources? • Encourage the update of electric and alternatively fuelled vehicles?
	Support the resilience of Oxfordshire's transport networks to the potential effects of climate change	• Increase the resilience of the transport network to the potential effects of climate change? • Reduce the impact of embodied carbon in transport infrastructure?Promote a coordinated approach to

ISA theme	Objectives	Assessment questions – will the option/proposal help to:
		the management of flood risk across public infrastructure provision? • Improve and extend green infrastructure networks as part of transport infrastructure provision to support adaptation to the potential effects of climate change? • Sustainably manage water run-off, reducing surface water runoff? • Ensure the potential risks associated with climate change are considered through new transport network programmes? • Reduce the impact of extreme weather events on the condition of the transport network?
Healthy and Safe Communities	Promote sustainable transport use and reduce the need to travel	• Encourage modal shift to more sustainable forms of travel? • Support accessibility to key services and facilities? • Reduce the need to travel?
	Improve the health and well-being of Oxfordshire's residents	• Reduce the impacts of air and noise pollution on health? • Promote the use of healthier modes of travel? • Enhance the provision of, and access to, green infrastructure in the county, in accordance with national standards? • Avoid any negative impacts to the quality and extent of existing recreational assets, such as formal or informal footpaths? • Improve access to the countryside for recreation?
	Support the vitality of communities	• Enhance the vitality of Oxfordshire's city, town, local and neighbourhood centres?
	Improve road safety	• Improve road safety and reduce road accidents, including those killed or seriously injured?
	Enhance community safety	• Reduce crime and improve perceptions of community safety? • Reduce community severance?
Equalities	Advance equality of opportunity for all	• Promote access to transport services for all including those with and without shared protected characteristics? • Provide opportunities to foster good relations between groups?
	Cater for existing and future residents' needs as well as the needs of different groups in the community, and improve access to local, high-quality community services and facilities.	• Maintain or enhance the quality of life of residents? • Address the needs of all age groups? • Meet the needs of those living in rural areas? • Improve accessibility of key infrastructure and local facilities, including specialist services for disabled and older people? • Reduce health inequalities and improve mobility? • Improve perceptions of security when accessing and using the transport network?

3. Appraisal of area-led options

An area-led approach to considering reasonable alternatives

3.1 The LTCP covers a large and diverse county, with a wide range of transport challenges. These challenges sit within diverse environmental and socio-economic settings.

3.2 A central role of appraising reasonable alternatives through the ISA process is to help identify the relative sustainability merits of different approaches to delivering enhanced transport provision in the county. In recognition of the diversity of Oxfordshire, an initial approach to the appraisal of reasonable alternatives subdivides the county into a number of distinct geographical areas.

3.3 The four areas are as follows

- **Greater Oxford:** This covers the city of Oxford, and its hinterland, including Horspath, Wheatley, and Kidlington.
- **Market towns:** This covers the market towns of Oxfordshire including Banbury, Abingdon, Bicester, Witney and the Science Vale (comprising the grouping of Wantage, Grove, Didcot, Harwell, Milton and Culham).
- **Better connected rural areas:** This covers the better-connected rural areas in Oxfordshire, focusing on Carterton, Eynsham, Henley, Wallingford, Thame, Faringdon and Chipping Norton.
- **Less well-connected rural areas:** This covers the less well-connected rural areas in Oxfordshire, incorporating the rural hinterland of the county and smaller towns. These include Burford, Woodstock, Shrivenham, Kingston Bagpuize, Watlington, Chinnor, Chalgrove, Deddington, Kirtlington, and Upper Heyford.

3.4 **Figure 3.1** highlights the broad locations covered by these areas.

3.5 For each of these areas a number of options have been identified and subsequently appraised. For all areas a do minimum is described which would be applied in all circumstances, together with one or more options for additional levels of intervention over and above the do minimum. These options are designed to reflect the key issues facing that area, and the different approaches that can be taken to intervention/investment in transport infrastructure and management.

3.6 The detail of the options appraised, and the appraisal findings, are presented below.

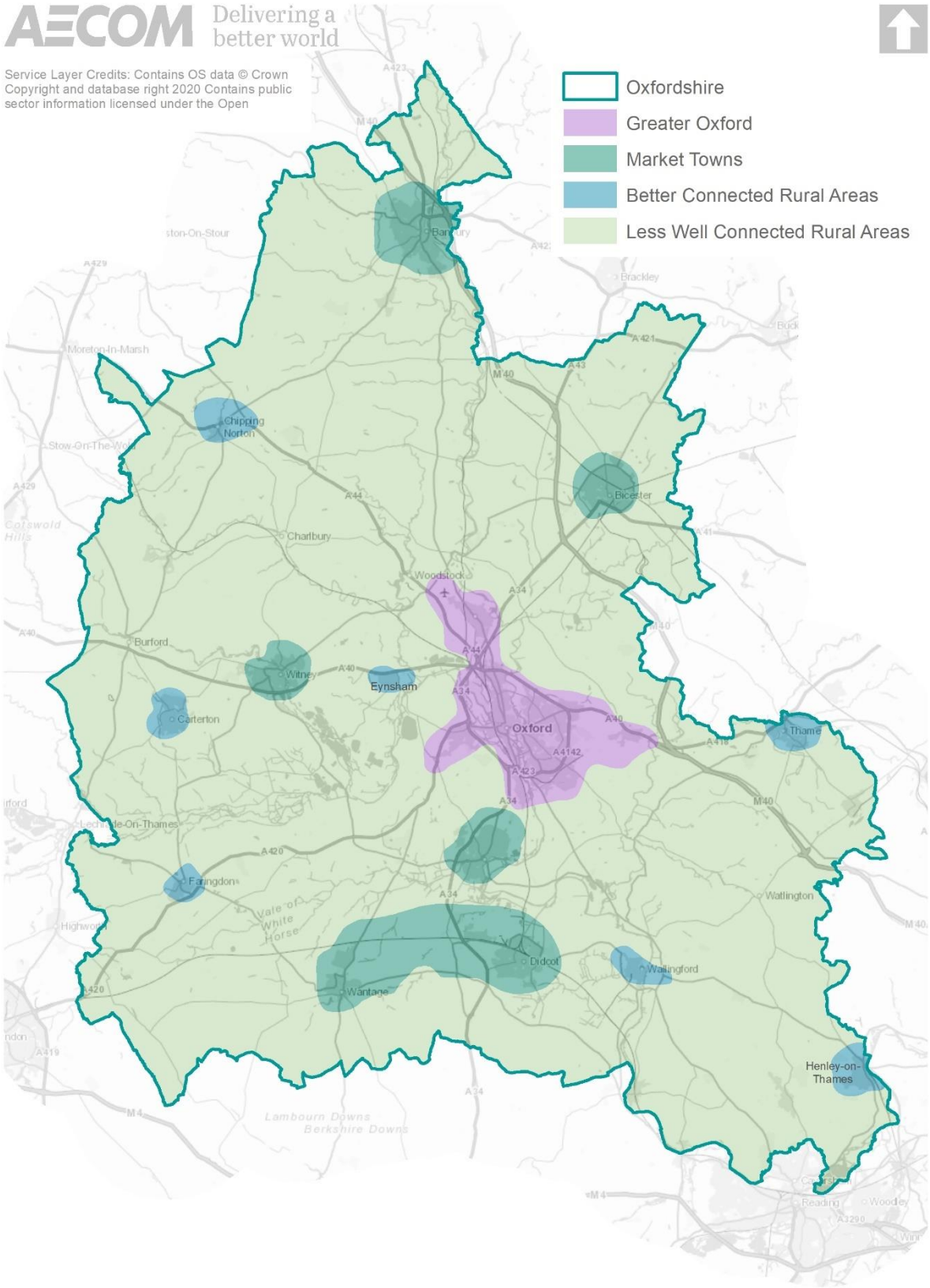

Figure 3.1 Areas of Oxfordshire for which options have been appraised for the LTCP

Greater Oxford

3.7 This area covers the city of Oxford, and its hinterland, including Horspath, Wheatley, and Kidlington.

3.8 **Figures 3.2** to **3.4** highlight the key environmental constraints in this area.

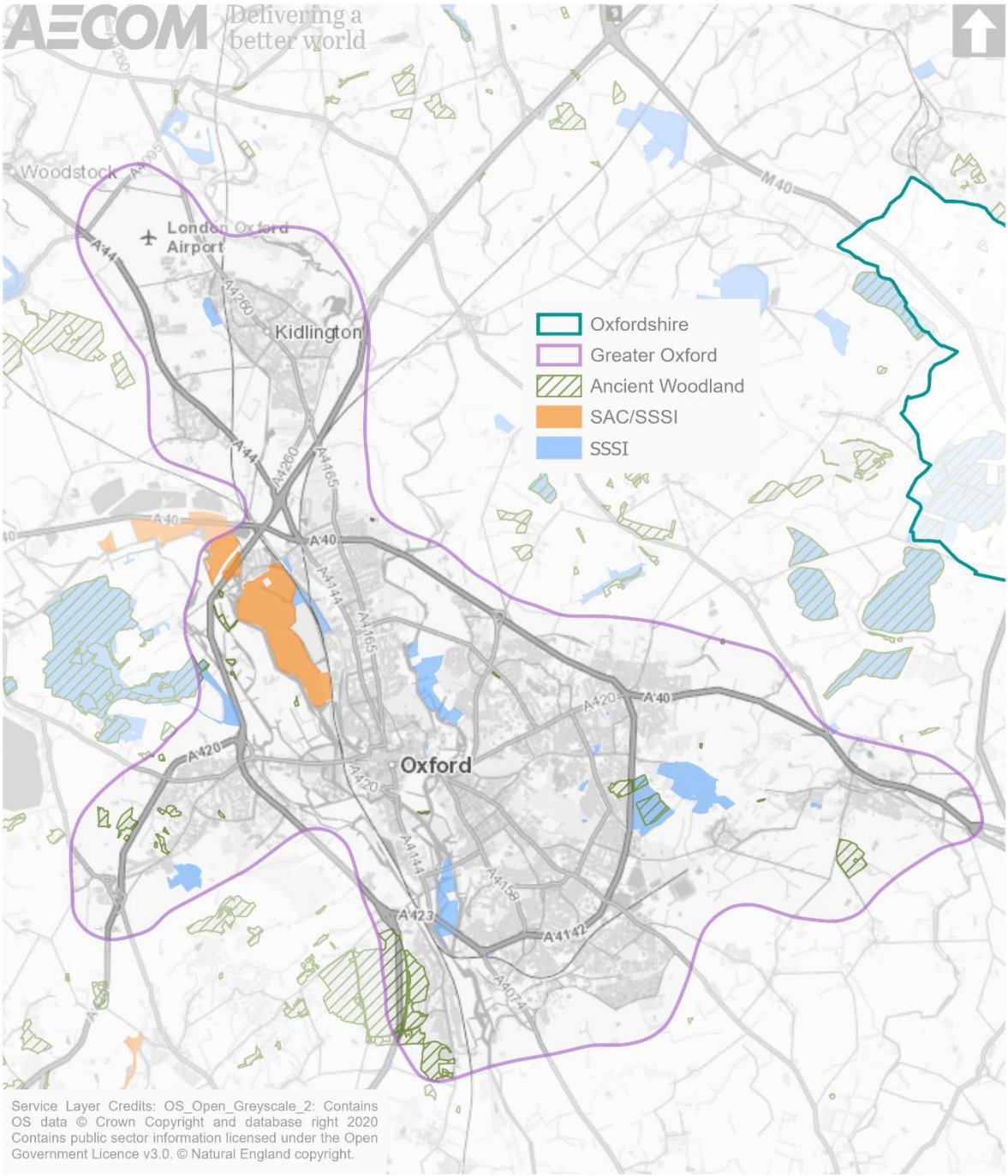

Figure 3.2: Biodiversity designations in the vicinity of Oxford

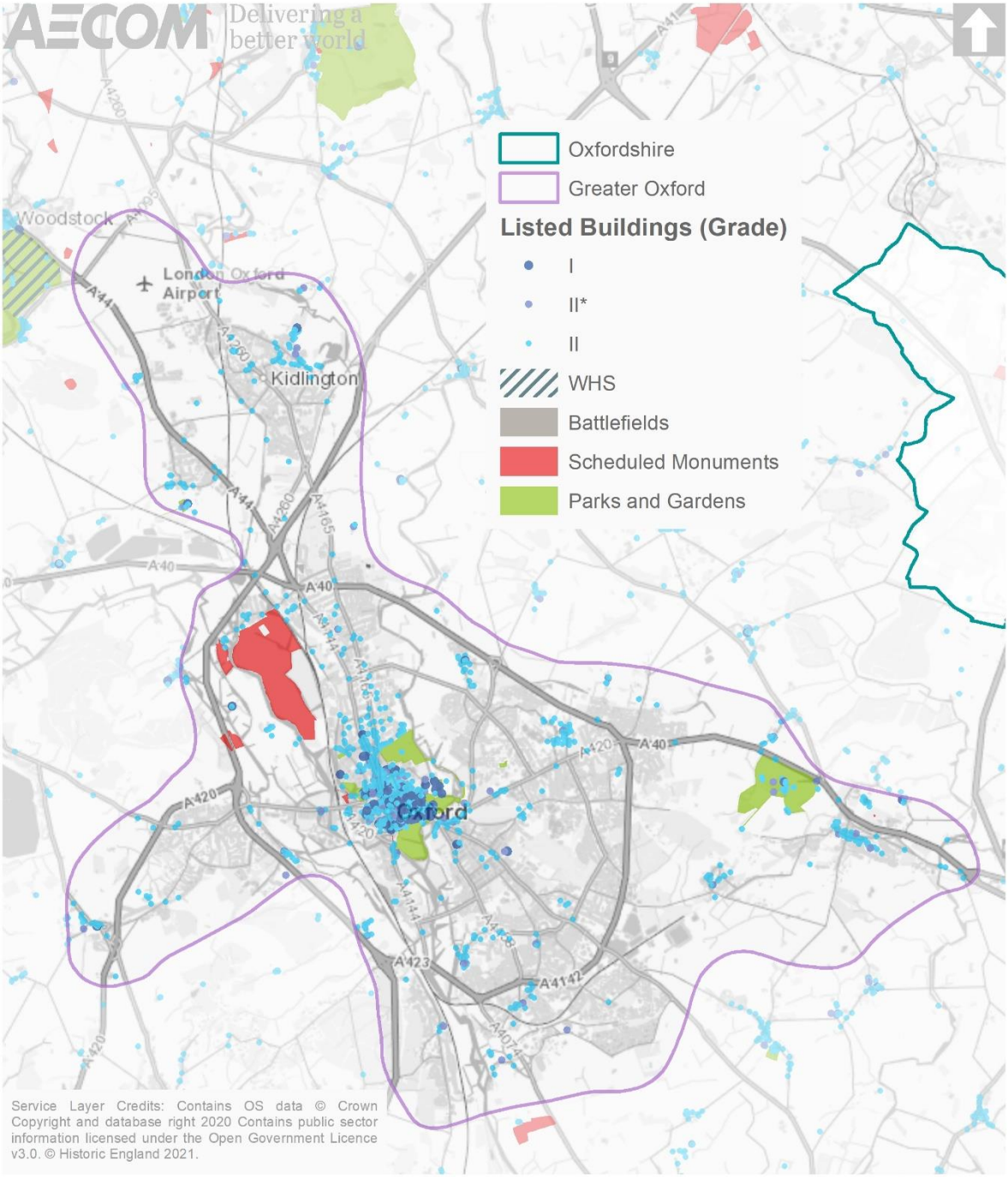

Figure 3.3: Historic environment designations in the vicinity of Oxford

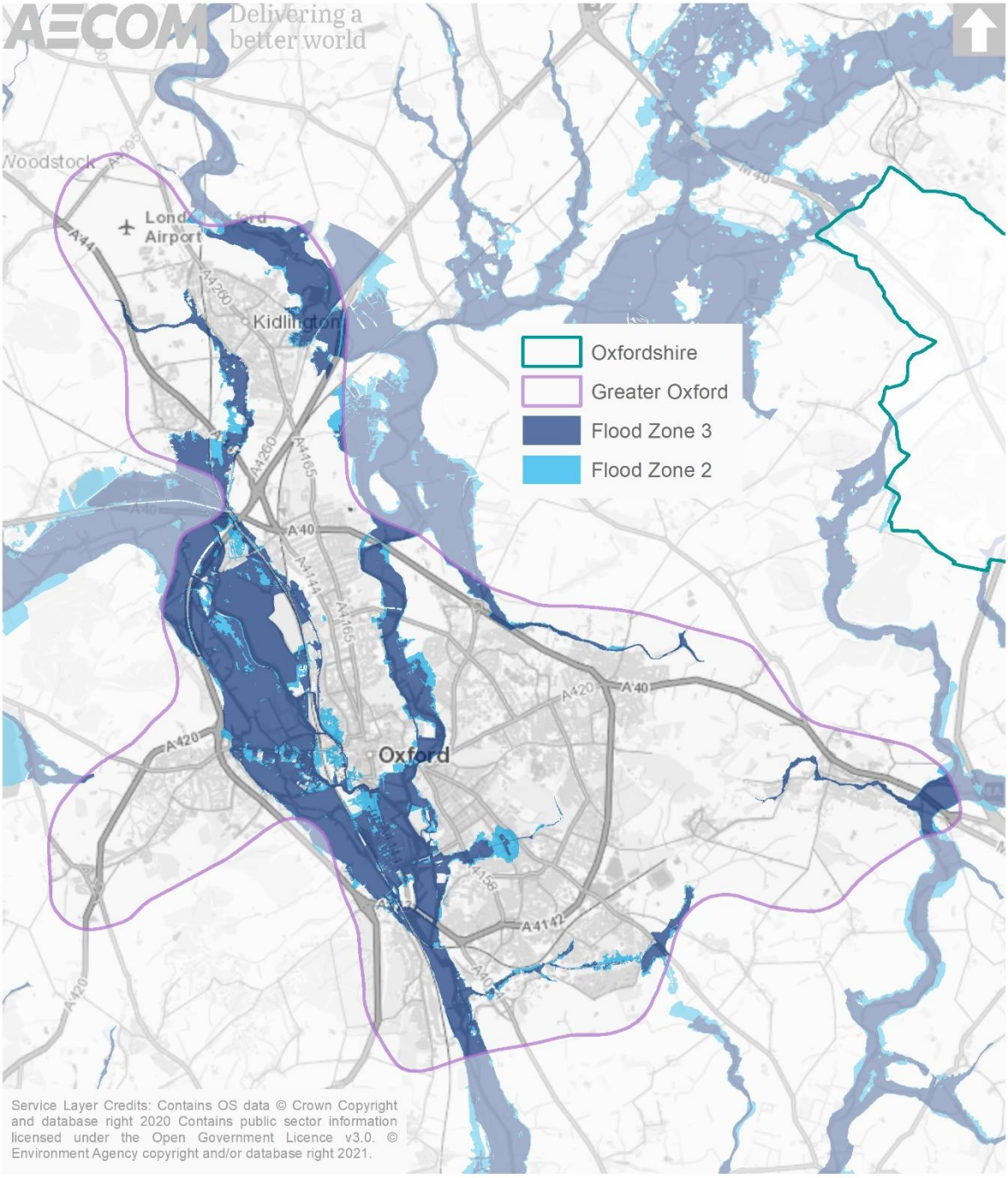

Figure 3.4: Flood zones in the vicinity of Oxford

3.9 Three options have been considered for the Greater Oxford area as alternatives for the ISA, as follows.

Option GO1: Do minimum

3.10 A 'do minimum' option would rely on committed investment, which would continue at a local and strategic level. In practice this would incorporate existing measures such as:

- Delivery of the Connecting Oxford proposals:
  - New traffic filters in Oxford
  - Workplace parking levy in the Eastern arc of Oxford
  - Oxford Zero Emission Zone
  - Oxford city cycling quickways
  - Oxford Low Traffic Neighbourhood trials
  - Various road corridor improvements
  - Various smaller active travel, bus and public realm improvements

Option GO2: Optimise use of existing infrastructure

3.11 This option would comprise enhancements to the existing city-wide transport network. It would incorporate improved bus services on key corridors, enhancements to walking and cycling linkages, an expansion of demand management measures and more effective use of Park and Ride provision.

Option GO3: Initiate more significant enhancements

3.12 This option would seek to take forward significant capacity enhancements to the city's transport network. This would include, for example, an expansion of Park and Ride provision and development of the network into a rapid transit system, or delivery of major rail proposals such as Cowley Branch line and a comprehensive upgrade of the railway between Oxford and Didcot. In terms of the road network it would initiate significant junction capacity enhancements at key 'pinchpoints' and potentially, initiate new local and cross-city links (if possible).

Appraisal findings

3.13 The following table presents appraisal findings in relation to the three options introduced above. These are organised by the eight ISA themes.

3.14 For each ISA theme, a commentary on the likely effects is presented. Options are also ranked numerically reflecting their relative sustainability performance, with '1' the most favourable ranking and '3' the least favourable ranking.

Table 3.1: Appraisal of options for Greater Oxford

Option GO1: Do minimum
Option GO2: Optimise use of existing infrastructure
Option GO3: Initiate more significant interventions

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		GO 1	GO 2	GO 3
Biodiversity	The key internationally designated site in the vicinity of the Oxford urban area is the Oxford Meadows SAC, which incorporates the nationally designated Pixey and Yarnton Meads SSSI, the Cassington Meadows SSSI and Port Meadow with Wolvercote Common & Green SSSI. This extends along the eastern bank of the River Thames from the north west of the city centre. Further SSSIs in the vicinity of the city include Hook Meadow and The Trap Grounds SSSI, Wytham Woods SSSI, New Marston Meadows SSSI, Magdalen Grove SSSI, Iffley Meadows SSSI, Brasenose Wood and Shotover Hill SSSI, Holton Wood SSSI and Rushy Meadows SSSI. Reflecting the geodiversity of the city, there are also a number of smaller SSSIs designated for their geological interest, including Sugworth SSSI, Magdalen Quarry SSSI, Littlemore Railway Cutting SSSI, Rock Edge SSSI, Lye Valley SSSI, Littleworth Brick Pit SSSI, and Lyehill Quarry SSSI. Key habitats in the urban area include lowland meadow, coastal and floodplain grazing marsh and good quality semi-improved grassland Biodiversity Action Plan (BAP) Priority Habitats along the River Thames, deciduous woodland and lowland dry acid grassland BAP Priority Habitats on the edge of the city and wood-pasture and parkland, lowland meadows, lowland fens, deciduous woodland and good quality semi-improved grassland BAP Priority Habitats located along the River Cherwell corridor. Option GO3, through facilitating the delivery of significant new transport infrastructure in and around the urban area, has increased potential to lead to significant effects on biodiversity habitats, species and networks. This includes from land take, habitat loss and fragmentation and disturbance. In this respect Option GO1, which relies on committed investment, and Option GO2, which focuses on enhancing existing transport infrastructure, would lead to fewer physical impacts on key areas of sensitivity. Option GO2 however has additional potential to lead to impacts on habitats and ecological networks on existing transport corridors. This is given many existing transport routes are important biodiversity corridors, containing and linking key habitats, and adjoining designated sites. These corridors support a significant number of protected species. As such, Option GO2 still has the potential to lead to significant effects without the implementation of appropriate avoidance and mitigation measures. However, the scale of effects is less likely to be significant than those which result from Option GO3. It should be noted though that the delivery of new and enhanced transport infrastructure may support some enhancements to biodiversity networks. For example, the Government's 25-year Environment Plan seeks to embed an environment net gain principle for infrastructure development. In addition, National Highways' Road Investment Strategy states that by 2040 its schemes must deliver a net gain in biodiversity and Network Rail has committed to make a net positive contribution to biodiversity. In this context there is scope for transport infrastructure enhancements to support environmental net gain in and around the urban area. This includes through delivering enhancements in the Network Enhancement Zones[4] and Network Expansion Zones[5] identified in the vicinity of Oxford.	1	2	3

[4] Network Enhancement Zones comprise land within close proximity to existing habitat components that have been identified by Natural England as likely to be suitable for habitat re-creation for the particular habitat.
[5] Network Expansion Zones are areas identified with potential for expanding, linking and joining biodiversity networks.

Option GO1: Do minimum
Option GO2: Optimise use of existing infrastructure
Option GO3: Initiate more significant interventions

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		GO 1	GO 2	GO 3
Water and Soil Resources	Option GO3, through facilitating the delivery of significant new transport infrastructure, will require larger landtake than Option GO1 and GO2. This has increased potential to lead to the development of previously undeveloped land, including, potentially the productive agricultural land classified as Grade 2 or 3b (i.e. land classified as the best and most versatile) present in the area. Without mitigation measures, an increased delivery of new transport infrastructure has the potential to have impacts on water and soil quality through increases in surface water run-off. However, no significant impacts on water quality would be anticipated from schemes if the required embedded mitigation measures are incorporated within the construction and operational stage. Option GO2 also offers additional opportunities to deliver enhancements to surface water management on existing transport corridors.	2	1	3
Historic Environment	The Oxford urban area has a rich historic environment resource, as highlighted by the significant number of features and areas designated for their heritage value. The historic environment of the urban area is also framed by the significant number of undesignated features of heritage value which are vulnerable to change given their lack of statutory and local protections. In addition, transport corridors are often themselves important heritage resources. The urban area and area around the city also has a rich and diverse archaeological resource. The increased number of physical transport infrastructure schemes likely to be initiated through Option GO3 have the potential to lead to impacts on the key assets (including designated features and areas) located in the vicinity of the key routes and areas targeted for interventions. The significance of effects from these interventions will however depend on design, layout and scale of the schemes, and mitigation and avoidance measures proposed. It should also be noted that well designed schemes have the potential to lead to enhancements to the public realm and the setting of the historic environment. Similarly, measures which help to relieve congestion may support improvements to local distinctiveness and the quality of the public realm, with benefits for the setting of the historic environment. In relation to Option GO2, an approach which focuses to a greater degree on optimising existing transport infrastructure has the potential to incorporate proposals which better reveal the significance of heritage assets. In addition, through doing the most of the options to encourage of modal shift, facilitate a limitation in traffic flows and improve traffic management, the option has the potential to do more to limit adverse effects from traffic on the setting of historic environment assets. In this respect a ‘do minimum’ approach taken forward through Option GO1 has somewhat more limited potential to bring similar benefits.	2	1	3
Landscape	Option GO3, through facilitating the delivery of significant new transport infrastructure, has increased potential to have impacts on townscape and landscape character in and around the Oxford urban area. Option GO1 and GO2, through focusing on the existing urban transport network, is less likely to deliver new infrastructure which has significant impacts on local character, distinctiveness or a sense of place. The significance of effects from schemes initiated by Option GO3 would however depend on the design, layout and scale of the schemes, and the mitigation and avoidance measures proposed. It should also be noted that well designed schemes have the potential to lead to enhancements to the public realm and townscape/landscape character. Similarly, measures which help to	2	1	3

Option GO1: Do minimum
Option GO2: Optimise use of existing infrastructure
Option GO3: Initiate more significant interventions

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		GO 1	GO 2	GO 3
	relieve congestion may support improvements to local distinctiveness and the quality of the public realm. With regards to Option GO2, an approach which focuses on existing corridors is less likely to lead to direct adverse impacts on townscape and landscape character. Local character also has the potential to benefit from initiatives taken forward through this option by an encouragement of modal shift, a limitation in traffic flows and improved traffic management. This will help limit adverse effects from traffic on the townscape and landscape character. In this respect a 'do minimum' approach taken forward through Option GO1 has less potential to initiate measures which bring these benefits.			
Air Quality and Noise	Oxford City Council previously declared Air Quality Management Areas (AQMAs) in central Oxford (2003) and at Green Road roundabout (2005) where it was deemed probable that the annual mean nitrogen dioxide objective will not be met. Following further detailed assessments in 2008 and 2009 several additional areas were identified where the annual mean nitrogen dioxide objective will not be met. In September 2010 the City Council made an Air Quality Management Order declaring the whole of the city as an AQMA, to include the seven localised hotspots where pollution levels of nitrogen dioxide have exceeded national objectives. AQMAs were also declared for nitrogen dioxide relating to transport emissions for parts of Botley in 2008 and, by Cherwell District Council, Kidlington in 2014. Through delivering a more comprehensive package of schemes which supports modal shift to alternative modes of transport to the private car, Option GO2 has more potential than Option GO1 to support air and noise quality enhancements in and around Oxford. Option GO3, through bringing forward junction capacity enhancements and new road schemes has the potential to lead to air quality enhancements at key 'pinchpoints' on the network which have existing air quality issues. In combination with an expansion of Park and Ride provision and development of the network into a rapid transit system, or delivery of major rail proposals, this has the potential to support significant enhancements of air quality at specific locations. However, through junction improvements and road schemes contributing to an overall increase in traffic flows on the wider road network, the option has the potential to increase traffic flows over a broader area, including through stimulating induced demand. This may contribute to increases in emissions of the key pollutants which affect air quality over a wider area. For the same reason, the option also has the potential to lead to more significant effects on noise quality.	2	1	3
Climate Change	Option GO3's promotion of road schemes that relieve congestion and / or increase capacity has the potential effect of releasing demand for vehicle trips currently suppressed. As such the release of this induced demand may lead to increases in greenhouse gas emissions, even with rail improvements proposed through the option. An expansion of Park and Ride provision through the option also has the potential to encourage use of the private car for at least part of the journey. Option GO2, through delivering a more comprehensive package of schemes that Option GO1, will do more to support modal shift to alternative modes of transport to the private car. As such the option has additional potential to support a limitation of greenhouse gas emissions from transport. In terms of adapting to the effects of climate change, Option GO3, and to a lesser extent, Option GO2, has more potential than Option GO1 to lead to	2	1	3

Option GO1: Do minimum
Option GO2: Optimise use of existing infrastructure
Option GO3: Initiate more significant interventions

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		GO 1	GO 2	GO 3
	proposals which enhance the resilience of particular locations to climate change. This is given the option will deliver transport schemes with the potential to initiate physical measures which will limit climate change impacts. However, the effect of initiatives depends on detailed interventions, including scheme design and layout, the integration of green infrastructure provision and other measures to help regulate the effects of extreme weather events. Similarly, the effect of initiatives on fluvial, surface water and groundwater flooding depend on scheme design considerations, including location, design and layout and the implementation of measures such as sustainable drainage systems.			
Healthy and Safe Communities	A do minimum approach promoted through Option GO1 would do less to help address the key socio-economic and quality of life issues influenced by transport in and around the Oxford urban area. In this context a range of issues are less likely to be addressed without appropriate interventions, including accessibility issues, congestion and severance issues, and elements relating to social exclusion. Option GO2, through providing a focus on improved bus services and enhancements to walking and cycling linkages would do more than Option GO1 to encourage public transport use and active travel. In addition to supporting social inclusion and community vitality, this will contribute to the quality of life of residents through limiting the impact of traffic and congestion on neighbourhoods and on severance issues. In addition to increasing travel choice through initiating significant transport capacity enhancements, including by rail, Option GO3 has the potential to lead to a range of economic opportunities through enhancing connections with the strategic and local transport network and key employment and growth areas. This will help maximise economic opportunities and enhance the vitality of the county's economy through improvements in transport connectivity. Option GO3, through enabling a reduction of congestion at key bottlenecks on the network, has the potential to reduce the impacts of traffic and congestion on health and wellbeing at these locations. This includes through enhancements to air and noise quality, and improvements in the quality of the public realm. However, a potential stimulation of traffic growth over a larger area due to induced demand has the potential to have wider negative effects on health and wellbeing of residents through impacts on the quality of the public realm and a contribution to air and noise pollution. This does however have the potential to be offset by the additional enhancements to the rail and Park and Ride network facilitated by the option. Option GO2 has increased potential to support modal shift from the private car. This will support healthier modes of travel, including through encouraging active travel modes such as walking and cycling. Through promoting modal shift, and limiting induced demand, it also offers the potential to support air and noise quality enhancements and enhancements to the quality of the public realm. This will support the health and wellbeing of residents. Options GO2 and GO3 have increased potential to facilitate enhancements to multifunctional green infrastructure networks in the Oxford area alongside transport infrastructure improvements, including along existing transport corridors. This will provide benefits for health and wellbeing. Option GO1, through initiating a do minimum approach, has the least potential to address the transport issues which adversely affect health and wellbeing.	3	2	1

Option GO1: Do minimum
Option GO2: Optimise use of existing infrastructure
Option GO3: Initiate more significant interventions

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		GO 1	GO 2	GO 3
Equalities	Groups with 'protected characteristics' tend to be disproportionately affected by the negative effects of transport infrastructure, including from the physical and severance effects of transport corridors, effects on the quality of the public realm, and the effects of traffic and congestion on health and wellbeing. These groups are also disproportionately affected by accessibility issues. In this context, Option GO2, which seeks to 1) enhance accessibility by public transport and walking and cycling and 2) limit the impact of the private car on the built environment, including through demand management measures, will do more to support the needs of groups with protected characteristics. Whilst a significant expansion of transport capacity proposed through Option GO3 has the potential to support accessibility for certain groups, the option has some potential to impact on equalities groups through stimulating car use. This includes through impacting on the quality of local neighbourhoods and increasing severance issues. In addition, the option has increased potential to impact on the health and wellbeing of these groups through undermining air and noise quality and impacting on road safety. However, it should be noted that the benefits from the more significant interventions through this option, including with regards to the additional enhancements to the rail and Park and Ride network will help offset these potential impacts. With regard to Option GO1, a do minimum approach would do less to help address the key socio-economic and quality of life issues influenced by transport in Oxford and is less likely to address the transport and accessibility needs of groups with protected characteristics.	3	2	1

Market Towns

3.15 These options cover the larger market towns in Oxfordshire, including Banbury, Abingdon, Bicester, Witney and the Science Vale (comprising the grouping of Wantage, Grove, Didcot, Harwell, Milton and Culham).

3.16 **Figures 3.5** to **3.7** highlight the key environmental constraints in these locations.

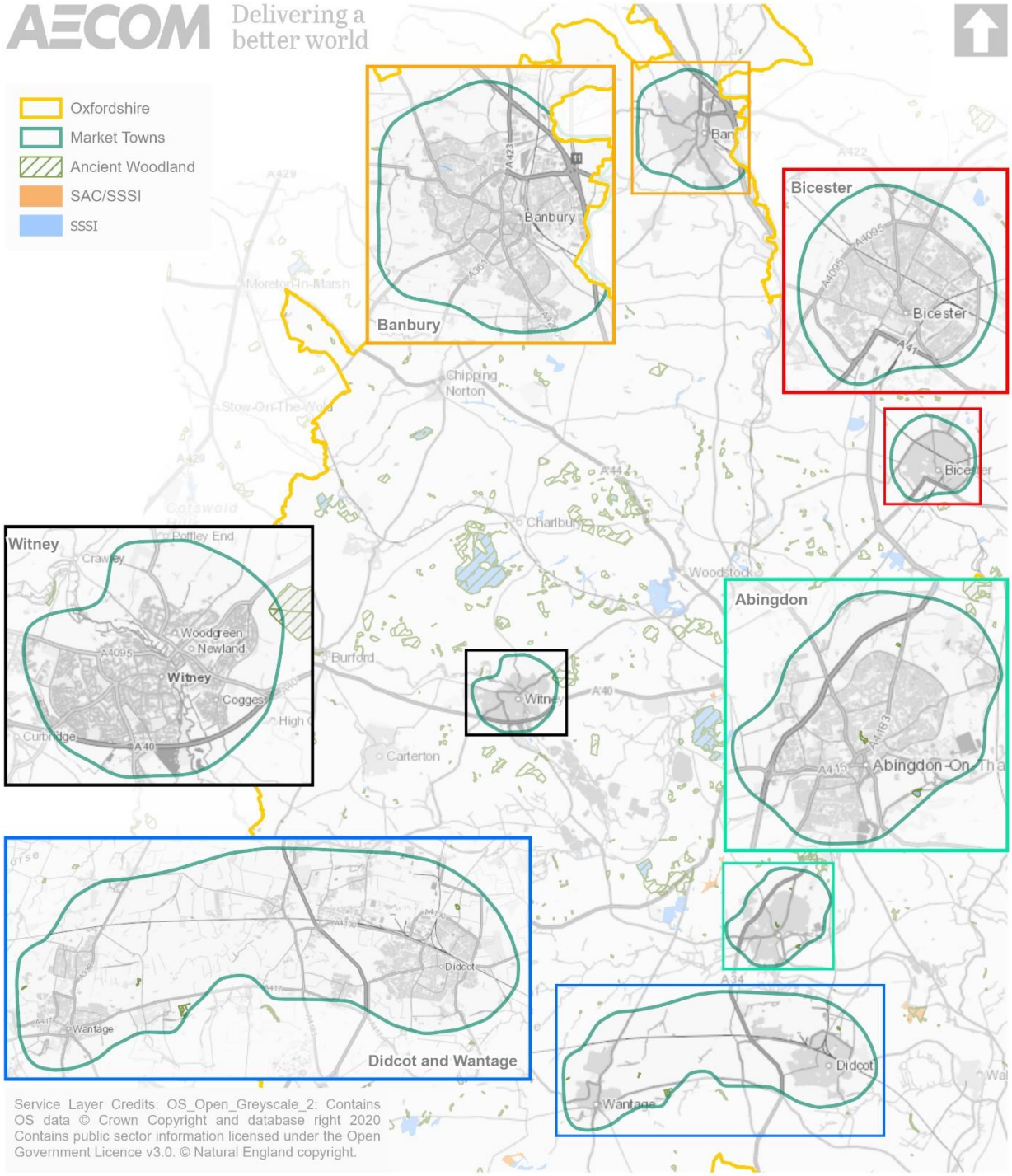

Figure 3.5: Biodiversity designations in the vicinity of Oxfordshire's market towns

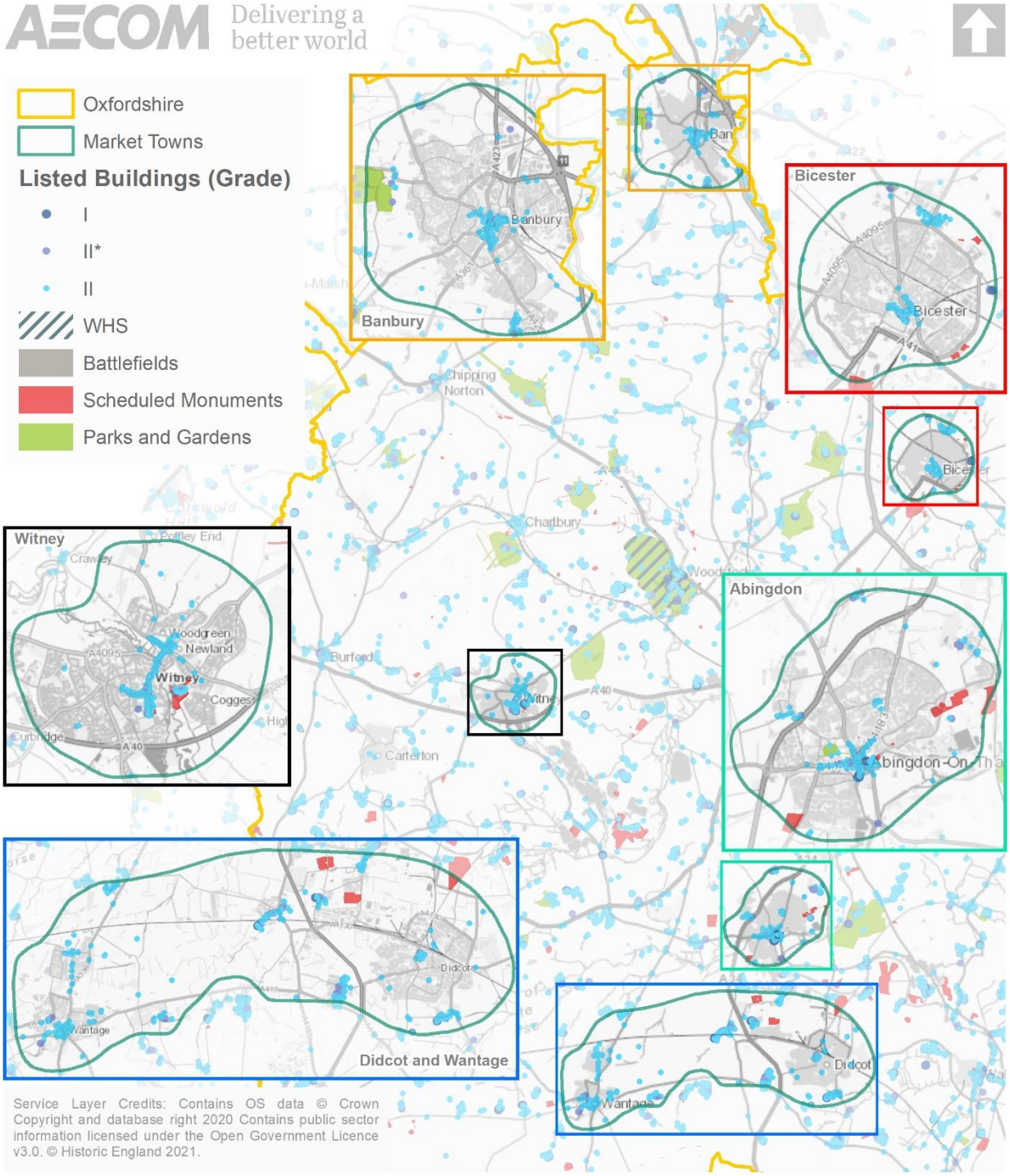

Figure 3.6 Historic environment designations in the vicinity of Oxfordshire's market towns

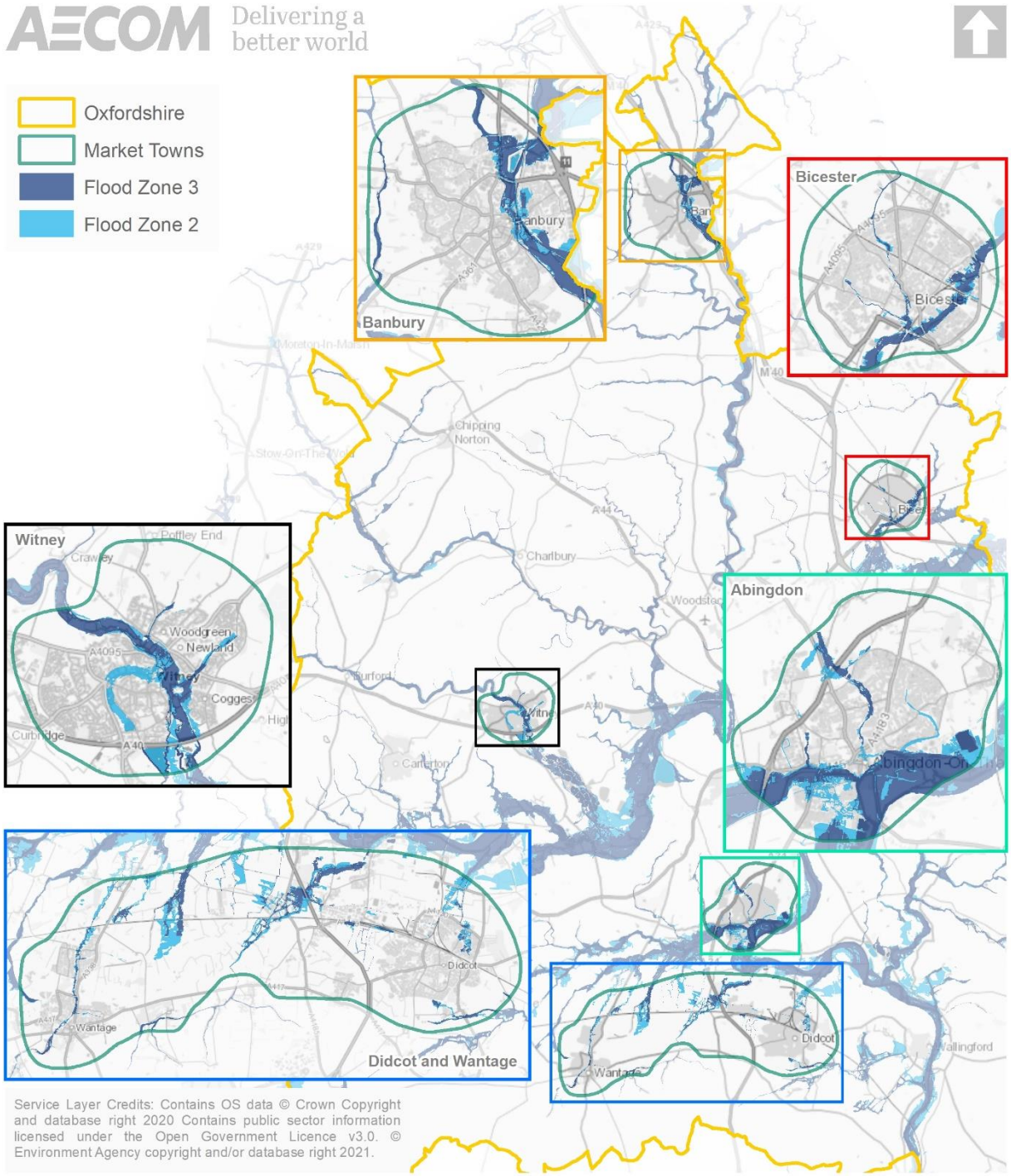

Figure 3.7: Flood zones in the vicinity of Oxfordshire's market towns

3.17 Three options have been considered as alternatives for the ISA, as follows.

Option MT1: Do minimum

3.18 A do minimum option would rely on committed investment in transport infrastructure in the vicinity of the market towns, which would continue at a local and strategic level. In practice this would comprise road corridor/junction improvements and some public realm, active travel and public transport improvements.

Option MT2: Optimise use of existing infrastructure

3.19 This option would seek to support Oxfordshire's market towns to make better use of existing transport networks. This includes through delivering measures such as enhancements to bus services, improved road maintenance regimes, electric charging infrastructure and enhanced walking and cycling links. The option would also seek to support the vitality of town centres and the visitor economy through high quality design and layout of transport infrastructure.

Option MT3: Initiate more significant physical interventions

3.20 This would seek to deliver more significant physical interventions to the transport network, including new transport corridors (including link roads), and enhanced Park and Ride provision (which could play a role in some towns). It would also include larger active travel schemes, Low Traffic Neighbourhoods and Oxfordshire wide cycle network connections. It could also include the introduction of demand management measures and the delivery of mobility/transport hubs.

Appraisal findings

3.21 The following table presents appraisal findings in relation to the three options introduced above. These are organised by the eight ISA themes.

3.22 For each ISA theme, a commentary on the likely effects is presented. Options are also ranked numerically reflecting their relative sustainability performance, with '1' the most favourable ranking and '3' the least favourable ranking.

Table 3.2: Appraisal of options for Oxfordshire's market towns

Option MT1: Do minimum
Option MT2: Optimise use of existing infrastructure
Option MT3: Initiate more significant physical interventions

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		MT1	MT2	MT3
Biodiversity	In terms of internationally and nationally designated sites present in the vicinity of the market towns, three of the market towns have small SSSIs located within or close to their urban areas. These are Neithrop Cutting SSSI (which is on the route of a former railway line in the north west of Banbury), Culham Brake (which is a small area of willow carr located by the River Thames east of Abingdon) and Ducklington Mead SSSI (which is located to the south east of Witney and comprises unimproved meadow situated between two arms of the River Windrush). Given their size, nature and location, these are not significant constraints in the context of the options being considered. All of the settlements have a range of important biodiversity habitats present locally, including BAP Priority Habitats, and also Local Wildlife Sites and Local Geological Sites. All three options have the potential to lead to effects on habitats and species without the implementation of appropriate avoidance and mitigation measures. However, Option MT2, which focuses on optimising the existing transport network rather than new physical infrastructure, would be least likely to lead to significant impacts on biodiversity	2	1	3

Option MT1: Do minimum
Option MT2: Optimise use of existing infrastructure
Option MT3: Initiate more significant physical interventions

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		MT1	MT2	MT3
	networks. Option MT3, through delivering a broader range of transport measures requiring new physical infrastructure and interventions, has the potential to lead to additional impacts on habitats and ecological networks in the vicinities of market towns. These are likely to be more far reaching than the current approach being taken forward through Option MT1. It should also be noted though that delivery of new and enhanced transport infrastructure may support some enhancements to biodiversity networks. In this context there is scope for transport infrastructure enhancements in the vicinities of the market towns to support environmental net gain locally. This includes through delivering enhancements in the numerous Network Enhancement Zones and Network Expansion Zones identified in the vicinities of the towns.			
Water and Soil Resources	In terms of impacts on land and soils resources, Option MT3 has the potential to lead to additional land take through the delivery of new more significant physical interventions to the transport network, including new transport corridors (including link roads), and enhanced Park and Ride provision (which could play a role in some towns). This has the potential to lead to land take on productive agricultural land, potentially leading to the loss of land classified as the best and most versatile agricultural land. Less significant effects are likely to take place from Option MT1, and through focussing on the existing transport network, Option MT2, would be least likely to lead to significant landtake on productive agricultural land. No significant impacts on water quality would be anticipated from schemes linked to the three options if the required embedded mitigation measures are incorporated within the construction and operational stage.	2	1	3
Historic Environment	Oxfordshire's market towns have a rich historic environment resource. This is highlighted by the presence of significant clusters of listed features in and around the towns and the presence of conservation areas in each of the settlements considered under these options. The significance of direct effects on the historic environment from the interventions taken forward through each option will depend on the design, layout and scale of the schemes, and mitigation and avoidance measures proposed. Options MT1 and MT3, through delivering new physical transport infrastructure, have the potential to have direct effects on the fabric and setting of features and areas of historic environment interest in and around Abingdon, Banbury, Bicester, Witney and the settlements in the Science Vale. Direct impacts from Option MT1, when compared to Option MT3, will however be limited by the significantly smaller scale of the new physical infrastructure likely to be taken forward through the option and the fact that much of it will be delivered through committed investment. Option MT2, whilst not delivering significant new physical infrastructure, has the potential to have impacts on existing transport corridors through initiating interventions which will optimise the network. The option however seeks to support the vitality of existing settlements through delivering high quality design and layout of transport infrastructure. In this respect the option has the potential to deliver well designed schemes which lead to enhancements to the public realm and the fabric and setting of the historic environment. In terms of indirect effects to the significance of historic environment assets, Option MT3 will do most to encourage car use. In this context, through initiating a range of measures which will stimulate traffic flows	2	1	3

Option MT1: Do minimum
Option MT2: Optimise use of existing infrastructure
Option MT3: Initiate more significant physical interventions

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		MT1	MT2	MT3
	(such as the construction of new link roads and Park and Ride provision), the option has the potential to increase impacts on the fabric and setting of the historic environment. This includes through facilitating a release of induced demand on the road network. Option MT2, through initiating an increased focus on modal shift from the private car, will support the fabric and setting of the historic environment through a limitation in traffic flows and improved traffic management. This will help limit adverse effects from traffic and congestion on the fabric and setting of historic environment assets. In this respect a 'do minimum' approach taken forward through Option MT1 has more limited potential to bring similar benefits.			
Landscape	The North Wessex Downs AONB is located to the south of Didcot and Wantage. Witney is also located 2km south east of the Cotswolds AONB. Whilst no nationally designated landscapes are located within the immediate vicinities of the other market towns, the hinterland of each of the towns have a distinctive landscape character which is valued by residents and visitors alike. In addition, the towns have a distinctive townscape, as highlighted by the presence of conservation areas in many parts of the towns. Options MT1 and MT3, through delivering new physical transport infrastructure, has the potential to have direct effects on landscape character around Abingdon, Banbury, Bicester, Witney and the settlements in the Science Vale. This includes on the special qualities of the North Wessex Downs AONB in the vicinity of the Science Vale. Direct impacts from Option MT1, when compared to Option MT3, will however be limited by the significantly smaller scale of the new physical infrastructure likely to be taken forward through the option and the fact that much of it will be delivered through committed investment. Option MT2, whilst not delivering significant new physical infrastructure, has the potential to have impacts on existing transport corridors through initiating interventions which will optimise the network. The option however seeks to support the vitality of existing settlements through delivering high quality design and layout of transport infrastructure. In this respect the option has the potential to deliver well designed schemes which support townscape character. In terms of indirect effects to landscape character, Option MT3 will do most to encourage car use. In this context, through initiating a range of measures which will stimulate traffic flows (such as the construction of new link roads and Park and Ride provision), the option has the potential to increase impacts on landscape and townscape character through visual and noise impacts. This includes through facilitating a release of induced demand on the road network. Option MT2, through initiating an increased focus on modal shift from the private car, will support landscape character through a limitation in traffic flows and improved traffic management. This will help limit adverse effects from traffic and congestion landscape character. In this respect a 'do minimum' approach taken forward through Option MT1 has more limited potential to bring similar benefits.	2	1	3
Air Quality and Noise	AQMAs are present in the following settlements considered under these options: Abingdon, Bicester and Badbury and Witney. Of the options, Option MT3 will do most to encourage car use. In this context, through initiating a range of measures which will stimulate traffic flows (such as the construction of new link roads and Park and Ride provision), the option has the potential to increase emissions from	2	1	3

Option MT1: Do minimum
Option MT2: Optimise use of existing infrastructure
Option MT3: Initiate more significant physical interventions

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		MT1	MT2	MT3
	transport which affect air quality. This includes through facilitating a release of induced demand on the road network. The option also has the most potential to lead to significant negative effects on noise quality. Option MT2, through initiating an increased focus on modal shift from the private car, will support air and noise quality through a limitation in traffic flows and improved traffic management. In this respect Option MT2 will do more than Option MT1 to support air quality (and noise quality) at hotspots. This includes through delivering a more comprehensive package of schemes which supports modal shift from the private car to public transport and walking and cycling.			
Climate Change	Of the options, Option MT3 will do most to encourage car use. In this context, through initiating a range of measures which will stimulate traffic flows (such as the construction of new link roads and Park and Ride provision), the option has the potential to increase greenhouse gas emissions from transport. This includes through facilitating a release of induced demand on the road network. Option MT2, through initiating an increased focus on modal shift from the private car, will support a limitation of emissions through a limitation in traffic flows and improved traffic management. In this respect Option MT2 will do more than Option MT1 to support a reduction of emissions. This includes through delivering a more comprehensive package of schemes which supports modal shift from the private car to public transport and walking and cycling. In terms of adapting to the effects of climate change, the effect of initiatives taken forward through the options depend on detailed interventions, including scheme design and layout, the integration of green infrastructure provision and other measures to help regulate the effects of extreme weather events. Similarly, the effect of initiatives on fluvial, surface water and groundwater flooding depend on scheme design considerations, including design and layout and the implementation of measures such as sustainable drainage systems.	2	1	3
Healthy and Safe Communities	Option MT2, through delivering additional packages of schemes with a focus on public transport and active travel enhancements, will support social inclusion and community vitality. The option also has the potential to contribute to the quality of life of residents through limiting the impact of traffic and congestion on neighbourhoods and on severance issues. In this respect a do minimum approach promoted through Option MT1 would do less to help address some of the key accessibility issues seen in the vicinities of market towns, including from their surrounding hinterlands. This includes relating to the lack of choices relating to public transport, its affordability and reliability (including during off peak times), and existing pressures on the road network. In addition to increasing travel choice through initiating additional packages of enhancements, Option MT2 has the potential to support the economic vitality of market towns through enhancing connections with the strategic and local transport network. Option MT3, through facilitating a wider range of transport interventions, including new transport corridors, enhanced Park and Ride provision, larger scale active travel schemes, Oxfordshire wide cycle network connections and the delivery of mobility/transport hubs also will support community and economic vitality. In terms of health and wellbeing Option MT2 has increased potential to support modal shift from the private car. This will support healthier modes of travel, including through encouraging active travel modes such as	3	1	2

Option MT1: Do minimum
Option MT2: Optimise use of existing infrastructure
Option MT3: Initiate more significant physical interventions

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		MT1	MT2	MT3
	walking and cycling. Through promoting modal shift, the option also offers the potential to support air and noise quality enhancements and enhancements to the quality of the public realm. This will support the health and wellbeing of residents. Option MT1, through initiating a do minimum approach, has less potential to address the transport issues which adversely affect health and wellbeing in market towns. However, Option MT3, through initiating a wider range of physical infrastructure measures, including road capacity enhancements, has the potential to increase traffic flows and congestion. This has the potential to increase impacts on air and noise quality, and increase road safety and quality of life issues for residents.			
Equalities	Groups with 'protected characteristics' tend to be disproportionately affected by the negative effects of transport infrastructure, including from the physical and severance effects of transport corridors, effects on the quality of the public realm, and the effects of traffic and congestion on health and wellbeing. These groups are also disproportionately affected by accessibility issues. Option MT3 is likely to deliver a comprehensive package of measures for market towns which will deliver travel choice, improve connectivity by all modes of transport and support accessibility. Whilst a significant expansion of transport capacity proposed through Option MT3 has the potential to support accessibility for certain groups, the option has some potential to impact on equalities groups through stimulating car use. This includes through impacting on the quality of local neighbourhoods and increasing severance issues. In addition, the option has increased potential to impact on the health and wellbeing of these groups through undermining air and noise quality and impacting on road safety. However, it should be noted that the benefits from the more significant interventions through this option, including with regards to an expansion of active travel networks, will help offset these potential impacts. With regard to Option MT1, a do minimum approach which relies largely on existing commitments would do less to help address the key socio-economic and quality of life issues influenced by transport in market towns and is less likely to address the transport and accessibility needs of groups with protected characteristics. In this context, Option MT2, which seeks to 1) enhance accessibility by public transport and walking and cycling and 2) limit the impact of the private car on the built environment and secure enhancements to the quality of the public realm, will do more to support the needs of groups with protected characteristics.	3	2	1

Better-connected rural areas

3.23 These options cover the better-connected rural areas in Oxfordshire, focusing on Carterton, Eynsham, Henley, Wallingford, Thame, Faringdon and Chipping Norton.

3.24 **Figures 3.8** to **3.10** highlight the key environmental constraints in these areas.

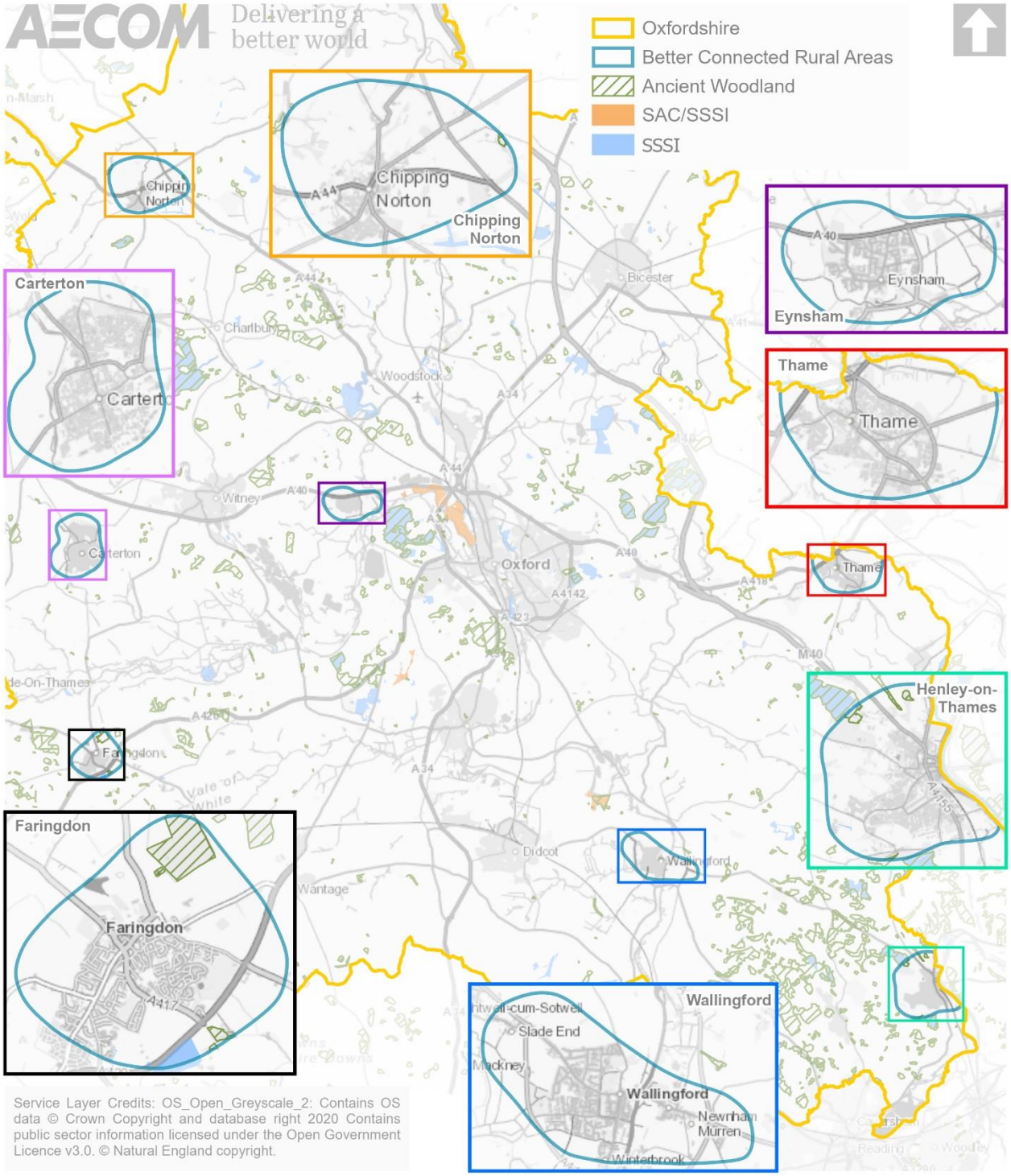

Figure 3.8: Biodiversity designations in the vicinity of better-connected rural areas

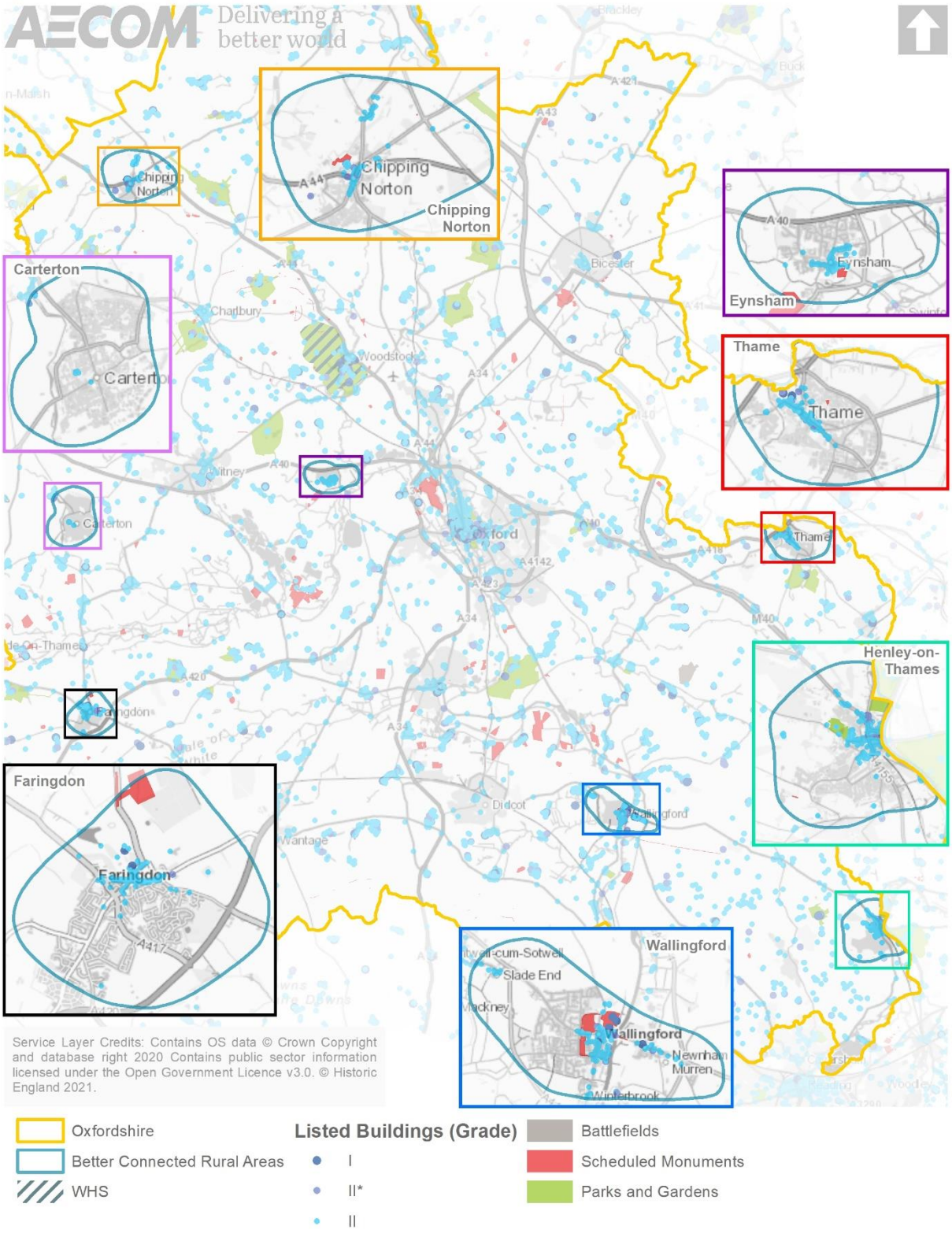

Figure 3.9: Historic environment designations in the vicinity of better-connected rural areas

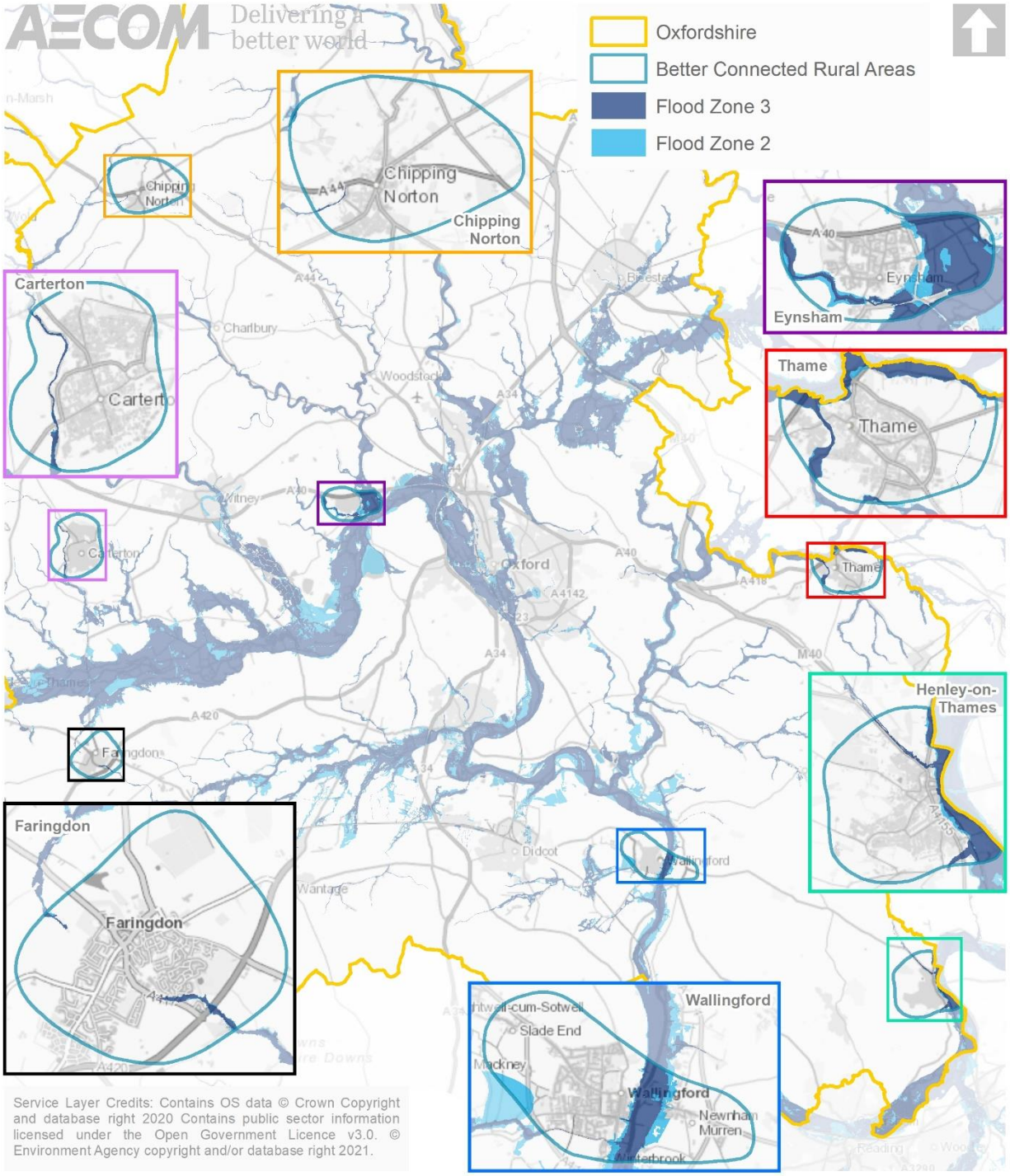

Figure 3.10: Flood zones in the vicinity of better-connected rural areas

3.25 Three options have been considered as alternatives for the ISA, as follows.

Option BR1: Do minimum

3.26 A do minimum option would rely on committed investment in transport infrastructure, which would continue at a local and strategic level. In practice this would mean minor junction improvements and some minor active travel improvements. A new Park and Ride would continue to be delivered at Eynsham.

Option BR2: Optimise use of existing infrastructure

3.27 This option would seek to support more accessible rural areas through making better use of existing transport networks. This includes through delivering measures such as enhancements to bus services, enhanced walking and cycling links, provision of car clubs, improved maintenance regimes and electric charging infrastructure.

Option BR3: Initiate more significant interventions, including with regards to multimodal interchange

3.28 This option would seek to enhance multi-modal interchanges serving rural areas, including through the delivery of new Park and Ride facilities, additional car parking provision at key transport nodes and new walking and cycle links.

Appraisal findings

3.29 The following table presents appraisal findings in relation to the three options introduced above. These are organised by the eight ISA themes.

3.30 For each ISA theme, a commentary on the likely effects is presented. Options are also ranked numerically reflecting their relative sustainability performance, with '1' the most favourable ranking and '3' the least favourable ranking.

Table 3.3: Appraisal of options for Oxfordshire's better-connected rural areas

Option BR1: Do minimum
Option BR2: Optimise use of existing infrastructure
Option BR3: Initiate more significant physical interventions, including with regards to multimodal interchange

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		BR1	BR2	BR3
Biodiversity	In terms of internationally and nationally designated sites present in the vicinity of the areas identified as better-connected rural areas, two of the settlements are located in the immediate vicinity of national designated sites. In this context Henley-on-Thames is located close to four SSSIs, namely Temple Island Meadows SSSI, Lambridge Wood SSSI, Harpsden Wood SSSI and Highlands Farm Pit, and Faringdon is located across from the A420 from the Wicklesham and Coxwell Pits SSSI All of the settlements have a range of important biodiversity habitats present locally, including BAP Priority Habitats, and also Local Wildlife Sites and Local Geological Sites. Option BR3, through initiating more significant transport interventions, including Park & Ride facilities and new car parking provision, has increased potential to lead to significant effects on biodiversity habitats, species and networks. This includes from land take, habitat loss and fragmentation and disturbance. In this respect Option BR1, which relies on committed investment, and Option BR2, which focuses on enhancing existing transport infrastructure with limited physical interventions would lead to fewer physical impacts on key areas of sensitivity. It should also be noted that the delivery of new and enhanced transport infrastructure may support some enhancements to biodiversity networks. For example, the Government's 25-year Environment Plan seeks to embed an environmental net gain principle for infrastructure development. In this context there is scope for the delivery of new transport infrastructure to support environmental net gain in rural areas. This includes through delivering enhancements in the Network Enhancement	1	2	3

Option BR1: Do minimum

Option BR2: Optimise use of existing infrastructure

Option BR3: Initiate more significant physical interventions, including with regards to multimodal interchange

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		BR1	BR2	BR3
	Zones[6] and Network Expansion Zones[7] identified in many rural areas of Oxfordshire by Natural England.			
Water and Soil Resources	Option BR3, through facilitating the delivery of additional new physical transport infrastructure (including Park & Ride sites), will require increased landtake than Option BR1 and BR2. This has increased potential to lead to the development of previously undeveloped land, including potentially productive land classified as the best and most versatile agricultural land. Without mitigation measures, additional delivery of new transport infrastructure such as Park & Ride sites has the potential to have impacts on water and soil quality through increases in surface water run-off. However, no significant impacts on water quality would be anticipated from schemes if the required embedded mitigation measures are incorporated within the construction and operational stage.	1	1	3
Historic Environment	The parts of Oxfordshire identified as better-connected rural areas have a rich historic environment. The increased number of physical transport infrastructure schemes likely to be initiated through Option BR3 have the potential to lead to impacts on the key assets (including designated features and areas) located in the vicinity of the locations targeted for interventions. The significance of effects from these interventions will however depend on design, layout and scale of the schemes, and mitigation and avoidance measures proposed. It should also be noted that well designed schemes have the potential to lead to enhancements to the public realm and the setting of the historic environment. Similarly, measures which help to relieve congestion may support improvements to local distinctiveness and the quality of the public realm, with benefits for the setting of the historic environment. In relation to Option BR2, an approach which focuses to a greater degree on soft measures, technological solutions and optimising the existing network is less likely to lead to direct adverse impacts on the historic environment and historic landscape/townscape character. The setting of the historic environment also has the potential to benefit from initiatives taken forward through this option by an encouragement of modal shift, a limitation in traffic flows and improved traffic management. This will help limit adverse effects from traffic on the setting of historic environment assets. In this respect a 'do minimum' approach taken forward through Option BR1 has more limited potential to bring similar benefits.	2	1	3
Landscape	In terms of the locations considered under these options, Chipping Norton is within and Carterton is located 1.75km from the Cotswolds AONB, Henley-on-Thames and Wallingford are located adjacent to the Chilterns AONB, and Wallingford is adjacent to the North Wessex Downs AONB. In this respect Option BR3, through facilitating the delivery of additional transport infrastructure, including Park & Ride, in the vicinity of these settlements has additional potential to lead to impacts on the special qualities of the AONBs present locally. This includes through the loss of features of landscape value, impacts on local distinctiveness and effects on tranquillity. Options BR1 and BR2, through focusing less on the delivery of physical infrastructure enhancements, are unlikely to deliver	2	1	3

[6] Network Enhancement Zones comprise land within close proximity to existing habitat components that have been identified by Natural England as likely to be suitable for habitat re-creation for the particular habitat.

7 Network Expansion Zones are areas identified with potential for expanding, linking and joining biodiversity networks.

Option BR1: Do minimum
Option BR2: Optimise use of existing infrastructure
Option BR3: Initiate more significant physical interventions, including with regards to multimodal interchange

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		BR1	BR2	BR3
	transport initiatives which have significant impacts on these nationally designated landscapes, or more broadly, landscape character. The significance of effects from schemes initiated by Option BR3 would however depend on the design, layout and scale of the schemes, and the mitigation and avoidance measures proposed. It should also be noted that well designed schemes have the potential to lead to enhancements to the public realm and local character. Similarly, measures which help to relieve congestion may support improvements to local distinctiveness and the quality of the public realm. With regards to Option BR2, an approach which focuses to a greater degree on soft measures, technological solutions and active travel is less likely to lead to direct adverse impacts on landscape character. Local character also has the potential to benefit from initiatives taken forward through this option by an encouragement of modal shift, a limitation in traffic flows and improved traffic management. This will help limit adverse effects from traffic on landscape character. In this respect a 'do minimum' approach taken forward through Option BR1 has less potential to initiate measures which bring these benefits.			
Air Quality and Noise	Air quality is an issue for some of the settlements considered under these options. This includes Chipping Norton, Henley-on-Thames, Wallingford, where AQMAs have been declared for emissions of nitrogen dioxide. In addition, noise quality is an important issue for some rural areas. Options BR2 and BR3 will do more though than Option BR1 to deliver packages of schemes which supports modal shift from the private car to public transport and walking and cycling, with benefits for noise and air quality. Option BR3, through introducing new Park & Ride provision at some locations, may however increase noise and air quality issues at locations closer to such facilities. In addition, Option BR2, through delivering improved communications infrastructure such as broadband and mobile phone infrastructure enhancements, may do more to reduce the need to travel for key services and facilities. This will support noise and air quality.	2	1	3
Climate Change	Option BR2 has a close focus on technical solutions to transport challenges. Through delivering improved communications infrastructure such as broadband and mobile phone infrastructure enhancements, the option will support a reduction of the need to travel to key services, facilities and opportunities. The option also has a focus on smart travel, community transport, provision of car clubs and improvements to electric charging infrastructure. In this context, the option will initiate a range of approaches which will help limit greenhouse gas emissions from transport. Option BR3, as part of its proposed package of interventions, seeks to deliver enhanced multimodal interchange, including new Park & Ride provision and parking provision. The overall effect of these interventions on greenhouse gas emissions is uncertain. Whilst Park & Ride provision will support modal shift for at least part of users' journey, it also has the potential to encourage car use. However, this option recognises that car travel will remain the predominant choice for many living in rural areas, and such provision has the potential to support modal shift for at least part of the journey. In this respect the detailed location and design of such multi-modal provision should be carefully considered to ensure that newly generated trips are limited, and benefits maximised.	2	1	3

Option BR1: Do minimum
Option BR2: Optimise use of existing infrastructure
Option BR3: Initiate more significant physical interventions, including with regards to multimodal interchange

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		BR1	BR2	BR3
	Option BR1 will do less to initiate interventions which will limit greenhouse gas emissions from transport in rural areas. This is given it relies on committed investment in transport infrastructure. As such, Option BR2, through combining an approach which seeks to limit the need to travel, promote modal shift from the private car, whilst supporting the decarbonisation of private travel, will do the most of the options to support climate change mitigation in rural areas through limiting greenhouse gas emissions from transport. In terms of adapting to the effects of climate change, the effect of initiatives taken forward through the options depend on detailed interventions, including scheme design and layout, the integration of green infrastructure provision and other measures to help regulate the effects of extreme weather events. Similarly, the effect of initiatives on fluvial, surface water and groundwater flooding depend on scheme design considerations, including design and layout and the implementation of measures such as sustainable drainage systems.			
Healthy and Safe Communities	A 'do minimum' approach relying on existing commitments promoted through Option BR1 would do the least of the options to address the key socio-economic and quality of life issues influenced by transport in rural areas. In this context a range of issues are less likely to be addressed without appropriate interventions, including accessibility issues, the useability and affordability of public transport, and social exclusion. Option BR2, through seeking to support rural bus services, promoting smart travel / 'on demand' community transport, and provision of car clubs, will help support accessibility for those without access to a private car. In addition, through delivering improved communications infrastructure such as broadband and mobile phone infrastructure enhancements, the option will support a reduction of the need to travel to key services, facilities and opportunities, with benefits for social inclusion. Option BR3 recognises that car use will remain a key choice for many in rural areas through seeking to enhance multimodal interchange, including potentially through Park & Ride. This will support accessibility for those with access to private transport. Options BR2 and BR3 will therefore both bring benefits for the quality of life of rural residents. In this context a mixture of the schemes taken forward through these options would be likely to deliver most benefits for those living in rural areas. In addition to increasing travel choice, Options BR2 and BR3 have the potential to support economic vitality through enhancing connections to key services, facilities and employment opportunities and supporting the visitor economy. Option BR2 will also support the diversification of the rural economy through enhancing digital connectivity in rural areas. Health and wellbeing are closely linked to deprivation issues. In this context deprivation in rural areas is directly influenced by accessibility and social exclusion issues. This is highlighted by the higher levels of deprivation seen in rural areas relating to the 'Barriers to Housing and Services' domain. In this respect Options BR2 and BR3 will do more to deliver accessibility enhancements which will help limit deprivation in rural areas. Option BR1, through initiating a do minimum approach, has the least potential to address the transport issues which adversely affect health and wellbeing in rural areas.			

Option BR1: Do minimum

Option BR2: Optimise use of existing infrastructure

Option BR3: Initiate more significant physical interventions, including with regards to multimodal interchange

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		BR1	BR2	BR3
Equalities	In rural areas, groups with 'protected characteristics' tend to be disproportionately affected by accessibility issues. For those lacking their own transport, including the young, the elderly, and those with mobility issues, access to services and facilities is a significant challenge. These groups are often the least able to afford high costs of public transport and research shows that, on average, people on lower incomes in rural areas pay a higher proportion of their income on travel costs. In this respect Options BR2 and BR3 will do more to deliver accessibility enhancements which will support the needs of equalities groups in the better-connected rural areas of Oxfordshire. Option BR2, through supporting rural bus services and providing an additional impetus on smart travel / 'on demand' community transport will help enhance accessibility to those groups without access to a private car. Communications enhancements, including to broadband and mobile phone infrastructure will also help overcome some of the barriers to accessing services and facilities for those with protected characteristics. Option BR3 recognises that car use will remain the predominant and necessary choice for many of those with protected characteristics in rural areas through seeking to enhance multimodal interchange, including potentially through Park & Ride. This will support accessibility for those with access to private transport. Option BR1, through initiating a do minimum approach, has the least potential to enhance accessibility for those groups with protected characteristics in the rural areas in Oxfordshire.	3	2	1

Less well-connected rural areas

3.31 These options cover the less well-connected rural areas in Oxfordshire, incorporating the rural hinterland of the county and smaller towns. These include Burford, Woodstock, Shrivenham, Kingston Bagpuize, Watlington, Chinnor, Chalgrove, Deddington, Kirtlington, and Upper Heyford.

3.32 **Figures 3.11** to **3.13** highlight the key environmental constraints in these areas.

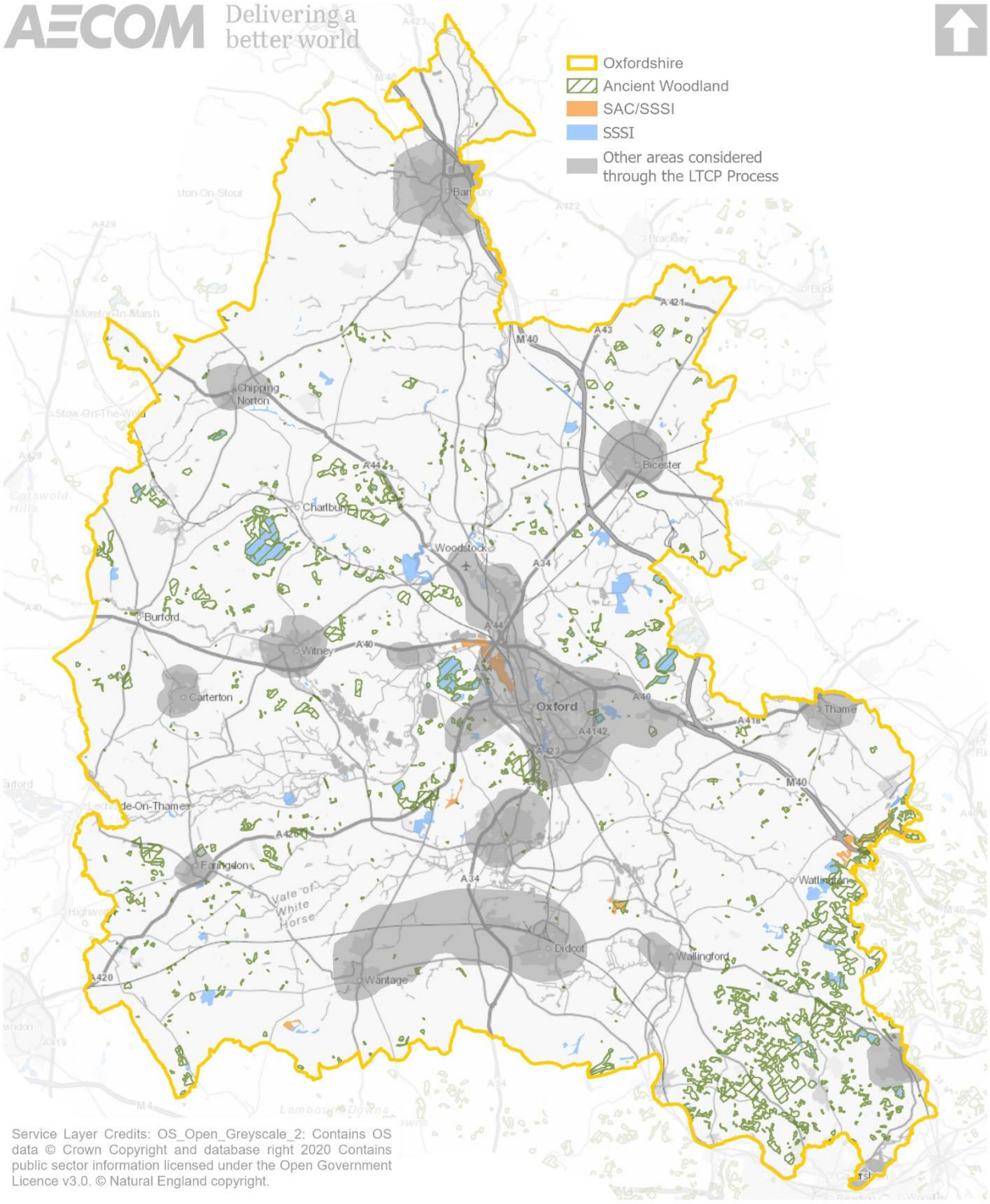

Figure 3.11: Biodiversity designations in the vicinity of less well-connected rural areas

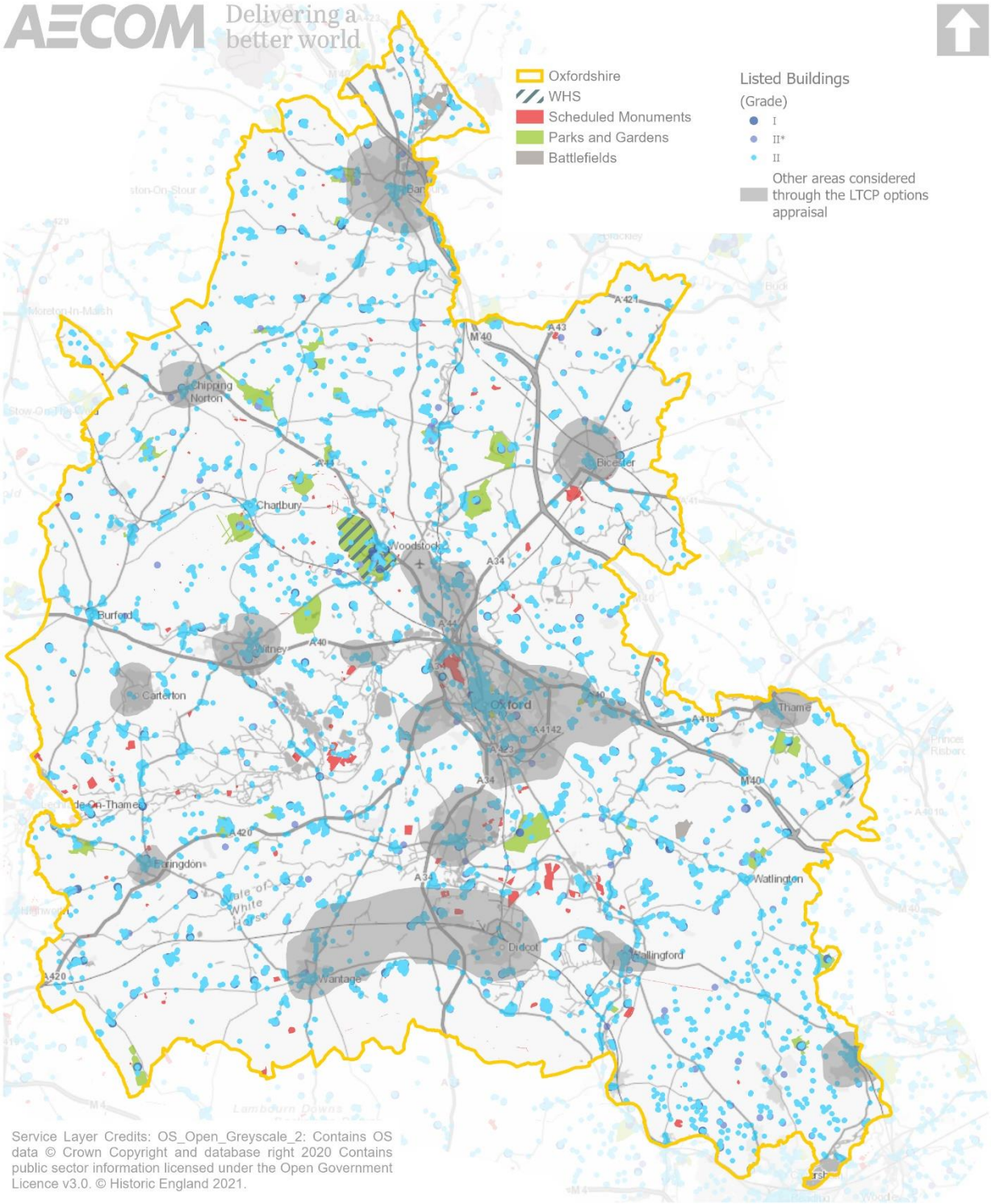

Figure 3.12: Historic environment designations in the vicinity of less well-connected rural areas

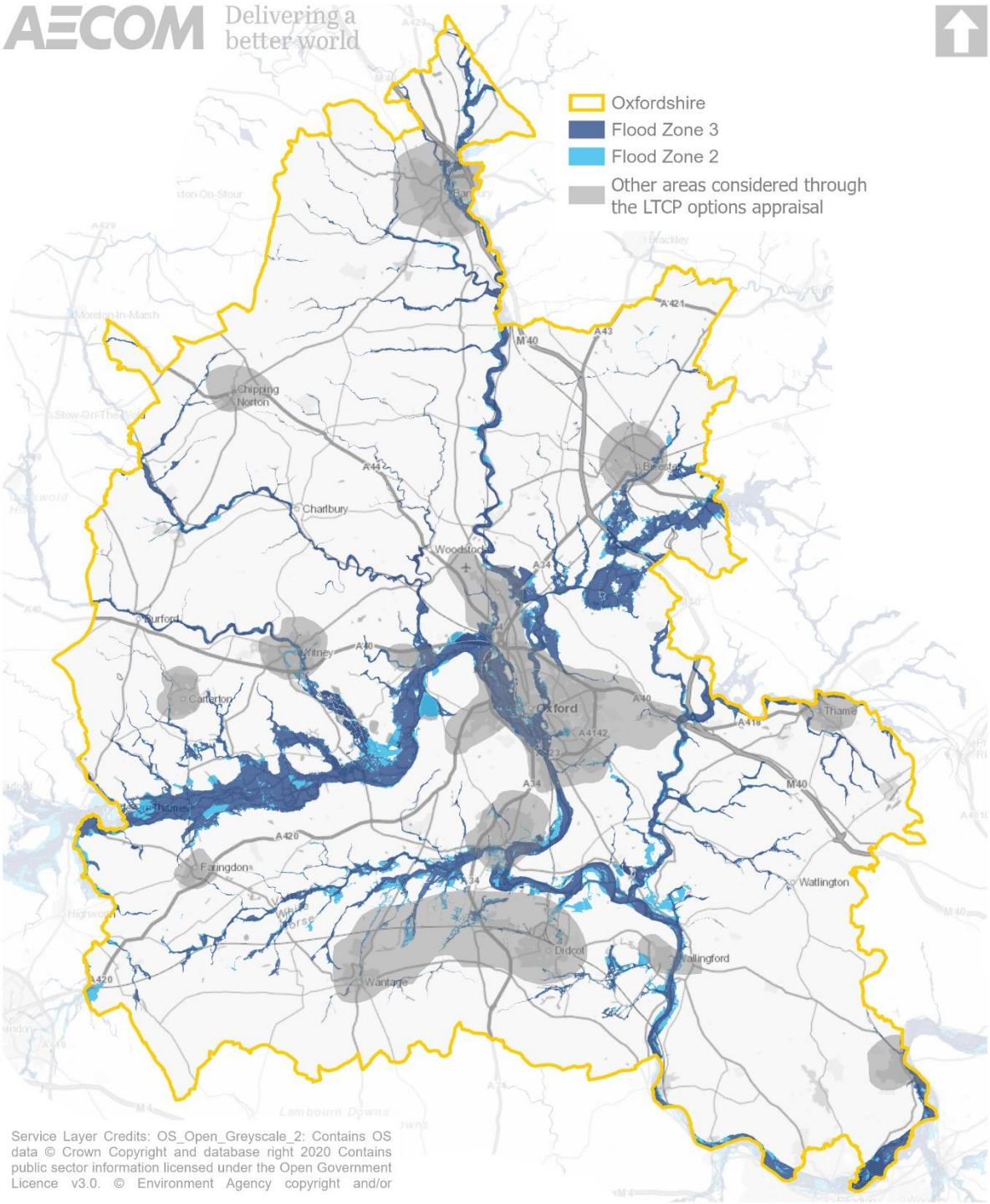

Figure 3.13: Flood zones in the vicinity of less well-connected rural areas

3.33 Three options have been considered as alternatives for the ISA, as follows.

Option LR1: Do minimum

3.34 A do minimum option would rely on committed investment in transport infrastructure, which would continue at a local and strategic level. In practice this would mean some minor active travel, public transport or road improvements. A number of larger schemes have also been proposed linked to new development, for example in the vicinity of Chalgrove.

Option LR2: Optimise use of existing infrastructure and take a technological approach to transport challenges in rural areas

3.35 This option would seek to make best use of existing infrastructure. It would include measures such as supporting rural bus services, providing an additional impetus on smart travel / 'on demand' community transport, provision of car clubs, communications enhancements (including broadband and mobile phone infrastructure improvements) and improvements to electric charging infrastructure.

Option LR3: Initiate more significant interventions, including with regards to multimodal interchange

3.36 This option would seek to enhance multi-modal interchanges serving rural areas, including through the delivery of new Park and Ride facilities, and additional car parking provision, including at key sub-regional transport nodes. This could also include the development of a countywide walking and cycling network.

Appraisal findings

3.37 The following table presents appraisal findings in relation to the three options introduced above. These are organised by the eight ISA themes.

3.38 For each ISA theme, a commentary on the likely effects is presented. Options are also ranked numerically reflecting their relative sustainability performance, with '1' the most favourable ranking and '3' the least favourable ranking.

Table 3.4: Appraisal of options for Oxfordshire's less well-connected rural areas

Option LR1: Do minimum
Option LR2: Optimise use of existing infrastructure and take a technological approach to transport challenges in rural areas
Option LR3: Initiate more significant interventions, including with regards to multimodal interchange

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		LR1	LR2	LR3
Biodiversity	The rural areas of Oxfordshire have a significant number of internationally designated sites, including SACs, SPAs and Ramsar sites, and nationally designated sites including SSSIs and National Nature Reserves. These cover a range of internationally and nationally significant habitats and form important components of regional and national ecological networks. In addition, there are numerous areas of biodiversity value which are not covered by statutory designations, which hold a range of important habitats and protected species. Option LR3, through initiating more significant transport interventions, including Park & Ride facilities and new car parking provision, has increased potential to lead to significant effects on biodiversity habitats, species and networks. This includes from land take, habitat loss and fragmentation and disturbance. In this respect Option LR1, which relies on committed investment, and Option LR2, which focuses on enhancing existing transport infrastructure with limited physical interventions would lead to fewer physical impacts on key areas of sensitivity. It should also be noted that the delivery of new and enhanced transport infrastructure may support some enhancements to biodiversity networks. For example, the Government's 25-year Environment Plan seeks to embed an environment net gain principle for infrastructure development. In this context there is scope for the delivery of new transport infrastructure to support environmental net gain in rural areas. This includes through delivering enhancements in the Network Enhancement	1	2	3

Option LR1: Do minimum
Option LR2: Optimise use of existing infrastructure and take a technological approach to transport challenges in rural areas
Option LR3: Initiate more significant interventions, including with regards to multimodal interchange

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		LR1	LR2	LR3
	Zones[8] and Network Expansion Zones[9] identified in many rural areas of Oxfordshire by Natural England.			
Water and Soil Resources	Option LR3, through facilitating the delivery of additional new physical transport infrastructure (including Park & Ride sites), will require increased landtake than Option LR1 and LR2. This has increased potential to lead to the development of previously undeveloped land, including potentially productive land classified as the best and most versatile agricultural land. Without mitigation measures, additional delivery of new transport infrastructure such as Park & Ride sites has the potential to have impacts on water and soil quality through increases in surface water run-off. However, no significant impacts on water quality would be anticipated from schemes if the required embedded mitigation measures are incorporated within the construction and operational stage.	1=	1=	3
Historic Environment	The rural areas of Oxfordshire have a rich historic environment. This is accompanied by distinctive historic landscapes, including within the three AONBs designated in the county. The increased number of physical transport infrastructure schemes likely to be initiated through Option LR3 have the potential to lead to impacts on the key assets (including designated features and areas) located in the vicinity of the locations targeted for interventions. The significance of effects from these interventions will however depend on design, layout and scale of the schemes, and mitigation and avoidance measures proposed. It should also be noted that well designed schemes have the potential to lead to enhancements to the public realm and the setting of the historic environment. Similarly, measures which help to relieve congestion may support improvements to local distinctiveness and the quality of the public realm, with benefits for the setting of the historic environment. In relation to Option LR2, an approach which focuses to a greater degree on soft measures, technological solutions and demand management measures is less likely to lead to direct adverse impacts on the historic environment and historic landscape/townscape character. The setting of the historic environment also has the potential to benefit from initiatives taken forward through this option by an encouragement of modal shift, a limitation in traffic flows and improved traffic management. This will help limit adverse effects from traffic on the setting of historic environment assets. In this respect a 'do minimum' approach taken forward through Option LR1 has reduced potential to bring similar benefits.	2	1	3
Landscape	The landscapes of the rural areas of Oxfordshire are attractive and diverse. In this respect, the Oxfordshire Wildlife and Landscape Study identifies 24 separate landscape types within the county, made up of individual landscape description units with a similar pattern of geology, topography, land use and settlements. The value of the landscape is recognised by the presence of the nationally designated landscapes of the North Wessex Downs AONB covering part of the south of Oxfordshire, the Chilterns AONB covering part of south eastern Oxfordshire and the Cotswolds AONB covering the north western part of Oxfordshire.	2	1	3

[8] Network Enhancement Zones comprise land within close proximity to existing habitat components that have been identified by Natural England as likely to be suitable for habitat re-creation for the particular habitat.
9 Network Expansion Zones are areas identified with potential for expanding, linking and joining biodiversity networks.

Option LR1: Do minimum
Option LR2: Optimise use of existing infrastructure and take a technological approach to transport challenges in rural areas
Option LR3: Initiate more significant interventions, including with regards to multimodal interchange

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		LR1	LR2	LR3
	Option LR3, through facilitating the delivery of additional transport infrastructure, including Park & Ride, has additional potential to lead to impacts on landscape character locally. This includes through the loss of features of landscape value, impacts on local distinctiveness and effects on tranquillity. Options LR1 and LR2, through focusing less on the delivery of physical infrastructure enhancements, are unlikely to deliver transport initiatives which have significant impacts on landscape character. The significance of effects from schemes initiated by Option LR3 would however depend on the design, layout and scale of the schemes, and the mitigation and avoidance measures proposed. It should also be noted that well designed schemes have the potential to lead to enhancements to the public realm and local character. Similarly, measures which help to relieve congestion may support improvements to local distinctiveness and the quality of the public realm. With regards to Option LR2, an approach which focuses to a greater degree on soft measures, technological solutions and demand management measures is less likely to lead to direct adverse impacts on landscape character. Local character also has the potential to benefit from initiatives taken forward through this option by an encouragement of modal shift, a limitation in traffic flows and improved traffic management. This will help limit adverse effects from traffic on landscape character. In this respect a 'do minimum' approach taken forward through Option LR1 has less potential to initiate measures which bring these benefits.			
Air Quality and Noise	Air quality is not a significant issue for most rural areas in Oxfordshire; however, at some locations there are air quality issues associated with emissions from road transport (for example in Marcham, where an AQMA was declared along the A415 in 2015). Noise quality is also key issue for many rural areas. Options LR2 and LR3 will do more than Option LR1 to deliver packages of schemes which supports modal shift from the private car to public transport and walking and cycling, with benefits for noise and air quality. Option LR3, through introducing new Park & Ride provision at some locations, may however increase noise and air quality issues at locations closer to such facilities. In addition, Option LR2, through delivering improved communications infrastructure such as broadband and mobile phone infrastructure enhancements, may do more to reduce the need to travel for key services and facilities. This will support noise and air quality.	2	1	3
Climate Change	Option LR2 has a close focus on technical solutions to transport challenges. Through delivering improved communications infrastructure such as broadband and mobile phone infrastructure enhancements, the option will support a reduction of the need to travel to key services, facilities and opportunities. The option also has a focus on smart travel, community transport and maintaining existing public transport links, and on enhancing electric charging infrastructure. In this context, the option will initiate a range of approaches which will help limit greenhouse gas emissions from rural transport. Option LR3, as part of its proposed package of interventions, seeks to deliver enhanced multimodal interchange, including new Park & Ride provision. The overall effect of these interventions on greenhouse gas emissions is uncertain. Whilst Park & Ride provision will support modal shift for at least part of users' journey, it also has the potential to	2	1	3

Option LR1: Do minimum
Option LR2: Optimise use of existing infrastructure and take a technological approach to transport challenges in rural areas
Option LR3: Initiate more significant interventions, including with regards to multimodal interchange

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		LR1	LR2	LR3
	encourage car use. However, this option recognises that car travel will remain the predominant choice for many living in rural areas, and such provision has the potential to support modal shift for at least part of the journey. In this respect the detailed location and design of such multi-modal provision should be carefully considered to ensure that newly generated trips are limited, and benefits maximised. Option LR1 will do less to initiate interventions which will limit greenhouse gas emissions from transport in rural areas, including through providing least support to alternative modes of transport to the private car or the decarbonisation of the transport network. As such, Option LR2, through combining an approach which seeks to limit the need to travel, promote modal shift from the private car, whilst supporting the decarbonisation of private travel, will do most of the options to support climate change mitigation in rural areas through limiting greenhouse gas emissions from transport. In terms of adapting to the effects of climate change, the effect of initiatives taken forward through the options depend on detailed interventions, including scheme design and layout, the integration of green infrastructure provision and other measures to help regulate the effects of extreme weather events. Similarly, the effect of initiatives on fluvial, surface water and groundwater flooding depend on scheme design considerations, including design and layout and the implementation of measures such as sustainable drainage systems.			
Healthy and Safe Communities	A 'do minimum' approach relying on existing commitments promoted through Option LR1 would do the least of the options to address the key socio-economic and quality of life issues influenced by transport in rural areas. In this context a range of issues are less likely to be addressed without appropriate interventions, including rural accessibility issues, the availability and affordability of public transport, and social exclusion. Option LR2, through seeking to maintain existing rural bus services, support smart travel and 'on demand' community transport, will help support accessibility for those without access to a private car. In addition, through delivering improved communications infrastructure such as broadband and mobile phone infrastructure enhancements, the option will support a reduction of the need to travel to key services, facilities and opportunities, with benefits for social inclusion. Option LR3 recognises that car use will remain the predominant and necessary choice for many in rural areas through seeking to enhance multimodal interchange, including potentially through Park & Ride. This will support accessibility for those with access to private transport. Options LR2 and LR3 will therefore both bring benefits for the quality of life of rural residents. In this context a mixture of the schemes taken forward through these options would be likely to deliver most benefits for those living in rural areas. In addition to increasing travel choice, Options LR2 and LR3 have the potential to support economic vitality through enhancing connections to key services, facilities and employment opportunities and supporting the visitor economy. Option LR2 will also support the diversification of the rural economy through enhancing digital connectivity in rural areas. Health and wellbeing are closely linked to deprivation issues. In this context deprivation in rural areas is directly influenced by accessibility and social exclusion issues. This is highlighted by the higher levels of	3	2	1

Option LR1: Do minimum
Option LR2: Optimise use of existing infrastructure and take a technological approach to transport challenges in rural areas
Option LR3: Initiate more significant interventions, including with regards to multimodal interchange

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		LR1	LR2	LR3
	deprivation seen in rural areas relating to the 'Barriers to Housing and Services' domain. In this respect Options LR2 and LR3 will do more to deliver accessibility enhancements which will help limit deprivation in rural areas. Option LR2, through supporting rural bus services and providing an additional impetus on smart travel / 'on demand' community transport will help enhance accessibility to those without access to a private car. Communications enhancements, including to broadband and mobile phone infrastructure will also help overcome some of the barriers to accessing services and facilities. Option LR1, through initiating a do minimum approach, has the least potential to address the transport issues which adversely affect health and wellbeing in rural areas			
Equalities	In rural areas, groups with 'protected characteristics' tend to be disproportionately affected by accessibility issues. For those lacking their own transport, including the young, the elderly, and those with mobility issues, access to services and facilities is a significant challenge. These groups are often the least able to afford high costs of public transport and research shows that, on average, people on lower incomes in rural areas pay a higher proportion of their income on travel costs. In this respect Options LR2 and LR3 will do more to deliver accessibility enhancements which will support the needs of equalities groups in the rural areas of Oxfordshire. Option LR2, through supporting rural bus services and providing an additional impetus on smart travel / 'on demand' community transport will help enhance accessibility to those groups without access to a private car. Communications enhancements, including to broadband and mobile phone infrastructure will also help overcome some of the barriers to accessing services and facilities for those with protected characteristics. Option LR3 recognises that car use will remain the predominant and necessary choice for many of those with protected characteristics in rural areas through seeking to enhance multimodal interchange, including potentially through Park & Ride. This will support accessibility for those with access to private transport. Option LR1, through initiating a do minimum approach, has the least potential to enhance accessibility for those groups with protected characteristics in the rural areas in Oxfordshire.	3	2	1

Overall conclusions

3.39 The assessment of the options considered as reasonable alternatives for the four identfied areas has shown that in many cases that the 'do minimum' option performs less favourably against the ISA themes. This is given these options will do less to deliver enhancements which will help address some of the key accessibility and social inclusion issues experienced in different parts of Oxfordshire, or support economic vitality. Whilst in some cases the do minimum options may reduce the potential for direct adverse environmental effects, they also preclude opportunities to deliver key environmental enhancements in the county, including relating to air and noise quality, the quality of the townscape, landscape and the public realm, or relating to the rejuvenation of features and areas of historic environment interest. In addition, the do minimum options limit opportunities for utilising transport infrastructure enhancements to deliver sub-regional or local environmental net gain or for limiting greenhouse gas emissions.

3.40 The options which focus to a greater degree on 'soft' measures and demand management measures are less likely than the options supporting physical transport capacity enhancements to lead to direct adverse impacts on key environmental and socio-economic receptors in the county. These options also have the potential to deliver significant environmental enhancements and quality of life benefits through the encouragement of modal shift, a reduction in the need to travel, a limitation in traffic flows and improved traffic management.

3.41 The options which propose significant transport capacity enhancements have the potential to have a range of direct impacts on key receptors, including from landtake and impacts on the quality of the public realm. Physical transport capacity enhancements also have the potential to stimulate induced demand, with the potential to lead to direct and indirect impacts on features, areas and networks of environmental sensitivity, air and noise quality and greenhouse gas emissions.

3.42 The significance of effects from these interventions will though depend on the design, layout and scale of the schemes, and the mitigation and avoidance measures proposed. It is also recognised that the implementation of appropriate measures to 'lock in' the benefits of physical transport capacity enhancements is possible with the implementation of an appropriate package of complementary 'soft' transport and demand management measures. It is also recognised that such capacity enhancements have the potential to offer environmental benefits and deliver net gain, if designed appropriately.

4. Options for key LTCP themes

4.1 To support plan making further, the ISA process has considered different approaches that can be taken associated with the key thematic issues currently being explored for the LTCP Part 1.

4.2 In light of this, three sets of options have been developed and appraised through the ISA process relating to the following key themes:

- The climate emergency;
- road safety; and
- freight.

4.3 For each of these key themes a number of options have been identified and subsequently appraised. For each theme a do minimum is described which would be applied in all circumstances, together with two further options for additional levels of intervention over and above the do minimum. These options are designed to reflect the key issues facing the theme, and the different approaches that can be taken to intervention/investment in transport infrastructure and management.

4.4 The detail of the options appraised, and the appraisal findings, are presented below.

Options relating to the climate emergency

4.5 The assessment of these options seeks to explore and support an understanding of different approaches that can be taken would be for delivering a truly net-zero Oxfordshire transport system.

4.6 Three options have been considered as alternatives for the ISA, as follows.

Option CE1: Do minimum

4.7 A do minimum option would rely on committed investment in transport infrastructure, which would continue at a local and strategic level. In practice this would mean road corridor and junction improvements, demand management measures in Oxford, mixture of active travel improvements and some new routes and some public transport schemes

Option CE2: Expand opportunities for electric car use and hydrogen vehicles

4.8 Recognising the falling cost and availability of electric vehicles, this option would focus on the delivery of new and improved infrastructure for such vehicles. Approaches would include improved charging infrastructure (including off street charging hubs and on street solutions where possible), enhanced parking availability and a reduction in charges for electric vehicles (including parking charges). The option would also seek to facilitate the delivery of new and improved infrastructure for hydrogen vehicles, recognising recent advances in this technology.

Option CE3: Demand management measures and enhancements in digital connectivity

4.9 This option would take a demand management approach, which would seek to limit significantly the number of private vehicles on the road. Approaches include zero emission zones, higher parking charges, a restriction in Park and Ride use and enhancements in digital connectivity.

Appraisal findings

4.10 The following table presents appraisal findings in relation to the three options introduced above. These are organised by the eight ISA themes.

4.11 For each ISA theme, a commentary on the likely effects is presented. Options are also ranked numerically reflecting their relative sustainability performance, with '1' the most favourable ranking and '3' the least favourable ranking.

Table 4.1: Appraisal of options relating to the climate emergency

Option CE1: Do minimum
Option CE2: Expand opportunities for electric car use and hydrogen vehicles
Option CE3: Demand management measures and enhancements in digital connectivity

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		CE1	CE2	CE3
Biodiversity	Air pollution is a major driving force changing the natural environment, which changes the basic structure and function of ecosystems and the biodiversity which it supports. Deposited directly from the air and rain, nitrogen from transport enriches and acidifies the soil. This contributes to eutrophication and causes a competition effect where the more vulnerable plants cannot compete with hardier or nitrogen-loving plants. Ammonia from catalytic converters is also an issue. In this respect, an expansion of alternative fuelled vehicles stimulated through Option CE2 has the potential to help limit impacts on biodiversity from air quality issues through limiting emissions of nitrogen dioxide from transport. Similarly, a focus on demand management measures and enhancements in digital connectivity through Option CE3 will support a reduction of emissions from transport. This latter option may also serve to limit the need for new transport infrastructure which might impact on habitats and species through reducing demand for travel. A do minimum approach promoted through Option CE1 would do least to limit impacts from transport on habitats and species.	3	1=	1=
Water and Soil Resources	Option CE1, through facilitating the delivery of additional new physical transport infrastructure would require increased landtake than Options CE2 and CE3. This has increased potential to lead to the development of previously undeveloped land, including potentially productive land classified as the best and most versatile agricultural land. However it should be noted that as Option CE1 is a 'do minimum' option it is unlikely that the other options would significantly reduce land take given schemes would likely progress regardless. In the longer term though, reduced demand for road transport under Option CE3 has the potential to limit the need for new physical infrastructure associated with road transport. Without mitigation measures, additional delivery of new transport infrastructure through the options also has the potential to have impacts on water and soil quality through increases in surface water run-off. However, no significant impacts on water quality would be anticipated from schemes if the required embedded mitigation measures are incorporated within the construction and operational stage.	2=	2=	1
Historic Environment	Option CE3, which focuses to a greater degree on demand management measures and on reducing the need to travel through digital communication enhancements will help preclude direct adverse impacts on the historic environment and historic landscape/townscape character. The setting of the historic environment also has the potential to benefit from initiatives taken forward through this option by an encouragement of modal shift, a limitation in traffic flows and improved traffic management. This will help limit adverse effects from traffic on the setting of historic environment assets. Option CE2, which seeks to encourage the take up of electric vehicles will also support the setting of the historic environment through supporting improvements to noise quality. The physical transport infrastructure schemes likely to be initiated through Option CE1 have the potential to lead to impacts on the key assets (including designated features and areas) located in the vicinity of the key routes and areas targeted for interventions. The significance of effects	3	2	1

Option CE1: Do minimum
Option CE2: Expand opportunities for electric car use and hydrogen vehicles
Option CE3: Demand management measures and enhancements in digital connectivity

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		CE1	CE2	CE3
	from these interventions will however depend on design, layout and scale of the schemes, and mitigation and avoidance measures proposed. It should also be noted that committed schemes are likely to continue to take place through Options CE2 and CE3.			
Landscape	Option CE3, which focuses to a greater degree on demand management measures and on reducing the need to travel through digital communication enhancements, will help preclude direct adverse impacts on landscape character from new transport infrastructure. The setting of landscape character also has the potential to benefit from initiatives taken forward through this option by an encouragement of modal shift, a limitation in traffic flows and improved traffic management. This will help limit adverse effects from traffic on the landscape. Option CE2, which seeks to encourage the take up of electric vehicles will also support landscape character through supporting improvements to noise quality. The increased number of physical transport infrastructure schemes likely to be initiated through Option CE1 have the potential to lead to impacts on the specific and distinct characteristics of the landscape in the vicinity of the key routes and areas targeted for interventions. The significance of effects from these interventions will however depend on design, layout and scale of the schemes, and mitigation and avoidance measures proposed. It should also be noted that committed schemes are likely to continue to take place through Options CE2 and CE3.	3	2	1
Air Quality and Noise	There are 13 AQMAs within Oxfordshire, all of which been designated for exceedances in the annual mean concentration objective of 40µg/m^3 for nitrogen dioxide (NO_2) An expansion of alternative fuelled vehicles stimulated through Option CE2 will help limit emissions of nitrogen dioxide from transport. This is particularly likely to have benefits for air quality in Oxford city and the towns of Oxfordshire, where the majority of air quality issues exist. Similarly, a focus on demand management measures and enhancements in digital connectivity through Option CE3 will support a reduction of emissions from transport. Given electric vehicles will continue to emit particulate matter from road, tyre and brake wear, an overall reduction in car use has the most potential to support air quality improvements in the county. Both Options CE2 and CE3 will help support improvements to noise quality. In terms of Option CE2, an additional shift to electric vehicles (which are quieter than combustion models) has the potential to reduce noise pollution, especially in urban areas where speeds are generally low and traffic often stands still. Option CE3, through potentially facilitating an increased degree of modal shift, a limitation in traffic flows and improved traffic management will also support noise quality. A do minimum approach promoted through Option CE1 would do least to limit impacts from transport on air and noise quality.	3	2	1
Climate Change	Whilst over the entire lifecycle of a vehicle, the difference is less pronounced, there is a significant difference in greenhouse gas emissions between vehicles with a combustion engine and electric vehicles. Option CE2, through seeking to further stimulate electric vehicle use, will help decarbonise the transport sector. Similarly, a focus on demand management measures and enhancements in digital connectivity through Option CE3 will support a reduction of greenhouse gas emissions from transport through helping to limit traffic flows. In this respect both options	3	2	1

Option CE1: Do minimum
Option CE2: Expand opportunities for electric car use and hydrogen vehicles
Option CE3: Demand management measures and enhancements in digital connectivity

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		CE1	CE2	CE3
	will support the target to make Oxfordshire's transport network zero-carbon by 2040. A do minimum approach promoted through Option CE1 would do least of the options to limit greenhouse gas emissions from transport or decarbonise the transport sector.			
Healthy and Safe Communities	There is increasing evidence that poor air quality has significant impacts on health and wellbeing. Breathing air with a high concentration of NO_2 can irritate airways in the human respiratory system. Such exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), and emergency hospital admissions. Longer exposures to elevated concentrations of NO_2 may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. People with asthma, as well as children and the elderly are generally at greater risk for the health effects of NO_2. It can also cause early death from both short-term and long-term exposure, causes cardiovascular harm (e.g. heart attacks, strokes, heart disease, congestive heart failure), is likely to cause respiratory harm and may cause reproductive and developmental harm. A recent report published by the government estimates that between 28,000 and 36,000 people die as a result of air pollution every year in the UK.[10] In this respect, a shift to electric vehicles promoted by Option CE2 will have benefits for health and wellbeing through supporting enhancements to air quality. A focus on demand management measures and enhancements in digital connectivity through Option CE3 will also support air quality, and also the use of healthier modes of travel through encouraging modal shift and reducing the demand for travel by the private vehicle. More broadly, accessibility will be supported by a continuation of the current approach proposed by Option CE1, which seeks to initiate interventions which deliver a balanced transport network. However, a focus on demand management and restricting the use of the private vehicle through Option CE3 has the potential to reduce accessibility for those reliant on a car. This may particularly impact on those living in less accessible locations, including rural areas. A presumption towards electric vehicle use through Option CE2 may benefit some sectors of society more than others. These issues have been discussed under the Equalities theme below.	1	2	3
Equalities	Groups with 'protected characteristics' tend to be disproportionately affected by the negative effects of transport infrastructure, including from the physical and severance effects of transport corridors, effects on the quality of the public realm, and the effects of traffic and congestion on health and wellbeing. In this context, Option CE3, which seeks to limit demand for private car use, will help limit impacts of the transport network needs of groups with protected characteristics. However, a focus on demand management and restricting the use of the private vehicle through Option CE3 has the potential to reduce accessibility for those groups with protected characteristics reliant on a car. This may particularly impact on those living in less accessible locations of Oxfordshire, including rural areas.	1	2	3

[10] Committee on the Medical Effects of Air Pollutants (August 2018) Associations of long-term average concentrations of nitrogen dioxide with mortality https://www.gov.uk/government/publications/nitrogen-dioxide-effects-on-mortality

Option CE1: Do minimum
Option CE2: Expand opportunities for electric car use and hydrogen vehicles
Option CE3: Demand management measures and enhancements in digital connectivity

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		CE1	CE2	CE3
	Option CE2, which seeks to facilitate an increased uptake in electric vehicle use, will support groups with protected characteristics who are particularly affected by air quality and noise issues associated with traffic and congestion. However, in terms of mobility, a focus on electric vehicle use through the option has the potential to raise equalities issues. This is associated with the barriers to electric car uptake which exist in respect of the initial higher capital costs of electric vehicles and, in the short term, the availability of charging provision. In this respect groups with protected characteristics, particularly those from a lower socio-economic background and those living in urban areas are less likely to see the benefit of such as approach. With regard to Option CE1, an approach which assumes 'business as usual' would continue to support the transport and accessibility needs of groups with protected characteristics.			

Options relating to road safety

4.12 Road safety is a key issue for Oxfordshire, with various discussions taking place as to how to address the issue. This includes a potential reduction of speed limits in different parts of the county. As such number of alternative options relating to the issue has been considered through the ISA.

4.13 These options are as follows.

Option RS1: Continue with the current approach to speed limits

4.14 This would continue with the current approach to speed limits. This allows Oxfordshire County Council to set local speed limits in situations where local needs and conditions suggest a speed limit which is lower than the national speed limit is appropriate.

Option RS2: Apply a 20mph zone in urban areas

4.15 This would apply a blanket 20mph zone on routes which are currently have a 30mph speed limit, but only in urban areas.

Option RS3: Apply a 20mph limit to areas within 30mph zones

4.16 This would apply a blanket replacement of current 30mph zones in the county with 20mph zones.

Appraisal findings

4.17 The following table presents appraisal findings in relation to the three options introduced above. These are organised by the eight ISA themes.

4.18 For each ISA theme, a commentary on the likely effects is presented. Options are also ranked numerically reflecting their relative sustainability performance, with '1' the most favourable ranking and '3' the least favourable ranking.

Table 4.2: Appraisal of options relating to road safety

Option RS1: Continue with the current approach to speed limits
Option RS2: Apply a 20mph zone in urban areas
Option RS3: Apply a 20mph limit to areas within 30mph zones

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		RS1	RS2	RS3
Biodiversity	Option RS3 has the most potential to limit impacts on biodiversity in Oxfordshire. This is given lower speeds would help limit traffic collisions involving wildlife in both urban and rural areas, and also help reduce air and noise pollution which impact on habitats and species. Option RS2 would bring similar benefits, but only to urban areas. Effects of Option RS1 would be dependent on the speed limits set locally.	3	2	1
Water and Soil Resources	There are unlikely to be significant differences between the options with regards to land take or impacts on water resources. However, a reduction in speed limits has some limited potential to reduce the potential for water quality impacts from spillages associated with road accidents.	3	2	1
Historic Environment	Higher speeds can impact on the fabric of the historic environment through issues such as vibration. Higher speeds also impact on the setting and wider significance of heritage assets through effects on noise and visual impacts. In this respect, Options RS2 and RS3 have particular potential to reduce speeds in urban and both urban / rural locations respectively. As Option RS3 addresses both urban and rural areas, it is likely to be the best performing of the options in relation to this ISA theme.	3	2	1
Landscape	Higher speeds can impact on landscape and townscape character through effects on noise quality and visual impacts. In this respect, Options RS2 and RS3 have particular potential to reduce speeds in urban and both urban / rural locations respectively. As Option RS3 addresses both urban and rural areas, it is likely to be the best performing of the options in relation to this ISA theme.	3	2	1
Air Quality and Noise	Impacts from lower speeds on air quality are uncertain. In one respect, cars are more efficient and produce fewer emissions at speeds closer to 50mph, and as such are less efficient at 20 mph than 30 mph. However, the greater the speed of vehicles in built-up areas, the higher is the incidence of acceleration, deceleration, and braking, all of which increase air pollution. Similarly, in terms of noise pollution, at speeds below 30mph this is closely linked to the extent to which vehicles accelerate, decelerate and brake. In this respect effects depend on the location of speed limits in association with other measures to enhance road safety (such as traffic calming measures), which may have inadvertent effects on air quality if located in inappropriate locations. It should also be noted that indirect effects of such measures on reducing traffic flows may also support a limitation of emissions. The relative performance of the options is uncertain therefore.	?	?	?
Climate Change	Impacts from lower speeds on greenhouse emissions are uncertain. In one respect, cars are more efficient and produce fewer greenhouse gas emissions at speeds closer to 50mph, and as such are less efficient at 20 mph than 30 mph. However, the greater the speed of vehicles in built-up areas, the higher is the incidence of acceleration, deceleration, and braking, all of which increase emissions. In this respect effects depend on the location of speed limits in association with other measures to enhance road safety (such as traffic calming measures), which may have inadvertent effects on emissions if located in inappropriate locations. It should also be noted that indirect	?	?	?

	effects of such measures on reducing traffic flows may also support a limitation of greenhouse gas emissions. The relative performance of the options is uncertain therefore.			
Healthy and Safe Communities	All options are likely to lead to safety benefits to communities. Furthermore, effective use of speed limits could encourage residents to partake in more healthier modes of travel, including walking and cycling, as a secondary effect of increased safety on roads. This would bring benefits to the overall health and wellbeing of the community. Option RS2 would help to reduce speed limits in urban areas, which would benefit communities at 'high risk' collision zones such as near schools and other sensitive, as well as encouraging walking as a mode of transport. It would also provide benefits to cyclists in urban areas. Given its coverage of rural areas, Option RS3 has the potential to bring additional benefits through a wider coverage of the county. Whilst RS3 and RS2 are likely to bring additional benefits with regards to road safety, there are some uncertainties with regards to speed limits' impacts on air and noise quality (as discussed above). In this respect a flexible approach to speed limits (facilitated by Option RS1) may be appropriate in some circumstances.	3	2	1
Equalities	Option RS2 would help to reduce speed limits in urban areas, which would benefit groups with protected characteristics who are most affected by road safety issues. Given its coverage of rural areas, Option RS3 has the potential to bring additional benefits through a wider coverage of the county. As previously noted under the Healthy and Safe Communities ISA theme, Option RS1 will enable approaches to be tailored to the needs of the existing community, with a view to benefitting those communities at greatest risk of safety and pollution effects from speeding vehicles. However, in principal, Option RS2 has the potential to bring the most overall benefits for groups with protected characteristics.	2	1	3

Options relating to freight

4.19 Freight is an ongoing issue for Oxfordshire. Whilst regional freight cannot be readily influenced by the LTCP, the LTCP's Freight and Logistics Strategy can potentially influence the 'last mile' approach to freight transport. This relates to the last leg of a freight journey to its final destination.

4.20 Last-mile delivery is driving some of the growth in the freight transport industry in terms of the increasing number of LGVs (light goods vehicles) on the county's roads. This is given: the rise in e-commerce, with an associated greater demand for online shopping and home delivery services, express and parcels services; the continued outsourcing of service functions to specialist companies; and increasing demand for smaller, more frequent collections and deliveries to companies (associated with just-in-time distribution). These trends have accelerated as a result of the Covid-19 pandemic.

4.21 As such three options relating to this issue have been considered through the ISA process, as follows.

Option FR1: Continue with the current approach to last mile freight transport

4.22 This would continue with the current approach which does not seek to initiate specific provisions relating to 'last mile' freight transport.

Option FR2: Seek to consolidate last mile freight transport

4.23 This option would seek to deliver initiatives such as area-wide freight management strategies, the use of multi-user freight consolidation centres or mobile depots and micro-consolidation hubs. It would also seek to utilise low carbon modes of transport for the 'last mile' segment of the supply chain, such as e-cargo bikes.

Option FR3: Initiate innovative approaches to last mile freight transport

4.24 This option would encourage the use of drones (autonomous delivery vehicles in the air) and droids (autonomous delivery vehicles on the ground) to undertake last mile freight transport.

Appraisal findings

4.25 The following table presents appraisal findings in relation to the three options introduced above. These are organised by the eight ISA themes.

4.26 For each ISA theme, a commentary on the likely effects is presented. Options are also ranked numerically reflecting their relative sustainability performance, with '1' the most favourable ranking and '3' the least favourable ranking.

Table 4.2: Appraisal of options relating to freight

Option FR1: Continue with the current approach to last mile freight transport
Option FR2: Seek to consolidate last mile freight transport
Option FR3: Initiate innovative approaches to last mile freight transport

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		FR1	FR2	FR3
Biodiversity	Options FR2 and FR3 have the potential to reduce freight traffic in certain locations. This has the potential to reduce impacts from such movements on biodiversity from air and noise quality issues and road kills. Impacts from Option FR3 on some species (including bird species) from innovative approaches such as drones are however uncertain and may need to be managed.	3	1	2
Water and Soil Resources	Options FR2 and FR3 have the potential to reduce freight traffic in certain locations. This may help limit pollutants in surface water run-off from freight vehicles.	3	1	2
Historic Environment	Freight movements can have a significant impact on the fabric of the historic environment through issues such as vibration and impacts on air quality. Freight movements also have an impact on the setting and wider significance of heritage assets through impacts on noise and visual impacts. In this respect, Options FR2 and FR3 have particular potential to reduce freight traffic in certain locations, including built up areas with greater concentrations of heritage assets. This is given the larger numbers of freight movements in these locations for 'last mile' purposes. As Option FR2 is likely to deliver a more comprehensive package for reducing freight traffic than the other options, it is the best performing of the options in relation to this ISA theme.	3	1	2
Landscape	Freight movements can have a significant impact on landscape and townscape character linked to noise and visual impacts. In this respect, Options FR2 and FR3 have the potential to reduce impacts from freight movements on local character. Given Option FR2 is likely to deliver a more comprehensive package for reducing freight traffic than the other options, it is the best performing of the options in relation to this ISA theme.	3	1	2

Option FR1: Continue with the current approach to last mile freight transport
Option FR2: Seek to consolidate last mile freight transport
Option FR3: Initiate innovative approaches to last mile freight transport

ISA theme	Discussion of potential effects and relative merits of options	Rank of preference		
		FR1	FR2	FR3
Air Quality and Noise	Freight movements are a significant contributor to air and noise quality issues on the road network in Oxfordshire. Options FR2 and FR3, through helping to consolidate and limit the number of freight movements associated with the 'last mile' of delivery will therefore help limit inputs to air and noise pollution. The options have the potential to bring particular benefits to air and noise quality in built up areas given the larger number of these types of freight movements in these locations. As Option FR2 is likely to deliver a more comprehensive package for reducing freight traffic than the other options, it is the best performing of the options in relation to this ISA theme.	3	1	2
Climate Change	Freight movements are a significant contributor to greenhouse gas emissions from transport in Oxfordshire. Options FR2 and FR3, through helping to consolidate and limit the number of freight movements associated with the 'last mile' of delivery will therefore help limit greenhouse gas emissions. As Option FR2 is likely to deliver a more comprehensive package for reducing freight traffic than the other options, it is the best performing of the options in relation to this ISA theme.	3	1	2
Healthy and Safe Communities	Freight has a significant effect on health and wellbeing and the quality of life of residents. This includes through impacts on air and noise quality, contributions to road safety issues, and perceptions of safety and security. In this respect Options FR2 and FR3, through helping to consolidate and limit the number of freight movements associated with the 'last mile' of delivery will support the quality of life and health and wellbeing of residents. Given Option FR2 is likely to deliver a more comprehensive package for reducing freight traffic than the other options, it is the best performing of the options in relation to this ISA theme.	3	1	2
Equalities	Groups with 'protected characteristics' tend to be disproportionately affected by the negative effects of freight transport, including from the physical and severance effects, road safety issues, effects on the quality of the public realm, and from air and noise quality. In this respect Options FR2 and FR3, through helping to consolidate and limit the number of freight movements associated with the 'last mile' of delivery will support the quality of life and health and wellbeing of those with protected characteristics. Given Option FR2 is likely to deliver a more comprehensive package for reducing freight traffic than the other options, it has the most potential to bring benefits for equalities groups.	3	1	2

5. Next steps

5.1 This Interim ISA Report has been designed to support the current decision-making process on the draft LTCP, and has been produced voluntarily with the intention of informing this stage of preparation of the LTCP.

5.2 The forthcoming consultation on the LTCP, which is anticipated will be undertaken in November 2021, will be accompanied by a full ISA Report. This will present to stakeholders the information required by the SEA Regulations, and include an assessment of the draft plan as consulted on.

5.3 Following the consultation period, comments will be reviewed and analysed and the HRA will be undertaken and consulted on with Natural England. The final LTCP Part 1 will then be developed, with a view to adoption in 2022. Any changes arising to the LTCP will need to be assessed as part of the ISA process.

5.4 SEA Regulations 16.3c)(iii) and 16.4 require that a 'statement' be made available to accompany the plan, as soon as possible after the adoption of the plan or programme. The purpose of the ISA Statement is to outline how the ISA process has influenced and informed the LTCP development process and demonstrate how consultation on the ISA has been taken into account. To meet these requirements, an ISA Adoption Statement will be published with the adopted version of Part 1 of the LTCP.

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Cherwell District Council and Oxfordshire County Council

Equality and Climate Impact Assessment

Local Transport and Connectivity Plan

August 2021

Contents

Section 1: Summary details

Directorate and Service Area	Environment and Place, Strategic Infrastructure and Planning
What is being assessed (e.g. name of policy, procedure, project, service or proposed service change).	Local Transport and Connectivity Plan
Is this a new or existing function or policy?	New policy document
Summary of assessment Briefly summarise the policy or proposed service change. Summarise possible impacts. Does the proposal bias, discriminate or unfairly disadvantage individuals or groups within the community? (following completion of the assessment).	The LTCP outlines a clear vision to deliver a zero-carbon Oxfordshire transport system that enables the county to thrive whilst, protecting the environment and making Oxfordshire a better place to live for all residents. We plan to achieve this by reducing the need to travel, discouraging unnecessary individual private vehicles and making walking, cycling, public and shared transport the natural first choice. Policies have been identified in a range of key categories in order to achieve this. Possible impacts include improved accessibility benefitting older and disabled residents. It will also help to improve connectivity for rural areas and create a more balanced transport system benefitting all residents, including those in areas of deprivation. Impacts also include benefits for other council services, such as through improved health and a significant contribution to reducing carbon emissions from transport by changing the way residents travel.
Completed By	Joe Kay / Melissa Goodacre
Authorised By	Lauren Rushen / Sandra Fisher-Martins
Date of Assessment	August 2021

Section 2: Detail of proposal

Context / Background Briefly summarise the background to the policy or proposed service change, including reasons for any changes from previous versions.	Local Transport Plans are statutory documents, required under the Transport Act 2008. We are calling ours the Local Transport and Connectivity Plan (LTCP), to better reflect our strategy both for digital infrastructure and for connecting the whole county. The LTCP outlines our long term vision for transport in the county and the policies required to deliver this. The LTCP vision and policies will be used to influence and inform how we manage transport and the types of schemes we implement. The current Local Transport Plan 4 (LTP4) was adopted by the Council in 2016. It has provided a strategic transport policy framework for Oxfordshire over the last few years. However, the local and regional policy context has changed significantly since the publication of LTP4. This includes the council's new corporate priorities, commitment to enabling a zero carbon Oxfordshire by 2050 and increased national emphasis on encouraging walking, cycling and public transport use. The LTCP is an opportunity to develop a transport policy framework that reflects these changes and implements a new way of thinking.
Proposals Explain the detail of the proposals, including why this has been decided as the best course of action.	The LTCP outlines a clear vision to deliver a zero-carbon Oxfordshire transport system that enables the county to thrive whilst, protecting the environment and making Oxfordshire a better place to live for all residents. We plan to achieve this by reducing the need to travel, discouraging unnecessary individual private vehicles and making walking, cycling, public and shared transport the natural first choice. Policies have been identified in the following key categories in order to achieve this: • Walking and cycling • Healthy place shaping • Road safety • Digital connectivity • Public transport • Air and environmental quality • Network and congestion management • Innovation • Data • Freight

	• Regional connectivity • Local connectivity It was decided that this was the best course of action in order to address the following key challenges. These were identified from evidence base analysis, stakeholder engagement and public consultation: • Decarbonisation – Delivering a zero-carbon transport system is a critical part of contributing to UK targets and addressing climate change. • The private car – Increasing private car use is having negative impacts on human health and the environment. • Future growth – Proposals for over 85,000 new jobs and 100,000 new homes in the county will have a significant impact on our transport network. • Connectivity – There is a need to improve connectivity by all modes, particularly along certain corridors. • Wider challenges – Transport is also critical to addressing wider challenges, notably public health, inequalities, air quality, safety and climate action. This course of action was also required because previous approaches to reducing car use in the county have not been successful. Attempts to manage traffic flow and accommodate other modes have been unsuccessful as the car remains the dominant mode of choice. This has created environments that are not welcoming places for people and negatively impact on biodiversity and air quality.
Evidence / Intelligence List and explain any data, consultation outcomes, research findings, feedback from service users and stakeholders etc, that supports your proposals and can help to inform the judgements you make about potential impact on different individuals, communities or groups and our ability to deliver our climate commitments.	The LTCP is supported by an evidence baseline report. Analysis of this data has helped to identify the challenges and underpin the policies identified. This report includes data about: • Policy context • Road and rail links • Private car • Public transport • Walking and cycling • Road safety • Air quality • Freight • Highway maintenance • Health

	• Natural and historic environment • Rivers and canals • Population • Young people • Deprivation • Urban vs rural • Economy • Digital connectivity • Future housing and jobs There have also been 2 rounds of public engagement on the LTCP to date. An engagement exercise was undertaken in Spring 2020, with the public and stakeholders asked to comment on a series of topic papers focused on different transport and connectivity topics. Following this, public consultation was conducted on the vision document in February-March 2021. This included seeking feedback on the draft vision, key themes and proposed policies. Feedback from this consultation has been used to refine the vision, key themes and policies in the LTCP. There has also been engagement with County Councillors through the cross-party Transport Cabinet Advisory Group and Locality Meetings and broader stakeholders via the LTCP Stakeholder Group. The Steering Group includes representatives from transport operators, transport user groups, the Local Enterprise Partnership, and the key employers of Oxford University and Oxford Brookes. All of this engagement has helped to understand different groups needs and refine the proposals in the LTCP.

Alternatives considered / rejected Summarise any other approaches that have been considered in developing the policy or proposed service change, and the reasons why these were not adopted. This could include reasons why doing nothing is not an option.	A do nothing approach was not considered appropriate for a range of reasons. This includes: • Changes to national, sub-national and local policy since 2016 that need to be reflected • The previous LTP4 does not account for new priorities such as decarbonisation • The need for a new approach to transport policy if we are to tackle transport and associated challenges in the county such as congestion and air quality. During the policy drafting process, a range of policies have been developed and amended. There are currently over 80 policies in the LTCP, so we have not included all approaches that were considered here. However, reasons for not progressing certain approaches include poor alignment with the vision and broader objectives, level of ambition and feasibility challenges. The Integrated Sustainability Appraisal that accompanies the LTCP includes a more detailed assessment of reasonable alternatives.

Section 3: Impact Assessment - Protected Characteristics

Protected Characteristic	No Impact	Positive	Negative	Description of Impact	Any actions or mitigation to reduce negative impacts	Action owner* (*Job Title, Organisation)	Timescale and monitoring arrangements
Age	☐	☒	☐	LTCP includes policies that will improve accessibility, benefitting older and younger residents. Key policies that will improve accessibility for different age groups are summarised below. **Walking and cycling** – All of the policies in the walking and cycling section seek to improve the choice of routes available and the range of resident they support. This includes developing greenways which will be traffic free routes for less experienced cyclists such as children. **School Streets** – Will improve road safety by closing roads and make it easier for children to access school by walking or cycling. **Community Transport** – Offers transport solutions to those that are elderly or less mobile, helping to improve accessibility and tackle isolation.		Combination of policies will be delivered by a range of stakeholders.	Annual review and monitoring of LTCP.

Disability	☐	☒	☐	LTCP includes policies that will improve accessibility, benefitting disabled residents. Key policies that will improve accessibility for disabled residents are summarised below. **Transport user hierarchy** – Outlines the way in which we will develop, assess and prioritise transport schemes and policies. This includes mobility aids and non-standard bicycles etc. ensuring future work will consider the needs of disabled residents. **Healthy Streets Approach** - Embedding the Healthy Streets Approach into relevant guidance and decision making processes will improve the human experience of streets and consider factors directly related to disability. **Connected and Autonomous Vehicles (CAV)** – Supporting the uptake of CAV's has the potential to improve the accessibility of disabled residents.		Combination of policies will be delivered by a range of stakeholders.	Annual review and monitoring of LTCP.

Gender Reassignment	☒	☐	☐				
Marriage & Civil Partnership	☒	☐	☐				
Pregnancy & Maternity	☒	☐	☐				

Race	☐	☒	☐	LTCP includes policies that will help to improve access to walking and cycling infrastructure for ethnic minority groups. Key policies that will help to achieve this are summarised below. **Walking and cycling** - All of the policies in the walking and cycling section seek to improve the choice of routes available and the range of residents they support. **Health Impact Assessment (HIA)** – By requiring HIA's for significant infrastructure projects we will ensure impacts on vulnerable or disadvantaged groups are identified and addressed. **Community activation** – Measures to support infrastructure schemes will enable the whole community and particularly those with greatest need to benefit from the improvements.		Combination of policies will be delivered by a range of stakeholders.	Annual review and monitoring of LTCP.

Sex	☐	☒	☐	LTCP includes policies that will help to improve access to walking and cycling infrastructure for women. Key policies that will help to achieve this are the same as those summarised in the previous row.		Combination of policies will be delivered by a range of stakeholders.	Annual review and monitoring of LTCP.
Sexual Orientation	☒	☐	☐				
Religion or Belief	☒	☐	☐				

Section 3: Impact Assessment - Additional Community Impacts

Additional community impacts	No Impact	Positive	Negative	Description of impact	Any actions or mitigation to reduce negative impacts	Action owner (*Job Title, Organisation)	Timescale and monitoring arrangements
Rural communities	☐	☒	☐	The LTCP includes specific consideration for rural communities and includes polices that will improve connectivity. Key policies that will help to achieve this are summarised below. **Strategic active travel network (SATN)** – Development of the SATN will serve as a roadmap for planning walking and cycling improvements in the more rural areas of the county. **Greenways** – Development of Oxfordshire Greenways will provide off-road routes for active travel in rural areas. **Rural journeys** – This policy will ensure we work with partners and stakeholders to develop tailored solutions for our smaller market towns and rural areas that improve connectivity,		Combination of policies will be delivered by a range of stakeholders.	Annual review and monitoring of LTCP.

Additional community impacts	No Impact	Positive	Negative	Description of impact	Any actions or mitigation to reduce negative impacts	Action owner (*Job Title, Organisation)	Timescale and monitoring arrangements
				accessibility, and contribute to delivery of our transport vision			
Armed Forces	☒	☐	☐				
Carers	☒	☐	☐				
Areas of deprivation	☐	☒	☐	The LTCP and its policies will benefit all residents including those in areas of deprivation. Key policies that will help to achieve this are summarised below. **Health Impact Assessment (HIA)** – By requiring HIA's for significant infrastructure projects we will ensure impacts on vulnerable or disadvantaged groups are identified and addressed. **Community activation** – Measures to support infrastructure schemes will enable the whole community and particularly those with greatest		Combination of policies will be delivered by a range of stakeholders.	Annual review and monitoring of LTCP.

Additional community impacts	No Impact	Positive	Negative	Description of impact	Any actions or mitigation to reduce negative impacts	Action owner (*Job Title, Organisation)	Timescale and monitoring arrangements
				need to benefit from the improvements. **Passenger micromobility** – Will improve simple, low cost access to bicycles and e-scooters for all residents and help to unlock more town for more people.			

Section 3: Impact Assessment - Additional Wider Impacts

Additional Wider Impacts	No Impact	Positive	Negative	Description of Impact	Any actions or mitigation to reduce negative impacts	Action owner* (*Job Title, Organisation)	Timescale and monitoring arrangements
Other Council Services	☐	☒	☐	The LTCP will benefit resident's health, wellbeing and accessibility. This will have positive impacts on other services such as public health.		Combination of policies will be delivered by a range of stakeholders.	Annual review and monitoring of LTCP.
Providers	☒	☐	☐				
Social Value [1]	☒	☐	☐				

[1] If the Public Services (Social Value) Act 2012 applies to this proposal, please summarise here how you have considered how the contract might improve the economic, social, and environmental well-being of the relevant area

Section 3: Impact Assessment - Climate Change Impacts

Climate change impacts	No Impact	Positive	Negative	Description of impact	Any actions or mitigation to reduce negative impacts	Action owner (*Job Title, Organisation)	Timescale and monitoring arrangements
Energy use in our buildings or highways	☐	☒	☐	The LTCP will be a key part of changing how residents travel and reducing carbon emissions on our highways. This includes a policy which commits the council to assessing, managing and minimising embodied and operational carbon in transport infrastructure projects.	Assessment of embodied and operational carbon will help future transport infrastructure projects to mitigate or reduce future carbon emissions.	Combination of policies will be delivered by a range of stakeholders.	Annual review and monitoring of LTCP.
Our fleet	☒	☐	☐				
Staff travel	☐	☒	☐	Through the LTCP vision, policies and associated communication, the LTCP may help to change staff travel patterns and encourage the use of walking, cycling, shared and public transport.		Combination of policies will be delivered by a range of stakeholders.	Annual review and monitoring of LTCP.
Purchased services and products	☒	☐	☐				

(including construction)							
Maintained schools	☒	☐	☐				

OCC and CDC aim to be carbon neutral by 2030. How will your proposal affect our ability to reduce carbon emissions related to

We are also committed to enable Cherwell to become carbon neutral by 2030 and Oxfordshire by 2050. How will your proposal affect our ability to:

Climate change impacts	**No Impact**	**Positive**	**Negative**	**Description of impact**	**Any actions or mitigation to reduce negative impacts**	**Action owner** (*Job Title, Organisation)	**Timescale and monitoring arrangements**
Enable carbon emissions reduction at district/county level?	☐	☒	☐	The LTCP will be a key part of changing how residents travel and reducing carbon emissions from transport.		Combination of policies will be delivered by a range of stakeholders.	Annual review and monitoring of LTCP.

Section 4: Review

Where bias, negative impact or disadvantage is identified, the proposal and/or implementation can be adapted or changed; meaning there is a need for regular review. This review may also be needed to reflect additional data and evidence for a fuller assessment (proportionate to the decision in question). Please state the agreed review timescale for the identified impacts of the policy implementation or service change.

Review Date	February 2023 (annual review of LTCP following adoption in early 2022)
Person Responsible for Review	Joe Kay, Strategic Transport Lead
Authorised By	Lauren Rushen / Sandra Fisher-Martins

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